Vermont Department of Environmental Conservation
Waste Management and Prevention Division
Sites Management Section
I-Rule CORRECTIVE ACTION PLAN Checklist

Site Number: **2016-4625**

Site Name: **CityPlace Burlington (former Burlington Town Center)**

Site Address: **49 Church Street**

Site City/Town: **Burlington, VT**

Report Title: **Corrective Action Plan**

Report Date: **May 17, 2018 (**Revised June 14, 2018)

Consultant: **ATC**

Report Author: **Erik Urch**

Deliverable	YES	N/A	Comments	WMPD Use Only	
				Adequate	Inadequate
Subchapter 5. Corrective Action					
§35-505. Corrective Action Plan					
Executive Summary	X		Included		
Public Notice	X		Section 3, Pg 8, Appendix A		
Performance standards	X		Section 4, Pg 10		
Remedial Construction Plan	X		Section 5, Pg 11		
Waste Management Plan	X		Section 6, Pg 14		
Implementation schedule	X		Section 7, Pg 17		
Corrective Action Maintenance Plan	X		Section 8, Pg 18		
Institutional Control Plan	X		Section 9, Pg 19		
Redevelopment and Reuse Plan	X		Section 10, Pg 20		
QA/QC Plan	X		Section 11, Pg 21		
Cost estimate		X	Not applicable		
Updated maps	X		Figures		
Tabular contaminant concentrations	X		Tables		
Cross-sections	X		Appendix B Geotechnical Report		
Proposed contractors and subcontractors	X		Section 12, Pg 22		
P.E. Signature and certification	X		Section 13, Pg 23		

CORRECTIVE ACTION PLAN
CITY PLACE BURLINGTON
49 CHURCH STREET
BURLINGTON, VT

ATC PROJECT NO. 280EM00175

MAY 2018 (Revised June 14, 2018)

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EXECUTIVE SUMMARY

On behalf of BTC Mall Associates, ATC Group Services, LLC (ATC) prepared this Corrective Action Plan (CAP) in accordance with Vermont Department of Environmental Conservation (VTDEC) Investigation and Remediation of Contaminated Properties Rule (iRule, July 27, 2017) for Phase 1 of the CityPlace Burlington redevelopment project (the Site) located at 49 Church Street in Burlington, Vermont. The Site is previously known as Burlington Town Center and is listed by the Vermont Department of Environmental Conservation (VTDEC) as City Center Mall hazardous site #2016-4625.

The Site is undergoing deconstruction activities of existing mall structures to make way for a new mixed-use residential/commercial 14-story building that will include residential apartments, affordable housing, retail space, community space, and an in-building parking garage. The project will also include the re-establishment of Pine and St. Paul Streets between Bank and Cherry Streets. Phase 2 of the project will include future redevelopment of existing mall structures to the east between St. Paul and Church Streets, which are not subject to this CAP.

The objective of this CAP is to mitigate vapor intrusion potential of subsurface vapors into the new building and to complete additional Site Investigation activities. Previous testing indicates that contaminated vapors were present beneath the former mall slab at concentrations exceeding State screening levels. Additional testing of vapors will be performed to evaluate vapor conditions in soils associated with proposed bottom of slab (BOS) grades and to further evaluate potential source(s) of these vapors. These vapors present a risk of exposure to building occupants through the potential vapor intrusion pathway.

An Evaluation of Corrective Action Alternatives (ECAA) was completed by ATC, which identified two common alternatives to mitigate vapor intrusion potential: 1) active sub-slab depressurization system (SSDS) and 2) passive SSDS. ATC recommended the active SSDS primarily because of a more predictable operational performance and more protective of human health. As such, up to four SSDSs will be installed and monitored to mitigate vapor intrusion potential.

1.0 INTRODUCTION

On behalf of BTC Mall Associates (Client), ATC Group Services, LLC (ATC) prepared this revised Corrective Action Plan (CAP) for Phase 1 of the CityPlace Burlington redevelopment project (the Site) located at 49 Church Street in Burlington, Vermont. The revisions were made to address comments received from Ms. Sarah Bartlett of the Vermont Department of Environmental Conservation (VTDEC) in a June 8, 2018 email. Refer to **Figure 1** for a site location map and **Figure 2** for an abutters map. The Site is previously known as Burlington Town Center and is listed by the VTDEC as City Center Mall hazardous site #2016-4625.

As of this writing, the Site is currently undergoing deconstruction activities of existing mall structures to make way for a new mixed-use residential/commercial 14-story building that will include residential apartments, affordable housing, retail space, community space and an in-building parking garage. The project will also include the re-establishment of Pine and St. Paul Streets between Bank and Cherry Streets. Initial construction activities are scheduled to commence in August 2018 following completion of deconstruction activities and the estimated completion of construction is slated for February 2020. Phase 2 of the project will include future redevelopment of existing mall structures to the east between St. Paul and Church Streets, which are not subject to this CAP.

The objective of this CAP is to mitigate vapor intrusion potential of identified subsurface vapors into the new building using a sub-slab depressurization system (SSDS). Additional Site Investigation activities are included in this CAP. This CAP was prepared in accordance with VTDEC Investigation and Remediation of Contaminated Properties Rule (iRule, July 27, 2017). Prior to the implementation of an approved CAP, there is a required 30-day Public Comment Period. A News Brief has been included in **Appendix A**, and should be provided to all impacted or adjacent property owners.

1.1 SITE INFORMATION

The property owner is BTC Mall Associates at 101 Cherry Street, Suite 440, Burlington, VT 05401, dsinex@devonwoodinvestors.com, 802-658-2545.

1.1.1 Site Use and History

The Site is situated within a City block between Cherry and Bank Streets to the north/south and St. Paul and Pine Streets to the east/west, which were previously blocked by the mall but will be re-established as part of the redevelopment. This area is zoned as Mixed Use Downtown Core (FD6) as referenced in the City of Burlington Zoning Map dated February 7, 2018 and is serviced by municipal water, sewer and stormwater. Historic land uses at the Site prior to the 1970s back to at least the 1940s included residential dwellings, an undertaker, a doctor's office and the St. Paul's Church and Chapel, which was destroyed by fire in 1971. These buildings are depicted on the aerial photograph provided in **Figure 3**.

1.1.2 Site Infrastructure and Elevations

Original grade elevations at the Site ranged from approximately 212 to 217 feet above mean sea level (AMSL). In the 1970s, these structures were razed and the original mall structure were

subsequently constructed, along with an expansion of the mall in the 1990s along Bank Street. Bottom of slab (BOS) grades associated with the mall structure ranged from 197.5 to 207.5 feet AMSL, resulting in excavations ranging from 4.5 to 19.5 feet. Therefore, the mall was excavated well into native soils through the removal of a significant amount of overburden. This information indicates that contaminants of concern (COC) identified in soil vapor beneath the mall may be from offsite source(s) related to partitioning from groundwater and/or preferential pathways (utility corridors/penetrations) due to the fact that shallow migration pathways would be hindered by the deep foundations. Additional fate and transport details are provided in later sections of this CAP. Proposed BOS grades for the new building will range from 192.5 to 206.5 AMSL. This is further discussed in the Conceptual Site Model (CSM) in Section 1.3 in the context of groundwater.

1.2 PREVIOUS INVESTIGATIONS

ATC and current/historic geotechnical engineers performed previous investigations at the Site and surrounding area pertinent to this CAP, which are outlined below.

1.2.1 Environmental Data Gap Analysis

In June 2016, Environmental Compliance Services, Inc. (ECS), prior to its acquisition by ATC, completed an Environmental Data Gap Analysis (EDGA) under contract with VTDEC to identify potential near surface and subsurface contaminants (i.e. contaminants of concern (COCs)) that could hinder the redevelopment. This included reviewing pertinent historical documents and reports, Federal and State environmental databases, and VTDEC files for known hazardous waste sites near the Site. At this time, VTDEC listed the Site as a hazardous waste site (#2016-4625) for administrative purposes prior to any knowledge of potential release(s) at the Site.

The EDGA concluded that the following COCs could be present at the Site due to historical use of the Site and surrounding properties, including volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) including polynuclear aromatic hydrocarbons (PAHs), and metals. Several high risk properties were identified during the study or subsequently identified in proximity to the Site, including former dry cleaners, former services garages, and former filling stations (or retail gasoline stations). Historical fossil fuel combustion activities, historic church fires both on and adjacent to Site, and urban fills were also identified during the EDGA and subsequent research activities as potential risks to site soils. Refer to **Figure 3** for an illustration of adjacent high risk sites utilizing a 1961 aerial photograph which represents an appropriate time period for when these sites were active. Additional high risk sites were identified in the EDGA at locations more distal to the Site. **Table T1** below provides additional details.

TABLE T1:
SUMMARY OF ADJACENT HIGH RISK SITES

Site	Address	Activity	Source(s)
Outdoor Gear Exchange (OGE) (Hazardous Site #2015-4576)	37 Church Street	Former dry cleaner, former filling station	State databases, Sanborn Maps
Former AutoCenter	108 Cherry Street	Former service garage, former dry cleaner	State databases, Sanborn Maps, historic photos

Former Israel Solomon Tailor & Dry Cleaning	170 Bank Street	Former dry cleaner	State databases, historic photos
Former Gulf Station	149 Bank Street	Former service garage, former filling station	Historic photos
MacAulliffe Office Products (closed Hazardous Site #91-1022)	Unknown	Former gasoline USTs	State databases

Based on the results of the EDGA, ECS recommended developing a comprehensive sampling and analysis plan to assess potential impacts to groundwater, soil and soil vapor at the Site. The plan was to focus on but not limited to potential impacts from potential migration from the adjacent OGE site using a tiered sampling approach to minimize disturbance to existing mall activities and to adhere to the redevelopment demolition and construction schedule. ECS also recommended additional analytical testing for soil characterization purposes and if COCs were identified, to perform a risk assessment to determine risk to future building occupants and construction workers in addition to developing a Soil Management Plan (SMP) and Site-Specific Health & Safety Plan (HASP). Following consultations with Client and DEC, it was determined that the investigation would focus on the elements outlined below.

1.2.2 Initial Site Investigation

In April 2017, ATC completed an initial site investigation (ISI) which included soil and sub-slab soil vapor sampling at the Site. Soil sampling was performed at six locations (GD-B1 through GD-B6) around the perimeter of the existing mall footprint within proposed construction depths in conjunction with geotechnical evaluations outlined in the next section. Soil quality data are summarized in **Tables 1, 2, 3, and 4,** which include updated soil screening values (SSVs) including Vermont Screening Levels (VSLs) and EPA Regional Screening Levels (RSLs) for residential soils. Sub-slab soil vapor sampling was performed at five locations (SSVP-1 through SSVP-5) throughout the lowest floor of the existing mall building. Sub-slab soil vapor quality data are summarized in **Table 5,** which includes updated Vapor Intrusion Screening Values (VISVs) for residential sub-slab soil gas. Refer to **Figure 4** for illustrations previous all sampling locations. In summary, the ISI concluded the following:

- Soil quality:
    - VOCs: Tetrachloroethylene or perchloroethylene (PCE) and trichloroethylene (TCE) were detected in soils in GD-B5 and GD-B6 on the northern property boundary along Cherry Street. Acetone, chloroform, toluene and/or m,p-xylene were also detected in GD-B1, GB-B2, GD-B3, GD-B5 and/or GD-B6 below SSVs.

    - PAHs: Several PAHs were detected in all samples except GD-B3 (4-5.5) and GD-B5 (0.5-2). All results were below SSVs. In accordance with iRule, toxic equivalency Quotient (TEQ) values were calculated from PAH concentrations. GD-B1 (0-2), GD-B4 (0.5-2) and GD-B6 (0-2) were above residential VSLs. However, all results were below urban background.

- Metals: Several metals were detected in all samples at concentrations below SSVs.

In summary, all soil quality analytical results were below respective SSVs or urban background concentrations and therefore, soil at the Site is *unregulated* based on this dataset so long as all soils remain within an urban environment. Additional soil testing within the interior of the Site will be conducted as part of CAP implementation to supplement this dataset, which is outlined later.

- Sub-slab soil vapor quality:
  - VOCs: PCE was detected in all soil vapor samples and above VISV in SSVP-1 and 2, which are outside of the project area. TCE was detected in all samples except SSVP-1 at concentrations below VISV with the exception of SSVP-3, which was detected well above VISV. Ethylene dibromide (EDB) or 1,2-dibromoethane was detected in all samples above VISV. Ethylene dichloride (EDC) or 1,2-dichloroethane was detected in SSVP-5 above VISV. Chloroform was detected in SSVP-1 and SSVP-3 the latter of which was above VISV.

In summary, several VOCs which may be form offsite sources exceeded VISVs throughout the Site, indicating that soil vapor *presents a risk* of vapor intrusion into the new building. This risk will be further characterized and managed via SSDSs, which is detailed later. Refer to **Figure 5** for a contaminant distribution map in soil vapor.

1.2.3 GEOTECHNICAL EVALUATIONS

In addition to environmental investigations outlined above, ATC reviewed geotechnical reports performed by others to assist in developing the CSM. This included a report prepared by Geodesign, Inc. (Geodesign) on November 22, 2017 entitled *Geotechnical Engineering Report – Phase 1A and 1B* which included data and information dated back the 1960s during evaluations associated with Burlington's Urban Renewal Project in addition to more recent studies. The report focused on recommendations for foundation design, foundation drainage, temporary earth support and support of existing foundations, material reuse, recommended materials and compaction requirements. For the purpose of this CAP, ATC focused on report details relating to subsurface soil stratigraphy and groundwater in and around the Site, including a review of all available boring logs. Refer to **Figure 4** for boring locations in and around the Site and refer to **Appendix B** for the geotechnical report. A brief summary is provided below:

- Subsurface soils consist of fill overlying native sands, silty sands, clay and glacial till, which if further detailed in the CSM in Section 1.3.
- Groundwater is encountered between 40 and 75 feet below existing exterior grade and perched horizons have also been identified above foundation levels.
- An observation of "oil" was noted in historic boring logs (1968) from B-1 (20 to 21.5 ft bgs) and B-2 (10-11.5 ft bgs) along Bank Street. This is discussed further in the context of potential offsite source(s) in the CSM in Section 1.3.

1.3 CONCEPTUAL SITE MODEL

Based on the information outlined above, ATC has formulated a conceptual site model (CSM) in accordance with §35-302 of iRule which outlines potential source(s) of release(s), infrastructure

considerations, historical land use, geology, hydrogeology, contaminant fate and transport, sensitive receptors and potential exposure pathways. It is important to note that a release(s) of oil and/or hazardous materials from a specific source(s) on the Site has not been identified in the current dataset. Contaminants detected onsite to date may be from offsite sources.

1.3.1 Site Geology and Hydrogeology

According to the VTDEC Natural Resources Atlas (NRA), surficial soil is mapped as pebbly marine sand of Champlain Sea origin. Boring explorations indicate that subsurface soils consist of fill material that extends from grade to 2 to 8 feet below ground surface (ft bgs) and generally consists of brown fine to coarse sand with varying amounts of gravel and silt. Native sand/silt extends to 40 and 90 ft bgs and generally consists of light brown to olive brown fine to medium sand and silt. Silt/clay extends to 120 to 166 ft bgs and generally consists of gray clay/silt and silt/clay with intermittent seams of silt, clayey silt or silty clay. Glacial till extends to a maximum explored depth of 174 ft bgs and generally consists of silt and fine to medium sand with little fine gravel. A boulder was also encountered within the glacial till in GD-B1. Groundwater associated with the surficial aquifer is encountered between 40 to 55 ft bgs in the east and 55 to 75 ft bgs in the west with multiple perched zones noted within silt seams throughout the sand/silt layer. Refer to cross-sections provided in the geotechnical evaluation (**Appendix B**) for illustrations of soil profiles. Groundwater in the surficial aquifer is expected to flow to the west/southwest in accordance with topography; however, no known empirical data is currently available to confirm this at the Site or surrounding sites. Bedrock is mapped as dolostone and was not encountered during the explorations.

1.3.2 Potential Source(s) and Release(s)

COCs detected above screening values at the Site include TCE, EDB, EDC and chloroform in sub-slab soil vapor. PCE was also detected at the Site below screening values. No current or historic high risk land uses that may have released these COCs have been identified at the Site. However, several former high risk sites (dry cleaners, service garages and filling stations) have been identified adjacent to the Site, which is outlined in Section 1.2.1. Documented releases of PCE, TCE and chloroform have been identified at OGE; potential releases that may be related to these and the other COCs detected on the Site are suspected from one or more of the remaining offsite high risk locations; however the dataset is not sufficient enough to confirm this with certainty.

1.3.3 Contaminant Fate and Transport

PCE, TCE and chloroform are chlorinated solvents commonly utilized in dry cleaning and/or service garages as solvents, parts washers, degreasers and/or spot removers. Chloroform was also used as a fumigant. These chemicals are dense non-aqueous phase liquids (DNAPL). As such, if released in sufficient quantities, DNAPL will migrate both laterally and vertically through both the unsaturated and saturated zones based on gravity and soil structure whereby DNAPL pools, ganglia (disconnected fingers), adsorbed and diffused phases can occur which can result in persistent sources of groundwater and soil vapor contamination. DNAPL migration can be affected by minor changes in soil permeabilities.

TCE and to a lesser extent PCE and chloroform are soluble in water, thereby often resulting in expansive groundwater plumes. These compounds will also tend to partition from groundwater to the vapor phase due to relatively high Henry's constants. Dechlorination of PCE and TCE into

daughter products, including cis- and trans-1,2-dichloroethylene (DCE) and vinyl chloride can occur under anaerobic conditions or cometabolically in the presence of petroleum contamination. These daughter products have not been identified at the Site, indicating that these processes are not active. Based on the historical record of high risk activities outlined earlier, it is possible these contaminants originated offsite and migrated onto the Site through the mechanisms outlined above. Based on the age of these offsite high risk activities which appear to have ceased prior to the 1970s (>40 years ago) and the fact that these contaminants are detected today indicates there is sufficient source mass to drive the groundwater and soil vapor phases now and into the future.

EDB was historically used as an additive to leaded gasoline (lead scavenger) and also as a fumigant for pest control. EDC was also historically used as a lead scavenger and fumigant in addition to current uses as a solvent, degreaser and dispersant (EPA, 2000). Based on reasonably ascertainable information, a possible source of these contaminants may be release(s) from former offsite filling station(s), the closest of which were OGE site and the former Gulf Station at 149 Bank Street (see **Figure 3**). However, these compounds were not detected at OGE so it is unlikely the source(s) is the former filling station at that location. Additionally, the highest concentrations were detected in SSVP-5 which is in the general vicinity of “oil” that was noted in historic geotechnical logs B-1 and B-2 along Bank Street as referenced in Section 1.2.3. EDB and EDC are also DNAPLs and will tend to migrate in accordance with the mechanisms outlined above.

1.3.4 Sensitive Receptors and Exposure Pathways

Sensitive receptors identified at the Site include soil, groundwater and indoor air. No impacts to soil have been identified at the Site above screening values. Groundwater has not been tested on the Site; however, there are no public or private wells in the area and therefore, there is no known exposure to groundwater. Indoor air within the new building is at risk from soil vapor contamination through the potential vapor intrusion pathway. However, this potential pathway will be removed by the SSDSs outlined herein.

2.0 EVALUATION OF CORRECTIVE ACTION ALTERNATIVES

ATC recommended that the Site be exempt from conducting an evaluation of corrective action alternatives based on the following:

- There is no impact to drinking water sources as all properties in the area are connected to City water;
- Vapor intrusion potential will be mitigated by SSDSs outlined herein;
- No other potential impacts present a threat to human health;
- There are no known sources of groundwater contamination on the site but potential groundwater contamination at the site from offsite sources; however, there is no known exposure to groundwater due to deep depth (40 – 75 ft bgs); any vapors partitioning from potential groundwater sources will be addressed with the SSDSs;
- There are no known direct contact exposure risks to hazardous materials as all soils tested are below screening values; and
- The proposed remedy for vapor mitigation proposed herein (SSDS) has been demonstrated to be reliable, cost effective, and effective in addressing contaminated vapor concerns.

However, VT DEC did not approve this exemption as referenced in comments provided in an email dated June 8, 2018. Therefore, an Evaluation of Corrective Action Alternatives (ECAA) was completed by ATC and submitted under separate cover on June 14, 2018, and the CAP was revised as referenced herein.

The ECAA identified two common alternatives to mitigate vapor intrusion potential: 1) active sub-slab depressurization system (SSDS) and 2) passive SSDS. ATC recommended the active SSDS primarily because of a more predictable operational performance and more protective of human health. As such, up to four SSDSs will be installed and monitored to mitigate vapor intrusion potential.

3.0 PUBLIC NOTICE

A public notice required under this CAP is submitted under separate cover. The notice is provided in **Appendix A**. An illustration of all adjoining property owners who will receive the public notice in accordance with iRule §35-506(a)(1) is provided in **Figure 2** and a list in provided in **Table T2** below:

TABLE T2:
ADJOINING PROPERTY OWNERS

Property Address	Owner(s)	Mailing Address	Phone/Email
20 Pine St	Cathedral Immaculate Conception Parish Charitable Trust c/o Salvatore R. Matano	P.O. Box 489 Burlington, VT 05402	N/A
33 Pine St	Luke F. Clavelle, Steven V. Lipkin	PO Box 4156 Burlington, VT 05406	N/A
67 Cherry St	Devonwood/BTC Mall Associates	101 Cherry St Suite 440 Burlington, VT 05401	(802) 658-2545 dsinex@devonwoodinvestors.com
70-72 Cherry St	Craig Pease	70-B Cherry St Burlington, VT 05401	N/A
76 Cherry St	Burlington Housing Authority	65 Main St Burlington, VT 05401	(802) 864-0538 jdoin@burlingtonhousing.org
101 Cherry St	Devonwood/BTC Mall Associates	101 Cherry St Suite 440 Burlington, VT 05401	(802) 658-2545 dsinex@devonwoodinvestors.com
108 Cherry St	State of Vermont Buildings & General Services	4 Governor Aiken Ave Montpelier, VT 05622	(802) 828-1115 marc.ogrady@vermont.gov
100 Bank St	100 Bank LLC	210 College St Burlington, VT 05401	(802) 658-7400 Jdextradeur@redstonevt.com
109 Bank St	Sisters & Brothers Investment	75 So. Winooski Ave Burlington, VT 05401	N/A
117 Bank St	Sisters & Brothers Investment	75 So. Winooski Ave Burlington, VT 05401	N/A

131-137 Bank St	Sisters & Brothers Investment	75 So. Winooski Ave Burlington, VT 05401	N/A
125-129 Bank St	125 Bank Street FJT, LLC	1 National Life Dr M230 Montpelier, VT 05604	N/A
139 Bank St	First Baptist Church c/o Redstone Property Management	210 College St Burlington, VT 05401	(802) 658-7400 Jdextradeur@redstonevt.com

4.0 PERFORMANCE STANDARDS

The objective of the corrective action is to mitigate vapor intrusion potential of contaminated sub-slab soil vapor into the new building through the construction, operation and maintenance of SSDSs. The existing dataset indicates that TCE, EDB, EDC and chloroform exceed VISVs for residential sub-slab soil gas. Following startup and initial shakedown period, influent concentrations of these contaminants will be monitored from each SSDS on a quarterly basis for one year to evaluate potential seasonal fluctuation. These data will be utilized to calculate mass discharge for comparison with Vermont Air Pollution Control Regulations to determine if treatment is required.

If all compounds are below their respective VISVs, the system(s) will be shut down to operate in passive mode indefinitely. Conversely, should any system continue to exceed VISVs following the initial year of operation, monitoring will continue on an annual basis during the heating season until VISVs are below their respective values. Each SSDS will also be monitored for vacuum influence to ensure 2 Pascals (Pa, or 0.008 inches of water) of vacuum is maintained throughout the footprints. System adjustments will be performed as outlined later to maintain this performance standard as required.

The current dataset indicates soil quality is unregulated. Should any future testing indicate that soils may be regulated and therefore, require proper onsite or offsite management, those soils will be managed in accordance with iRule-compliant details outlined in the next section.

5.0 REMEDIAL CONSTRUCTION PLAN

The Contractor is responsible for full VOSHA compliance on this project. In addition to typical Construction Industry VOSHA Standards, hazardous materials are also present in air (soil vapor). The Contractor is responsible for VOSHA health and safety evaluations and personal protective equipment for its employees as required for this project, including but not limited to Job Safety Analysis, personal exposure monitoring, written respirator program, written health and safety program, medical monitoring and issuing of personal protective equipment.

5.1 Sub-slab Depressurization Systems

The objective of SSDS is to create a negative pressure field of at least 2 Pascals (0.008 inches of water) below the entire footprint of all occupied spaces that are slab on grade and to remove at least one pore volume of air per hour from the sub-slab collection bed in each area. ATC has reviewed civil design drawings, including Volume 1 of the CPB IFB Plan Set dated 19 April 2018. The drawings indicate occupied spaces will include discrete and separated areas on the basement and ground floor levels at differing elevations. The area of the parking garage on the basement floor level will be excluded based on the following:

- All the levels of the parking garage meet the Vermont Commercial Building Energy Standards, the 2015 International Building Code and the VT Division of Fire Safety Memorandum, April 18, 2014. Functionally the garage fans exhaust each floor continuously at variable rates. The maximum rate is 0.75 cubic feet per minute (cfm) per square foot (sf) of garage area. The building control system will vary the ventilation rate from 0.75 cfm/sf to 0.05 cfm/sf based on the concentration of carbon monoxide in the garage air.

- The ventilation air flows parking garage openings (for cars) to 10 garage exhaust fans spread across the floors and areas. Seven exhaust fans discharge up through the building roof at the fifth floor, the balance discharge through areaways or the building's loading dock. The garage exhaust fan discharge and building ventilation air inlet spacing meets the requirements of ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality and the 2015 International Mechanical Code.

- The parking garage will have attendants working in the building continuously over typically three eight-hour shifts. The attendant booths will have equipment to supply outdoor air on a continuous basis into the booth, making them positive with respect to the surrounding garage and thereby mitigating any vapor intrusion potential into the booth.

5.1.1 Additional Soil Vapor Testing

Following completion of demolition, ATC will perform additional soil vapor testing in conjunction with additional soil testing outlined in Section 6.1.1. The objective is to evaluate soil vapor conditions at proposed BOS elevations, the data of which will be utilized for the dual purpose of further characterizing soil vapor at the Site and establishing design parameters for SSDS treatment, if required. The testing will include the advancement of direct push technology (DPT) tooling fitted with a one-foot or similar vapor screen at proposed locations illustrated on **Figure 6**. This includes the estimated locations of previous points SSVP-3, SSVP-4 and SSVP-5 to update conditions in these areas to the proposed BOS grades, along with eight additional locations

(SSVP-6 through SSVP-13). Additional locations or adjustments may be required to achieve the objective of characterizing soil vapor conditions.

Upon achieving the appropriate depth, the tooling will the appropriately sealed to the surface utilizing bentonite. Soil vapors will then be pumped through Teflon tubing fitted to the tooling. The tubing will be connected to a low vacuum pump fitted with a "lung box" to draw air samples into a Tedlar bag. A factory-calibrated Hapsite field gas chromatograph (FGC) will be utilized to measure COCs (PCE, TCE, EDB, EDC and chloroform) in real time. ATC will ensure appropriate detection limits to meet VISVs. If any compounds cannot achieve this, the Tedlar bags will be delivered to an offsite environmental laboratory for analysis. To ensure appropriate QA/QC, 20% of the samples will be collected utilizing Summa canisters for offsite laboratory analysis of the COCs by EPA Method TO15. Following sampling, all boreholes will be sealed with hydrated bentonite.

The results will be compared to VISVs for sub-slab soil gas and will be utilized to update the CSM relating to potential source(s) and contaminant fate/transport. These data will also be utilized to calculate anticipated mass discharge from the proposed SSDSs utilizing proposed extraction rates for comparison with action levels set forth in Vermont's Air Pollution Control Regulations, November 2016.

Each vapor point will also be screened with a PID equipped with a 10.6 eV lamp for the purpose evaluating for the potential presence of grossly-contaminated vapors (i.e. PID readings >10 ppm) which may be indicative of a localized source(s). In this case. ATC will collect additional soil samples at these locations via an adjacent soil boring utilizing DPT soil profile tooling. The samples will be collected and analyzed for VOCs in accordance with procedures outlined in Section 6.1.1.

5.1.2 Extraction Points and Transmission Piping

The sub-slab components of the SSDSs will include individual 5-foot lengths of factory-slotted 4-inch diameter horizontal polyvinyl chloride (PVC) piping (extraction points) reduced and connected to 2-inch diameter horizontal solid PVC transmission piping. The extraction points will be staggered on approximately 60-foot centers (assuming a radius of influence (ROI) of 30 feet) throughout the footprint of the proposed occupied spaces. This ROI is proposed based on our experience with similar projects as a pilot test has not been performed as it is infeasible to do so with new construction installations. The extraction points will be positioned away from underslab utilities to the extent practicable to minimize "short-circuiting" through these featuers. The transmission piping will be sloped toward the extraction points to the extent practicable within the limited collection bed depth to assist the drainage of any condensation into the ground. Sloping grades may vary based on length of piping runs.

The extraction points and horizontal transmission pipes will be installed directly atop the sub-grade and the extraction points will be wrapped with filter fabric to minimize sediment intrusion into the lines. A 6-inch layer of peastone will be deposited on top of the piping to allow a permeable vapor collection bed beneath the building. A vapor barrier will be installed atop the collection bed and appropriately sealed to the foundation walls and other penetrations in accordance with the manufacturer's specifications. The concrete slab will then be poured.

Refer to **Figure 7** for a SSDS piping layout plan.

5.1.3 MANIFOLDS AND TREATMENT AREAS

The transmission piping for each extraction point will be directed to a common area and extend vertically to penetrate the slab into the building. Each pipe will be fitted with ball valves and manifolded into a single header. The individual pipes will be appropriately labeled to ensure that flow adjustment and discrete sampling of individual extraction points can occur as required. An appropriately sized blower will be installed in line in the single header. Exhaust piping details will be provided in bid specifications under separate cover by mechanical engineer and will comply with stack requirements and building codes. Refer to **Figure 8** for SSDS details.

Monitoring ports and differential pressure gauges (Magnehelic®) will be installed upstream of the blower within each pipe to allow measurement of air parameters and to perform flow adjustments, as necessary. Enough spacing within the remediation area will be provided to allow for the installation of a minimum of two 500-pound vapor phase granular activated carbon (VPGAC) units for air treatment, should this be required following startup. Extracted vapors from SSDS are typically not significant enough to create a classified hazardous environment within the utility room and therefore explosive proof components are not required.

5.1.4 SUB-SLAB MONITORING POINTS

Sub-slab monitoring points will be installed at targeted locations with the collection bed for the dual purpose of measuring sub-slab soil vapor quality and to collect vacuum measurements to confirm the effectiveness of the SSDSs. The monitoring points will consist of stainless steel vapor implants installed at approximately the same elevation as the SSDS piping and connected to ¼-inch diameter Teflon tubing that runs from the monitoring points to appropriately spaced access ports within the slab as required.. The monitoring points will be appropriately labeled to ensure discrete monitoring/sampling can occur. Additional details will be provided in bid specifications under separate cover once final floor plans are completed by the design team. Refer to **Figure 7** for monitoring point locations.

5.1.5 TELEMTRY

Each SSDS will be completed with telemetry to allow remote monitoring of system operations via vacuum switches and to ensure real time notification is provided should any of the systems go down. This will include CSV cellular auto dialers with onsite digital display panels and VFD controls. A technician will mobilize to the Site within four hours to diagnose any shut downs and evaluate the need for adjustments and/or repairs.

Additional details relating to system materials and components will be provided under separate cover in bid specifications. The piping layout provided herein is subject to change based on actual construction conditions; any potential adjustments will meet the objectives of the system and performance criteria. Any deviations from the CAP will be detailed in the corrective action completion report. Additionally, the SMS will be notified prior to any non-minor modifications that may be necessary.

6.0 WASTE MANAGEMENT PLAN

6.1 Soil Excavations

Based on the existing dataset from exterior boring locations, subsurface soils do not contain waste and are unregulated as all COCs were below SSVs for residential soils and PAHs are below the urban background concentration. Therefore, any soils excavated to accommodate the construction project can be reused onsite with no restrictions assuming the soils are geotechnically suitable for the intended reuse, which is beyond the scope of this CAP. Similarly, all soils can be reused offsite with no restrictions assuming reuse within an "Urban Soils Background Area" as defined by NRA due to PAH exceedances of residential screening values in three of the eleven soil samples outlined in Section 1.2.2.

6.1.1 Additional Soil Testing

To further characterize soils within the interior of the Site, which was previously inaccessible due to the presence of building infrastructure, ATC will oversee the advancement of three additional soil borings in conjunction with soil vapor testing outlined in Section 5.1.1. The borings will be targeted in representative areas slated for excavations that will be required for the installation of new building components, generally new slab on grade (SOG) areas and underground utility features, i.e. areas that will generate the bulk of excavated material to accommodate the new construction. The borings will be advanced to proposed construction depths and a summary is provided in **Table T3** below:

TABLE T3:
SUMMARY OF PROPOSED BORING INFORMATION

Boring ID	Boring Depth (ft)	Sample Interval(s) (ft)	Boring Location in New Building
SB-101	17	4-5 12-13	Low basement area north
SB-102	8	3.5-4.5	Parking ground floor west
SB-103	15	11.5-12.5	Stormwater tank

Refer to **Figure 6** for proposed boring locations which provides additional detail regarding proposed construction depths based on existing and proposed BOS differentials. The borings will be advanced approximately one foot beyond the depth differential rounded up to incorporate subbase. The drilling will be performed by a local environmental drilling firm under the direction of ATC and will include the advancement of three soil borings to a maximum depth of 17 ft bgs utilizing DPT. Actual boring depths will vary based on proposed excavation profiles as depicted in **Table T2** above.

During advancement, soils will be logged continuously and a PID will be utilized to measure total organic vapors (TOVs). Any visual or olfactory indications of contamination (i.e. odors, staining, discoloration) will also be noted. Discrete soil samples will be collected for offsite laboratory analysis for COCs, including VOCs, PAHs and metals. One duplicate sample will be collected for quality assurance/quality control purpose (QA/QC). This estimate assumes four soil samples,

which will include one sample at SB-102 and SB-103 and two samples at SB-101 for proper vertical characterization. It should be noted that only one deeper sample is anticipated in SB-103 since shallow soils were previously characterized in adjacent existing boring GD-B1. Sample depths will be targeted as one-foot intervals within the midpoint of the boring depths (see **Table T2**) or in the case of SB-103, within the midpoint of the deeper profile, unless any PID, visual or olfactory indication of contamination is apparent. In this case, the sample depths will be targeted at those intervals.

The borings will be backfilled with drilling spoils and drilling sand as required. It is estimated that one drum of investigation derived waste (IDW) will be generated from excess spoils and that these soils can staged onsite for eventual reuse as backfill. These additional data will be used to supplement the existing soil quality dataset to provide additional characterization of subsurface soils to ensure proper soil management procedures. If any COCs are detected above residential SSVs and/or PAHs are detected above urban background concentrations, onsite and offsite soil management restrictions will be applicable for those soils. As such, soil management provided herein is subject to change based on actual construction conditions; any potential adjustments will meet the objectives of the project and DEC requirements. **Table T4** below outlines soil management requirements for various soil quality levels.

TABLE T4:
SOIL MANAGEMENT LEVELS

Soil Level	Description	Onsite Options	Offsite Options
Level 1	COCs and PAHs below residential SSVs	Unregulated, no restrictions	Unregulated, no restrictions
Level 2	COCs below residential SSVs, PAHS below urban background	Unregulated, no restrictions	No restrictions except excess soils must remain within Urban Soils Background Area
Level 3	COCs below residential SSVs, PAHs above urban background (i.e. development soils)	Engineered soil cap, institutional controls	Landfill/recycling facility, categorical solid waste facility, receiving site
Level 4	COCs above residential SSVs but below hazardous waste thresholds (i.e. non-hazardous contaminated soils)	Engineered soil cap, institutional controls	Landfill/recycling facility
Level 5	COCs above hazardous thresholds (i.e. hazardous soils)	No applicable	Hazardous Waste Landfill or contained in determination

Details regarding final soil excavations (including volumes moved off-site and capped/paved areas) will be included in the corrective action completion report,

Although not anticipated at his time as all tested soil have been shown to be unregulated for site use, if an engineered soil cap is utilized, iRule §35-510(e)(3) requires a minimum of 18-inches if the area is not covered by an impervious surface and 6-inches if covered by an impervious surface. Alternative cap thicknesses may be utilized, providing additional institutional controls are placed on the property to ensure protection of human health and the environment, and pre-approval is granted by the DEC. The cap must also be clearly marked with a material that distinguishes the divide between the contaminated soils and the clean backfill, commonly a geotextile fabric.

6.1.2 Dewatering Contingency

It is not anticipated that dewatering will be required to accommodate the construction project as the static groundwater level is reported to be below construction depths (>40 ft bgs). However, the geotechnical evaluation identified several perched groundwater layers associated with silt horizons and indicated the potential that these seams could recharge into the excavations. If so, the Contractor will notify the Environmental Professional (EP) who will collect samples of the water for COCs prior to discharge if the water cannot be managed onsite via infiltration in the area of generation. Based on the sampling results and volumes, the EP will evaluate the need to mobilize a vacuum truck for proper offsite disposal and/or a discharge permit.

6.1.3 Unanticipated Contaminated Soils Contingency

The Contractor will contact EP immediately should any odorous and/or discolored soils are encountered which may indicate the presence of contamination. Under the direction of EP, the soils may be segregated and polyencapsulated onsite, sampled and waste profiled by EP and managed onsite or offsite as required in accordance with soil levels table based on sampling and profiling results. All dust suppression, anti-tracking and other common excavation requirements are beyond the scope of this CAP. ATC assumes these procedures will be performed in accordance with engineer's specifications outlined in contract documents.

6.1.4 Unanticipated Relic USTs Contingency

In the event any relic underground storage tanks (USTs) are discovered during the excavations, the Contractor will notify the EP immediately. The EP will arrange proper closure (removal) of the UST in accordance with DEC's *UST Closure and Site Assessment Requirements* dated June 2010 which will be performed by the hazardous waste contractor.

6.2 Investigation and Remediation Derived Wastes

Drilling spoils from the borings outlined above will be returned to the borehole to the extent practicable. Any excess spoils will be stockpiled onsite for reuse during the construction project. In the event grossly-contaminated soils are identified via field-screening methods, those soils will be segregated and deposited in 55-gallon DOT-approved steel drum(s) and sampled for COCs by the EP. The waste will be profiled and appropriately disposed offsite by the hazardous waste contractor. All other investigation derived waste (IDW) including drilling sleeves, gloves and baggies will be containerized in a drum for offsite disposal if required until investigations are complete. If no evidence of contamination is identified via field-screening methods, these materials will be disposed as solid waste.

Remediation derived wastes (RDW) may be generated should the SSDSs require treatment via VPGAC as outlined in Section 5.0. In this case, if monitoring results indicate the units are no longer effective at removing contaminants from the extraction airstreams, the EP will sample the media for VOCs and the profile the waste, which will be shipped offsite for appropriate disposal by the hazardous waste contractor.

7.0 IMPLEMENTATION SCHEDULE

A proposed timeframe schedule is provided in **Table T5** below:

TABLE T5:
ANTICIPATED PROJECT SCHEDULE

Activity	Estimated Date of Completion
Installation of SSDSs sub-slab components	August 17, 2018
Installation of SSDSs interior components	March 29, 2019
Submittal of Corrective Action Construction and Completion Report	June 28, 2019
Shakedown and startup of SSDSs (HVAC operational)	August 28, 2020
Submittal of Corrective Action Construction and Completion Report Addendum (initial monitoring results)	October 30, 2020

8.0 CORRECTIVE ACTION MAINTENANCE PLAN

Following initial startup and shakedown, which will commence once construction is complete and all HVAC systems are active, the SSDSs will be monitored in accordance with the schedule outlined below to ensure the systems are operating as designed. Each monitoring event will include collecting field measurements of vacuum/pressure, air velocity and temperature from each extraction leg, total influent and exhaust. Differential pressure measurements will also be collected from each sub-slab monitoring point. Extraction valves will be adjusted accordingly to balance sub-slab differential pressures as required.

This monitoring program will be conducted on a weekly basis for the first month, on a monthly basis for the second and third months, on a quarterly basis for the first year and then annual thereafter until performance criteria to operate in passive mode is achieved in accordance with Section 4.0. In addition to measuring field parameters outlined above and following one week of operation and then quarterly thereafter, and once the systems are balanced and following evacuation of at least one collection bed pore volume, the effluent airstream will be sampled from each system for laboratory analyses of PCE, TCE, EDB, EDC and chloroform via EPA Method TO15.

Additional emergency monitoring events may be required should telemetry indicate system shut downs or other performance issues as outlined in Section 5.1.5.

9.0 INSTITUTIONAL CONTROL PLAN

A deed restriction may be required prior to issuance of a Sites Management Activity Complete (SMAC) designation as an institutional control to comply with CAP requirements in accordance with iRule §35-603(b) since the corrective action (SSDSs) may require long term monitoring and active SSDS infrastructure must remain in place in order to prevent contamination from posing a risk to human health via the potential vapor intrusion pathway. The deed restriction, if required, will be completed by the owner and his attorneys and will comply with minimum elements and filing requirements outlined in iRule §35-603(c) and (d).

10.0 REDEVELOPMENT & REUSE PLAN

As outlined in Section 1.0, the project will include the demolition of existing mall structures to make way for a new multi-use 14-story building that will encompass the City block between Cherry and Bank Streets to the north/south and St. Paul and Pines Streets to the east/west, which will be re-established for pedestrian and vehicular traffic. The new building will be constructed generally five feet below the current mall structure with deeper penetrations in some areas. This will require the excavation of generally native soils to accommodate the new construction. The design indicates that all excavated soils will be reused onsite. Temporary offsite staging will be required to accommodate the construction project, locations to be determined. In the event any soils require on or offsite management, this will be performed in accordance with DEC requirements outlined in Section 6.0. The basement and ground floor levels that will be installed slab on grade (SOG) will consist of occupied spaces including retail space and mechanical rooms. A parking garage will also be included in these floors within the interior of the building up to the fourth floor. Refer to **Appendix C** for the full Issued for Bid (IFB) plan set dated April 19, 2018 for details of site/civil, landscape and structural components.

11.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN

Environmental media sampling will include pre-construction soil and soil vapor sampling and post-construction SSDS soil vapor sampling for COCs. The sampling will be conducted in accordance with ATC's standard operation procedures (SOPs) provided in **Appendix D** and the analyses will be performed by a Vermont certified environmental laboratory in accordance with established EPA methods. **Table T6** below outlines sampling and analytical requirements for the project.

TABLE T6:
SAMPLING AND ANALYTICAL METHOD REQUIREMENTS

Parameter	Matrix	# of QA/QC per batch	Sampling SOP ID	Analytical Method	Container	Preservation	Holding Time
VOCs	Soil	1 trip blank 1 duplicate	4,0, 5.0, 5.2	EPA 8260C	4-40 ml glass VOA vials	1 methanol, 2 DI water, 1 unpreserved, cool 4°	14 days to analysis
PAHs	Soil	1 duplicate	4,0, 5.0, 5.2	EPA 8270C SIM	8 oz. glass container	Cool 4°	14 days to prepare, 40 days to analysis
Metals	Soil	1 duplicate	4.0, 5.0, 5.2	EPA 200.7/200.8, 245.2/7470	8 oz. plastic or glass container	Cool 4°	28 days for mercury, 6 months for other
VOCs	Soil vapor	1 duplicate	15.0	EPA TO15	6L batch certified Summa canister	Dry, dark storage	30 days

12.0 PROPOSED CONTRACTORS & SUBCONTRACTORS

The EP will collect all environmental media samples outlined in Section 11.0. The following **Table T7** presents a list of anticipated contractors and subcontractors:

TABLE T7:
PROPOSED SUBCONTRACTORS

Contractor/ Subcontractor	Contact	Email	Address	Phone Number
Test America (Laboratory Services)	Kris Dusablon	Kristine.Dusablon @testamericainc.com	30 Community Drive, Suite 11 South Burlington, VT 05403	(802) 923-1022
NRC (Contaminated Waste Management)	John Kelliher	jkelliher@nrcc.com	280 Commerce St Williston, VT 05495	(802) 923-1445

The Excavation Contractor, SSDS Installation Contractor, Electrical Contractor and Contaminated Soil Waste Hauler and Disposal Facility (if required) are to be determined following bid selection.

13.0 P.E. SIGNATURE AND CERTIFICATION

This report has been prepared by the employees of ATC Group Services, LLC whose signatures appear below. Requests for information on the contents of this report should be directed to these individuals.

I certify under penalty of perjury that I am an environmental professional and that all content contained within this deliverable is to the best of my knowledge true and correct.

Prepared by:

Erik Urch
Senior Project Manager

Joseph J. Hayes, C.P.G, P.G.
Branch Manager

Nate Berube, P.E.
Professional Engineer
VT License #74152

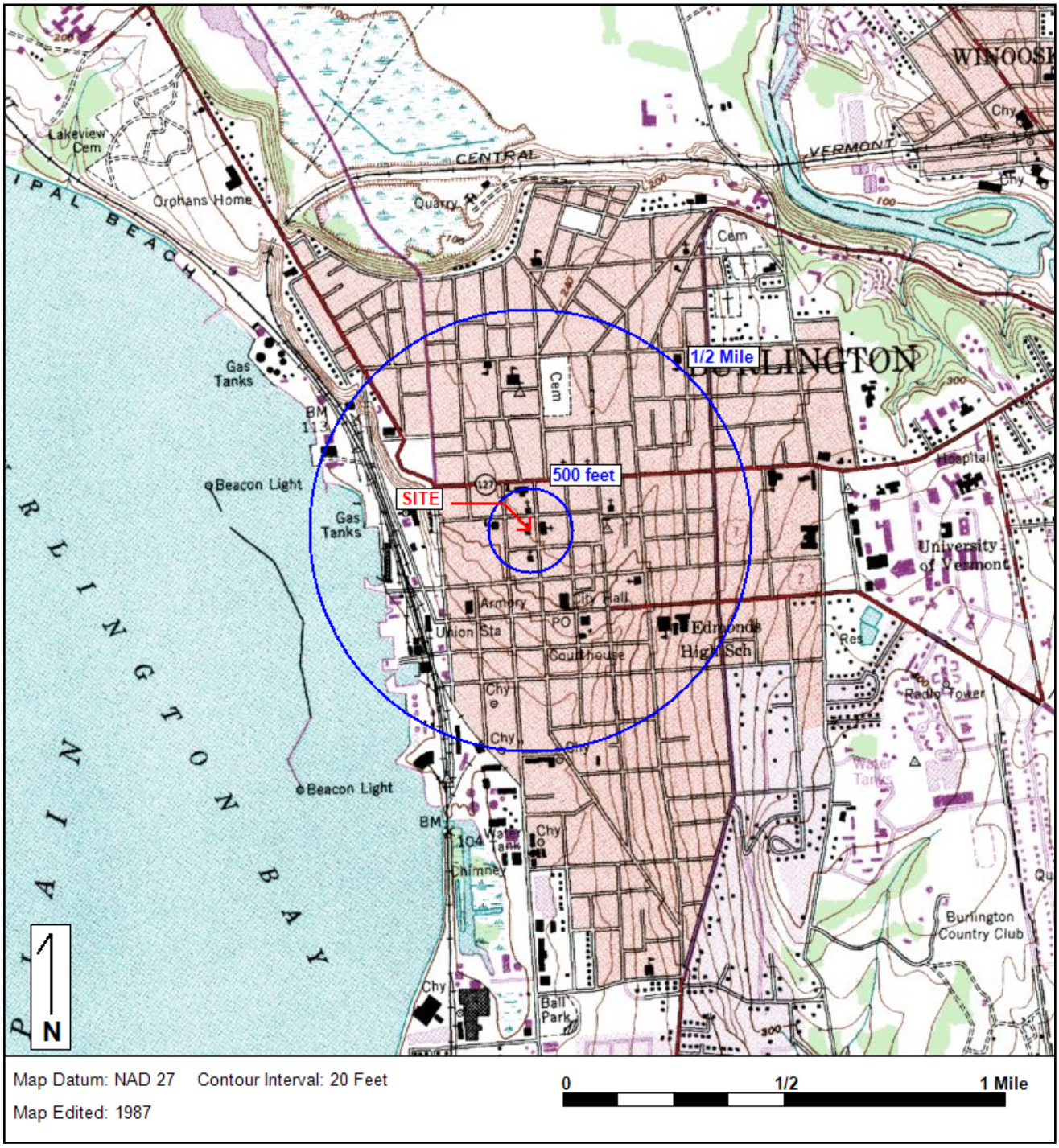


FIGURES

Environmental Compliance Services, Inc.
1 Elm Street, Suite 3
Waterbury, VT 05676
Phone 802-241-4131 Fax 802-244-6894
www.ecsconsult.com

CityPlace Burlington
49 Church St
Burlington, VT 05401

Figure 1: SITE LOCUS



Base Map: U.S. Geological Survey; Quadrangle Location: Burlington, VT

Lat/Lon: 44 28' 43.62" NORTH, 73 12' 51.95" WEST - UTM Coordinates: 18 642000.7 EAST / 4926603 NORTH

Generated By: Carol Farrington



33 PINE STREET
LUKE F. CLAVELLE
STEVEN V. LIPKIN
MAILING: P.O. BOX 4156
BURLINGTON, VT 05406

70 72 CHERRY STREET
CRAIG PEASE
MAILING: 70-B CHERRY STREET
BURLINGTON, VT 05406

76 CHERRY STREET
BURLINGTON HOUSING AUTHORITY
MAILING: 65 MAIN STREET
BURLINGTON, VT 05401
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20 PINE STREET
CATHEDRAL IMMACULATE CONCEPTION PARISH CHARITABLE TRUST
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BURLINGTON, VT 05406

108 CHERRY STREET
VERMONT STATE OF BUILDING & GENERAL SERVICE DEPARTMENT
MAILING: 10 BALDWIN STREET
MONTPELIER, VT 05663-7011
MARC O'GRADY, DIRECTOR
4 GOVERNOR AIKEN AVENUE
MONTPELIER, VT 05622-7011
PHONE: (802) 828-1115
E-MAILING: marc.o'grady@vermont.gov

100 BANK STREET
100 BANK LLC.
MAILING: 210 COLLEGE STREET
BURLINGTON, VT 05401
JUSTIN DEXTRADEUR, DEVELOPMENT MANAGER
PHONE: (802) 658-7400
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109, 117, 131, 137 BANK STREET
SISTERS & BROTHERS INVESTMENT
MAILING: 75 SOUTH WINOOSKI AVENUE
BURLINGTON, VT 05401

127-129 BANK STREET
125 BANK STREET FJT, LLC.
MAILING: 1 NATIONAL LIFE DRIVE, M230
MONTPELIER, VT 05604

Drn. By:	Ckd. By:	App'd By:	Ckd. Date:
DH	EU		

Project Number: 280EM00175
Drawing File: SEE LOWER LEFT

ATC

ABUTTERS MAP

CITY PLACE BURLINGTON
BURLINGTON, VERMONT

Date: 5/18
Scale: AS SHOWN
Figure: 2

H:\2018\OTHER OFFICES\VERMONT\CITYPLACE BURLINGTON\280EM00175–ABUTTERS.DWG, FIG2

H:\2018\OTHER OFFICES\VERMONT\CITYPLACE BURLINGTON\280EM00175-AREA HIGH RISK.DWG, FIG3



AREA MAP WITH HIGH RISK SITES

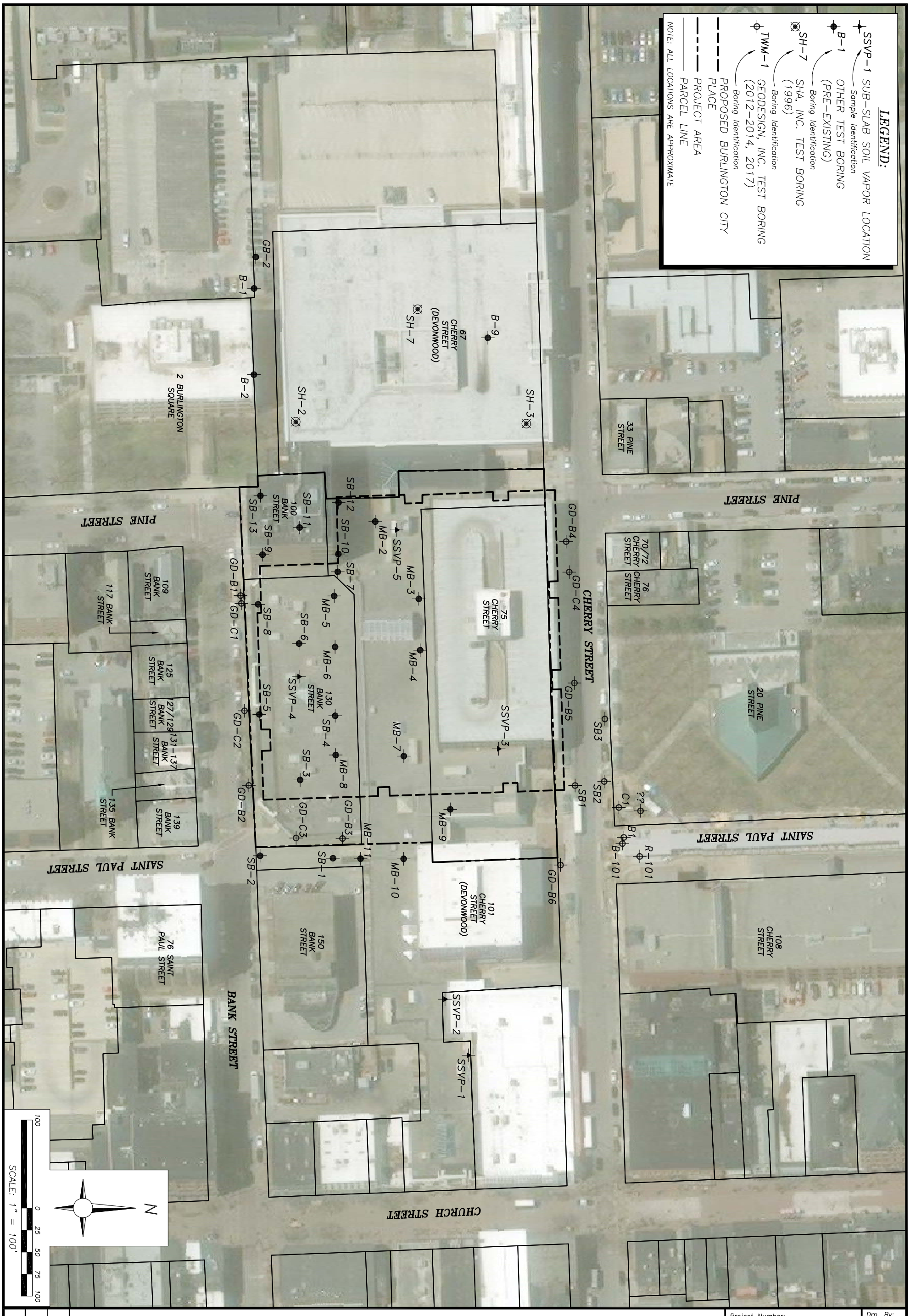
CITY PLACE BURLINGTON
BURLINGTON, VERMONT

Project Number: 280EM00175	Drn. By: DH
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Date: 5/18
Scale: AS SHOWN
Figure: 3

ATC

H:\2018\OTHER OFFICES\VERMONT\CITYPLACE BURLINGTON\280EM00175-SITE.DWG, FIG4



Date: 5/18	SITE PLAN	Project Number: 280EM00175	Drn. By: DH
Scale: AS SHOWN	CITY PLACE BURLINGTON BURLINGTON, VERMONT	Drawing File: SEE LOWER LEFT	Ckd. By: EU
Figure: 4		ATC	App'd By:
			Ckd. Date:

LEGEND:

SSVP-3 SUB-SLAB SOIL VAPOR LOCATION
Sample Identification

7.5 = SUB-SLAB SOIL VAPOR CONCENTRAITON (BOLD INDICATES EXCEEDANCE)
(21) = VT VAPOR INTRUSION SCREENING VALUE FOR SUB-SLAB SOIL VAPOR
ND = NOT DETECTED
NOTE: ALL LOCATIONS ARE APPROXIMATE

SSVP-5

Units	µg/m³
Tetrachloroethylene	7.5 (21)
Trichloroethylene	3.1 (6.7)
Ethylene Dibromide (EDB)	**277** (0.16)
1-Ethyl-3-(3-Dimethylaminopropyl) Carbodiimide (EDC)	**6.1** (3.6)
Chloroform	ND (4.1)

SSVP-4

Units	µg/m³
Tetrachloroethylene	3.3 (21)
Trichloroethylene	0.54 (6.7)
Ethylene Dibromide (EDB)	**9.2** (0.16)
1-Ethyl-3-(3-Dimethylaminopropyl) Carbodiimide (EDC)	ND (3.6)
Chloroform	ND (4.1)

SSVP-3

Units	µg/m³
Tetrachloroethylene	2.5 (21)
Trichloroethylene	**1,470** (6.7)
Ethylene Dibromide (EDB)	**5.4** (0.16)
1-Ethyl-3-(3-Dimethylaminopropyl) Carbodiimide (EDC)	ND (3.6)
Chloroform	**4.5** (4.1)

SSVP-5
SSVP-4
SSVP-3
SSVP-1

FACILITY MAP PROVIDED BY: BTC MALL ASSOCIATES, LLC.

SCALE: 1" = 40'
40 0 10 20 30 40
N

Figure: 5
Date: 5/18
Scale: AS SHOWN

CONTAMINANT DISTRIBUTION MAP - SUB-SLAB SOIL VAPOR

CITY PLACE BURLINGTON
BURLINGTON, VERMONT

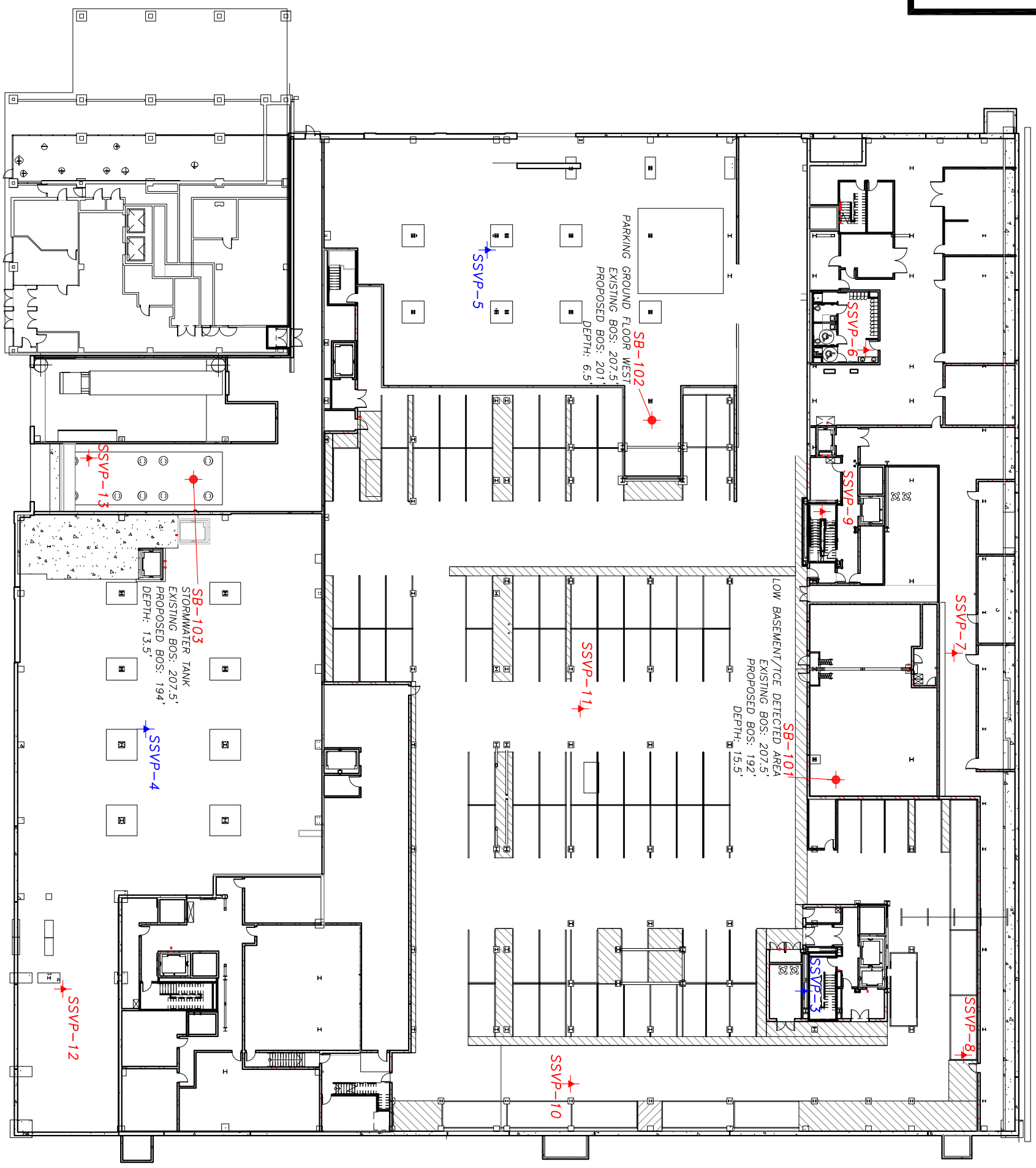
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ATC

LEGEND:

- SSVP-6 PROPOSED SOIL AND SOIL VAPOR TESTING LOCATIONS — Sample Identification
- SSVP-3 SUB-SLAB SOIL VAPOR LOCATION — Sample Identification
- B-1 PROPOSED SOIL BORING — Boring Identification

NOTE: ALL LOCATIONS ARE APPROXIMATE



FACILITY MAP PROVIDED BY: BTC MALL ASSOCIATES, LLC.

SCALE: 1" = 40'

40 0 10 20 30 40

N

Figure: 6	Scale: AS SHOWN	Date: 5/18	**PROPOSED SOIL AND SOIL VAPOR TESTING LOCATIONS** CITY PLACE BURLINGTON BURLINGTON, VERMONT

Project Number: 280EM00175	Drn. By: DH
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ATC	App'd By:
	Ckd. Date:

H:\2018\OTHER OFFICES\VERMONT\CITYPLACE BURLINGTON\280EM00175-PIPING PLAN.DWG, FIG7

LEGEND:

- EXTRACTION POINT (5 FT. SECTION OF 4" DIAMETER SLOTTED SCHEDULE 40 PVC)
- VACUUM POINT
- TRANSMISSION PIPE (2" DIAMETER SOLID SCHEDULE 40 PVC)
- SUBSLAB DEPRESSURIZATIONS SYSTEM MECHANICAL AREAS
- PARKING GARAGE (BASEMENT LEVEL)
- BASEMENT LEVEL
- LOWER BASEMENT LEVEL
- GROUND LEVEL



FACILITY MAP PROVIDED BY: BTC MALL ASSOCIATES, LLC.

SCALE: 1" = 40'

0 10 20 30 40

N

Figure: 7

Date: 5/18

Scale: AS SHOWN

SUB-SLAB DEPRESSURIZATIONS SYSTEM PIPING LAYOUT

CITY PLACE BURLINGTON
BURLINGTON, VERMONT

Project Number: 280EM00175

Drawing File: SEE LOWER LEFT

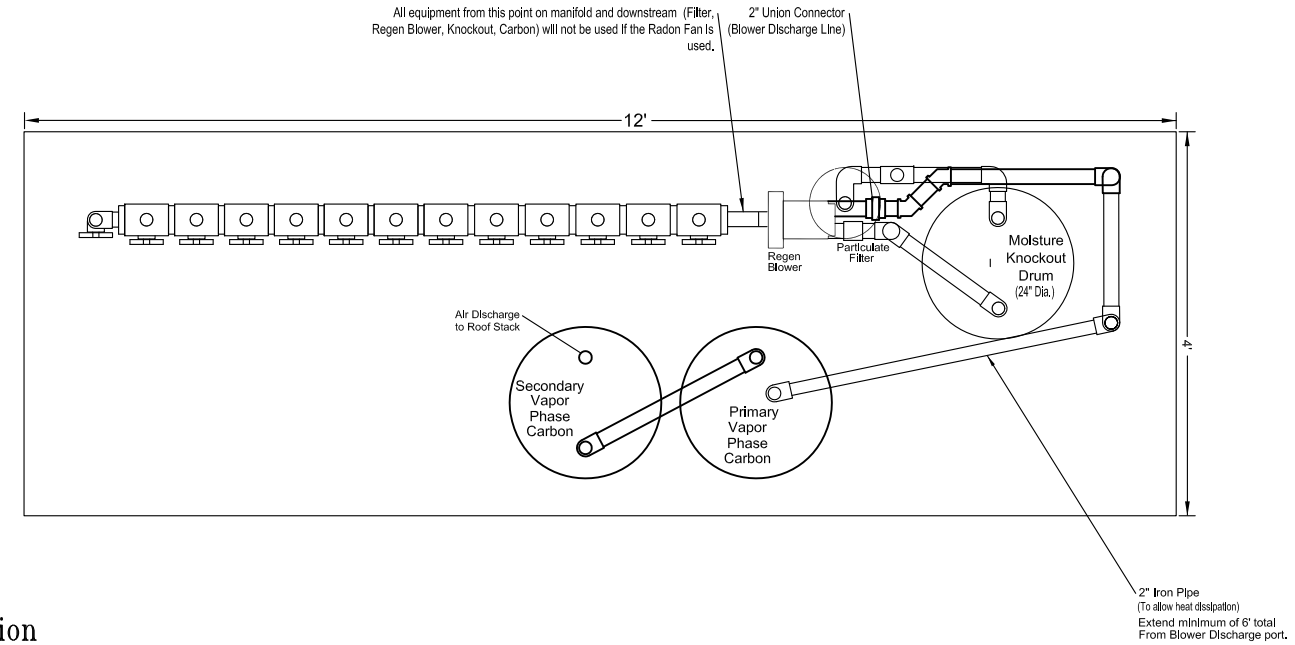
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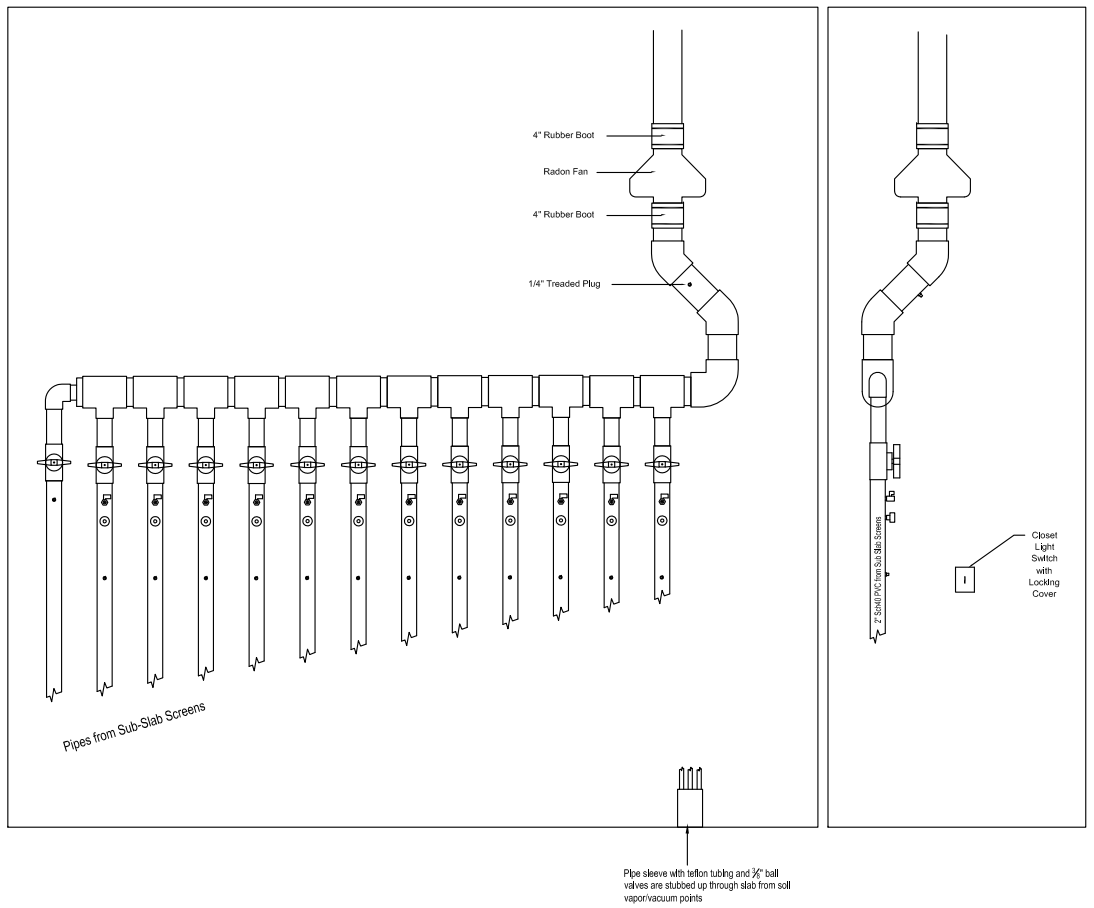
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Ckd. Date:

ATC

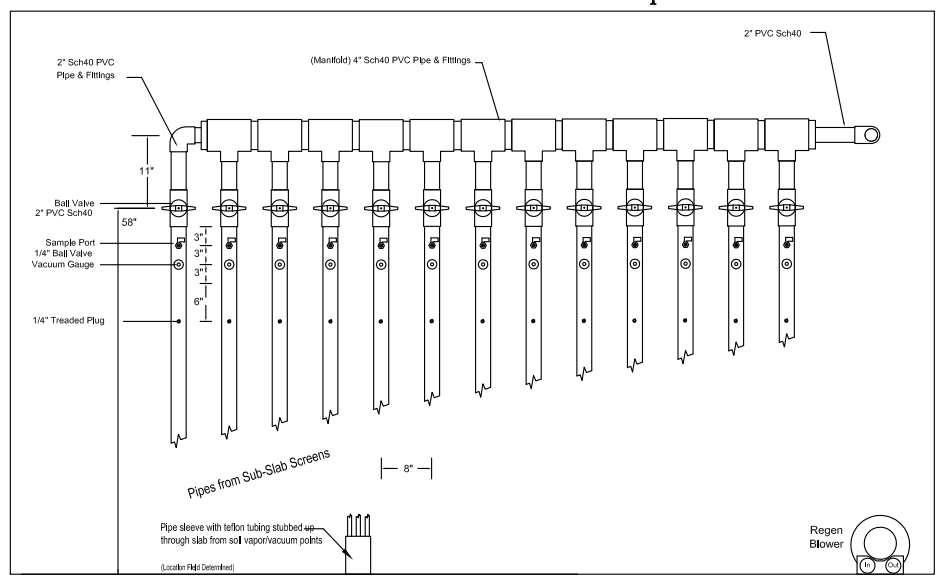


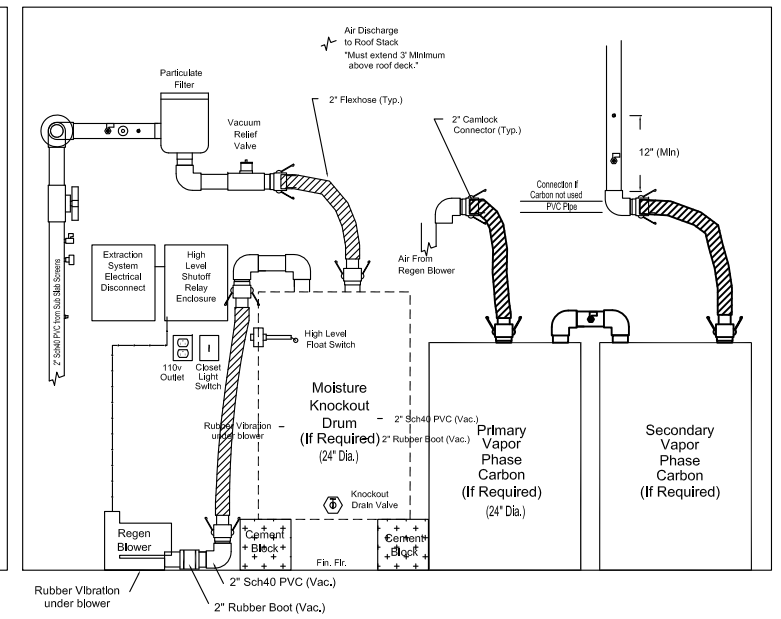
Fan Option



Sub-Slab Depressurization System Mechanical Area 1

Blower Option





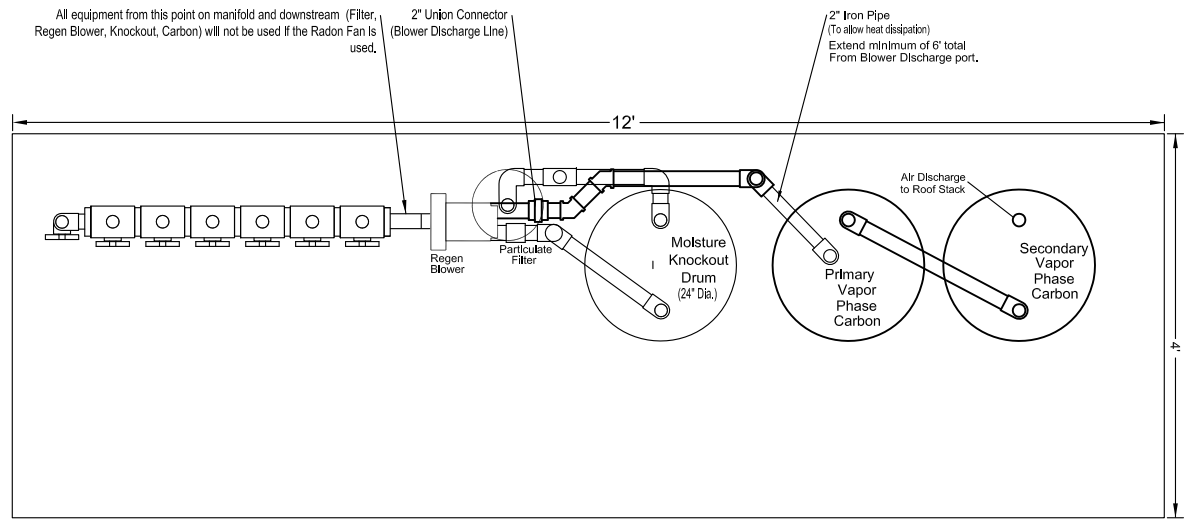
Drn. By:	DH
Ckd. By:	EU
App'd By:	
Ckd. Date:	
Project Number:	280EM00175
Drawing File:	DRAWING FILE

SUB-SLAB DEPRESSURIZATION SYSTEM DETAIL

CITY PLACE BURLINGTON
BURLINGTON, VERMONT

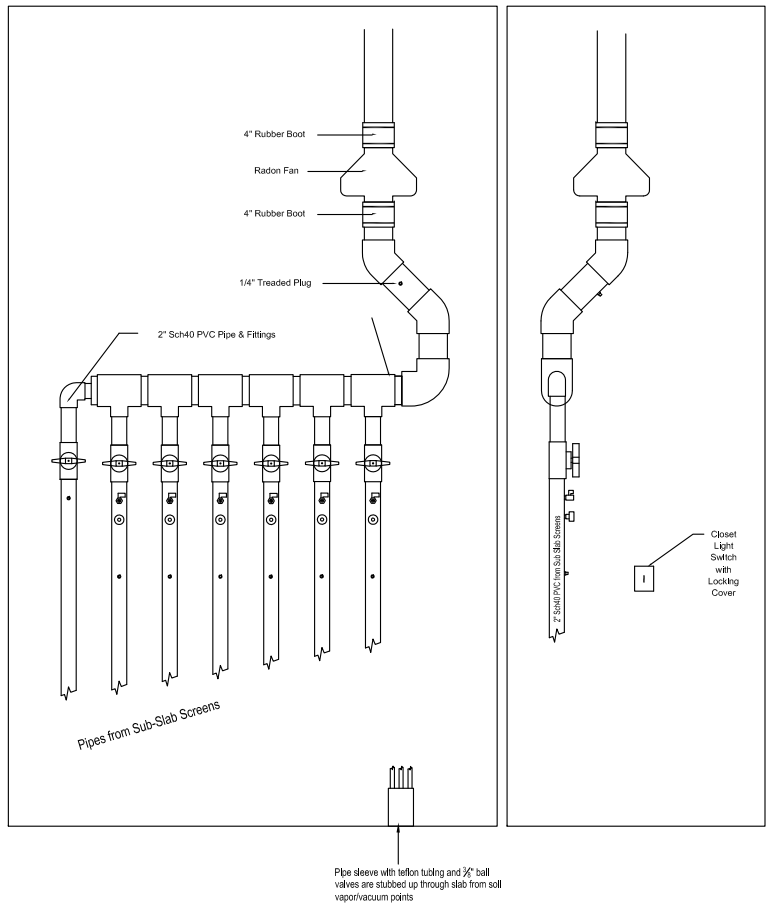
Date: 5/18
Scale: NOT TO SCALE
Figure: 8A

H:\2018\OTHER OFFICES\VERMONT\CITYPLACE BURLINGTON\280EM00175-SYSTEM DETAIL.DWG, FIG8A

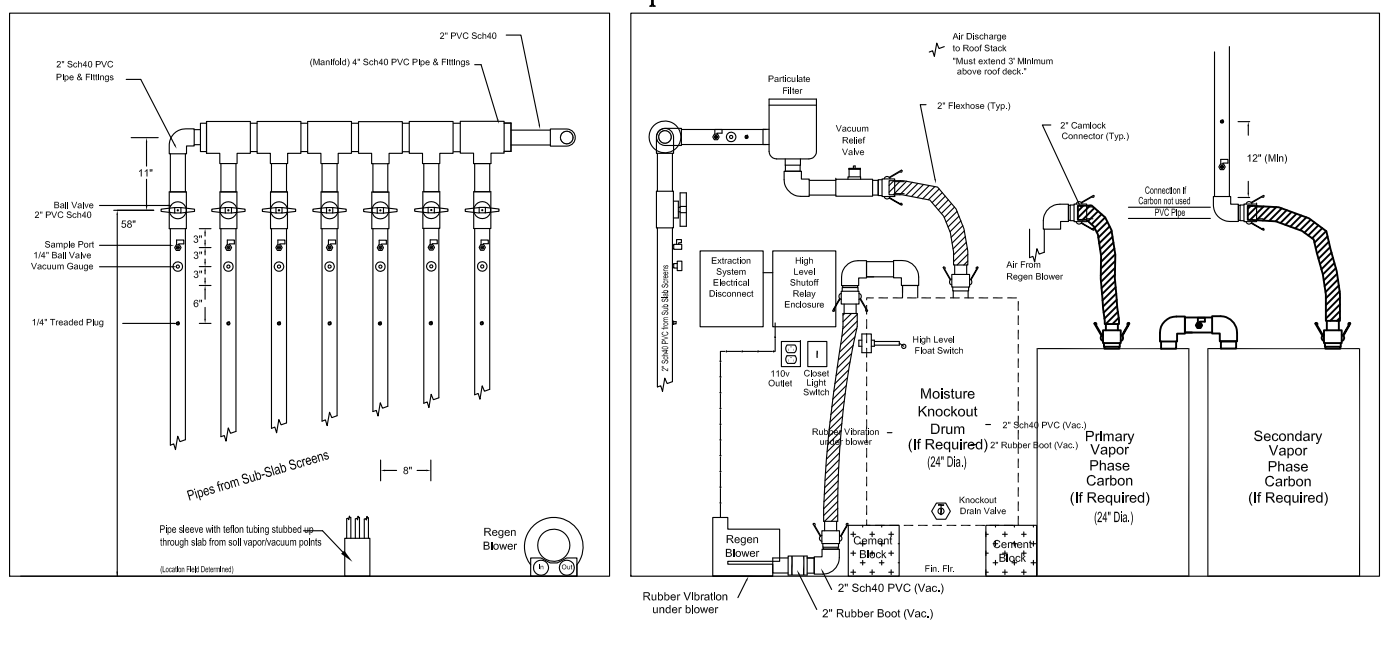


Sub-Slab Depressurization System Mechanical Area 2

Fan Option



Blower Option



Drn. By:	DH
Ckd. By:	EU
App'd By:	
Ckd. Date:	
Project Number:	280EM00175
Drawing File:	DRAWING FILE

SUB-SLAB DEPRESSURIZATION SYSTEM DETAIL

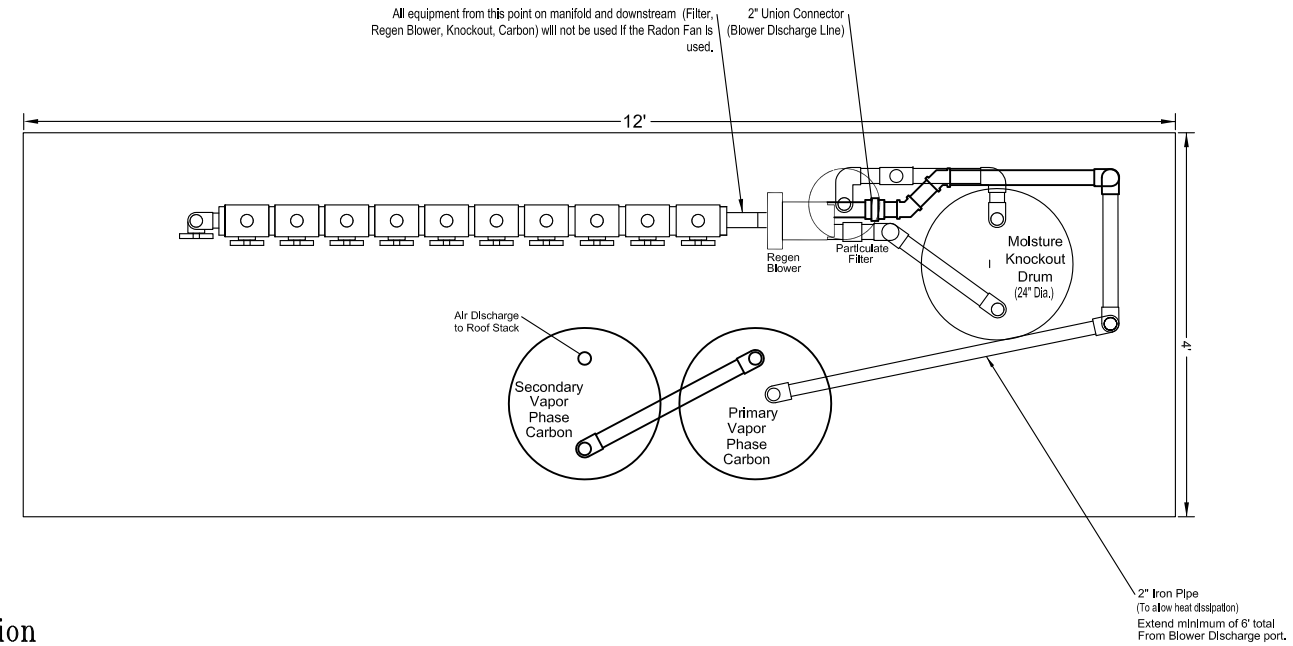
CITY PLACE BURLINGTON
BURLINGTON, VERMONT

Date: 5/18

Scale: NOT TO SCALE

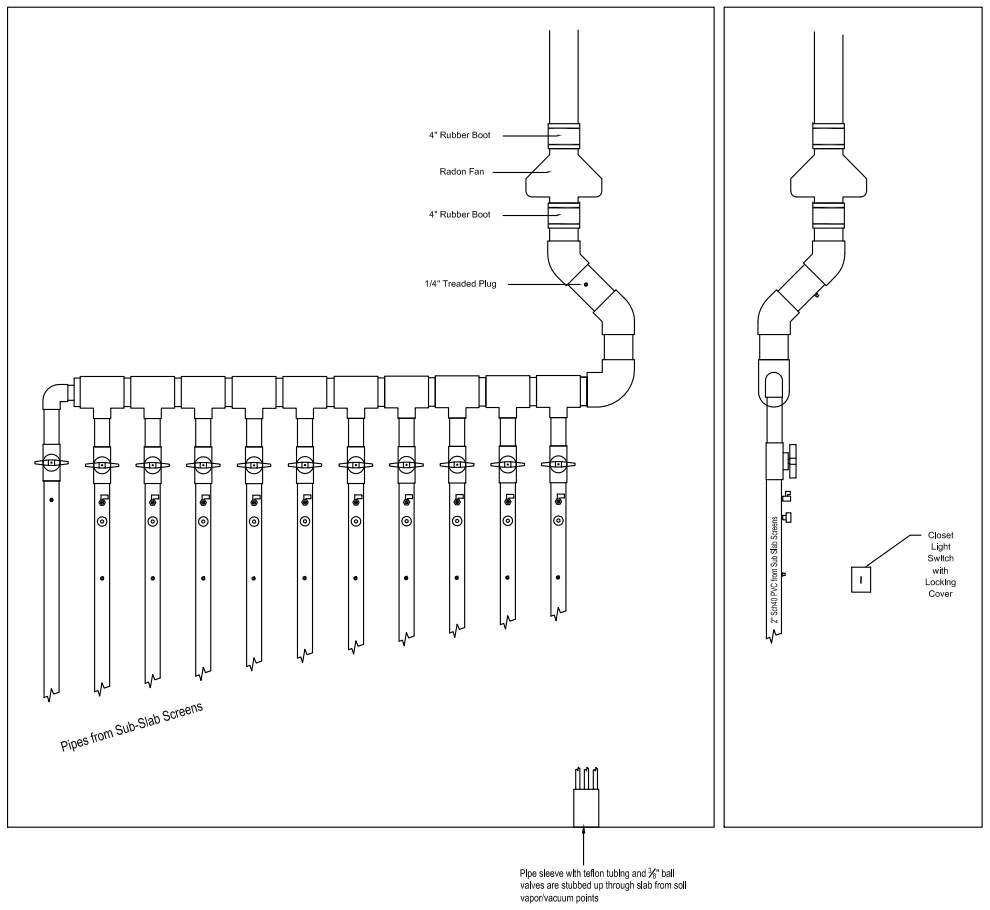
Figure: 8B

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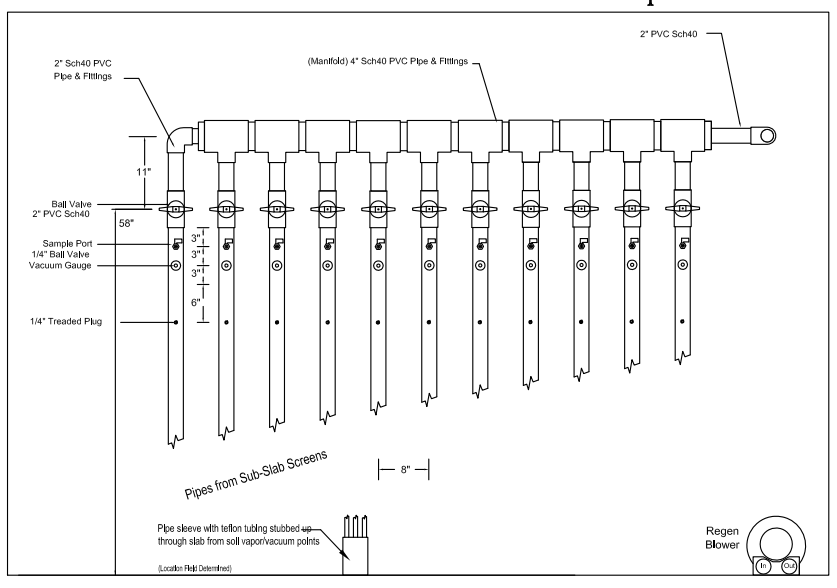


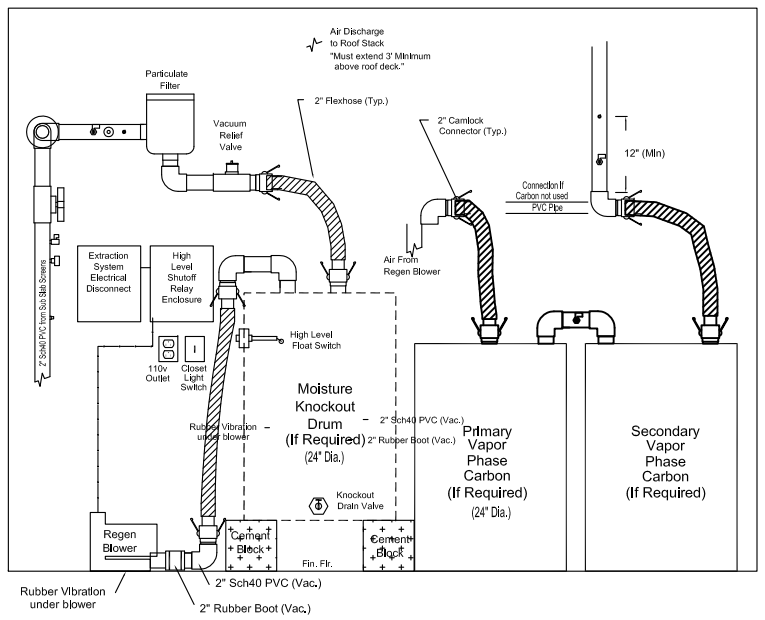
Sub-Slab Depressurization System Mechanical Area 3

Fan Option



Blower Option





Drn. By:	DH
Ckd. By:	EU
App'd By:	
Ckd. Date:	

Project Number: 280EM00175

Drawing File: DRAWING FILE

SUB-SLAB DEPRESSURIZATION SYSTEM DETAIL

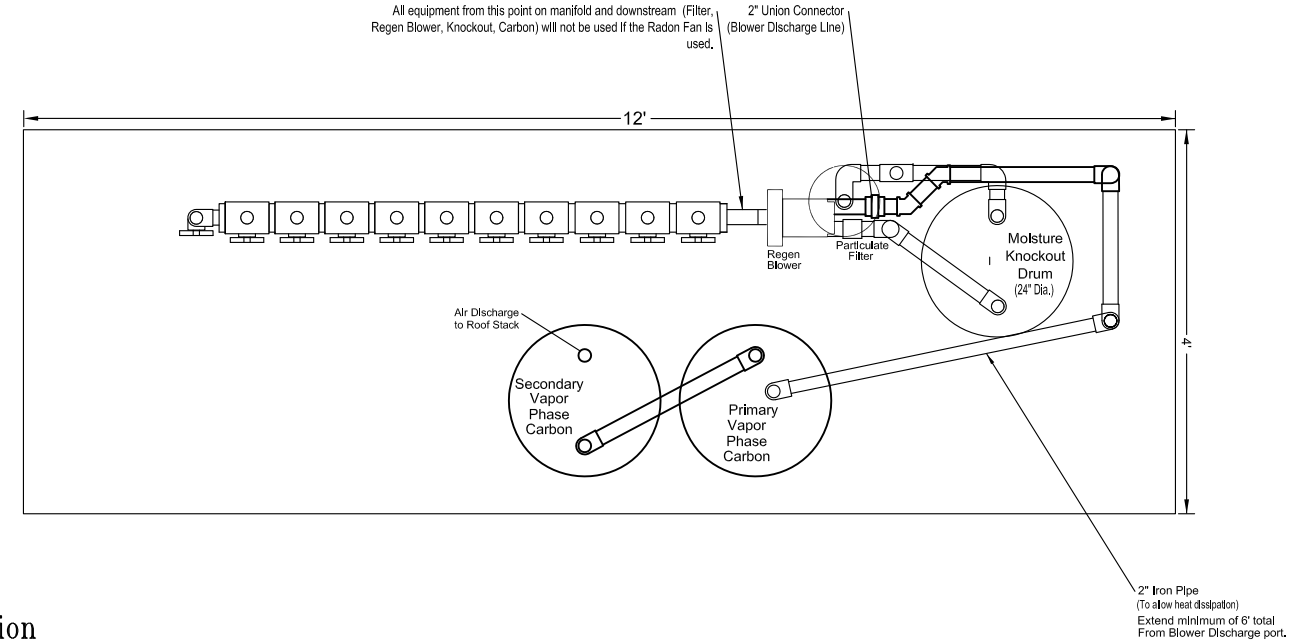
CITY PLACE BURLINGTON
BURLINGTON, VERMONT

Date: 5/18

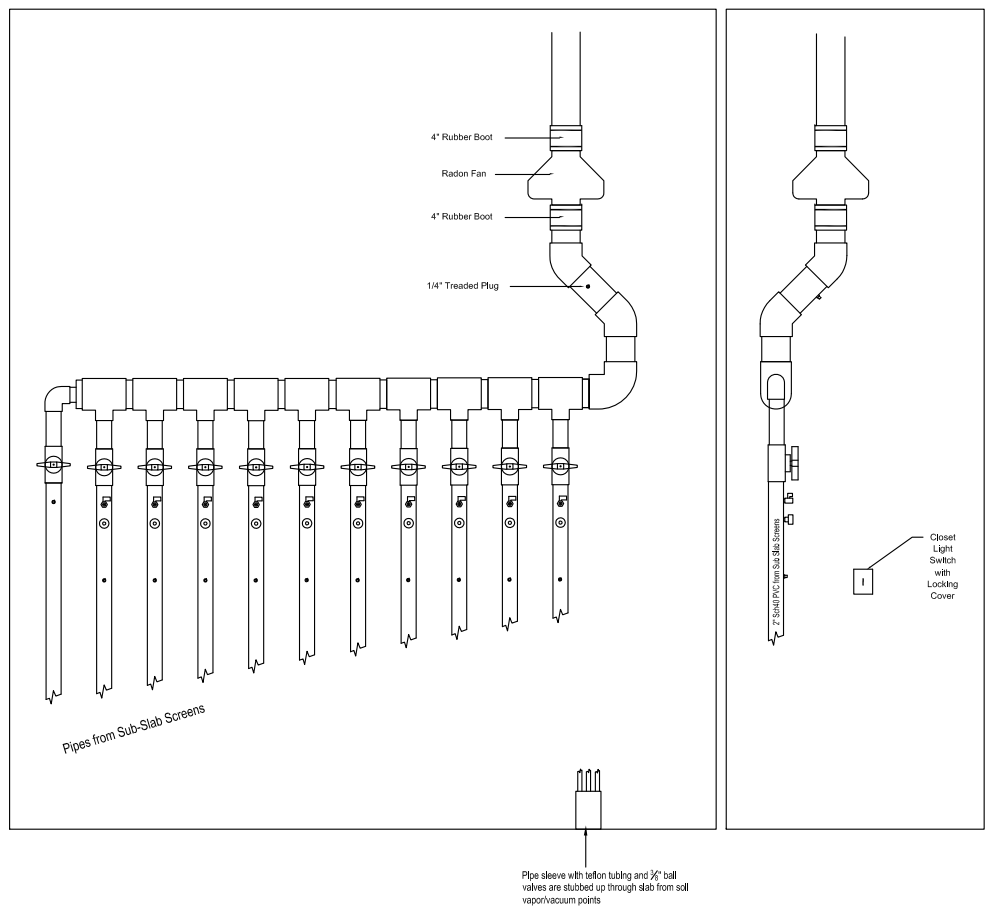
Scale: NOT TO SCALE

Figure: 8C

H:\2018\OTHER OFFICES\VERMONT\CITYPLACE BURLINGTON\280EM00175-SYSTEM DETAIL.DWG, FIG8C

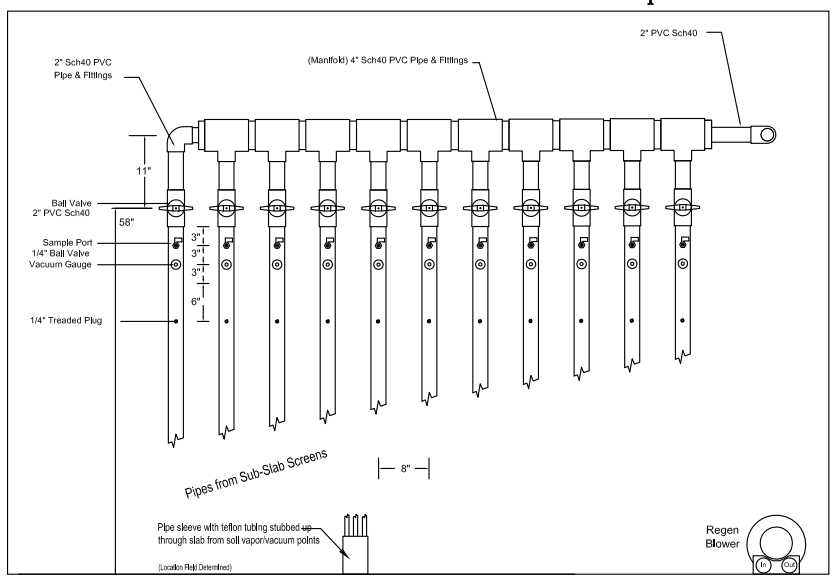


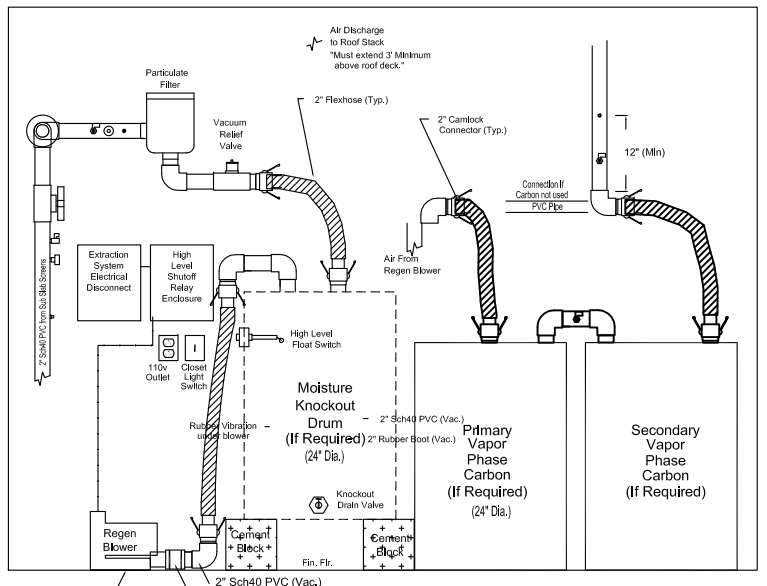
Fan Option



Sub-Slab Depressurization System Mechanical Area 4

Blower Option





Drn. By:	DH
Ckd. By:	EU
App'd By:	
Ckd. Date:	
Project Number:	280EM00175
Drawing File:	DRAWING FILE

ATC

SUB-SLAB DEPRESSURIZATION SYSTEM DETAIL

CITY PLACE BURLINGTON
BURLINGTON, VERMONT

Date: 5/18
Scale: NOT TO SCALE
Figure: 8D

H:\2018\OTHER OFFICES\VERMONT\CITYPLACE BURLINGTON\280EM00175-SYSTEM DETAIL.DWG, FIG8D

TABLES

TABLE 1

VOLATILE ORGANIC COMPOUND (VOC) SOIL SAMPLE RESULTS SUMMARY

CityPlace Burlington

Sample ID	Date	Depth (ft bgs)	Field PID (ppm)	VOCS (mg/kg)					
Detected Analyte				**Acetone**	**Chloroform**	**PCE**	**Toluene**	**TCE**	**m,p-Xylene**
VT VDH (mg/kg)				**39,900**	**--**	**1.46**	**4,640**	**0.442**	**--**
RSL Residential (mg/kg)				***61,000***	**0.32**	**24**	**4,900**	**0.94**	***550***
GD-B1-0-2	2/21/17	0-2	**0.0**	**0.12**	**0.0006J**	ND	**0.00061J**	ND	**0.0002J**
GD-B2-0-2	2/21/17	0-2	**0.4**	**0.0781**	**0.001J**	ND	**0.0019**	ND	**0.00025J**
GD-B2-8-9.5	2/21/17	8-9.5	**0.1**	**0.0519**	**0.00067J**	ND	**0.00039J**	ND	**0.00019J**
GD-B3-0.5-2	2/21/17	0.5-2	**0.0**	**0.0517**	ND	ND	**0.0026**	ND	ND
GD-B3-4-5.5	2/21/17	4-5.5	**0.3**	ND	**0.00066J**	ND	ND	ND	**0.00018J**
GD-B4-0.5-2	2/20/17	0.5-2	**0.0**	ND	ND	ND	ND	ND	ND
GD-B4-12-13	2/20/17	12-13	**0.0**	ND	ND	ND	ND	ND	ND
GD-B5-0.5-2	2/24/17	0.5-2	**0.0**	**0.0284a**	ND	**0.00059J**	**0.0032J**	ND	ND
GD-B5-12-13.5	2/24/17	12-13.5	**0.0**	**0.0155a**	ND	ND	**0.0076**	ND	ND
GD-B6-0-2	3/13/17	0-2	**0.0**	**0.0657**	ND	ND	**0.0027**	**0.0091**	ND
GD-B6-14-16	3/13/17	14-16	**0.0**	**0.0081**	ND	ND	**0.0027J**	**0.0023**	ND
QA/QC									
Trip Blank	2/20/17	NA	NA	ND	ND	ND	ND	ND	ND
Trip Blank	2/21/17	NA	NA	ND	ND	ND	ND	ND	ND
Trip Blank	2/24/17	NA	NA	ND	ND	ND	ND	ND	ND
Trip Blank	3/13/17	NA	NA	ND	ND	ND	ND	ND	ND
Duplicate (GD1-0-2)	2/21/17	0-2	**0.0**	**0.0411**	**0.001J**	ND	**0.00034J**	ND	ND
% Difference	--	--	--	*98*	*50*	--	*57*	--	--

NOTES:

Volatile organic compound (VOC) soil quality results, provided in mg/kg = milligrams per kilogram, analyzed by EPA Method 8260

PCE = perchloroethylene or tetrachloroethylene; TCE = trichloroethylene

ND = Not detected at or above stated laboratory reporting limit

RSL = EPA Regional Screening Levels for Residential Soils, (TR=1E-06, HQ=1.0) as noted (November 2017)

VT VDH = Vermont Department of Health Risk Based Residential Soil Screening Concentrations (TR=1E-06, HQ=1) from Appendix A of Investigation and Remediation of Contaminated Properties Rule, July 2017

J = Indicates estimated value

a = Initial and Continuing Calibration Verificaiton outside of acceptance criteria. Result may be biased high.

Bold = detections above the laboratory reporting limit

TABLE 2

SEMI VOLATILE ORGANIC COMPOUND (SVOC) SOIL SAMPLE RESULTS
CityPlace Burlington

Sample ID	Date	Depth (ft bgs)	Field PID (ppm)	SVOCS (mg/kg)												
Detected Analyte				Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Di-n-butyl phthalate	bis(2-Ethylhexyl)phthalate	Fluoranthene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene	Benzo(a)pyrene	Dibenzo(a,h)anthracene
VT VDH (mg/kg)				--	--	--	--	--	--	20.7	--	--	--	--	0.076[I]	--
RSL Residential (mg/kg)				1.1	1.1	--	11	110	--	39	2,400	1.1	--	1,800	0.11	0.11
GD1-0-2	2/21/17	0-2	**0.0**	**0.0619**	**0.0892**	**0.0511**	**0.031J**	**0.0733**	ND	ND	**0.1140**	**0.0526**	**0.0499**	**0.109**	**0.05870**	**0.0115**
GDB2-0-2	2/21/17	0-2	**0.4**	**0.0172J**	**0.0197J**	ND	ND	**0.0156J**	ND	ND	**0.0224J**	ND	ND	**0.0214J**	**0.0156**	ND
GDB2-8-9.5	2/21/17	8-9.5	**0.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.00431**	ND
GD3-0.5-2	2/21/17	0.5-2	**0.0**	ND	ND	ND	ND	ND	ND	ND	**0.0211J**	ND	ND	**0.0230J**	**0.0114**	ND
GD3-4-5.5	2/21/17	4-5.5	**0.3**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GD4-0.5-2	2/20/17	0.5-2	**0.0**	**0.0757**	**0.101**	**0.0614**	**0.0444**	**0.0841**	ND	ND	**0.147**	**0.0619**	**0.0511**	**0.141**	**0.0771**	**0.0156**
GD4-12-13	2/20/17	12-13	**0.0**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GDB5-0.5-2	2/24/17	0.5-2	**0.0**	**0.0336J**	**0.0372J**	**0.0365J**	**0.0295J**	**0.0335J**	**0.0114JB**	ND	**0.0439J**	**0.0363J**	**0.0139J**	**0.046J**	**0.0378**	**0.0085**
GDB5-12-13.5	2/24/17	12-13.5	**0.0**	ND	ND	ND	ND	ND	ND	**0.093J**	ND	ND	ND	ND	ND	ND
GD-B6-0-2	3/13/17	0-2	**0.0**	**0.0591**	**0.0678**	**0.0497**	**0.0309J**	**0.0554**	ND	ND	**0.1000**	**0.0548**	**0.0324J**	**0.0941**	**0.0636**	**0.0120**
GD-B6-14-16	3/13/17	14-16	**0.0**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.0080**	ND
QA/QC																
Duplicate (GD1-0-2)	2/21/17	0-2	**0.0**	**0.0419**	**0.0565**	**0.0331J**	**0.0188J**	**0.0474**	ND	ND	**0.0743**	**0.0346J**	**0.0366**	**0.0717**	**0.0418**	**0.00819**
% Difference	--	--		*39*	*45*	*43*	*49*	*43*	--	--	*42*	*41*	*31*	*41*	*34*	*34*

NOTES:
Soil quality results provided in mg/kg = milligrams per kilogram, and analyzed via EPA Method 8270
SVOCs = semi volatile organic compounds
ND = Not detected at or above stated laboratory reporting limit
RSL = EPA Regional Screening Levels for Industrial Soils, (TR=1E-06, HQ=1.0) as noted (November 2017)
VT VDH = Vermont Department of Health Risk Based Residential Soil Screening Concentrations (TR=1E-06, HQ=0.1) from Appendix A of Contaminated Properties Rules, July 2017
J = Indicates estimated value
B= Indicates anaylte found in associated method blank
Bold = detection above laboratory reporting limits
I = Residential Soil Screening Value

TABLE 3

METALS SOIL SAMPLE RESULTS SUMMARY
CityPlace Burlington

Sample ID	Date	Depth (ft bgs)	Field PID (ppm)	Metals (mg/kg)								
Detected Analyte				**Arsenic**	**Beryllium**	**Chromium**	**Copper**	**Lead**	**Mercury**	**Nickel**	**Silver**	**Zinc**
VTDEC Urban Background Soil Concentration (mg/Kg)				**16**	**--**	**--**	**--**	**111**	**--**	**--**	**--**	**--**
VT VDH SSLs (mg/kg)				**--**	**36.0**	**41,900**	**--**	**--**	**10.9**	**980**	**247**	**22,900**
RSL Residential (mg/kg)				**--**	**160**	**120,000**	**3,100**	**400**	**23**	**1,500**	**390**	**23,000**
GD1-0-2	2/21/17	0-2	**0.0**	**5.0**	ND	**10.8**	**14.3**	**22.9**	ND	**17.2**	ND	**45.2**
GDB2-0-2	2/21/17	0-2	**0.4**	**4.1**	**0.22**	**13.9**	**8.8**	**5.8**	ND	**18.0**	ND	**29.0**
GDB2-8-9.5	2/21/17	8-9.5	**0.1**	**3.5**	**0.30**	**17.3**	**15.4**	**6.5**	ND	**24.6**	ND	**47.3**
GD3-0.5-2	2/21/17	0.5-2	**0.0**	**4.4**	**0.22**	**9.3**	**114**	**13.3**	ND	**14.1**	ND	**48.2**
GD3-4-5.5	2/21/17	4-5.5	**0.3**	**6.0**	**0.23**	**14.9**	**14.6**	**6.1**	ND	**24.8**	ND	**45.7**
GD4-0.5-2	2/20/17	0.5-2	**0.0**	**4.6**	ND	**13.2**	**6.6**	**19.8**	**0.053**	**16.6**	**0.74**	**39.9**
GD4-12-13	2/20/17	12-13	**0.0**	**5.1**	**0.34**	**24.9**	**21.4**	**7.9**	ND	**33.4**	**ND**	**63.0**
GDB5-0.5-2	2/24/17	0.5-2	**0.0**	**4.3**	**11.6**	**13.5**	**13.5**	**19.9**	**0.037**	**19.8**	ND	**40.3**
GDB5-12-13.5	2/24/17	12-13.5	**0.0**	**3.4**	ND	**11.1**	**11.1**	**5.1**	ND	**17.1**	ND	**31.4**
GD-B6-0-2	3/13/17	0-2	**0.0**	**4.8**	ND	**11.6**	**11.5**	**20.2**	ND	**18.9**	ND	**37.8**
GD-B6-14-16	3/13/17	14-16	**0.0**	**5.1**	ND	**13.6**	**10.5**	**4.5**	ND	**18.9**	ND	**28.2**
QA/QC												
Duplicate (GD1-0-2)	2/21/17	0-2	**0.0**	**4.8**	ND	**25.1**	**11.6**	**16.2**	ND	**28.0**	ND	**45.7**
% Difference	--	--		*4*	--	*80*	*21*	*34*	--	*48*	--	*1*

NOTES:

Metals soil quality results provided in mg/kg = milligrams per kilogram and analyzed by EPA Methods 6010/7471

ND = Not detected at or above stated laboratory reporting limit

VT DEC Background Soil Concentrations from Appendix A of Investigation and Remediation of Contaminated Properites Rule, July 2017

RSL = EPA Regional Screening Levels for Industrial Soils, (TR=1E-06, HQ=1.0) as noted (May 2016)

Arsenic RSL not relevant and therefore not listed; superceded by bacgkround concentration (16 mg/kg).

Chromium = RSL values presented are for Chromium III

VT VDH = Vermont Department of Health Risk Based Residential Soil Screening Concentrations (TR=1E-06, HQ=0.1) from Appendix A of Investigation and Remediation of Contamintated Properties Rule, July 2017

Bold = detection above laboratory reporting limits

TABLE 4
Semi Volatile Organic Compound (SVOC) Sample Results
Benzo[a] pyrene Toxic Equivalency Quotient
CityPlace Burlington
Burlington, VT

Soil Sampling Results				Sample ID #	GD1-0-2			GDB2-0-2			GDB2-8-9.5			GD3-0.5-2			GD3-4-5.5		
Contaminant	**TEF**	**VT DEC Urban Bkgd**	**VT DOH Screening Levels**	**VT DOH Screening Levels**	**Conc.**	**1/2 ND**	**Value**	**Conc.**	**1/2 ND**	**Value**	**Conc.**	**1/2 ND**	**Value**	**Conc.**	**1/2 ND**	**Value**	**Conc.**	**1/2 ND**	**Value**
PAH							**TEF * Conc.**			**TEF * Conc.**			**TEF * Conc.**			**TEF * Conc.**			**TEF * Conc.**
Benz(a)anthracene	0.1				*0.0619*		0.00619	*0.0172*		0.00172	*ND<0.011*	0.0055	0.00055	*ND<0.0099*	0.00495	0.000495	*ND<0.011*	0.0055	0.00055
Benzo(a)pyrene	1				*0.0587*		0.0587	*0.0156*		0.0156	*0.00431*		0.00431	*0.0114*		0.0114	*ND<0.00093*	0.000465	0.000465
Benzo(b)fluoranthene	0.1				*0.0892*		0.00892	*0.0197*		0.00197	*ND<0.017*	0.0085	0.00085	*ND<0.015*	0.0075	0.00075	*ND<0.017*	0.0085	0.00085
Benzo(k)fluoranthene	0.01				*0.031*		0.00031	*ND<0.017*	0.0085	0.000085	*ND<0.018*	0.009	0.00009	*ND<0.016*	0.008	0.00008	*ND<0.018*	0.009	0.00009
Chrysene	0.01				0.0733		0.000733	0.0156		0.000156	ND<0.012	0.006	0.00006	ND<0.011	0.0055	0.000055	ND<0.012	0.006	0.00006
Dibenzo(a,h)anthracene	1				*0.0115*		0.0115	*ND<0.00084*	0.00042	0.00042	*ND<0.00089*	0.000445	0.000445	*ND<0.00081*	0.000405	0.000405	*ND<0.00089*	0.000445	0.000445
Indeno(1,2,3-cd)pyrene	0.1				*0.0526*		0.00526	*ND<0.017*	0.0085	0.00085	*ND<0.018*	0.009	0.0009	*ND<0.016*	0.008	0.0008	*ND<0.018*	0.009	0.0009
Total mg/kg		**0.58**	**0.076**	**1.54**			**0.0916**			**0.0208**			**0.0072**			**0.0140**			**0.0034**

Soil Sampling Results				Sample ID #	GD4-0.5-2			GD4-12-13			GDB5-0.5-2			GDB5-12-13.5			GD-B6-0-2			GD-B6-14-16		
Contaminant	**TEF**	**VT DEC Urban Bkgd**	**VT DOH SSL (Res)**	**VT DOH SSL (Ind)**	**Conc.**	**1/2 ND**	**Value**	**Conc.**	**1/2 ND**	**Value**	**Conc.**	**1/2 ND**	**Value**	**Conc.**	**1/2 ND**	**Value**	**Conc.**	**1/2 ND**	**Value**	**Conc.**	**1/2 ND**	**Value**
PAH							**TEF * Conc.**			**TEF * Conc.**			**TEF * Conc.**			**TEF * Conc.**			**TEF * Conc.**			**TEF * Conc.**
Benz(a)anthracene	0.1				*0.0757*		0.00757	*ND<0.011*	0.0055	0.00055	*0.0336*		0.00336	*ND<0.012*	0.006	0.0006	*0.0591*		0.00591	*ND<0.0099*	0.00495	0.000495
Benzo(a)pyrene	1				*0.0771*		0.0771	*ND<0.00094*	0.00047	0.00047	*0.0378*		0.0378	*ND<0.0024*	0.0012	0.0012	*0.0636*		0.0636	*0.0080*		0.000617
Benzo(b)fluoranthene	0.1				*0.101*		0.0101	*ND<0.017*	0.0085	0.00085	*0.0372*		0.00372	*ND<0.014*	0.007	0.0007	*0.0678*		0.00678	*ND<0.015*	0.0075	0.00075
Benzo(k)fluoranthene	0.01				*0.0444*		0.000444	*ND<0.018*	0.009	0.00009	*0.0295*		0.000295	*ND<0.016*	0.008	0.00008	*0.0309*		0.000309	*ND<0.016*	0.008	0.00008
Chrysene	0.01				0.0841		0.000841	ND<0.012	0.006	0.00006	0.0335		0.000335	ND<0.0092	0.0046	0.000046	0.0554		0.000554	ND<0.011	0.0055	0.000055
Dibenzo(a,h)anthracene	1				*0.0156*		0.0156	*ND<0.00090*	0.00045	0.00045	*0.0085*		0.0085	*ND<0.0017*	0.00085	0.00085	*0.012*		0.012	*ND<0.00081*	0.000405	0.000405
Indeno(1,2,3-cd)pyrene	0.1				*0.0619*		0.00619	*ND<0.018*	0.009	0.0009	*0.0363*		0.00363	*ND<0.033*	0.0165	0.00165	*0.0548*		0.00548	*ND<0.016*	0.008	0.0008
Total mg/kg		**0.58**	**0.076**	**1.54**			**0.1178**			**0.0034**			**0.0576**			**0.0051**			**0.0946**			**0.0032**

Notes:
All samples collected in March and April 2017 and expressed as milligrams per kilogram or mg/kg
Benzo(a)Pyrene = B(a)P
TEF = Toxic Equivalency Factor
B(a)P TEQ values were calculated from PAH analyical concentrations multiplied by the corresponding TEF and summed. Compounds that are non-detect were estimated based on half of the Method Detection Limit (MDL).
VT DOH = Vermont Department of Health
Res = Residential
Ind = Industrial
VT DEC Urban Background and Vermont Screeing Levels from Appendix A of Investigation and Remediation of Contaminated Properties Rule, July 2017

Table 5

Soil Vapor Analytical Results

CityPlace Burlington

Sample Location	SSVP-1 (not in project)	SSVP-2 (not in project)	SSVP-3	SSVP-4	SSVP-5	2017 VT DEC Vapor Intrusion Screening Values Sub-Slab Soil Gas - Residential (µg/m3)
Acetone	**110**	**67.0**	**78.6**	**128**	**183**	1,100,000
Benzene	**0.80J**	**0.70J**	**1.0J**	ND	**1.1J**	4.3
Bromoform	ND	ND	ND	ND	**5.2**	85
Bromoethene	ND	ND	ND	ND	**1.8**	--
Carbon disulfide	**0.75J**	**0.78J**	**0.93J**	ND	**0.78J**	24,000
Chloroform	**1.4J**	ND	**4.5**	ND	ND	4.1
Chloromethane	ND	ND	**0.43J**	ND	ND	3,100
1,2-Dibromoethane	**7.0**	**30**	**5.4**	**9.2**	**277**	0.16
1,2-Dichloroethane	ND	ND	ND	ND	**6.1**	3.6
Dichlorodifluoromethane (Freon12)	**7.4**	**25**	**12**	**682**	**106**	3,500
Ethanol	**167E**	**155E**	**102**	**92.0**	**177E**	--
Ethyl acetate	**9.0**	**8.3**	**9.7**	**7.9**	**1.7**	2,400
Heptane	**1.6J**	**1.6**	**1.8**	**1.4J**	**3.0**	--
Hexane	**6.3**	**3.9**	**2.0**	**1.9**	**5.6**	24,000
Isopropyl alcohol/isopropanol	**88.2**	**76.7**	**29.7**	**71.8**	**66.4**	7,000
Methylene chloride	**9.0**	**8.7**	**2.0**	**2.4**	**8.0**	3,400
Methyl ethyl ketone (MEK)	**12**	**6.2**	**6.2**	**8.8**	**6.8**	170,000
Methyl isobutyl ketone	ND	ND	ND	**4.9**	ND	100,000
Propylene	ND	ND	**2.7**	ND	ND	100,000
1,2,4-Trichlorobenzene	ND	ND	ND	ND	**10**	70
Tertiary Butyl Alcohol	**4.9**	**2.6**	**1.4**	**6.4**	**11**	**--**
Tetrachloroethene	**49**	**33**	**2.5**	**3.3**	**7.5**	21
Tetrahydrofuran	**27**	**14**	**13**	**19**	**14**	70,000
Toluene	**2.3**	**2.0**	**2.0**	**2.0**	**3.8**	170,000
Trichloroethene	ND	**0.47**	**1,470**	**0.54**	**3.1**	6.7
Trichlorofluoromethane	**7.3**	**4.8**	**2.2**	**11**	**42**	--
Xylenes (total)	**0.83J**	**1.0J**	ND	**2.3**	**2.3**	3,500

Notes:

Samples collect on March 6, 2017 and analyzed by EPA method TO-15

2017 Vermont Vapor Intrusion Screening Values are from Appendix A of the Investigation and Remediation of Contaminated Properties Rule, July 2017

ND = Not detect at or above stated laboratory detection limit

J = Indicates estimated value

E = Indicates value exceeds calibration range

APPENDIX A

PUBLIC NOTICE FORM

PUBLIC NOTICE

On behalf of BTC Mall Associates, ATC Group Services, LLC (ATC) prepared this Corrective Action Plan (CAP) in accordance with Vermont Department of Environmental Conservation (VTDEC) Investigation and Remediation of Contaminated Properties Rule (iRule, July 27, 2017) for Phase 1 of the CityPlace Burlington redevelopment project (the Site) located at 49 Church Street in Burlington, Vermont. The Site is previously known as Burlington Town Center and is listed by the Vermont Department of Environmental Conservation (VTDEC) as City Center Mall hazardous site #2016-4625.

The Site is undergoing deconstruction activities of existing mall structures to make way for a new mixed-use residential/commercial 14-story building that will include residential apartments, affordable housing, retail space, community space, and an in-building parking garage. The project will also include the re-establishment of Pine and St. Paul Streets between Bank and Cherry Streets. Phase 2 of the project will include future redevelopment of existing mall structures to the east between St. Paul and Church Streets, which are not subject to this CAP.

The objective of this CAP is to mitigate vapor intrusion potential of subsurface vapors into the new building and to complete additional Site Investigation activities. Previous testing indicates that contaminated vapors were present beneath the former mall slab at concentrations exceeding State screening levels. Additional testing of vapors will be performed to evaluate vapor conditions in soils associated with proposed bottom of slab (BOS) grades and to further evaluate potential source(s) of these vapors. These vapors present a risk of exposure to building occupants through the potential vapor intrusion pathway.

An Evaluation of Corrective Action Alternatives (ECAA) was completed by ATC, which identified two common alternatives to mitigate vapor intrusion potential: 1) active sub-slab depressurization system (SSDS) and 2) passive SSDS. ATC recommended the active SSDS primarily because of a more predictable operational performance and more protective of human health. As such, up to four SSDSs will be installed and monitored to mitigate vapor intrusion potential.

Any public comment regarding this corrective action can be sent to the VT DEC. For more information, contact Ms. Sarah Bartlett of the VT DEC at (802) 249-5641 or sarah.bartlett@vermont.gov.

APPENDIX B

GEOTECHNICAL ENGINEERING REPORT

GEODESIGN
INCORPORATED

GEOTECHNICAL ENGINEERS AND ENVIRONMENTAL CONSULTANTS

November 22, 2017
File No. 1332-01

Don Sinex
Devonwood Investors, LLC
101 Cherry St, Suite 440
Burlington, VT 05401

RE: Geotechnical Engineering Report – Phase 1A and 1B
Burlington City Place. Burlington, Vermont

Cc: Tim Hardy, P.E. – Hardy Structural Engineering

Dear Don:

Geo**Design** is pleased to provide this summary geotechnical report of findings and recommendations for the captioned project. This report is based on our November 13 (revised December 9, 22, and 29), 2016 proposed scope of services, and includes our prior reports and memorandum in the attachments. As discussed in our meeting on November 17, 2017, the report focuses on two foundation options: one option with, and one option without a basement.

We appreciate the opportunity to be of service to you on this project, and we look forward to continuing this collaboration through construction. If you have any questions, please contact Jason Gaudette at 802-674-2033 (Ext. 205).

Sincerely,
Geo**Design**, Inc.

Jason Gaudette, P.G.
Senior Associate

Jacob Wimett, P.E.
Senior Project Engineer

Theodore von Rosenvinge, P.E., D.GE
Senior Principal / Reviewer

Enclosed: Geotechnical Engineering Report (with Attachments)

54 MAIN STREET • POST OFFICE BOX 699 • WINDSOR, VERMONT 05089-0699
TELEPHONE: 802.674.2033 • FACSIMILE: 802.674.5943

GEOTECHNICAL
ENGINEERING REPORT

Burlington City Place
Phase I Renovation

Devonwood Investors
Burlington, VT

Don Sinex
Devonwood Investors, LLC
101 Cherry St, Suite 440
Burlington, VT 05401

November 22, 2017

GEODESIGN INCORPORATED

54 Main Street, P.O. Box 699, Windsor, Vermont 05089
(T) 802.674.2033, (F) 802.674.5943
Geo**Design** Project Number: 1332-01

Devonwood Investors
Burlington City Place Project
Geotechnical Engineering Report

by

Geo**Design**, Inc.

EXECUTIVE SUMMARY

Devonwood Investors is progressing with the design phase of the redevelopment project for the existing Town Center Mall located between Bank Street and Cherry Street in downtown Burlington, Vermont. The phased construction involves demolition of the western section of the existing mall, re-establishing Pine and St Paul Streets, and re-constructing within that footprint. The design team consists of PC Construction, Engineering Ventures, and Hardy Structural Engineers with Geo**Design** providing geotechnical recommendations.

This report is intended for final design and supplements and incorporates our March 2, 2017 Site Specific Seismic Ground Motion Study, our April 12, 2017 Geotechnical Data Report, and our April 28, 2017 Foundation Options Evaluation Memorandum.

Site soils are not suitable to support the proposed structure on conventional shallow spread footings. Geo**Design** identified deep foundations bearing in Glacial Till or Bedrock as the most reliable and effective method to control settlements.

A second option consists of load reduction via the addition of a basement in conjunction with ground improvement and a “buffer” zone of column loads supported on ductile iron pipe piles in the immediate vicinity of the existing structure at 100 Bank Street.

At the time of this report, both alternatives are both being explored in terms of cost and relative settlement risk.

Excavations to reach proposed footing levels will require support of excavation systems to protect the immediately adjacent structures, roadways, and utilities from damage. We are providing recommended limiting criteria for movements and vibrations for adjacent structures in this report. We recommend this criteria be reviewed by the design and ownership team.

Groundwater depths are inferred to be below anticipated excavation levels.

A site specific seismic ground motion study was performed and design criteria are provided.

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1 INTRODUCTION

Geo**Design** prepared this geotechnical recommendations report for the proposed Burlington City Place (BCP) redevelopment (previously referred to as the Burlington Town Center in our proposal and earlier reports). The BCP block is bounded by existing Cherry and Bank streets and proposed reconnections of Pine and St. Paul streets in downtown Burlington, Vermont. Refer to the site plans (Figures 1 and 2) provided in Attachment 1.

The proposed BCP building is Phase I of a redevelopment plan for the existing Burlington Town Center (a two-story mall) consisting of mixed-use residential, retail, and office space. Our report is based on our November 23 (revised December 29), 2016 proposal and the following:

- March 2, 2017 Site Specific Seismic Ground Motion Study (referred to as "our GMS");
- April 12, 2017 Geotechnical Data Report (referred to as "our GDR"); and,
- April 28, 2017 Foundation Options Evaluation Memo (referred to as "our Memo").
- Site meeting with the design and ownership team on November 17, 2017.

1.1 Objective

The objective of this report is to provide Devonwood Investors, PC Construction, and the design team with geotechnical data, design recommendations for foundation options, and construction considerations for the proposed project.

1.2 Background

This project consists of the redevelopment of an approximately 104,000 square foot area of land currently occupied by a mixed use mall development. The new development proposals include demolishing the existing portion of the mall west of St. Paul Street and construction of a commercial and residential mixed use building, up to 14 stories high (approximately 170 feet above existing grade).

Existing grades at the project area vary from approximately El. 220 (northeast) to El. 205 feet (southwest). Constructing new foundations will require support of excavation (SOE) systems that will vary in size and complexity depending on excavation depths. Protection of the existing 100 Bank Street building will also be required as it will remain adjacent to the new BCP building.

At the time of this report, options for both a basement level (approximate El. 191.5) and a lower level matching existing slab level (approximate El. 206.5) are being considered. Therefore, foundation design has not been finalized. As such, our recommendations are based on the most recent structural drawings available at the time of this report (Bid Set dated 10/01/2017 which was included in Addendum # BP1-1 dated 10/11/2017).

We also understand building loading conditions are still being revised, with potential changes provided in a December, 2017 addendum (including the potential for removal of the basement).

2 AVAILABLE INFORMATION

Project information including the site location, available information, geologic setting, and historical (pre-2017) geotechnical data is included in the attached GDR (Attachment 2). As part of our evaluation of subsurface conditions, we performed a review of available boring data from nearby projects performed by Geo**Design** and others.

3 SUBSURFACE EXPLORATIONS

Current (2017) explorations were performed at select locations to supplement existing data, distributed broadly across the site and extending deeper than most historical explorations. We requested performing explorations within the existing mall, but understood that was not possible. Details of the 2017 subsurface exploration programs are included in our GDR.

4 LABORATORY RESULTS

Testing was performed in Geo**Design**'s in-house laboratory in Windsor, VT and at the University of Massachusetts (UMASS) in Amherst, MA. Refer to Attachment 5 for a summary of results.

Grain size and Atterberg limit tests were performed on samples from the soil borings at our Windsor lab. Moisture content (19), washed sieve (9), Liquid and Plastic Limit (6), and sieve-hydrometer (4) testing were performed. These tests were performed to confirm visual soil descriptions, evaluate the suitability of re-use, and determine soil strength parameters.

Undisturbed tube samples were tested at UMASS. Three samples were tested, with analyses including water content, total and dry unit weight, Atterberg limit, grain size distribution, torvane, pocket penetrometer, and constant rate of strain (CRS) consolidation.

5 RECOMMENDATIONS

5.1 Foundation Design

As discussed in our November 17, 2017 site meeting two options are currently being priced:

- Basement Option (Slab at El. 191.5').
- No Basement Option (Slab at EL. 206.5').

These options are discussed below. Background information and prior foundation analysis is provided in Attachment 3. Deep foundations (i.e., piles) deriving their capacity within the

Glacial Till stratum (or Bedrock) is the lowest-risk solution with regards to settlements for the new BCP building and the existing 100 Bank Street building for either option.

5.1.1 Basement Option

Figure 3 in Attachment 1 depicts this option. One potential alternative to end-bearing piles is a Rammed Aggregate Pier (RAP) ground improvement system designed in conjunction with ductile iron pipe piles (DIPPs). This alternative has more settlement risk as discussed below. This approach is based on preliminary evaluation and consultation with a RAP designer. The key elements of this option are to:

- Stiffen the upper sand/silt with RAPs;
- Mitigate settlement impact at the adjacent 100 Bank Street structure using DIPPs; and,
- Load reduction as the result of removing a basement level of soil.

After consultation with a RAP designer, Geo**Design** provided the following criteria:

- Maximum Allowable Bearing Pressure (RAP supported foundations): 8,000 psf.*
- Settlement Tolerance: 1” Total, ½” Differential.

**Allowable bearing pressure provided is based on a preliminary evaluation performed by a RAP designer. Actual “design” maximum allowable bearing pressure will be provided by the RAP designer to meet required settlement criteria.*

Preliminary analyses by RAP/DIPP designers indicated that meeting ½” differential settlement criteria was feasible, but total settlements could be up to 1.5”. Estimated settlement on the order of less than 1/8” was provided by the RAP designer for the 100 Bank Street structure. We understand the design team and Owner have decided this level of settlement is acceptable.

If the RAP/DIPP scheme is selected, the RAP and DIPP designers will be required to submit final stamped designs prepared by a Licensed Engineer in the State of Vermont. In final design total and differential settlements may change. Ultimately, final settlement estimates provided by the RAP and DIPP designers will have to be reviewed and approved by the Design Team and Devonwood prior to proceeding with a RAP/DIPP option over end-bearing piles.

5.1.2 No Basement Option

We recommend end-bearing piles deriving their capacity from the Glacial Till stratum if a basement option is not selected. Figure 4 in Attachment 1 depicts this option. Recommended criteria for pile estimating purposes are included in Attachment 3.

5.2 Lower Level Slabs

5.2.1 Basement Option

Basement level slabs-on-grade should be isolated from the building walls. A minimum of 12 inches of free draining material (structural fill or crushed stone) should be installed below the bottom of concrete slabs.

We recommend a modulus of subgrade reaction of 150 pounds per cubic inch based on published correlations to the anticipated subgrade material (assumes a typical floor slab with light, concentrated loads) for concrete slabs residing in the natural Sand/Silt stratum.

5.2.2 No Basement Option

Lower level slabs for the no basement option will either be a structural slab (supported by the piles), or a slab-on-grade.

If a slab-on-grade slab is used, similar criteria to the basement option provided above would apply. In addition, non-engineered fill soils may be encountered below slab levels for the no basement option that will require removal or improvement. The lowest risk option is to remove all fill soils below slab levels during construction. A higher risk option involves leaving some fill soils in place provided they are densified using vibratory equipment with the densification process observed by Geo**Design**.

5.3 Seismic Design Considerations

We performed a site specific ground motion study utilizing in-situ seismic piezocone penetrometer testing to obtain shear wave velocities in the soil below the proposed building. Based on that information, we recommended a Seismic Site Class D per IBC 2015, with the following design parameters determined from our site specific study:

- Seismic Design Category (Assuming Risk Category I, II, or III) = “B”
- Sds = 0.325g
- Sd1 = 0.127g

Refer to Geo**Design**’s GMS, dated March 2, 2017 included in Attachment 3 for further details.

5.4 Horizontal Earth Pressures and Sliding Resistance

We recommend the following criteria for design of support of excavation (SOE) systems, basement/foundation walls, and site retaining walls:

Granular Backfill for Structures

- Coefficient of Active Earth Pressure, $K_a = (1-\sin\phi_f)/(1+\sin\phi_f) = 0.28$
- Coefficient of At-Rest Earth Pressure, $K_o = (1-\sin\phi_f) = 0.44$
- Coefficient of Passive Earth Pressure, $K_p = 2.0$ (Assumes wall movement will not be sufficient to mobilize full passive resistance)
- Backfill Density, $\gamma = 135$ pounds per cubic foot (pcf)
- Friction angle, $\phi_f = 34$ degrees

Native Sand/Silt (SOE Areas only)

- Coefficient of Active Earth Pressure, $K_a = (1-\sin\phi_f)/(1+\sin\phi_f) = 0.33$
- Coefficient of At-Rest Earth Pressure, $K_o = (1-\sin\phi_f) = 0.5$
- Backfill Density, $\gamma = 125$ pounds per cubic foot (pcf)
- Friction angle, $\phi_f = 30$ degrees

Coefficient of friction, (ultimate) ***f,*** (from DM-7.2 Table 1 7.2-63)

- Mass footing concrete on Granular Backfill or crushed stone = 0.55
- Mass footing concrete on Natural Sand/Silt Soil = 0.35

5.5 Foundation Drainage

Refer to Attachment 2 for groundwater observations and findings. We estimate the static water table will be much deeper than the lowest proposed building level. However, there is potential for perched groundwater conditions during heavy rainfall events, or slow infiltration through silty soils (i.e., soils that do not drain freely).

Therefore, we recommend foundation drainage that prevents water from building up along foundation walls. Foundation drainage systems will vary depending on whether a basement option is pursued. As discussed below, we recommend both an underslab and perimeter drainage system if a basement is constructed.

5.5.1 General

Perimeter building drains should consist of perforated 4" PVC pipes (perforations placed downward) and placed next to the exterior footings/pile caps. Pipes should be enveloped with at least six inches of ¾ crushed stone and fully wrapped with non-woven geotextile fabric (i.e., Mirafi 140N).

We recommend cleanout standpipes evenly installed at the building corners to facilitate access and should be constructed with gradual fittings (i.e., a wye and 45-degree elbow or sweep fittings). The four inch perforated pipes should connect to a solid collector pipe and drain directly to a drain manhole, if possible.

Except where excavations and backfill areas are restricted (i.e., basement areas), we recommend backfill beside foundation walls consist of Granular Fill for Structures (see Table 704.08A – Granular Fill for Structures, VAOT 2011 Standard Specifications for Construction) within five feet of the wall face to facilitate passage of surface water infiltration to the perimeter drains.

The ground surface around buildings should be graded to shed surface water away from the foundation and at least a one foot thick impermeable (clayey / silty) soil layer placed within five feet from the edge of perimeter walls.

5.5.1 Basement Option – Perimeter Drainage

Due to site restrictions, we understand that the basement option will require exterior wall footings designed as "Zero Lot" footings, eccentrically loaded with the basement walls constructed flush with the temporary support of excavation system. As such, a standard perimeter footing drain placed on the outer edge of the footing is not feasible.

We recommend that, in addition to a waterproof coating, composite drainage sheets be installed on exterior basement walls to facilitate drainage. The drainage layer should be connected to a perimeter drain system running on the interior side of the building walls and allow water to flow freely to a collection point once it has entered the system (i.e., soil should not separate drainage boards from the collection pipes).

We computed rough seepage estimates based on soil types observed in the borings. We estimate up to 100 gpm of discharge from the perimeter drain system may be possible during an isolated storm event causing an elevated/perched water table. Pumped drainage systems may be designed for larger than the estimated flows due to inherent uncertainties and simplifying assumptions associated with the seepage estimates.

Groundwater seepage rate is directly proportional to the hydraulic conductivity of the soil, which for our analysis was approximated based on comparing visual soil descriptions recorded during drilling to published correlations with soil types. Further field and or laboratory permeability testing, as well as hydraulic analysis by a site civil engineer of the surficial infiltration potential would be required if a more precise seepage rate is required beyond this rough estimate.

5.5.2 Basement Option – Underslab Drainage

A system of perforated, 4-inch drain pipes should be installed at an approximately 50-foot spacing below basement slabs with a positive pitch to facilitate drainage. Pipe perforations should be placed down. Where perforated pipes are installed, trenches should be lined with non-woven geotextile fabric and backfilled with ¾ inch crushed stone.

The underslab drainage system should outlet separately from the perimeter drainage system. The foundation drainage systems should collect to a central area, or may be divided in half such that

flow from each half of the building collects to one location to minimize extra excavation that would be required for proper sloping of drain pipes. We expect this drainage system will be generally dry, except during heavy precipitation events or during spring thawing.

5.6 Temporary Earth Support and Support of Existing Foundations

During construction, the existing 8-story office building (100 Bank Street), Bank Street, and Cherry Street will need to be protected from movement. New foundations should not be excavated that could undermine the existing 100 Bank Street structure, or surrounding underground utilities.

We recommend incorporating submittals for temporary excavation support systems into the project specifications that are stamped by a Professional Engineer licensed in the State of Vermont for review by the full design team. For excavation support measures to be considered acceptable, they must be installed in a top-down manner such as sheeting or soldier pile and lagging. We anticipate that tiebacks will be required for the basement option. Systems requiring excavating through bearing soils to be supported prior to installation of the SOE (such as waste block walls), or other passive systems that require movement of the soil to engage the system will not be considered appropriate for any system that is required to support existing structures.

Further discussion on the requirements for protection of existing structures and utilities is discussed in Sections 6.1 and 6.2 later in this report.

5.7 Material Reuse

The existing undocumented (non-engineered) fill may be suitable for reuse, but would require further laboratory testing on bulk samples once exposed in construction to show that they meet the required gradations for Granular Fill (or materials that may be specified by others).

The high silt content of natural site soils makes placement and compaction of natural site soils unsuitable for use as Granular Fill. Therefore, we recommend that this material be used in non-structural areas only as general backfill.

5.8 Recommended Materials

For soil and geotextile materials that will be used in construction of this project, we recommend the following material types and specifications:

Granular Fill (i.e. Granular Backfill for Structures): for use as general structural backfill, below slabs, and behind walls should consist of inorganic soil free of clay, loam, ice and snow, tree stumps, roots, and other organic matter. Granular fill shall meet the criteria of VAOT Item 704.08A, and consist of a well-graded material within the following limits:

Sieve Size	Percent finer by weight
3 inch	100
No. 4	45 – 75
No. 100	0 – 12
No. 200	0 – 6

Crushed Stone: recommended for use as a working mat to protect of footing subgrades, as a self-compacting slab base if desired, and as footing, underslab, and retaining wall drain backfill. Crushed stone will require geotextile fabric separation from site soils (see below for criteria), and shall have gradation compliant with VAOT Item 704.02B specifications for ¾-inch (19mm) crushed stone as follows:

Sieve Size	Percent finer by weight
1 inch	100
¾ inch	90 – 100
3/8 inch	20 – 55
No. 4	0 – 10
No. 8	0 – 5

Geotextile Fabric: The geotextile fabric placed around crushed stone pipe bedding or used as a separation fabric for crushed stone and soil material should meet AASHTO M288-15 Class 3 and the following criteria:

Property	Criteria	Test Method
Grab Strength	min. 120 lbs	ASTM D4632
Static (CBR) Puncture	min. 310 lbs	ASTM D6241
Trapezoid Tear	min. 50 lbs	ASTM D4533
Apparent Opening Size	No. 70 (U.S. Sieve Size)	ASTM D4751

Fabric should be needle-punched non-woven material. Seams should be overlapped a minimum of 12 inches. During stone placement, the stone drop height should not exceed three feet and equipment traffic should be kept off the fabric until at least 6 to 12 inches of material is placed.

5.9 Compaction Requirements

The required degree of compaction shall be based on a maximum dry density as determined by a Modified Proctor (ASTM D1557-12). The degree of compaction for fill placed in various areas shall be as follows:

Placement areas	Minimum degree of compaction
1. Below foundations (footings)	95%
2. Building slab subbase and base courses	95%
3. Above bottom of foundations	95%
4. Landscaped areas (if applicable)	90%

At the contractor's option, crushed stone may be substituted for compacted structural fill. Crushed stone is considered to be self-compacting, and would negate the need to run laboratory Proctor testing and have field density testing of in-place lifts. The crushed stone needs to be plate compacted to "chink up" the working surface in lifts. The maximum lift thickness for compaction of the crushed stone is 12 inches.

Recommended loose lift thickness for fill and the minimum number of passes of compaction equipment are summarized on the following table.

Compaction Method	Maximum Stone Size	Maximum Loose Lift Thickness		Minimum Number of Passes	
		Below Structures and Pavement	Less Critical Areas	Below Structures and Pavement	Less Critical Areas
Hand-operated vibratory plate or light roller in confined areas	4"	6"	8"	6	4
Hand-operated vibratory drum rollers weighing at least 1,000#	6"	8"	10"	6	4
Light vibratory drum roller, minimum dynamic force 3,000# per ft. of drum width	6"	10"	14"	6	4
Medium vibratory drum roller, minimum dynamic force 5,000# per ft. of drum width	8"	12"	18"	6	4
Large vibratory drum roller, minimum dynamic force 8,000# per ft. of drum width	10"	16"	24"	6	4

6 CONSTRUCTION CONSIDERATIONS

6.1 Limiting Movement Criteria

Protection of adjacent existing structures is required, and temporary excavation support measures by the contractor will be necessary to excavate new foundations. We recommend implementing an instrumentation monitoring program for existing structures during construction. Instrumentation may include vibration monitoring next to and within existing basement walls and crack monitoring of existing cracks of existing buildings.

We recommend establishing a performance-based threshold and limiting criteria for movements prior to construction.

Location	Criteria	Threshold Value	Limit Value
Adjacent Buildings (100 Bank Street)	Settlement	1/8-inch	1/4-inch
	Horizontal Movement	1/8-inch	1/4-inch

Burlington Electric Department Utilities (within sidewalk)	Settlement	1/4-inch	3/8-inch
	Horizontal Movement	1/4-inch	3/8-inch
Existing Structures	Crack Width Change	1/32-inch	3/32-inch

This recommended criteria is based on prior project experience with similarly constructed adjacent structures and utilities. Ultimately, we recommend the above criteria be reviewed by the Structural Engineer and the Owners for applicability prior to implementation.

6.2 Construction Vibrations

Vibrations associated with general construction activities (i.e., excavation and compaction) as well as the installation of driven H-piles, RAPs, DIPPs, and SOE elements should be expected. Given the immediate vicinity of these activities to existing structures and utilities we recommend imposing vibration limits on the project. We recommend maximum peak particle velocity associated with construction vibrations to be as follows

Structure Type / Condition	**Maximum PPV (in./sec.)**
Historic Buildings	0.25
Older Residential Structures	0.3
New Residential Structures and Modern Industrial/Commercial Buildings	0.5

These values are from the Transportation and Construction Vibration Guidance Manual produced by Caltrans in September 2013. Values are for continuous sources similar to those anticipated to be generated by construction at this site (i.e., impact pile-driving hammers, compaction equipment, RAP installation equipment, etc.). While the above criteria have been established to limit structural damage, they will be strongly perceptible if approached, and adjacent property owners should be alerted as such.

6.3 Subgrade Observation and Preparation

Geo**Design** should observe all foundation subgrades and pile installation (if constructed), and allow for recommendations in the field regarding suitability of preparation measures and subgrade conditions.

While final foundation subgrade preparation measures will be dependent on the foundation system implemented (and in the case of RAP's, will be provided in the RAP designer's submittal), we recommend the following measures for subgrade preparations:

- Water shall not be allowed to accumulate of prepared foundation subgrades, and subgrades should not be prepared under wet conditions.

- Protection of foundation subgrades using a layer of geotextile fabric covered by a minimum 6-inch thick working mat of crushed stone is recommended (may be thicker if required by the RAP designer). A low-strength concrete mud mat is also an acceptable alternative.
- Subgrades are silty in nature and will be subject to freezing. Subgrade will need to be protected from frost during anticipated freezing temperatures with frost blankets, ground heaters, or other appropriate methods. Subgrades shall not be allowed to freeze prior to placing concrete footings. This includes protection of the crushed stone working mats prior to backfilling.

6.4 Construction Dewatering

Groundwater is anticipated to be below bottom of excavation levels. However, perched zones above foundation levels (particularly levels associated with the basement option) were identified in our subsurface explorations and some seepage during construction should be expected.

Seepage associated with perched zones, as well as any runoff during precipitation events, will need to be controlled during construction. We expect that dewatering can be accomplished by diverting surface runoff away from excavations, and using localized shallow sumps and pumps.

6.5 Construction Documents / Final Design

It is important that Geo**Design**'s services be continued through preparation of construction contract documents so that we may participate with the design team to consult on geotechnical related issues as the project design is finalized. Currently two foundation options, both requiring final design analysis, are being considered. We should review and edit relevant project technical specifications and plans provided by others for appropriate incorporation of geotechnical issues.

The recommendations of this report are based on the material we have reviewed and design information available at the time of this report. As such, Geo**Design** has made certain assumptions regarding the proposed project which will likely need additional geotechnical review as foundation options are further developed. Once a decision is made on a foundation system being advanced to final design (i.e. end-bearing pile foundations vs. RAPs/DIPPs with a basement) we will remain available to assist with providing input on final design criteria and review. Refer to Section 5.1 of this report regarding the work-in-progress nature of the current foundation design.

6.6 Construction Services

Findings and opinions presented in this report are dependent on soil conditions and assumptions made from limited subsurface explorations. As such, changes in the nature of the subsurface which could have an effect on recommendations provided herein may not become apparent until construction.

It is critical that Geo**Design** continue to provide construction observation services for this project for compliance with our design concepts, specifications, and recommendations provided. At a minimum, Geo**Design** should provide:

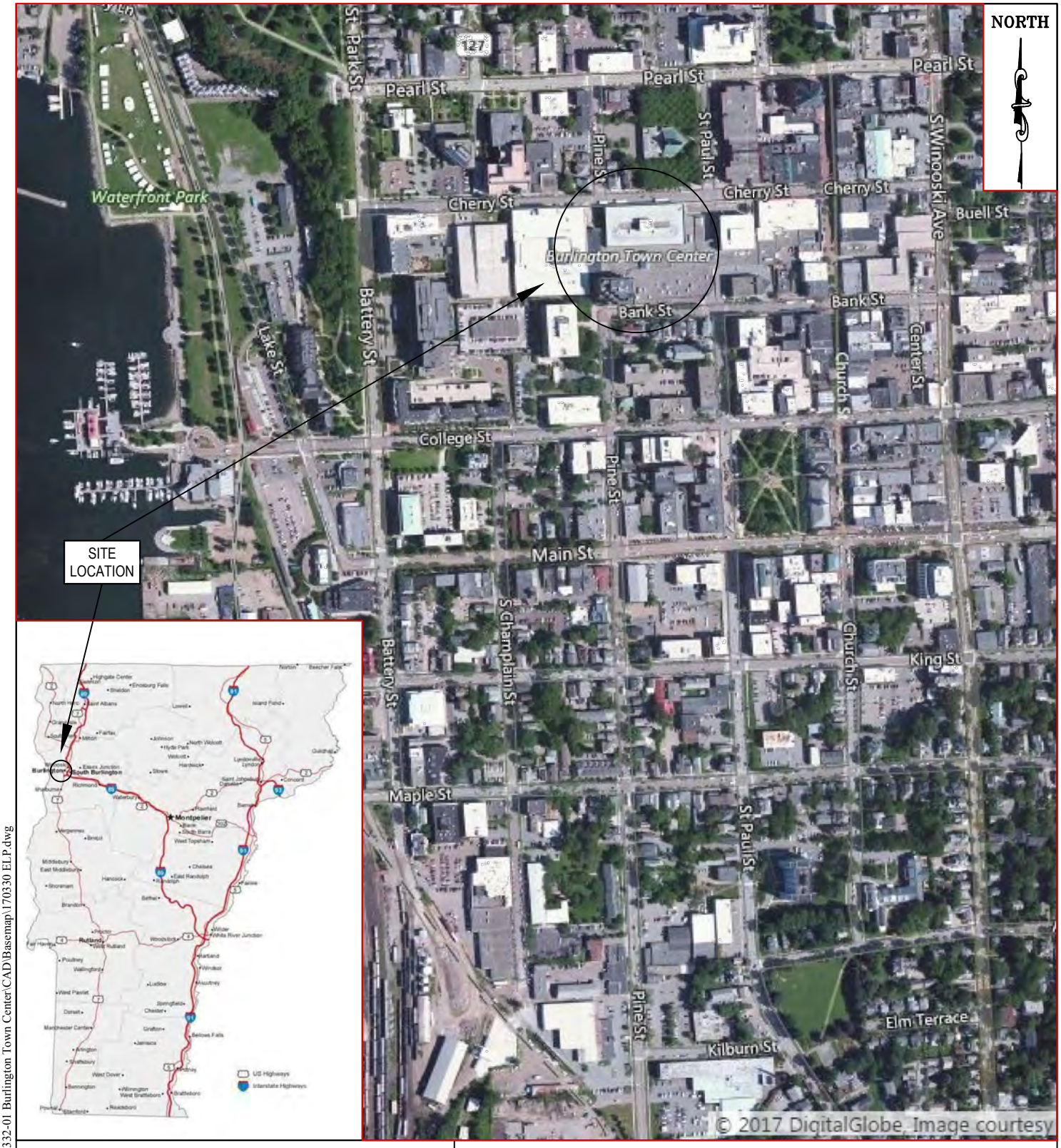
- Submittal Reviews for geotechnical components including but not necessarily limited to:
  - SOE Design Submittals
  - Foundation Design Element Submittals (i.e. RAPs, DIPPs, driven H-piles, etc.)
  - Soil Material Submittals for Granular Fill or Crushed Stone
  - Submittals for Geotextile Fabric
- Observation and documentation of RAP and/or pile installation for conformance with project specifications and design requirements.
- Observation and documentation of load/modulus testing for RAP and/or pile elements.
- Observation and documentation during foundation subgrade preparations, (including observation of any special foundation and earthwork measures employed for construction of this project that may be required by the RAP designer).
- Observation of SOE installation and follow up monitoring for compliance with our recommendations and project specifications (i.e. inclinometer readings, crack gauge monitoring, review of survey data, etc.).
- Vibration monitoring of adjacent structures.

7 LIMITATIONS

This report is subject to the limitations presented in Attachment 6.

8 ATTACHMENTS

ATTACHMENT 1 – FIGURES



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E-MAIL: http://www.geodesign.net
MIDDLEBURY, CT BURLINGTON, VT

SITE LOCATION PLAN
BURLINGTON CITY PLACE
BURLINGTON, VERMONT

FILE NO. 1332-01

NOTES:
1) NOT TO SCALE
2) BASEMAP COPYRIGHT BING/FROM VT ANR WEB ATLAS

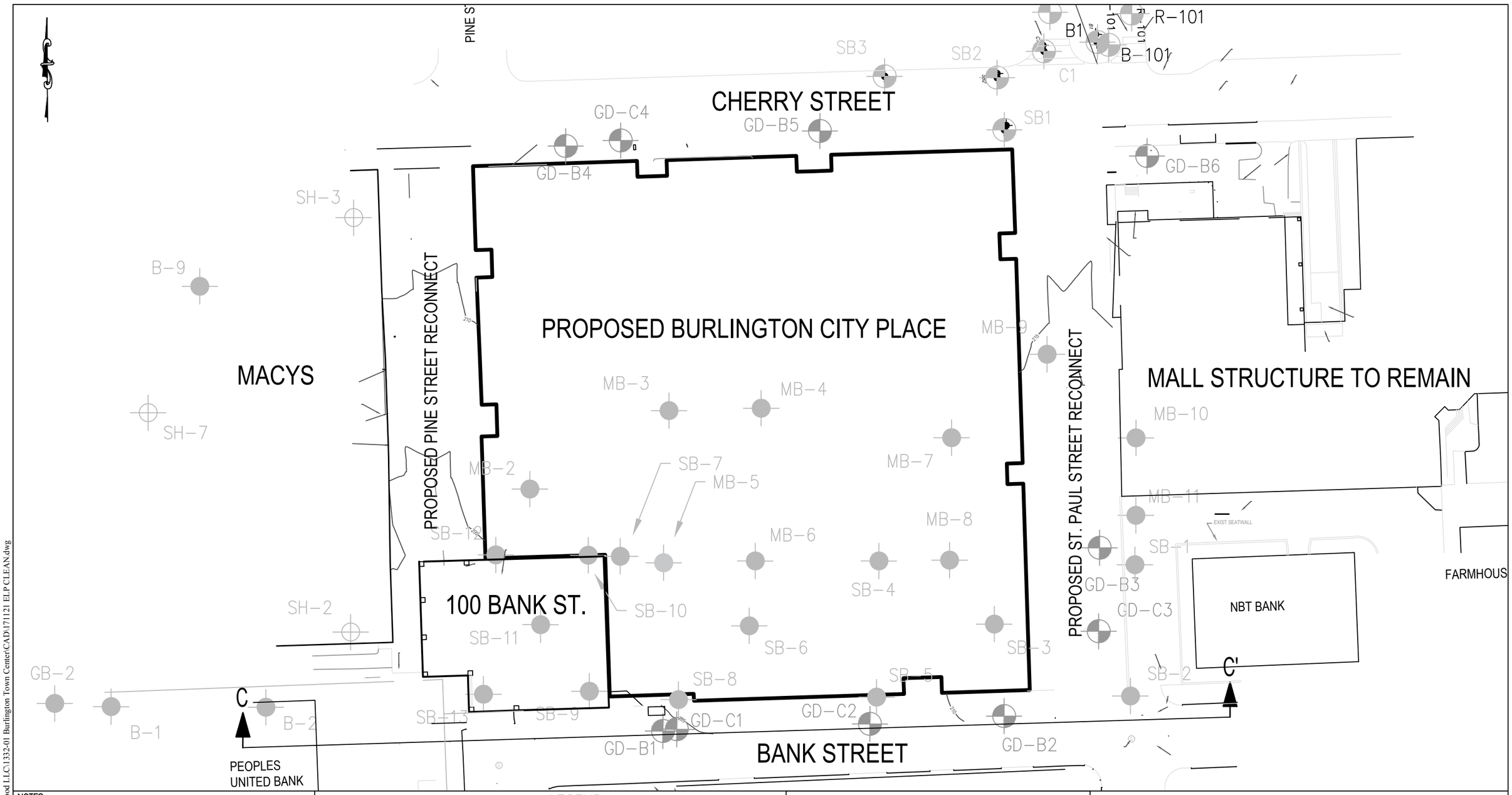
DATE: MARCH 31, 2017

DRAWN BY: AJB

REVIEWED BY: SP□

FIGURE NO. 1

CAD FILE No. M:\CI\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 ELP.dwg



NOTES:

1) BASE MAP DEVELOPED FROM AN ELECTRONIC FILE PROVIDED BY ENGINEERING VENTURES ENTITLED 'ACAD-14660 X-Base-Model.dwg' VIA EMAIL ON MARCH 29, 2017.
2) CPT EXPLORATIONS WERE PERFORMED BY CONTEC, INC. ON FEBRUARY 20, 2017. SOIL BORINGS WERE PERFORMED IN FEBRUARY AND MARCH, 2017 BY QCQA LABORATORIES. ALL 2017 EXPLORATIONS WERE OBSERVED AND LOGGED BY GEODESIGN PERSONNEL.
3) THE LOCATIONS OF THE EXPLORATIONS/BORINGS WERE DETERMINED BY TAPING AND VISUAL ESTIMATES FROM EXISTING SITE FEATURES. THESE LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
4) SEE GEODESIGNS GEOTECHNICAL DATA REPORT (APRIL 12, 2017) FOR LOCATIONS OF CROSS SECTIONS A-A' THROUGH D-D'.

LEGEND

GD-B1, GD-C1 — 2017 TEST BORING AND LOCATION BY GEODESIGN, INC.

B1, C1, SB1, R-101, B-101 — 2012-2014 TEST BORING AND LOCATION BY GEODESIGN, INC.

B-1, HB-1, SB-1, MB-1 — PRE-EXISTING TEST BORING NO. AND LOCATION BY OTHERS PER SHA REPORT

A A' — SUBSURFACE PROFILE AND LOCATION

SH-1 — 1996 TEST BORING NO. AND LOCATION BY SHA, INC.

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DRAWN BY: AJB/JFW | REVIEWED BY: JAG

EXPLORATION LOCATION PLAN
BURLINGTON CITY PLACE
BURLINGTON, VERMONT

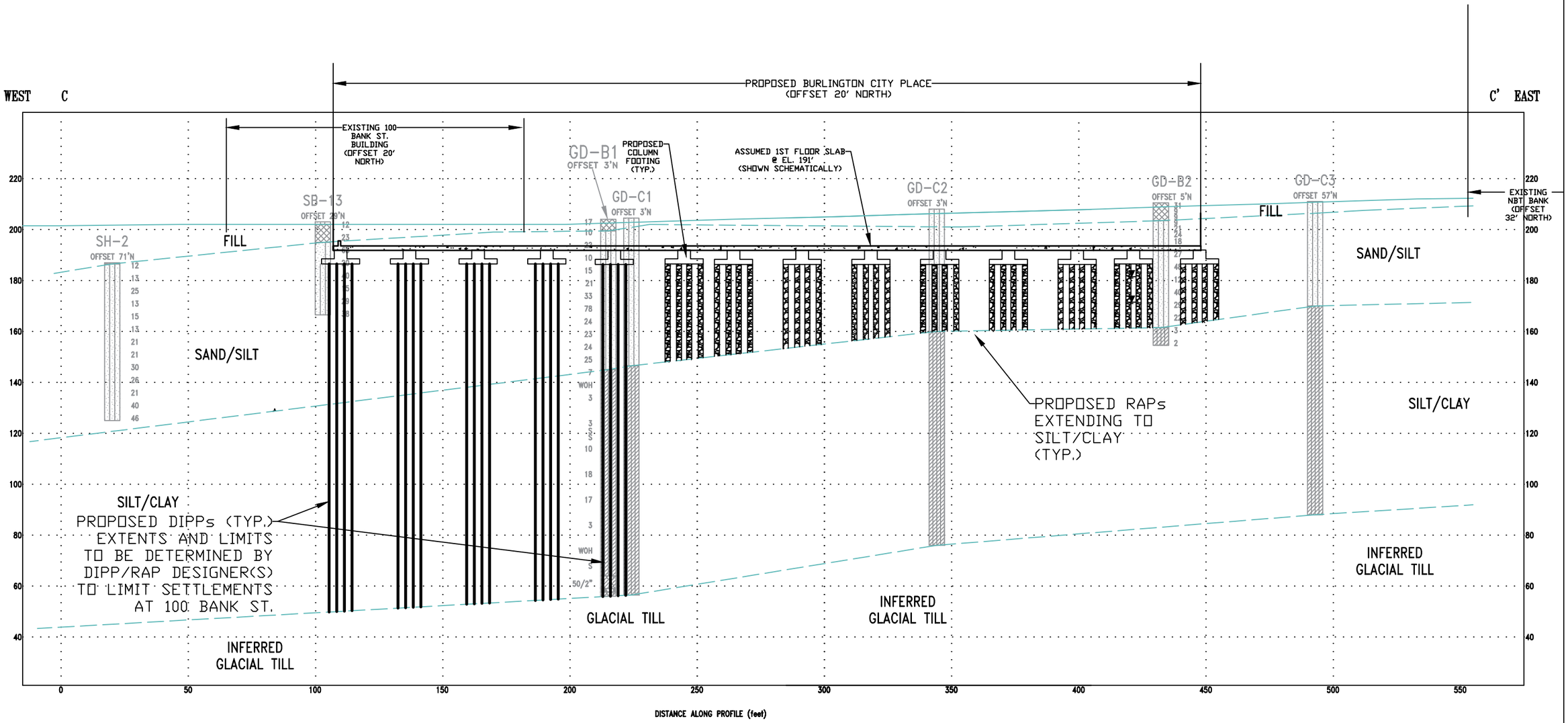
FILE NO. 1332-01

SCALE IN FEET
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0 30 60 120

DATE: NOVEMBER 21, 2017

FIGURE NO. 2

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PRELIMINARY
NOT FOR CONSTRUCTION

NOTE:
Figure is derived from "Schematic Cross Section 2 - Geopier Improvement Option (Conceptual)" provided in our April 28, 2017 Foundation Options Evaluation Memorandum. This sketch is conceptual in nature only. Actual elevations of floor slabs, footings, number of DIPP and RAP elements and extents, and other structural details are to be determined.

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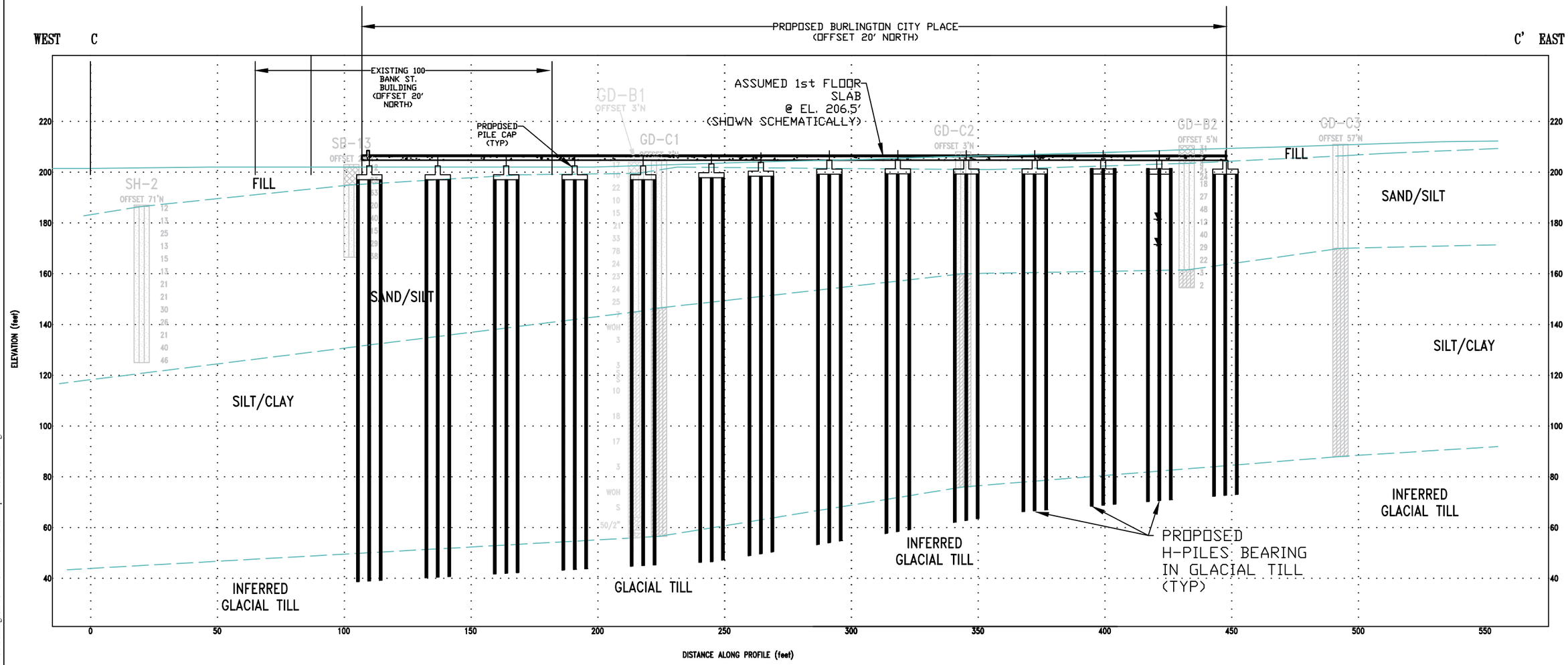
SCHEMATIC "BASEMENT" OPTION
BURLINGTON CITY PLACE
BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET
1" = 40'
0 20 40 80

DATE: NOVEMBER 21, 2017

FIGURE NO. 3



CAD FILE No. M:\CI\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 ELP.dwg

PRELIMINARY
NOT FOR CONSTRUCTION

NOTE:
Figure is derived from "Schematic Cross Section 4 - H-Piles Driven Into Glacial Till Layer (Conceptual)" provided in our April 28, 2017 Foundation Options Evaluation Memorandum. This sketch is conceptual in nature only. Actual elevations of floor slabs, pile caps, pile tips, number of piles and other structural details are to be determined.

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DRAWN BY: AJB/JFW
REVIEWED BY: SPK/JAG

SCHEMATIC "NO BASEMENT" OPTION
BURLINGTON CITY PLACE
BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET
1" = 40'
0 20 40 80

DATE: November 21, 2017

FIGURE NO. 4

ATTACHMENT 2 – GEODESIGN GEOTECHNICAL DATA REPORT

GEOTECHNICAL DATA REPORT

Burlington Town Center

Burlington, VT

Mr. Don Sinex
Devonwood Investors, LLC
101 Cherry St, Suite 440
Burlington, VT 05401

April 12, 2017

GEODESIGN INCORPORATED

54 Main Street, P.O. Box 699, Windsor, Vermont 05089
(T) 802.674.2033, (F) 802.674.5943
Geo**Design** Project Number: 1332-01

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- 5.4 Glacial Till 4
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1 SUMMARY

We are providing this Geotechnical Data Report (GDR) for the Burlington Town Center (BTC) project in Burlington, Vermont. This GDR is based on soil borings and cone penetration testing (CPT) performed to explore subsurface conditions at the site. This GDR is intended to serve as a basis for future design reports and/or memoranda that will be issued as final design progresses.

The generalized soil profile consists of fill overlying natural sand and silt overlying natural silt and clay overlying natural very dense glacial till. Bedrock was not encountered during our exploration program. Refer to the attached subsurface profiles A-A', B-B', C-C', and D-D'(Figures 3 through 10, in Appendix A) respectively for a visual depiction of the subsurface conditions.

2 BACKGROUND

The BTC project comprises the redevelopment of an approximately 104,000 square foot area of land currently occupied by a mixed use mall development. The new development proposals include demolishing the existing portion of the mall west of St. Paul Street and construction of a commercial and residential mixed use building, up to 14 stories high (approximately 170 feet above existing grade). Existing grades at the project area vary from approximately El. 220 (northeast) to El. 205 feet (southwest). See the attached Site Location Plan (Figures 1 in Appendix A) for the approximate extents of the project.

3 GEOLOGIC SETTING

The project site is located in downtown Burlington, Vermont and is bordered by Cherry Street to the north and Bank Street to the south. To the east there is the old St. Paul Street and to the west is the old Pine Street. These two streets actually continue on to the north and south of the site. The site generally slopes from east to west, with Lake Champlain located at the bottom of the slope (approximately 1/3 of a mile to the west).

Surficial soils are mapped as predominately pebbly marine sands (Vermont Agency of Natural Resources Atlas) historically deposited from the Champlain Sea. Soil samples collected within the upper 40 to 50 feet of our subsurface explorations generally match published information.

Bedrock, while not encountered in the explorations, is mapped as a dolostone of the Dunham Dolostone formation. Sandstone and dolostone of the Monkton Quartzite formation is also mapped as being very close to this site and may be the predominant rock type.

The nearest mapped fault is a solid barb thrust fault mapped as being approximately 1.6 miles west of the site (Vermont Agency of Natural Resources).

Refer to Appendix B for a visual depiction of surficial and bedrock geology mapped in the vicinity of the site.

4 SUBSURFACE EXPLORATIONS

Explorations consisted of soil borings and CPT testing. Geo**Design** personnel coordinated, observed, and logged all explorations on a full-time basis. Refer to Figure 2 in Appendix A for our Exploration Location Plan.

4.1 Soil Borings

Six soil boring locations (GD-Series) were drilled between February 20 and March 23, 2017. Borings were labeled GD-B1 through GD-B6. GD-B1 was drilled in two separate phases due to the original boring terminating prematurely due to breaking soil sampling equipment in the borehole. This required an offset boring to drill below 133 feet deep.

Borings were drilled by QCQA Laboratories using a CME 550 ATV mounted rig. Borings GD-B1 and GD-B6 were advanced with wash-drive drilling methods utilizing 4" flush joint casing and a carbide roller bit. Soil borings GD-B2 through GD-B5 were advanced using 3 ¼" hollow stem augers (HSA).

The drill rig was equipped with a CME automatic hammer (C_E ≈1.42 based on hammer energy testing performed by Geo**Design** for the Vermont Agency of Transportation).

Split spoon (SS) samples were collected in general accordance with the Standard Penetration Test (SPT) per ASTM D1586 with blow counts recorded on the logs. Three undisturbed tube samples (at 66.5 feet, 84.5 feet, and 135 feet deep) were collected in GD-B1. In addition, undisturbed tube samples were attempted with no recovery in GD-B1 (at 82 feet, 121.5 feet and 131.5 feet deep), and GD-B6 (at 52 feet, 54 feet and 72 feet deep). One NX rock core was attempted in GD-B1 which penetrated through a boulder from 145 feet to 146.3 feet deep.

Due to the presence of congested underground utilities, a vacuum truck was used to remove the upper 8 feet of soil at location GD-B5 prior to sampling.

4.2 Cone Penetration Testing

Four CPT tests (GD-C1 through GD-C4) were performed by ConeTec on February 20, 2017. The exploration program included seismic shear wave velocity testing performed at all locations, and porewater dissipation testing performed locations GD-C1, GD-C3, and GD-C4.

Refer to ConeTec's February 24, 2017 report provided in Appendix D for further details on CPT testing.

5 SUBSURFACE CONDITIONS

The generalized subsurface profile is summarized below and in Appendix A (Figures 3 through 10).

Density/consistency and soil composition descriptions are based on Soil Behavior Type provided by CPT data, SPT N-values, and visual classifications (Modified Burmister), respectively. Refer to the individual logs and CPT plots provided in Appendices C and D respectively for a more detailed description of soils and groundwater observations encountered at each exploration.

5.1 Fill

Fill soils were observed in all soil borings with the exception of GD-B5 which sampling was not performed due to the use of a vacuum truck. Observation of the boring sidewall did show indications of fill soils. Fill soils extended from 2 to 8 feet deep where encountered, and generally consisted of brown fine to coarse sand with varying amounts of gravel and silt.

Due to their similar composition and density to the natural soils, Fill soils were unable to be discerned from the natural sand/silt stratum in the CPT tests.

SPT N-values in the Fill varied widely from 5 to 31 blows per foot (bpf) with an average of 15 bpf, indicating a medium dense condition.

5.2 Sand/Silt

A natural Sand/Silt stratum was encountered below the Fill in all borings and observed in all CPT tests. This layer extended to between 40 and 50 feet deep on the eastern extents of the site (GD-B2, GD-C2, GD-C3, and GD-B6) and to between approximately 55 to 90 feet deep at the western extents of the site (GD-B1, GD-C1, and GD-C4). Soil borings GD-B3 through GD-B5 were terminated within this layer.

The composition of this layer typically consisted of a light brown to olive-brown fine to medium sand and silt with the primary soil component (e.g. sand or silt) varying throughout the stratum.

SPT N-values in the natural Sand/Silt stratum varied between 7 and 78 bpf, with a large majority being between 10 and 30 bpf indicating a medium dense soil condition.

5.3 Silt/Clay

A natural Silt/Clay stratum was encountered below the Sand/Silt in all CPT tests and at soil boring locations GD-B1, GD-B2, and GD-B6. Where encountered, this layer was approximately 80 to 90 feet thick, extending to between approximately 120 and 130 feet deep on the eastern extents of the site (GD-C2, GD-C3, and GD-B6), 140 to 150 feet deep at the southwestern portion of the site (GD-B1, GD-C1), and to 166 feet deep at the northwestern portion of the site (GD-C4). Soil boring GD-B2 was terminated within this layer.

The composition of this layer typically consisted of a gray clay & silt to silt & clay, with occasional seams of silt, clayey silt, or silty clay.

In general SPT N-values in the natural Silt/Clay stratum varied between Weight of Hammer (0 bpf) and 9 bpf with an average of 3 bpf, indicating a soft soil condition. However, a stiffer zone was consistently noted mid-layer in all CPT tests and GD-B1 and GD-B6. Generally this stiffer zone was noted 30 to 40 feet from the top of the layer, was typically 20 to 30 feet thick, and had SPT N-values from 10 to 24 bpf indicating a stiff to very stiff soil condition.

5.4 Glacial Till

Glacial Till was encountered in borings GD-B1 and GD-B6. In the CPT soundings, it is assumed Glacial Till was the refusal stratum in all CPT tests. GD-B1 and GD-B6 both terminated in this layer at 148’ and 174’ deep respectively.

The composition of Glacial Till generally consisted of silt and fine to medium sand with little fine gravel. One 15” boulder was cored through within the Glacial Till stratum in GD-B1.

SPT N-values in the Glacial Till were consistently above 90 bpf indicating a very dense soil condition.

5.5 Groundwater

Groundwater observations included wet soil samples encountered during drilling of the soil borings and pore pressure dissipation tests and dynamic pore pressure response from the CPT tests.

The groundwater gradient was generally from east to west (towards Lake Champlain), with depths in the 40’ to 55’ deep range to the east and 55’ to 75’ deep range to the west.

In addition, multiple perched zones of water were noted within silt seams throughout the Sand/Silt stratum were noticed in the soil borings, but these zones were generally concentrated within thin silty zones.

6 COMPARISON TO HISTORICAL SUBSURFACE DATA

As part of our evaluation of subsurface conditions at the site, we performed a review of available borings data from nearby projects performed by Geo**Design** and others.

For available data in the immediate vicinity of the site, we reviewed historical borings performed within the footprint of the current project by Green Mountain Boring in 1981 and 1984. This data was included in Sanborn, Head & Associates (SHA) August 1997 Preliminary Geotechnical Engineering Report (SB-Series and MB-Series borings logs - see Appendix E) for the expansion of the Burlington Square Mall into the space currently occupied by Macy’s. All of the SB-Series

and MB-Series logs provided in the SHA report indicated borings were terminated at 37’ deep or less. Each of these borings depict soil descriptions consistent with those we encountered within the natural Sand/Silt stratum.

For available deeper data that extended into the Silt/Clay stratum, the closest available data is from CPT test we collected in 2013 for the adjacent CCTA Facility (across Cherry Street from the BTC site). These CPT tests were extended up to 100’ and depicted a similar Sand/Silt over Silt profile observed at the BTC site. Refer to Appendix F for a full set of the nearby Geo**Design** data reviewed for this project.

7 LIMITATIONS

This report is subject to the limitations included in Appendix G.

Sincerely,
Geo**Design**, Inc.



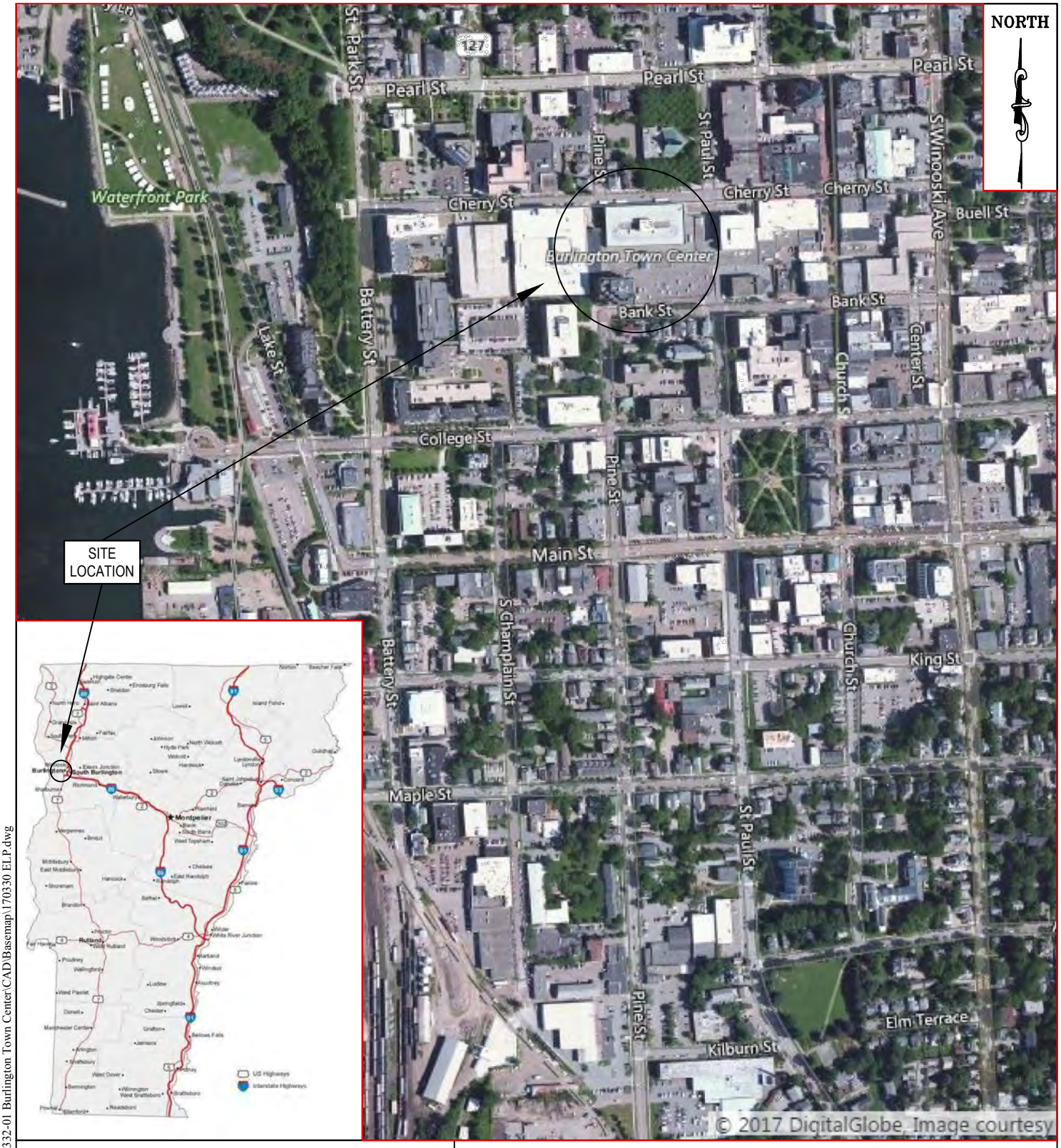


Jacob F. Wimett, P.E.
Senior Project Engineer

Shawn P. Kelley, Ph.D., P.E.
Senior Associate

8 APPENDICIES

APPENDIX A – FIGURES



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SITE LOCATION PLAN
BURLINGTON TOWN CENTER
BURLINGTON, VERMONT

FILE NO. 1332-01

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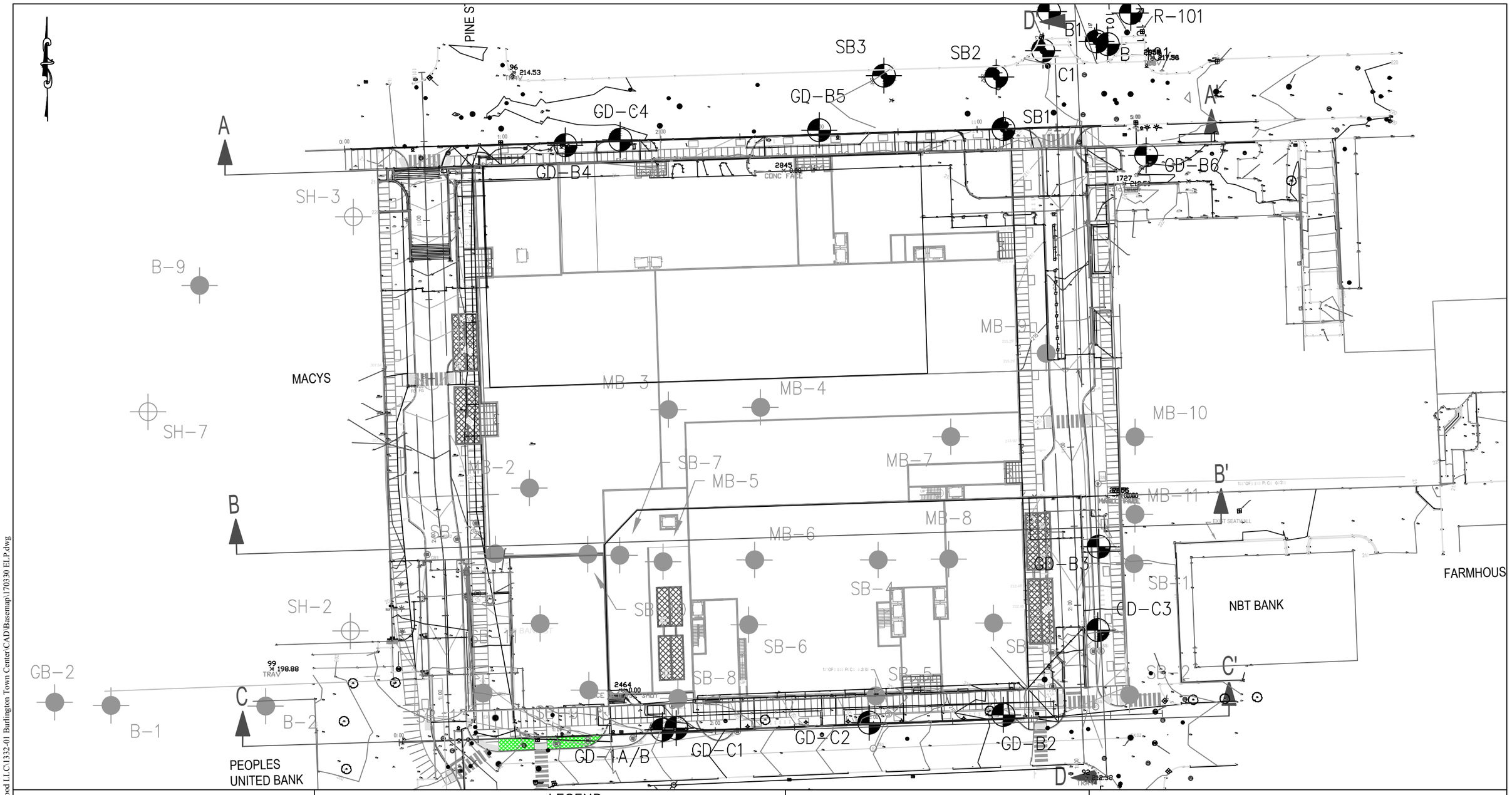
DATE: MARCH 31, 2017

FIGURE NO. 1

DRAWN BY: AJB

REVIEWED BY: SP□

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CAD FILE No. M:\CI\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 EL P.dwg

NOTES:

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LEGEND

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A A' — SUBSURFACE PROFILE AND LOCATION

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DRAWN BY: AJB

REVIEWED BY: SP□

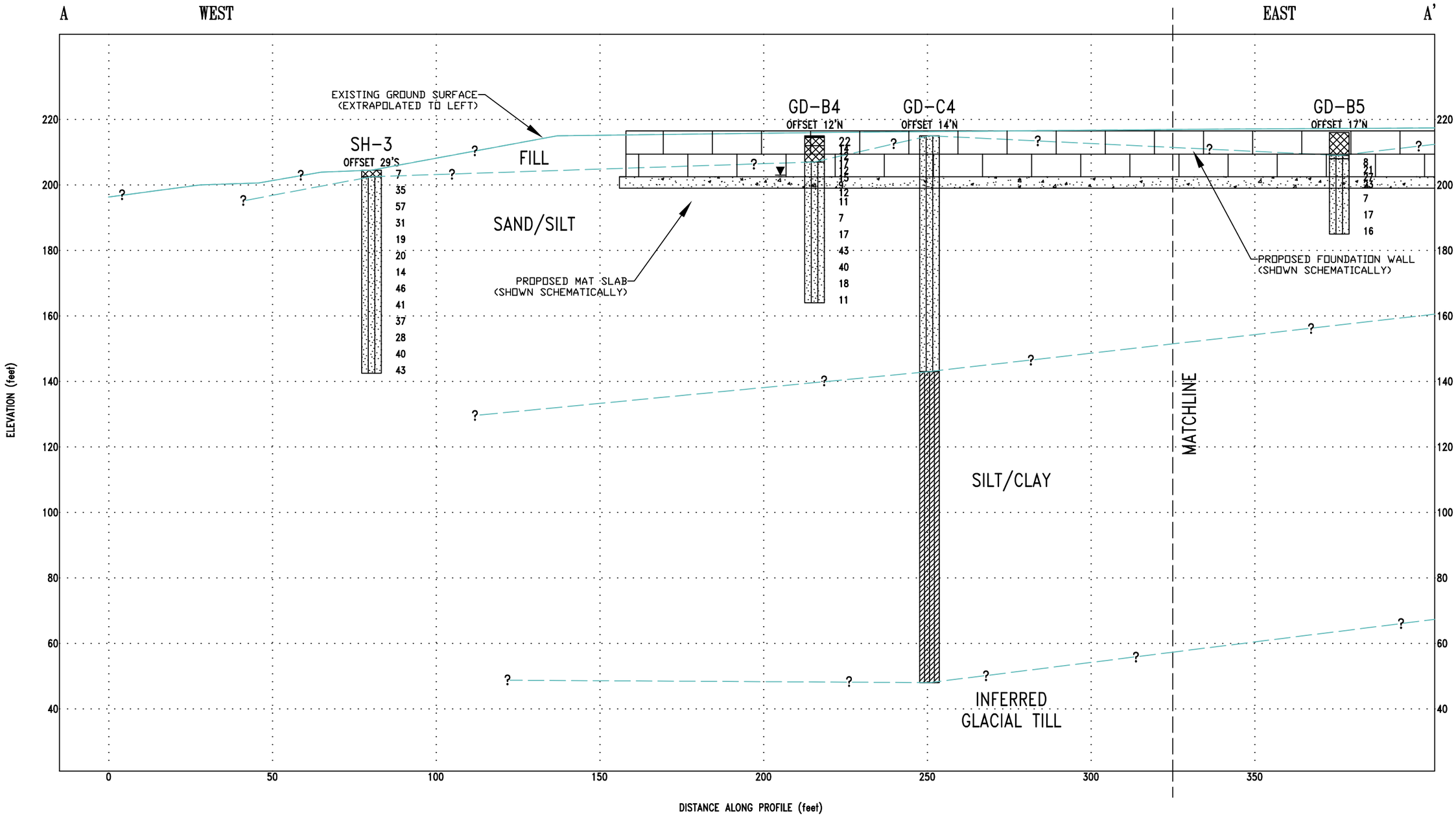
E□PLORATION LOCATION PLAN
BURLINGTON TOWN CENTER
BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET
1" = □0'
0 30 □0 120

DATE: MARCH 30, 2017

FIGURE NO. 2



11X17 W-E PROFILE BOREHOLE OFFSET 1332-01 BURLINGTON TOWN CENTER.GPJ FBNWNL01.GDT 3/28/17

GEODESIGN INCORPORATED

GeoDesign, Inc.

P.O. Box 699
Windsor, VT 05089
Phone: 802-674-2033/Fax: 802-674-5943

40 Farrell Street
S. Burlington, VT 05403
Phone: 802-652-5140

0 30

Scale (feet)

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.

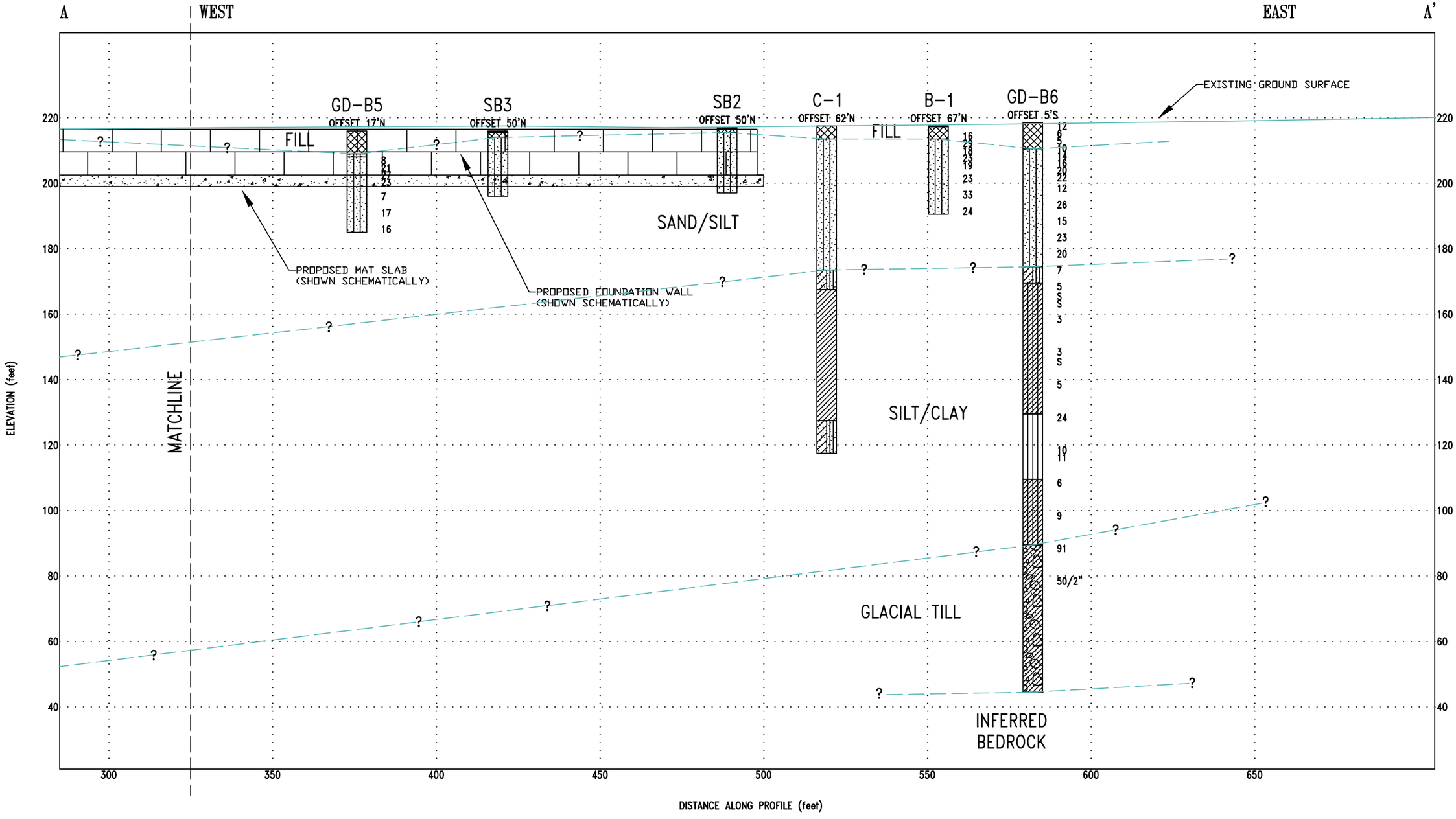
Date: 3/28/17 | Drawn By: AJB | Reviewed By: SPK

SUBSURFACE PROFILE SECTION A-A'

Burlington Town Center

Burlington, VT

File No.: 1332-01 | Figure No.: 3



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Phone: 802-652-5140

0 30

Scale (feet)

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.

SUBSURFACE PROFILE SECTION A-A'

Burlington Town Center

Burlington, VT

Date:	Drawn By:	Reviewed By:	File No.:	Figure No.:
3/28/17	AJB	SPK	1332-01	4

11X17 W-E PROFILE BOREHOLE OFFSET 1332-01 BURLINGTON TOWN CENTER.GPJ FBNWNL01.GDT 3/28/17

B WEST EAST B'

PROPOSED TOWN CENTER BUILDING

EXISTING TOWN CENTER BUILDING

GD-B1 OFFSET 119'S

GD-C1 OFFSET 118'S

EXISTING GROUND SURFACE

SH-2 OFFSET 51'S

SB-12 OFFSET 6'S

MB-2 OFFSET 36'N

SB-11 OFFSET 50'S

SB-10 OFFSET 8'S

SB-7 OFFSET 8'S

MB-5 OFFSET 13'S

MB-6 OFFSET 14'S

FILL

SAND/SILT

SILT/CLAY

INFERRED GLACIAL TILL

SAND/SILT

PROPOSED MAT SLAB (SHOWN SCHEMATICALLY)

PROPOSED FOUNDATION WALL (SHOWN SCHEMATICALLY)

MATCHLINE

ELEVATION (feet)

220 200 180 160 140 120 100 80 60 40

0 50 100 150 200 250 300 350

DISTANCE ALONG PROFILE (feet)

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40 Farrell Street
S. Burlington, VT 05403
Phone: 802-652-5140

0 30

Scale (feet)

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.

Date: 3/28/17 | Drawn By: AJB | Reviewed By: SPK

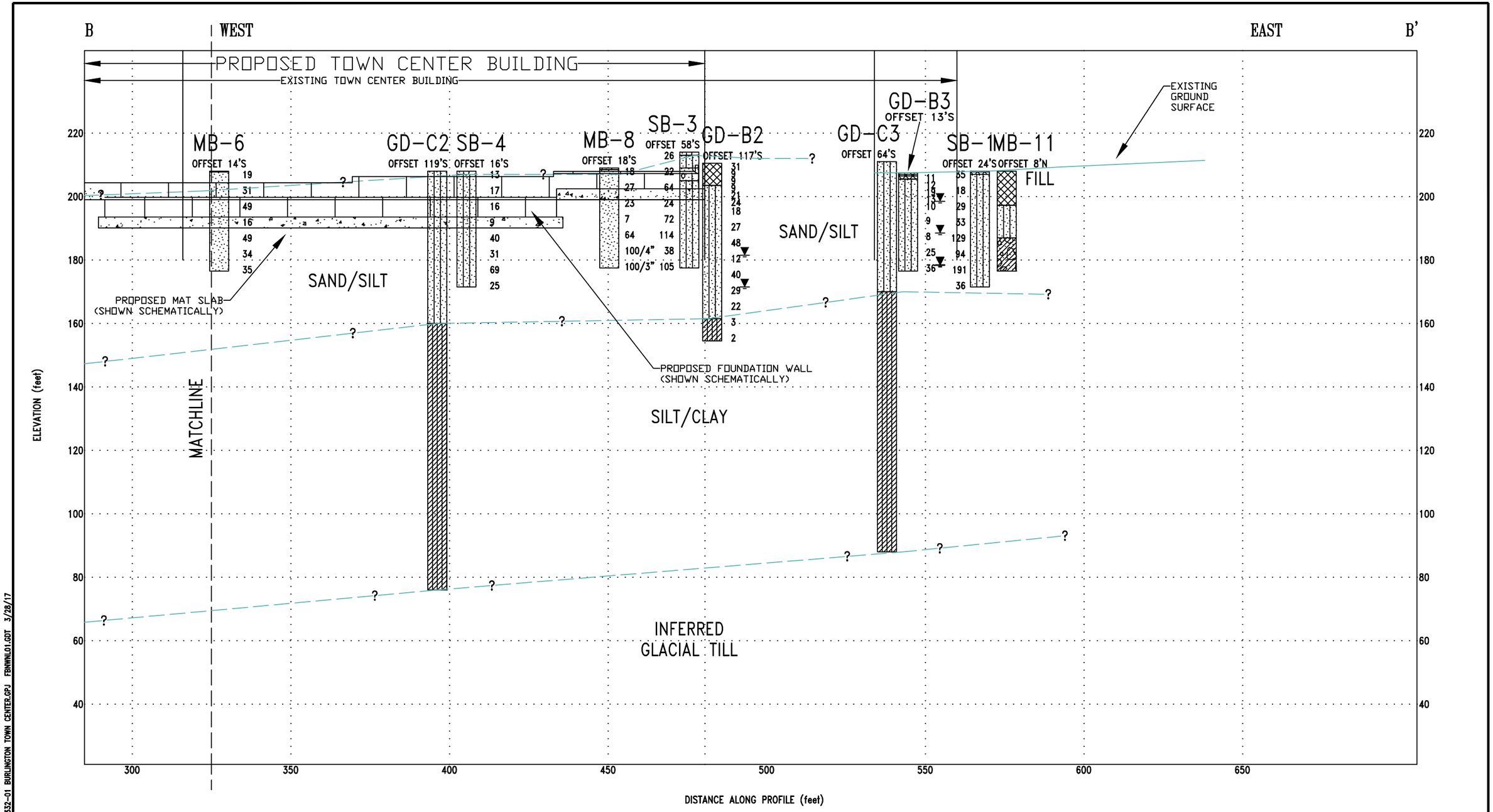
SUBSURFACE PROFILE SECTION B-B'

Burlington Town Center

Burlington, VT

File No.: 1332-01 | Figure No.: 5

11X17 W-E PROFILE BOREHOLE OFFSET 1332-01 BURLINGTON TOWN CENTER.GPJ FBNWNL01.GDT 3/28/17



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40 Farrell Street
S. Burlington, VT 05403
Phone: 802-652-5140

0 30
Scale (feet)

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.

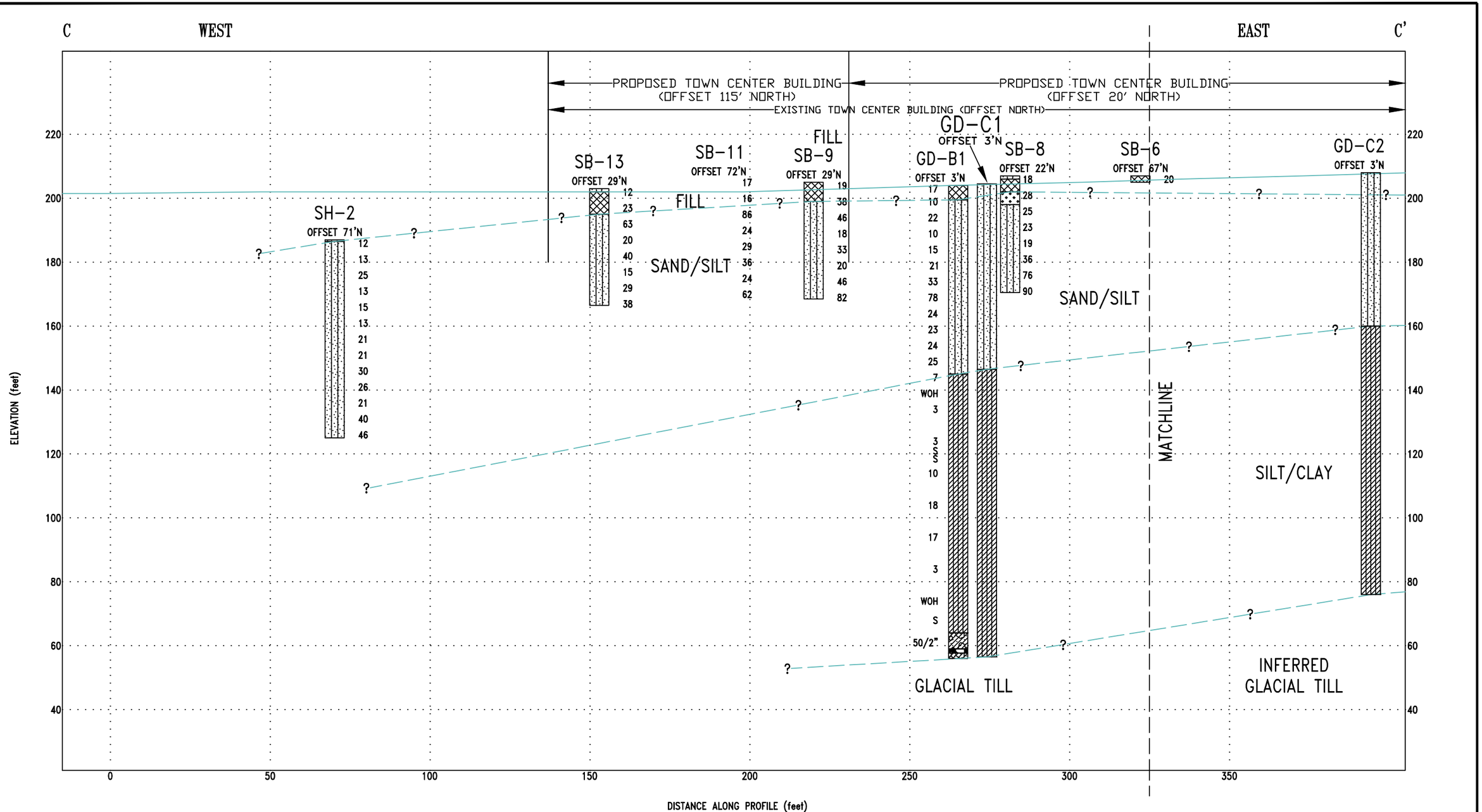
SUBSURFACE PROFILE SECTION B-B'

Burlington Town Center

Burlington, VT

Date: 3/28/17	Drawn By: AJB	Reviewed By: SPK	File No.: 1332-01	Figure No.: 6

11X17 W-E PROFILE BOREHOLE OFFSET 1332-01 BURLINGTON TOWN CENTER.GPJ FBNWNL01.GDT 3/28/17



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40 Farrell Street
S. Burlington, VT 05403
Phone: 802-652-5140

0 30
(feet)

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.

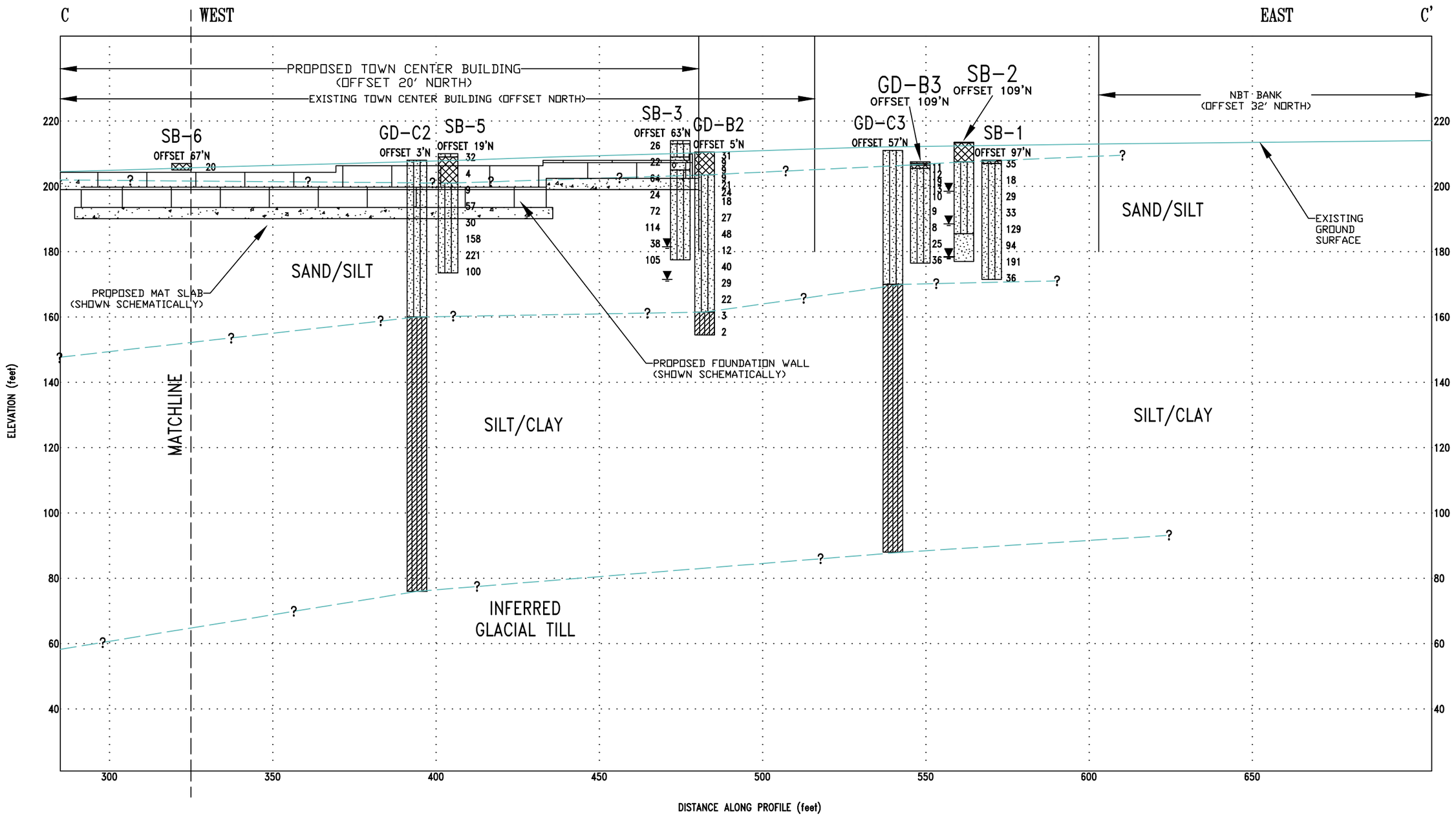
SUBSURFACE PROFILE SECTION C-C'

Burlington Town Center

Burlington, VT

Date: 3/28/17 | Drawn By: AJB | Reviewed By: SPK | File No.: 1332-01 | Figure No.: 7

11X17 W-E PROFILE BOREHOLE OFFSET 1332-01 BURLINGTON TOWN CENTER.GPJ FBNWNL01.GDT 3/28/17



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40 Farrell Street
S. Burlington, VT 05403
Phone: 802-652-5140

0 30
(feet)

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.

SUBSURFACE PROFILE SECTION C-C'

Burlington Town Center

Burlington, VT

Date:	Drawn By:	Reviewed By:	File No.:	Figure No.:
3/28/17	AJB	SPK	1332-01	8

11X17 W-E PROFILE BOREHOLE OFFSET 1332-01 BURLINGTON TOWN CENTER.GPJ FBNWNL01.GDT 3/28/17

D SOUTH NORTH D'

PROPOSED TOWN CENTER BUILDING (OFFSET 45' WEST)

EXISTING TOWN CENTER BUILDING

EXISTING GROUND SURFACE

GD-B2 OFFSET 64'W
GD-C2 OFFSET 149'W
SB-2 OFFSET 17'E
GD-C3 OFFSET 1'W
SB-3 OFFSET 67'W
SB-1 OFFSET 23'S
MB-8 OFFSET 93'W
GD-B2 OFFSET 1'E
MB-11 OFFSET 25'E
MB-10 OFFSET 27'E
MB-9 OFFSET 27'W
SH-3 OFFSET 461'W
SH-2 OFFSET 474'N

FILL
SAND/SILT
SILT/CLAY
INFERRED GLACIAL TILL

PROPOSED MAT SLAB (SHOWN SCHEMATICALLY)

PROPOSED FOUNDATION WALL (SHOWN SCHEMATICALLY)

MATCHLINE

ELEVATION (feet)

220 200 180 160 140 120 100 80 60 40

0 50 100 150 200 250 300 350

DISTANCE ALONG PROFILE (feet)

11X17 S-N PROFILE BOREHOLE OFFSET 1332-01 BURLINGTON TOWN CENTER.GPJ FBNWNL01.GDT 3/28/17

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40 Farrell Street
S. Burlington, VT 05403
Phone: 802-652-5140

0 30

Scale (feet)

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.

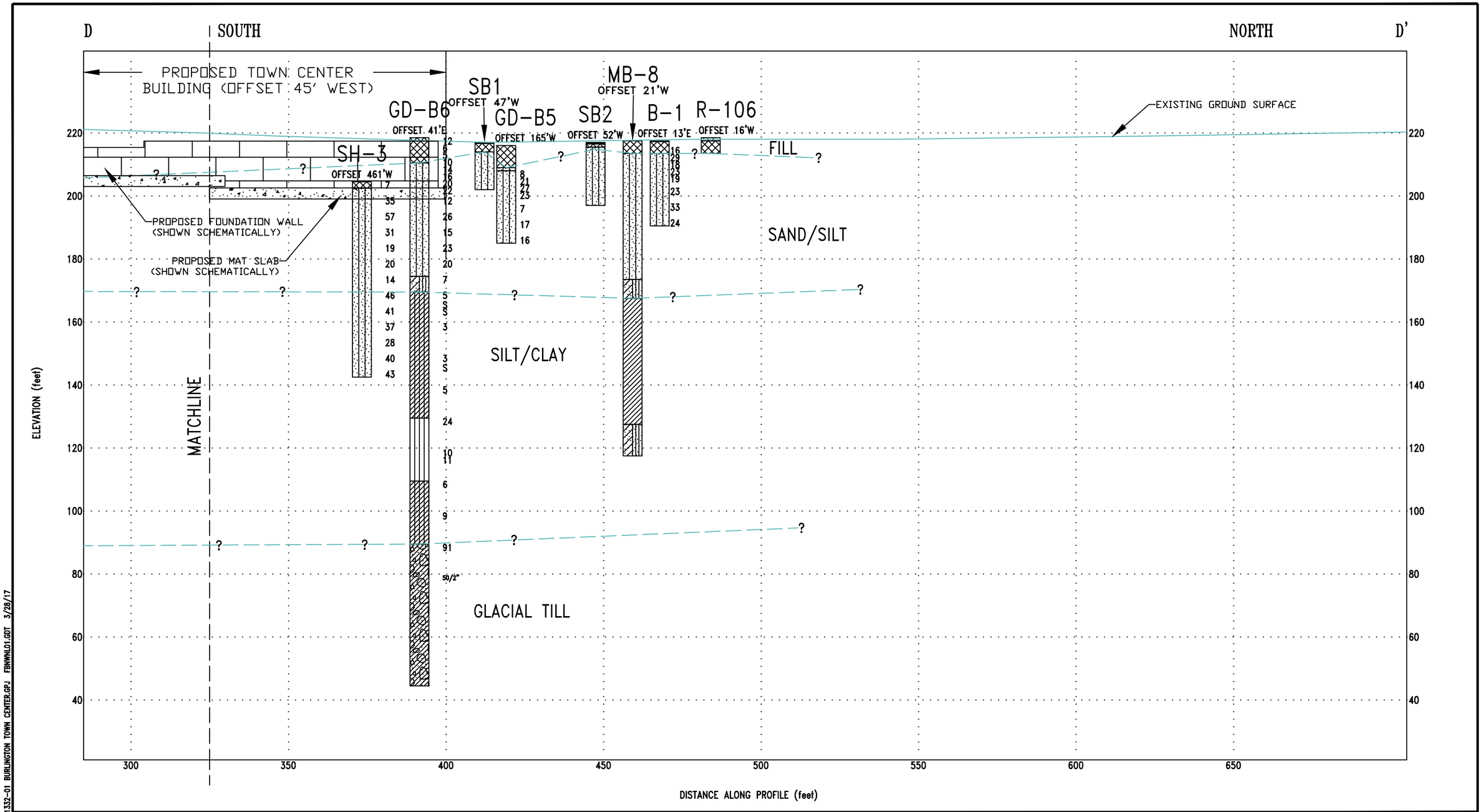
Date: 3/28/17 | Drawn By: AJB | Reviewed By: SPK

SUBSURFACE PROFILE SECTION D-D'

Burlington Town Center

Burlington, VT

File No.: 1332-01 | Figure No.: 9



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GeoDesign, Inc.

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Phone: 802-652-5140

0 30

Scale (feet)

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.

Date: 3/28/17 | Drawn By: AJB | Reviewed By: SPK

SUBSURFACE PROFILE SECTION D-D'

Burlington Town Center

Burlington, VT

File No.: 1332-01 | Figure No.: 10

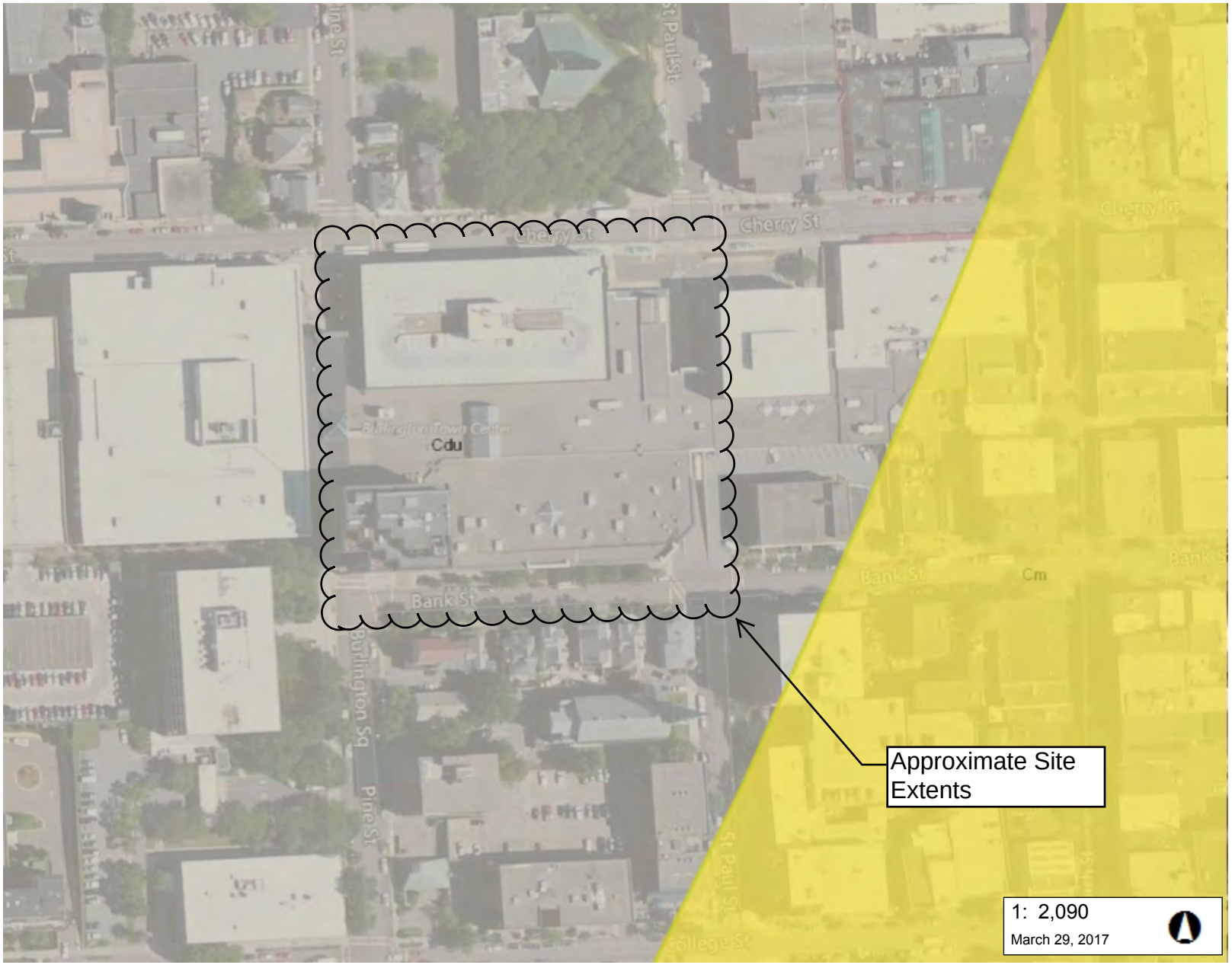
11X17 S-N PROFILE BOREHOLE OFFSET 1332-01 BURLINGTON TOWN CENTER.GPJ FBNWNL01.GDT 3/28/17

APPENDIX B – GEOLOGIC MAPS

Burlington Town Center - Bedrock Geology

Vermont Agency of Natural Resources

vermont.gov





LEGEND

Cdu:
Primary rock type is: dolostone
Secondary rock type is: conglomerate
Description: Dolostone, buff- and pink-mottled and massive, or light-gray, pinkish-gray-weathering, and massive to poorly bedded. Contains distinctive small pebbles and grains of well-rounded quartz, minor beds of dolostone-breccia and conglomerate occur near Rutland
Sedimentary class.
Found within zone:
In the Vermont Valley Sequence and Middlebury Synclinorium belt of the Dunham Dolostone.
AGE: Lower Cambrian

Cm:
Primary rock type is: sandstone
Secondary rock type is: dolostone
Description: Reddish-brown, pebbly, thin- to thick-bedded sandstone, orangey-gray- and buff-weathering well-bedded dolostone, and reddish-brown-weathering dolomitic quartzite
Sedimentary class.
Found within zone:
In the Vermont Valley Sequence and Middlebury Synclinorium belt of the Monkton Quartzite.
AGE: Middle Cambrian

NOTES

Map created using ANR's Natural Resources Atlas

106.0 0 53.00 106.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 174 Ft. 1cm = 21 Meters

© Vermont Agency of Natural Resources

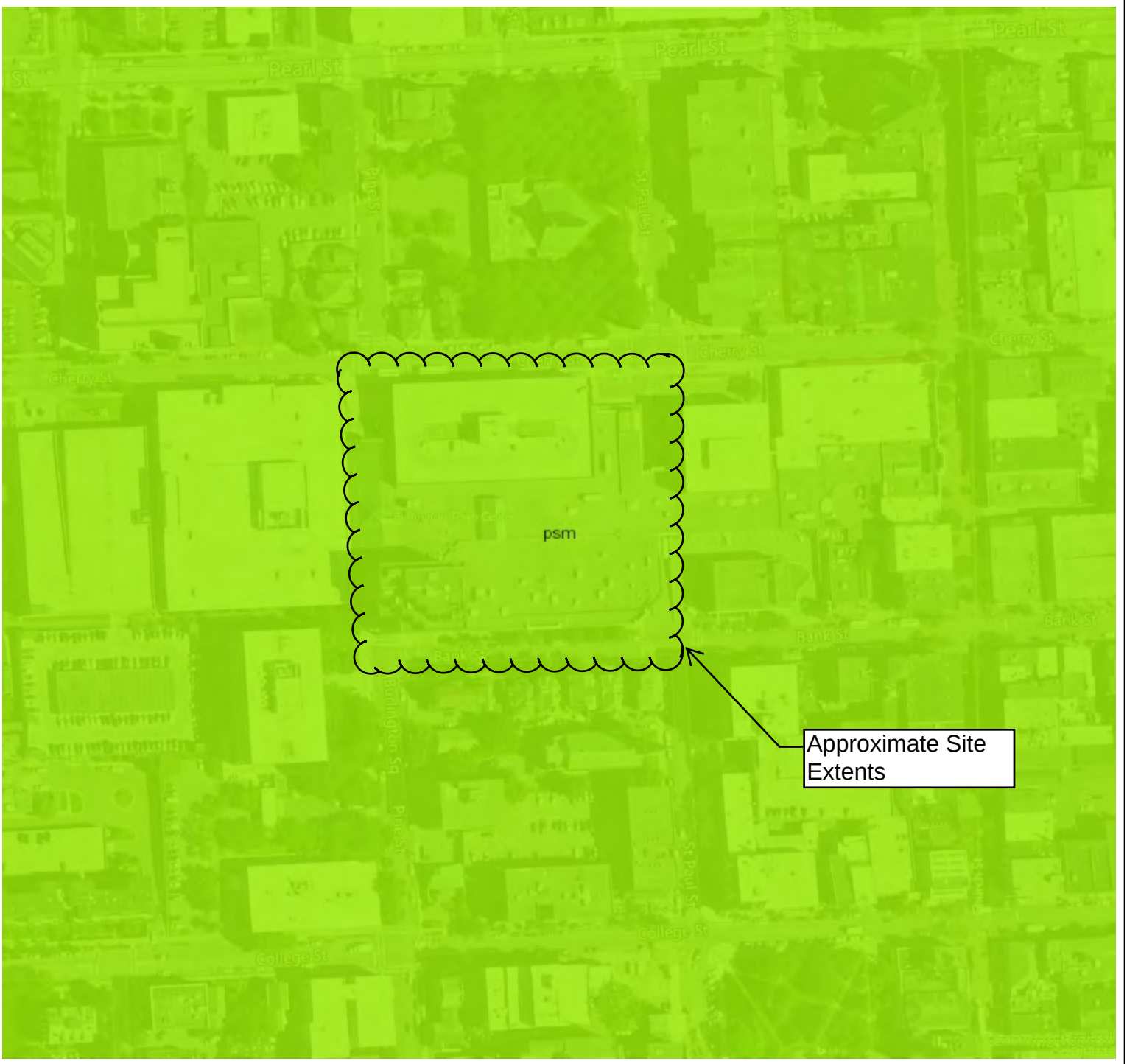
THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

Burlington Town Center - Surficial Geology

Vermont Agency of Natural Resources

vermont.gov





LEGEND

Surficial Geology (Lithology)

psm = Pebbly Marine Sand

NOTES

Map created using ANR's Natural Resources Atlas

1: 2,500

March 29, 2017

417.0 0 208.00 417.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere

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1" = 208 Ft. 1cm = 25 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

APPENDIX C – GEODESIGN BTC SOIL BORING LOGS

GEODESIGN INCORPORATED
Geotechnical / Construction / Environmental Engineers and Scientists
P.O. Box 699
Windsor, VT 05089
Phone: 802-674-2033/Fax: 802-674-5943
40 Farrell Street
S. Burlington, VT 05403
Phone: 802-652-5140

BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B1**
Page No.: 1 of 6
File No.: 1332-01
Checked By: HGJ/AJB

					Casing:	Sampler:	Groundwater Observations			
Boring Company:	QC/QA Laboratories, Inc.			Type:	Flush	SS	Date	Depth (ft)	Elev. (ft)	Notes
Foreman:	John Leonhardt			I.D.:	4.0 in.	1.38 in.				
GeoDesign Rep.:	Jacob Wimett/Shawn Kelley			Hammer Wt.:	140 lbs	140 lbs	▼ 2/21/17, 12:00			See Note 2.
Date Started:	February 21, 2017	Date Finished:	March 23, 2017	Hammer Fall:	30 in.	30 in.	▼			
N. Coordinate:	721841	E. Coordinate:	1453711	Rig Type:	CME 550 ATV		▼			
Ground Surface Elevation (feet):	204			Hammer Type:	Automatic		▼			
Station:		Offset:	ft							

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
		S1	SS	24	14	0	14	11	6	5			Fill		S1) Medium dense, brown fine to medium SAND, some Silt, little fine to coarse Gravel, moist.
5		S2	SS	24	10	4	6	4	6	5			4.5 Sand/Silt 199.5		S2) Medium dense; S2A (Upper 6"): Brown fine to coarse SAND, some fine Gravel (fractured), little Silt, moist. With a slight organic odor. S2B (Lower 4"): Tan/brown fine SAND, some Silt, moist.
10		S3	SS	24	14	9	12	11	11	9					S3) Medium dense, light brown/tan fine SAND and SILT, moist.
15		S4	SS	24	11	14	5	5	5	4					S4) Medium dense, light brown fine SAND, some Silt, moist to wet.
20		S5	SS	24	14	19	4	6	9	12					S5) Medium dense, light brown/tan with occasional brown banding SILT and fine SAND, moist.
25		S6	SS	24	16	24	7	9	12	12					S6) Medium dense, olive-brown SILT, some fine Sand, wet.

Remarks

1) Borehole coordinates are based visual estimates made to existing site features and an electronic topographical site plan entitled "ACAD-14660 X-Base-Model.dwg" provided by Engineering Ventures via email on 3/30/17. Ground surface elevation estimated from the same electronic file.
2) Borehole advanced using drive & wash techniques - moisture of samples possibly affected.
3) Advanced open-hole below 9 feet deep.

Notes:

1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

SMALL REMARK FONT STANDARD 1332-01 BURLINGTON TOWN CENTER.GPJ GEODESIGN STANDARD .GDT 7/24/17

GEODESIGN INCORPORATED
Geotechnical / Construction / Environmental Engineers and Scientists
P.O. Box 699
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S. Burlington, VT 05403
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BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B1**
Page No.: 2 of 6
File No.: 1332-01
Checked By: HGJ/AJB

| | | |

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BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B1**
Page No.: 3 of 6
File No.: 1332-01
Checked By: HGJ/AJB

Boring Company: QC/QA Laboratories, Inc.
Foreman: John Leonhardt
GeoDesign Rep.: Jacob Wimett/Shawn Kelley
Date Started: February 21, 2017 Date Finished: March 23, 2017
N. Coordinate: 721841 E. Coordinate: 1453711
Ground Surface Elevation (feet): 204
Station: Offset: ft

	Casing:	Sampler:
Type:	Flush	SS
I.D.:	4.0 in.	1.38 in.
Hammer Wt.:	140 lbs	140 lbs
Hammer Fall:	30 in.	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/21/17, 12:00			See Note 2.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Modified Burmister)
													Sand/Silt *(Continued)*		
55		S12	SS	24	11	54	9	12	13	12					S12) Medium dense, brown SILT and fine SAND, wet.
													59		
60		S13	SS	24	17	59	2	3	4	7			Silt/Clay 145.0		S13) Medium, gray Clayey SILT, trace Clay & Silt seams to 1/8" thick, trace fine Sand, wet.
65		S14	SS	24	24	64	WOH	WOH	WOH	3					S14) Very soft, gray SILT & CLAY grading locally to Clayey SILT, wet.
		ST1	ST	24	18	66.5	P	U	S	H					ST1) Unable to discern Top Bottom: Clayey SILT to SILT & CLAY, wet.
70		S15	SS	24	22	69	2	1	2	4					S15) Soft, gray SILT & CLAY, wet. With some laminations and Silt partings. (Pocket Pen=0.5-0.75 tsf. Torvane=0.15 tsf).
75															

Remarks: 5) After sampling ST1, casing advanced to 55 feet deep to end day 2/22/17.

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **GD-B1**

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BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B1**
Page No.: 4 of 6
File No.: 1332-01
Checked By: HGJ/AJB

Boring Company:	QC/QA Laboratories, Inc.																		
Foreman:	John Leonhardt																		
GeoDesign Rep.:	Jacob Wimett/Shawn Kelley																		
Date Started:	February 21, 2017	Date Finished:	March 23, 2017																
N. Coordinate:	721841	E. Coordinate:	1453711																
Ground Surface Elevation (feet):	204																		
Station:		Offset:	ft																

	Casing:	Sampler:	Groundwater Observations			
			Date	Depth (ft)	Elev. (ft)	Notes
Type:	Flush	SS				
I.D.:	4.0 in.	1.38 in.				
Hammer Wt.:	140 lbs	140 lbs	▼ 2/21/17, 12:00			See Note 2.
Hammer Fall:	30 in.	30 in.	▼			
Rig Type:	CME 550 ATV		▼			
Hammer Type:	Automatic		▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description: Depth & Elevation(feet)	Symbol	Sample Description: Classification System: Modified Burmister
													Silt/Clay *(Continued)*		
80		S16	SS	24	24	79	WOH	WOH	3	3					S16) Soft, gray SILT & CLAY, wet. With 1" thick seam of SILT in middle of sample. (Pocket Pen=0.75-0.35 tsf; Torvane=0.35 tsf).
		ST4	PS	24	0	82	P	U	S	H					ST4) No recovery. (Sampled in offset borehole - see Remark No. 9 regarding sample numbering)
85		ST5	PS	21	21	84.5	P	U	S	H					ST5) Gray SILT & CLAY (Sampled in offset borehole, see Remark No. 9 regarding sample numbering).
90		S17	SS	24	21	89	2	5	5	6					S17) Stiff, gray SILT & CLAY, trace fine Sand, wet. With 1" thick seam of SILT in middle of sample. (Pocket Pen=1.0-2.0 tsf. Torvane=0.3-0.45 tsf).
95															
100		S18	SS	24	20	99	4	5	13	17					S18) Very stiff, gray SILT & CLAY, trace fine Sand, wet. With 1" thick seam of fine SAND,

Remarks: 6) No recovery for sample ST4 at 84' deep. Note wedge rollers to be jammed preventing collection of sample. Clear hole to 84.5' and re-attempt a second tube (ST5).

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

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S. Burlington, VT 05403
Phone: 802-652-5140

BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B1**
Page No.: 5 of 6
File No.: 1332-01
Checked By: HGJ/AJB

Boring Company: QC/QA Laboratories, Inc.
Foreman: John Leonhardt
GeoDesign Rep.: Jacob Wimett/Shawn Kelley
Date Started: February 21, 2017 Date Finished: March 23, 2017
N. Coordinate: 721841 E. Coordinate: 1453711
Ground Surface Elevation (feet): 204
Station: Offset: ft

	Casing:	Sampler:
Type:	Flush	SS
I.D.:	4.0 in.	1.38 in.
Hammer Wt.:	140 lbs	140 lbs
Hammer Fall:	30 in.	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/21/17, 12:00			See Note 2.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
													Silt/Clay *(Continued)*		some Silt in middle of sample. (Pocket Pen=0.75-1.5 tsf. Torvane=0.2-0.25 tsf).
105															
110		S19	SS	24	24	109	4	7	10	11					S19) Very stiff, gray Clayey SILT to SILT & CLAY, trace fine Sand, wet. (Pocket Pen=1.0-2.0 tsf. Torvane=0.4-0.5 tsf).
115															
120		S20	SS	24	24	119	WOH	WOH	3	4					S20) Soft, gray SILT & CLAY, trace fine Sand, wet. (Pocket Pen=0.75-1.5 tsf. Torvane=0.4-0.5 tsf).
		ST2	ST	24	0	121.5	P	U	S	H					ST2) Gray SILT & CLAY, wet. (Recovered with SS after soil fell out of ST). (Pocket Pen=0.5-0.75 tsf. Torvane=0.3-0.35 tsf).
125															

Remarks: 7) No recovery of ST2, obtained SS sample for classification only.

Notes:
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3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

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Phone: 802-652-5140

BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B1**
Page No.: 6 of 6
File No.: 1332-01
Checked By: HGJ/AJB

Boring Company: QC/QA Laboratories, Inc.
Foreman: John Leonhardt
GeoDesign Rep.: Jacob Wimett/Shawn Kelley
Date Started: February 21, 2017 Date Finished: March 23, 2017
N. Coordinate: 721841 E. Coordinate: 1453711
Ground Surface Elevation (feet): 204
Station: Offset: ft

	Casing:	Sampler:
Type:	Flush	SS
I.D.:	4.0 in.	1.38 in.
Hammer Wt.:	140 lbs	140 lbs
Hammer Fall:	30 in.	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/21/17, 12:00			See Note 2.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Modified Burmister)
													Silt/Clay *(Continued)*		
130		S21	SS	24	24	129	WOH	WOH	WOH	WOH					S21) Very soft gray SILT & CLAY, wet. (Pocket Pen=0.75-1.25 tsf. Torvane-0.35-0.45 tsf).
		ST3	ST	24	0	131.5	P	U	S	H					ST3) No recovery.
135															
		ST6	PS	18.5	18.5	135	P	U	S	H					ST6) Gray SILT & CLAY (inferred from bottom of tube).
140													140		
													Glacial Till 64.0		
		S22	SS	14	12	142	44	84	50/2"						S22) Refusal, purple-brown SILT, some fine to coarse Sand, little (-) fine Gravel, wet. With fractured tan and black fine GRAVEL in the spoon tip.
145													145		
		C1	C	36	21	145							Boulder 59.0		C1) Top 15": BOULDER. Bottom 6": Purple-gray-red SILT & CLAY, some fine to coarse Sand, some fine to coarse Gravel, wet.
													146.3 Glacial Till 57.7		
													148		
150													Bottom of Exploration at 133.5 ft 56.0		

Remarks

8) Tube head pin sheared off during recovery of ST3. Not able to extract tube sample from borehole. Abandon hole and offset ~5 feet west to continue below 133' deep.
9) Drive casing to 54' deep in offset location and advance roller bit to 82' deep prior to sampling ST4 and ST5. Tube sample numbering is out of order as a result of offset borehole samples taking place after ST2 and ST3 were previously attempted at greater depths in the original borehole.
10) Driller notes significant increase in roller bit resistance beginning at approximately 140' deep on the inferred transition into Glacial Till soils.
11) Roller bit refusal at 145' deep. Attempt core sample and break through a boulder after 15" of penetration (roller bit advanced to 148' without picking up resistance that would indicate rock). Attempt to advance the roller bit through the boulder but end in near refusal (1 to 2 inches of penetration after 45 minutes of grinding).

Notes:
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4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **GD-B1**

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BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B2**
Page No.: 1 of 2
File No.: 1332-01
Checked By: HGJ/AJB

Boring Company: QC/QA Laboratories, Inc.
Foreman: John Leonhardt
GeoDesign Rep.: Jacob Wimett
Date Started: February 21, 2017 Date Finished: February 21, 2017
N. Coordinate: 721850 E. Coordinate: 1453927
Ground Surface Elevation (feet): 210.5
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/21/17, 13:05	29.0	181.5	Perched in silt
▼ 2/21/17, 13:25	39.0	171.5	Wet sample
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description: Depth & Elevation(feet)	Symbol	Sample Description: Classification System: Modified Burmister
		S1	SS	24	24	0	15	14	17	7			Fill		S1) Dense, brown fine to coarse SAND, some fine Gravel, little Silt, trace Organic Matter, moist.
		S2	SS	24	13	2	6	4	5	5					S2) Loose, brown fine to coarse SAND, little fine Gravel, trace Silt, moist.
5		S3	SS	24	14	4	3	4	5	6					S3) Loose, brown fine to coarse SAND, some (-) fine Gravel, trace Silt, moist.
		S4	SS	24	19	6	5	5	4	5			7		S4) Loose;
													Sand/Silt 203.5		S4A (upper 10"): Brown fine to coarse SAND, some fine to coarse Gravel, little silt, moist.
		S5	SS	24	16	8	4	9	12	11					S4B (lower 9"): Tan to light brown fine SAND and SILT, moist.
10		S6	SS	24	24	10	12	11	13	13					S5) Medium dense, light brown with faint layering fine SAND and SILT, moist.
															S6) Medium dense, olive-brown SILT, some fine Sand, moist.
15		S7	SS	24	22	14	4	7	11	12					S7) Medium dense, layered (to 8" thick) tan fine SAND and SILT to olive SILT, little fine Sand, moist (Sand) to very moist (Silt).
20		S8	SS	24	24	19	4	10	17	22					S8) Medium dense, tan to light brown SILT and fine SAND, moist.
25		S9	SS	24	19	24	8	21	27	28					S9) Dense, brown fine to medium SAND and SILT, moist.
30		S10	SS	24	18	29	3	6	6	5			▼		S10) Medium dense, olive-brown SILT, little fine Sand, very moist to wet.
35		S11	SS	24	24	34	8	20	20	14					S11) Dense, olive-brown SILT and fine SAND,

Remarks

1) Borehole coordinates are based visual estimates made to existing site features and an electronic topographical site plan entitled "ACAD-14660 X-Base-Model.dwg" provided by Engineering Ventures via email on 3/30/17. Ground surface elevation estimated from the same electronic file.
2) Samples S2, S4, S6 not performed per ASTM D1586 (borehole not cleaned to depth prior to sampling).

Notes:

1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

SMALL REMARK FONT STANDARD 1332-01 BURLINGTON TOWN CENTER.GPJ GEODESIGN STANDARD .GDT 7/24/17

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BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B2**
Page No.: 2 of 2
File No.: 1332-01
Checked By: HGJ/AJB

Boring Company: QC/QA Laboratories, Inc.
Foreman: John Leonhardt
GeoDesign Rep.: Jacob Wimett
Date Started: February 21, 2017 Date Finished: February 21, 2017
N. Coordinate: 721850 E. Coordinate: 1453927
Ground Surface Elevation (feet): 210.5
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/21/17, 13:05	29.0	181.5	Perched in silt
▼ 2/21/17, 13:25	39.0	171.5	Wet sample
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Modified Burmister)
													Sand/Silt *(Continued)*		moist.
40		S12	SS	24	24	39	10	13	16	18					S12) Medium dense, gray-brown fine SAND and SILT, wet.
45		S13	SS	24	21	44	5	7	15	19					S13) Medium dense, gray fine SAND and SILT, wet. With occasional 1/2" thick SILT seams.
													49		
50		S14	SS	24	24	49	1	1	2	2			Silt/Clay 161.5		S14) Soft, gray SILT & CLAY to CLAY & SILT, little fine Sand, wet. With occasional 1" thick seams of Clayey SILT.
55		S15	SS	24	24	54	WOH	WOH	2	1					S15) Very soft, gray SILT & CLAY, little fine Sand, wet. With 4" thick seam of Clayey SILT at top of sample.
													56		
													Bottom of Exploration at 56.0 ft 154.5		
60															
65															
70															

Remarks

Notes:
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3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **GD-B2**

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BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B3**
Page No.: 1 of 1
File No.: 1332-01
Checked By: HGJ/AJB

					Casing:	Sampler:
Boring Company:	QC/QA Laboratories, Inc.			Type:	H.S.A.	SS
Foreman:	John Leonhardt			I.D.:	3.25 in.	1.38 in.
GeoDesign Rep.:	Jacob Wimett			Hammer Wt.:	NA	140 lbs
Date Started:	February 21, 2017	Date Finished:	February 21, 2017	Hammer Fall:	NA	30 in.
N. Coordinate:	721956	E. Coordinate:	1453987	Rig Type:	CME 550 ATV	
Ground Surface Elevation (feet):	207.5			Hammer Type:	Automatic	
Station:		Offset:	ft			

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/21/17, 8:15	9.0	198.5	Perched silt seams
▼ 2/21/17, 8:30	19.0	188.5	Wet sample
▼ 2/21/17, 8:45	29.0	178.5	Saturated
▼ 2/21/17, 9:00	29.2	178.3	In augers (15 min.)

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Modified Burmister)
		S1	SS	18	12	0.5	3	5	6				Concrete 207.0		S1) Medium dense;
													Fill (Road Base) 206.5		S1A (Upper 6"): Brown - gray fine GRAVEL, some fine to coarse Sand, little Silt, moist.
		S2	SS	24	15	2	6	6	6	10			2 Fill Sand/Silt 205.5		S1B (Lower 6"): Brown fine SAND and SILT, moist.
5		S3	SS	24	20	4	6	10	9	7					S2) Medium dense, olive-brown SILT, some fine Sand, moist.
		S4	SS	24	24	6	6	6	7	9					S3) Medium dense, brown fine SAND and SILT, moist.
10		S5	SS	24	19	9	1	5	5	8					S4) Medium dense, light brown to olive-brown with occasional orange banding SILT and fine SAND, moist to very moist.
															S5) Medium dense, tan fine SAND, some Silt, moist. With 2 seams (2" and 4" thick) of olive SILT, wet.
15		S6	SS	24	24	14	2	3	6	15					S6) Loose, tan to olive-brown with occasional orange banding fine SAND and SILT, moist. With 3 seams (1" thick) of SILT, very moist.
20		S7	SS	24	19	19	2	4	4	4					S7) Loose, olive-brown SILT, some fine Sand, wet.
25		S8	SS	24	17	24	1	7	18	20					S8) Medium dense, alternating layers (4" to 5" thick) of tan and orange fine SAND, some Silt to olive-brown SILT, little fine Sand, moist (sand layers) to wet (silt layers).
30		S9	SS	24	18	29	8	17	19	22					S9) Dense, brown fine to medium SAND, some Silt, wet.
													31 Bottom of Exploration at 31.0 ft 176.5		
35															

Remarks

1) Borehole coordinates are based visual estimates made to existing site features and an electronic topographical site plan entitled "ACAD-14660 X-Base-Model.dwg" provided by Engineering Ventures via email on 3/30/17. Ground surface elevation estimated from the same electronic file.
2) Augered through ~6" of concrete slab prior to sampling.
3) Samples S2, S4, S6, S8 not performed per ASTM D1586 (borehole not cleaned to depth prior to sampling).

Notes:

1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **GD-B3**

SMALL REMARK FONT STANDARD 1332-01 BURLINGTON TOWN CENTER.GPJ GEODESIGN STANDARD .GDT 7/24/17

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BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B4**
Page No.: 1 of 2
File No.: 1332-01
Checked By: HGJ/AJB

Boring Company:	QC/QA Laboratories, Inc.				Casing:	Sampler:	
Foreman:	John Leonhardt			Type:	H.S.A.	SS	
GeoDesign Rep.:	Jacob Wimett			I.D.:	3.25 in.	1.38 in.	
Date Started:	February 20, 2017	Date Finished:	February 20, 2017	Hammer Wt.:	NA	140 lbs	
N. Coordinate:	722210	E. Coordinate:	1453650	Hammer Fall:	NA	30 in.	
Ground Surface Elevation (feet):	215			Rig Type:	CME 550 ATV		
Station:		Offset:	ft	Hammer Type:	Automatic		

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/20/17, 12:05	12.0	203.0	Perched
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Modified Burmister)
		S1	SS	18	18	0.5	8	10	12				Asphalt		
													Fill 214.5		S1) Medium dense, brown fine to coarse SAND, little fine Gravel, trace Silt, moist.
		S2	SS	24	20	2	7	6	8	7					S2) Medium dense;
															S2A (Upper 8"): Brown fine to coarse SAND, trace fine Gravel, trace Silt, moist.
5		S3	SS	24	21	4	2	4	8	8					S2B (Lower 12"): Tan fine SAND, little Silt, moist.
		S4	SS	24	24	6	7	8	9	12					S3) Medium dense, tan fine SAND, little Silt, moist.
													8		
		S5	SS	24	24	8	3	6	6	7			Sand/Silt 207.0		S4) Medium dense, tan with occasional dark brown banding fine to medium SAND, little Silt, slightly moist.
10															
		S6	SS	24	22	10	7	7	8	7					S5) Medium dense, tan to light brown fine SAND and SILT, moist. With 1" seam of layered SILT mid-sample.
		S7	SS	24	17	12	2	4	5	5			▼		S6) Medium dense, brown fine SAND and SILT, moist.
15		S8	SS	24	18	14	5	6	6	5					S7) Loose, brown fine SAND and SILT, very moist to wet.
															S8) Medium dense, brown fine SAND and SILT, very moist. Near vertical layering noted mid-sample.
20		S9	SS	24	21	19	4	4	7	6					S9) Medium dense, brown fine to coarse SAND, little Silt, trace fine Gravel, moist.
25		S10	SS	24	22	24	3	3	4	4					S10) Loose, brown alternating 3" to 4" thick layers of fine SAND and SILT to SILT, some fine Sand, moist (silt layers are very moist).
30		S11	SS	24	20	29	4	6	11	15					S11) Medium dense, tan/brown fine SAND and SILT, moist. With occasional 1" thick SILT seams.
35		S12	SS	24	24	34	15	19	24	15					S12) Dense tan fine SAND and SILT, very moist

Remarks

1) Borehole coordinates are based visual estimates made to existing site features and an electronic topographical site plan entitled "ACAD-14660 X-Base-Model.dwg" provided by Engineering Ventures via email on 3/30/17. Ground surface elevation estimated from the same electronic file.
2) Augered through ~6" of asphalt, no sample.
3) Samples S2, S4, S6, S8 not performed per ASTM D1586 (borehole not cleaned to depth prior to sampling).

Notes:

1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

SMALL REMARK FONT STANDARD 1332-01 BURLINGTON TOWN CENTER.GPJ GEODESIGN STANDARD .GDT 7/24/17

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BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B4**
Page No.: 2 of 2
File No.: 1332-01
Checked By: HGJ/AJB

Boring Company: QC/QA Laboratories, Inc.
Foreman: John Leonhardt
GeoDesign Rep.: Jacob Wimett
Date Started: February 20, 2017 Date Finished: February 20, 2017
N. Coordinate: 722210 E. Coordinate: 1453650
Ground Surface Elevation (feet): 215
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/20/17, 12:05	12.0	203.0	Perched
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Modified Burmister)
													Sand/Silt *(Continued)*		to wet. With occasional 1" thick SILT seams.
40		S13	SS	24	24	39	10	17	23	17					S13) Dense tan fine SAND and SILT, moist.
45		S13	SS	24	17	44	7	8	10	17					S14) Medium dense, brown/tan SILT and fine SAND, moist with wet zones.
50		S13	SS	24	15	49	5	6	5	6					S15) Medium dense, light brown/tan with orange oxidation alternating 4" layers of fine SAND and SILT, moist to SILT, little fine Sand, wet.
													51 Bottom of Exploration at 51.0 ft 164.0		

Remarks

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **GD-B4**

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S. Burlington, VT 05403
Phone: 802-652-5140

BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B5**
Page No.: 1 of 1
File No.: 1332-01
Checked By: HGJ/AJB

Boring Company:	QC/QA Laboratories, Inc.				
Foreman:	John Leonhardt				
GeoDesign Rep.:	Jacob Wimett				
Date Started:	February 24, 2017	Date Finished:	February 24, 2017		
N. Coordinate:	722220	E. Coordinate:	1453810		
Ground Surface Elevation (feet):	216				
Station:		Offset:	ft		

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/24/17, 12:00			See Note 3.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
													Fill (Inferred		
5															
													7		
													8 Sand/Silt (Inferred) 209.0		
		S1	SS	24	1	8	2	3	5	9			208.0 Sand/Silt		S1) Loose, brown fine to medium SAND, little Silt, moist.
10															
		S2	SS	24	16	10	3	9	12	11					S2) Medium dense, alternating 2"-3" layers of tan fine SAND, some Silt and olive SILT, little fine Sand, moist.
		S3	SS	24	15	12	15	12	15	16					S3) Medium dense, similar to S2.
15		S4	SS	24	12	14	10	12	11	12					S4) Medium dense, tan fine to medium SAND, some (-) Silt, trace (-) fine Gravel, moist.
20		S5	SS	24	12	19	4	3	4	4					S5) Loose, light brown to olive brown SILT to Clayey SILT, little fine Sand seams to 1/4" thick, trace gray Silty Clay seams to 1/8" thick, moist to wet.
25		S6	SS	24	15	24	9	7	10	11					S6) Medium dense, light brown fine to medium SAND, some Silt, wet.
30		S7	SS	24	13	29	4	7	9	8					S7) Medium dense; S7A (upper 10"): Olive brown with gray and orange SILT, little fine Sand, wet S7B (lower 3"): Tan fine SAND and SILT, moist.
													31 Bottom of Exploration at 31.0 ft 185.0		
35															

Remarks

1) Borehole coordinates are based visual estimates made to existing site features and an electronic topographical site plan entitled "ACAD-14660 X-Base-Model.dwg" provided by Engineering Ventures via email on 3/30/17. Ground surface elevation estimated from the same electronic file.
2) Borehole location pre-excavated to approximately 8 feet deep with vacuum truck due to proximity of existing utilities. Infer fill soils to approximately 7' deep bsed on a 6" thick zone of roots visible in the open hole sidewall between 6.5' and 7' deep.
3) Borehole advanced using drive & wash techniques - moisture of samples possibly affected.
4) Sample S3 not performed per ASTM D1586 (borehole not cleaned to depth prior to sampling).

Notes:

1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

SMALL REMARK FONT STANDARD 1332-01 BURLINGTON TOWN CENTER.GPJ GEODESIGN STANDARD .GDT 7/24/17

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Phone: 802-652-5140

BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B6**
Page No.: 1 of 5
File No.: 1332-01
Checked By: AJB

Boring Company: QC/QA Laboratories, Inc.
Foreman: John Leonhardt
GeoDesign Rep.: Jacob Wimett
Date Started: March 13, 2017 Date Finished: March 22, 2017
N. Coordinate: 722204 E. Coordinate: 1454017
Ground Surface Elevation (feet): 218.5
Station: Offset: ft

	Casing:	Sampler:
Type:	Flush	SS
I.D.:	4.0 in.	1.38 in.
Hammer Wt.:	140 lbs	140 lbs
Hammer Fall:	30 in.	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 3/13/17, 12:00			See Remark 3.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
		S1	SS	24	20	0	26	8	4	3			Fill		S1) Medium Dense; S1A (Upper 9"): Brown fine to coarse SAND and fine to coarse GRAVEL, little Silt, frozen to moist. S1B (Lower 11"): Brown fine to medium SAND, little (+) Silt, trace fine Gravel, moist.
		S2	SS	24	19	2	5	3	3	3					S2) Loose, brown fine to coarse SAND, some Silt, trace fine Gravel, moist.
5		S3	SS	24	24	4	3	2	3	2					S3) Loose, gray fine to coarse SAND, little (-) fine Gravel, trace Silt, moist.
		S4	SS	24	20	6	4	5	5	5			8		
		S5	SS	24	24	8	4	7	7	8			Sand/Silt 210.5		S4) Medium dense, light brown/tan fine SAND and SILT, moist.
10		S6	SS	24	19	10	7	8	8	8					S5) Medium dense, tan fine to medium SAND, trace Silt, trace (-) fine Gravel, moist.
		S7	SS	24	24	12	6	10	10	6					S6) Medium dense, tan fine to medium SAND, trace Silt, trace (-) fine Gravel, moist.
15		S8	SS	24	24	14	6	10	12	13					S7) Medium dense, tan fine SAND, some Silt, trace (-) fine Gravel, moist. S8) Medium dense; S8A (Upper 9"): Olive-brown SILT, little fine Sand, very moist. S8B (Lower 15"): Tan fine to medium SAND, little (+) Silt, moist.
20		S9	SS	24	15	19	4	4	8	8					S9) Medium dense; S9A (Upper 8"): Olive SILT, some fine Sand, wet. S9B (Lower 7"): Tan with brown banding fine to medium SAND, little (+) Silt, moist.
25		S10	SS	24	14	24	9	12	14	13					S10) Medium dense, tan with black/brown streaks fine to medium SAND, little Silt, wet.
30		S11	SS	24	13	29	5	6	9	11					S11) Medium dense, tan with orange and brown banding fine to medium SAND, little Silt, wet to moist.
35		S12	SS	24	12	34	7	9	14	14					S12) Medium dense;

Remarks

1) Borehole coordinates are based visual estimates made to existing site features and an electronic topographical site plan entitled "ACAD-14660 X-Base-Model.dwg" provided by Engineering Ventures via email on 3/30/17. Ground surface elevation estimated from the same electronic file.
2) Brick pavers at surface removed prior to drilling/sampling.
3) Borehole advanced with 3.25" Hollow Stem Augers to 14 feet deep. After sampling S8 at 14' deep, remove augers and advance 4" Flush Joint Casing to 14 feet deep and advance borehole open hole with the roller bit. Moisture descriptions may not accurately reflect insitu conditions due to continuously adding drilling fluid during borehole advance.
4) Samples S2, S4, S6, and S8 not performed per ASTM D1586 (borehole not cleaned to depth prior to sampling).

Notes:

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2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

SMALL REMARK FONT STANDARD 1332-01 BURLINGTON TOWN CENTER.GPJ GEODESIGN STANDARD .GDT 7/24/17

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Phone: 802-652-5140

BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B6**
Page No.: 2 of 5
File No.: 1332-01
Checked By: AJB

Boring Company: QC/QA Laboratories, Inc.
Foreman: John Leonhardt
GeoDesign Rep.: Jacob Wimett
Date Started: March 13, 2017 Date Finished: March 22, 2017
N. Coordinate: 722204 E. Coordinate: 1454017
Ground Surface Elevation (feet): 218.5
Station: Offset: ft

	Casing:	Sampler:
Type:	Flush	SS
I.D.:	4.0 in.	1.38 in.
Hammer Wt.:	140 lbs	140 lbs
Hammer Fall:	30 in.	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 3/13/17, 12:00			See Remark 3.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
													Sand/Silt *(Continued)*		S12A (Upper 6"): Tan/brown fine to coarse SAND, little Silt, trace (-) fine Gravel, wet to moist. S12B (Lower 6"): Tan with brown banding fine SAND and SILT, moist.
40		S13	SS	24	18	39	9	11	9	10					S13) Medium dense; S13A (Upper 17"): Brown fine to coarse SAND, little Silt, little fine Gravel, wet. S13B (Lower 1"): Olive-brown SILT, little fine Sand, wet.
													44		
45		S14	SS	24	19	44	4	4	3	3			Silt/Clay 174.5		S14) Loose, gray SILT grading locally to Clayey SILT, little fine Sand, wet.
50		S15	SS	24	24	49	WOH	2	3	2					S15) Medium gray SILT & CLAY, wet. (Pocket Pen = 0.3 tsf, Torvane = 0.3 tsf).
		ST1 / S16		24	0	52	P	U	S	H					ST1) No recovery. S16) Gray Clayey SILT to SILT & CLAY, wet. (Pocket Pen = 0.3 tsf, Torvane = 0.2 tsf). (Sampled through tube specimen that was not recovered)
55		ST2 / S17		24	0	54	P	U	S	H					ST2) No recovery. S17) Gray SILT & CLAY (upper 1") to SILT and fine SAND (lower 6"), wet. (Sampled through tube specimen that was not recovered)
60		S18	SS	24	0	59	1	1	2	1					S18) Soft, no recovery. Immediately attempted second sample (through lost sample zone), with new basket. Recovered 1" gray CLAY & SILT, wet.
65															
70		S19	SS	24	5	69	1	2	1	2					S19) Soft, gray CLAY & SILT to SILT & CLAY,

Remarks

5) Casing advanced from 14 to 49 feet deep prior to attempting ST1.
6) No recovery in shelby tube ST1. Split spoon advanced through same depth to obtain sample, with blows through disturbed material 2-1-3-3.
7) No recovery in shelby tube ST-2. Split spoon advanced through same depth to obtain sample, with blows through disturbed material 5-3-2-2.
8) Drilling paused after sample S18 at 11:30AM on 3/14, and resumed on 3/16 (due to blizzard).

Notes:
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3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

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Phone: 802-652-5140

BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B6**
Page No.: 3 of 5
File No.: 1332-01
Checked By: AJB

Boring Company:	QC/QA Laboratories, Inc.				
Foreman:	John Leonhardt				
GeoDesign Rep.:	Jacob Wimett				
Date Started:	March 13, 2017	Date Finished:	March 22, 2017		
N. Coordinate:	722204	E. Coordinate:	1454017		
Ground Surface Elevation (feet):	218.5				
Station:		Offset:	ft		

	Casing:	Sampler:
Type:	Flush	SS
I.D.:	4.0 in.	1.38 in.
Hammer Wt.:	140 lbs	140 lbs
Hammer Fall:	30 in.	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 3/13/17, 12:00			See Remark 3.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description: Depth & Elevation(feet)	Symbol	Sample Description: Classification System: Modified Burmister
													Silt/Clay *(Continued)*		wet. (Pocket Pen = 0.16tsf, Torvane = 0.1 tsf).
		ST3	ST	24	0	72	P	U	S	H					ST3) No recovery. Slowly push spoon sampler through same depth (52' to 74') using rig hydraulics. Recover gray Clayey SILT, wet. With seams up to 2" thick of SILT, some fine Sand, or Silty CLAY. (PP = 0.27tsf, TV = 0.28 tsf).
75															
80		S20	SS	24	24	79	WOH	1	4	4					S20) Medium gray alternating layers (3" to 6") Clayey SILT and SILT & CLAY, trace fine Sand, wet. (Pocket Pen = 0.5tsf, Torvane = 0.25tsf).
85															
90		S21	SS	24	18	89	5	9	15	20					S21) Medium dense, gray SILT, some fine Sand, little Clayey Silt (at top of sample), wet.
95															
100		S22	SS	24	0	99	5	5	5	6					S22) Medium dense, no recovery.
		S23	SS	24	21	101	6	6	5	6					S23) Medium dense, gray Clayey SILT, trace fine Sand, wet. With occasional SILT & CLAY seams 1" to 2" thick.
105															

Remarks

Notes:
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4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

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BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B6**
Page No.: 4 of 5
File No.: 1332-01
Checked By: AJB

Boring Company: QC/QA Laboratories, Inc.
Foreman: John Leonhardt
GeoDesign Rep.: Jacob Wimett
Date Started: March 13, 2017 Date Finished: March 22, 2017
N. Coordinate: 722204 E. Coordinate: 1454017
Ground Surface Elevation (feet): 218.5
Station: Offset: ft

	Casing:	Sampler:
Type:	Flush	SS
I.D.:	4.0 in.	1.38 in.
Hammer Wt.:	140 lbs	140 lbs
Hammer Fall:	30 in.	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 3/13/17, 12:00			See Remark 3.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description: Depth & Elevation(feet)	Symbol	Sample Description: Classification System: Modified Burmister
													Silt/Clay *(Continued)*		
110		S24	SS	24	24	109	2	3	3	6					S24) Medium, gray CLAY & SILT, wet. With ~3" seams of SILT, little fine Sand. (Pocket Pen = 0.5 tsf, Torvane = 0.4 tsf).
115															
120		S25	SS	24	24	119	2	4	5	9					S25) Medium, gray SILT & CLAY, wet. With layers up to 3" thick of Clayey SILT, trace fine Sand. (Pocket Pen = 1.0 tsf, Torvane = 0.38 tsf).
125													129		
130		S26	SS	22	22	129	30	45	46	65/4"			Glacial Till 89.5		S26) Very dense, purple-brown SILT and fine to medium SAND, little (-) fine Gravel, wet.
135															
140		S27	SS	8	8	139	62	50/2"							S27) Refusal, purple-brown SILT and fine to

Remarks

9) End of day 3/16 at 119 feet deep. Borehole collapsed to approximately 90 feet deep overnight.
10) Infer top of glacial till at 129' deep. Driller noted no change in resistance during roller bit advance above sample S26 (at 129' deep).
11) Note slower roller bit advance with frequent unsustained grinding and chatter during roller bit advance below 129' deep on inferred gravel/cobbles.

Notes:
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4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

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BORING LOG

Project Name

Burlington Town Center

Burlington, VT

Boring No.: **GD-B6**
Page No.: 5 of 5
File No.: 1332-01
Checked By: AJB

Boring Company:	QC/QA Laboratories, Inc.		
Foreman:	John Leonhardt		
GeoDesign Rep.:	Jacob Wimett		
Date Started:	March 13, 2017	Date Finished:	March 22, 2017
N. Coordinate:	722204	E. Coordinate:	1454017
Ground Surface Elevation (feet):	218.5		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	Flush	SS
I.D.:	4.0 in.	1.38 in.
Hammer Wt.:	140 lbs	140 lbs
Hammer Fall:	30 in.	30 in.
Rig Type:	CME 550 ATV	
Hammer Type:	Automatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 3/13/17, 12:00			See Remark 3.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description: Depth & Elevation(feet)	Symbol	Sample Description: Classification System: Modified Burmister
													Glacial Till *(Continued)*		medium SAND, little (-) fine Gravel, wet.
145															
150															
155															
160															
165															
170															
													174		
175													Bottom of Exploration at 174.0 ft 44.5		

Remarks

12) End of day on 3/17 with borehole advanced to 159' deep. Upon arrival on 3/18 note borehole to have collapsed to 60' deep. While clearing borehole driller notes there seems to be bridged zones where soil collapsed as opposed to the entire hole below 60' deep.
13) End of exploration at 174' deep due to insufficient power in the drill rig pump. Pump was unable to bring drill cuttings to the surface

Notes:
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3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **GD-B6**

APPENDIX D – CONETEC CPT REPORT

PRESENTATION OF SITE INVESTIGATION RESULTS

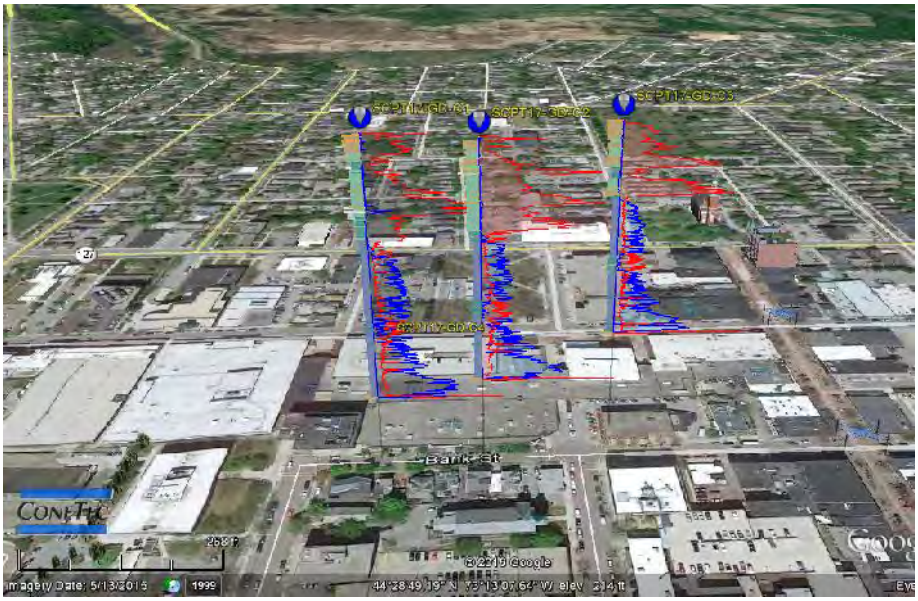
Burlington Town Center
Burlington, Vermont

Prepared for:

GeoDesign, Inc.

ConeTec Job No: 17-53020

Project Start Date: 20-Feb-2017
Project End Date: 20-Feb-2017
Report Date: 24-Feb-2017



Prepared by:

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Introduction

The enclosed report presents the results of a seismic piezocone penetration testing (SCPTu or SCPT) program carried out at the Burlington Town Center site located in Burlington, Vermont. The site investigation program was conducted by ConeTec Inc. (ConeTec), under contract to GeoDesign, Inc. (GeoDesign) of Shelburne, Vermont.

A total of 4 seismic cone penetration tests were completed at 4 locations. The SCPT program was performed to evaluate the subsurface soil conditions. SCPT sounding locations were selected and numbered under supervision of GeoDesign personnel (Mr. Shawn Kelley).

Project Information

Project	
Client	GeoDesign, Inc.
Project	Burlington Town Center, Burlington, VT
ConeTec project number	17-53020

A map from Google earth including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT Truck Rig	25 ton truck mounted (twin cylinders)	SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
SCPT	GPS (GlobalSat MR-350)	32618 (WGS 84 / UTM North)

Cone Penetration Test (CPT)	
Depth reference	Ground surface at the time of the investigation.
Tip and sleeve data offset	0.1 meter. This has been accounted for in the CPT data files.
Pore pressure dissipation (PPD) tests	Five pore pressure dissipation test was completed primarily to determine the phreatic surface.
Additional Comments	Shear wave velocity tests were conducted at various depth intervals at all locations.

Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
468:T1500F15U500	468	15	225	1500	15	500

Limitations

This report has been prepared for the exclusive use of GeoDesign, Inc (Client) for the project titled "Burlington Town Center, Burlington, VT". The report's contents may not be relied upon by any other party without the express written permission of ConeTec. ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

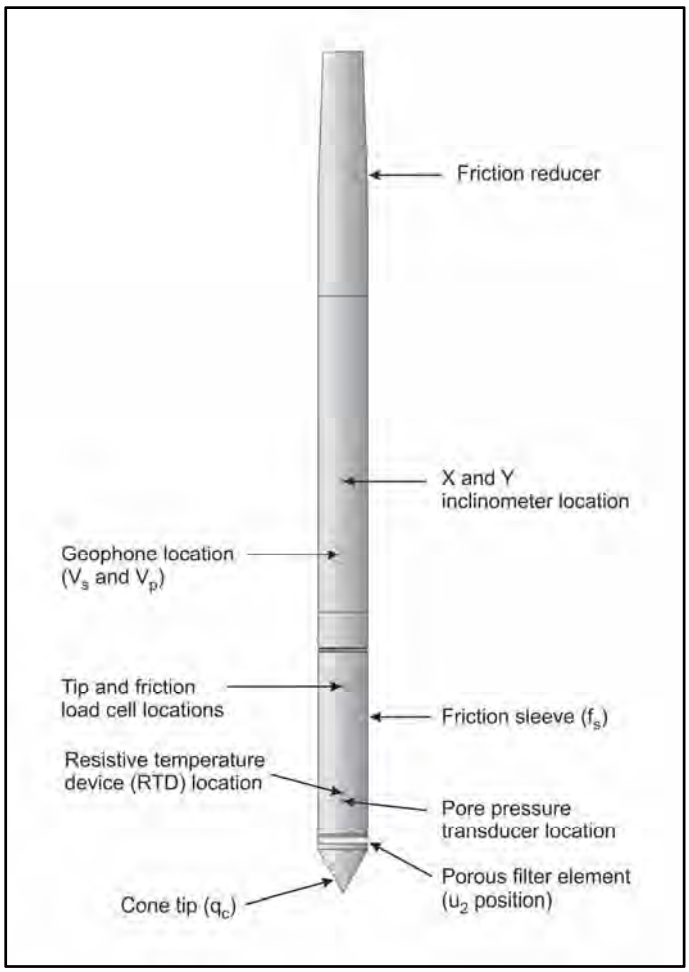


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1\text{-}a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high

friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is included in an appendix.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

Mayne, P.W. and Peuchen, J., 2012, “Unit weight trends with cone resistance in soft to firm clays”, Geotechnical and Geophysical Site Characterization *4,* Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, “Interpretation of geotechnical parameters from seismic piezocone tests”, CPT’14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, “Use of Piezometer Cone Data”, Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, “Soil Classification Using the Cone Penetration Test”, Canadian Geotechnical Journal, Volume 27: 151-158.

Robertson, P.K., 2009, “Interpretation of cone penetration tests – a unified approach”, Canadian Geotechnical Journal, Volume 46: 1337-1355.

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (Vp) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

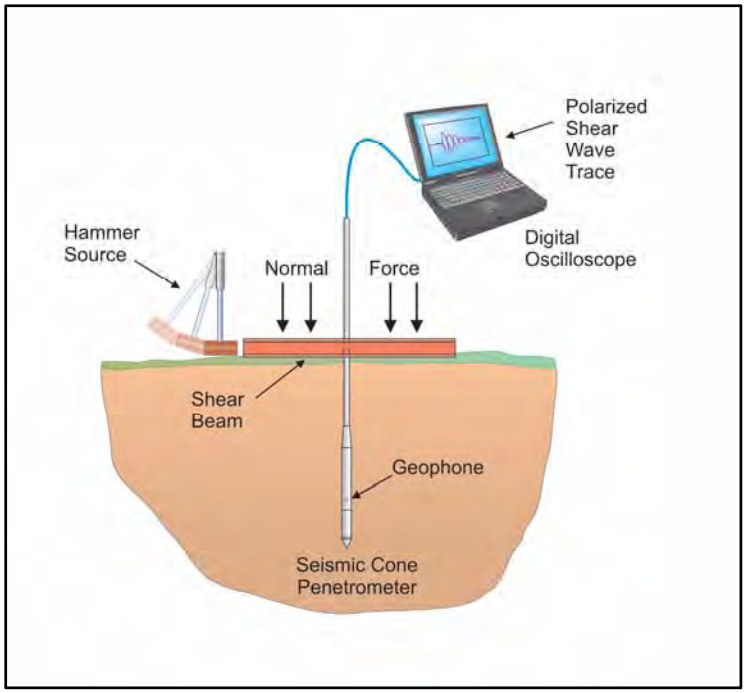


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

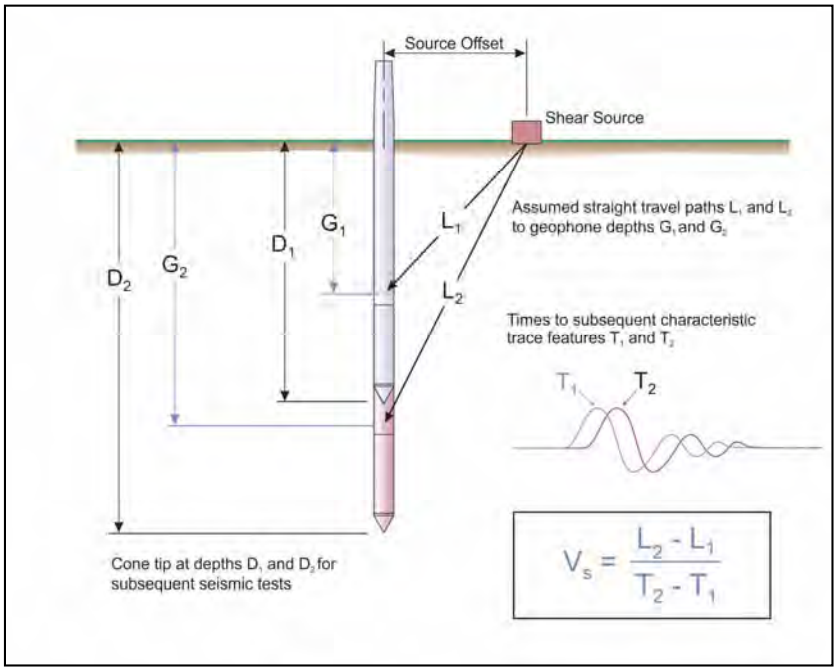


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 100 feet (30 meters) ($\bar{v}_s$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE, 2010.

$$\bar{v}_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

References

American Society of Civil Engineers (ASCE), 2010, “Minimum Design Loads for Buildings and Other Structures”, Standard ASCE/SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, “Seismic CPT to Measure In-Situ Shear Wave Velocity”, Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

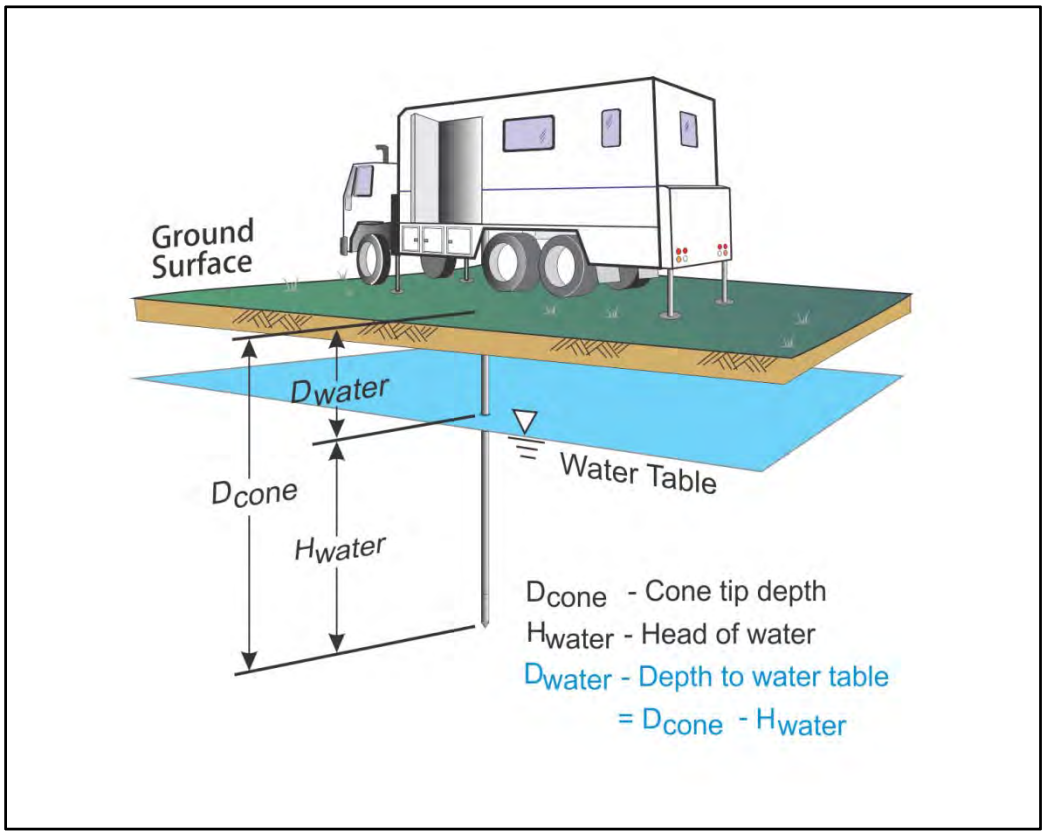


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

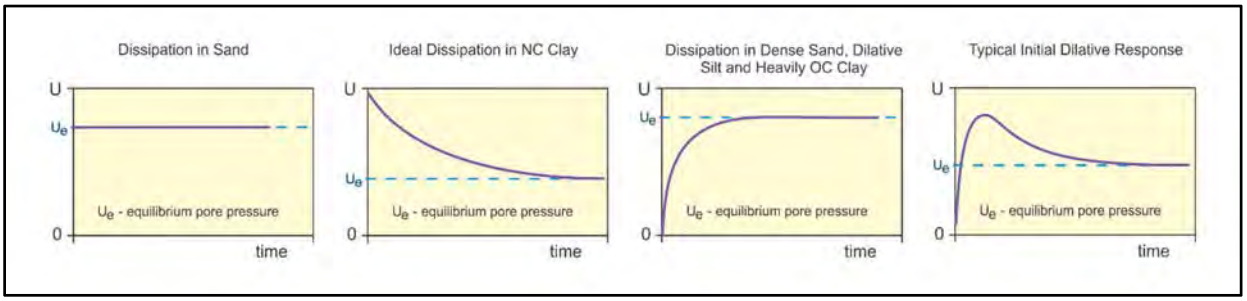


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
I_r is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

References

Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, "Analytical cavity expansion-critical state model cone dissipation in fine-grained soils", Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, "Estimating coefficient of consolidation from piezocone tests", Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Normalized Cone Penetration Test Plots
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots

CONETEC

Job No:	17-53020
Client:	GeoDesign
Project:	Burlington Town Center, Burlington, VT
Start Date:	20-Feb-2017
End Date:	20-Feb-2017

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Northing[2] (m)	Easting (m)	Refer to Notation Number
SCPT17-GD-C1	17-53020_SPGD-C1	20-Feb-2017	468:T1500F15U500	56.8	148.29	6	4926528	641935	
SCPT17-GD-C2	17-53020_SPGD-C2	20-Feb-2017	468:T1500F15U500	56.4	131.72	3	4926523	641980	3
SCPT17-GD-C3	17-53020_SPGD-C3	20-Feb-2017	468:T1500F15U500	49.8	122.87	8	4926556	642035	
SCPT17-GD-C4	17-53020_SPGD-C4	20-Feb-2017	468:T1500F15U500	71.9	166.50	19	4926644	641915	
Totals	4 soundings				569.38	36			

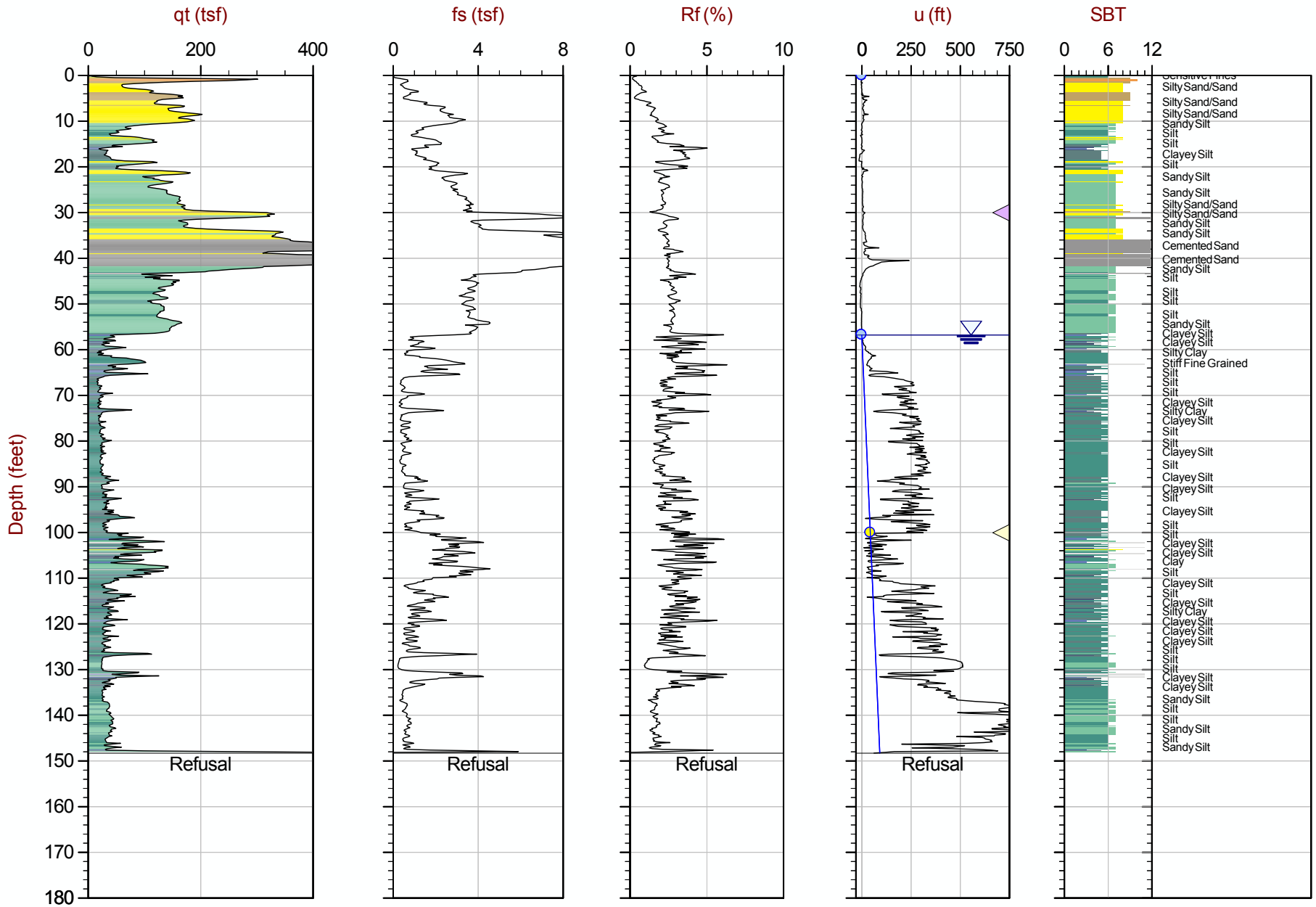
1. Assumed phreatic surface depths were determined from the pore pressure data unless otherwise noted. Hydrostatic data were used for calculated parameters.
2. Coordinates are WGS 84 / UTM Zone 18 and were collected using a MR-350 GlobalSat GPS Receiver.
3. Assumed phreatic surface estimated from the dynamic pore pressure response.
4. No phreatic surface detected

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 15:13
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C1
Cone: 468:T1500F15U500



Max Depth: 45.200 m / 148.29 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C1.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926528m E: 641935m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

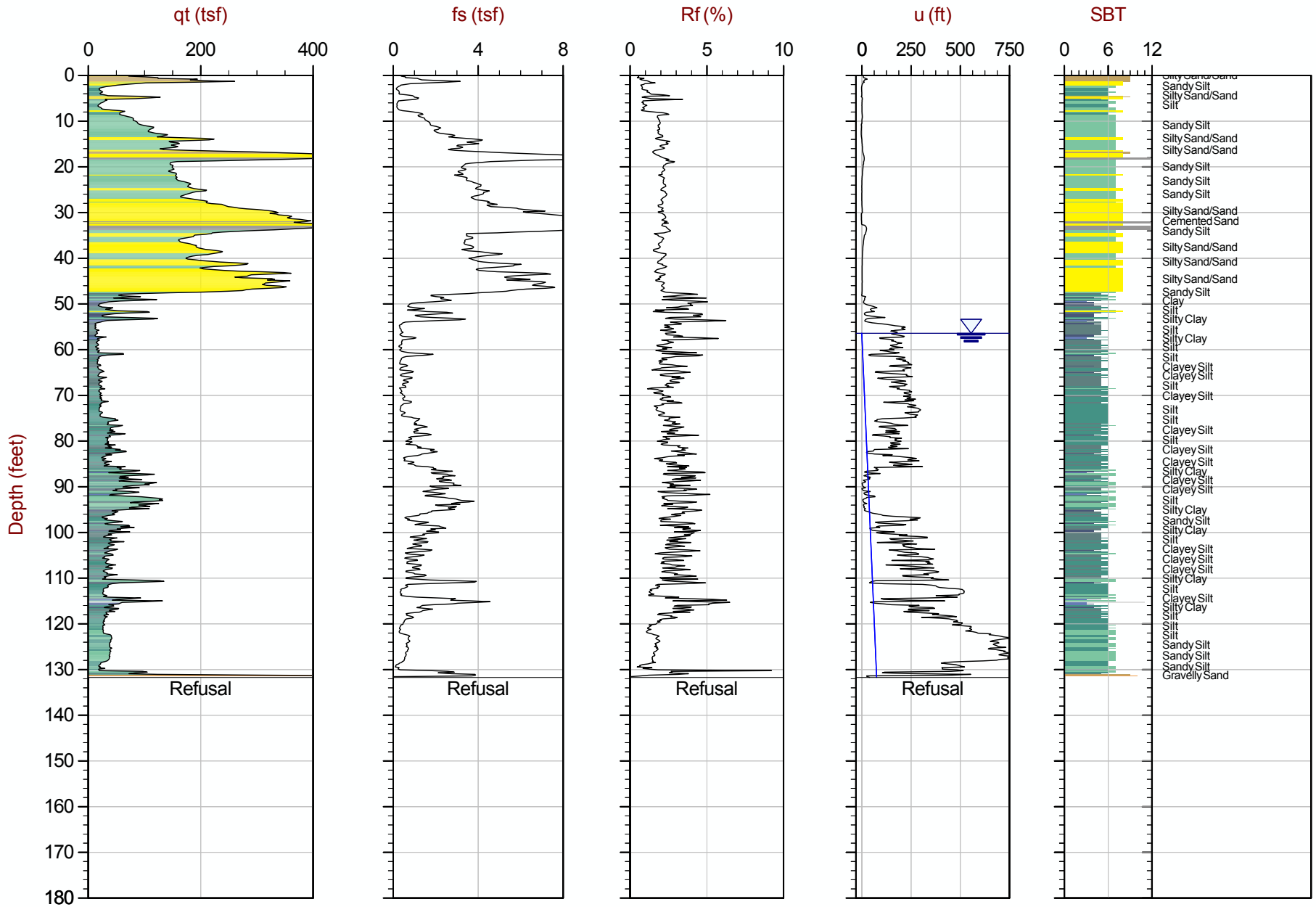
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 12:30
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C2
Cone: 468:T1500F15U500



Max Depth: 40.150 m / 131.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C2.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926523m E: 641980m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

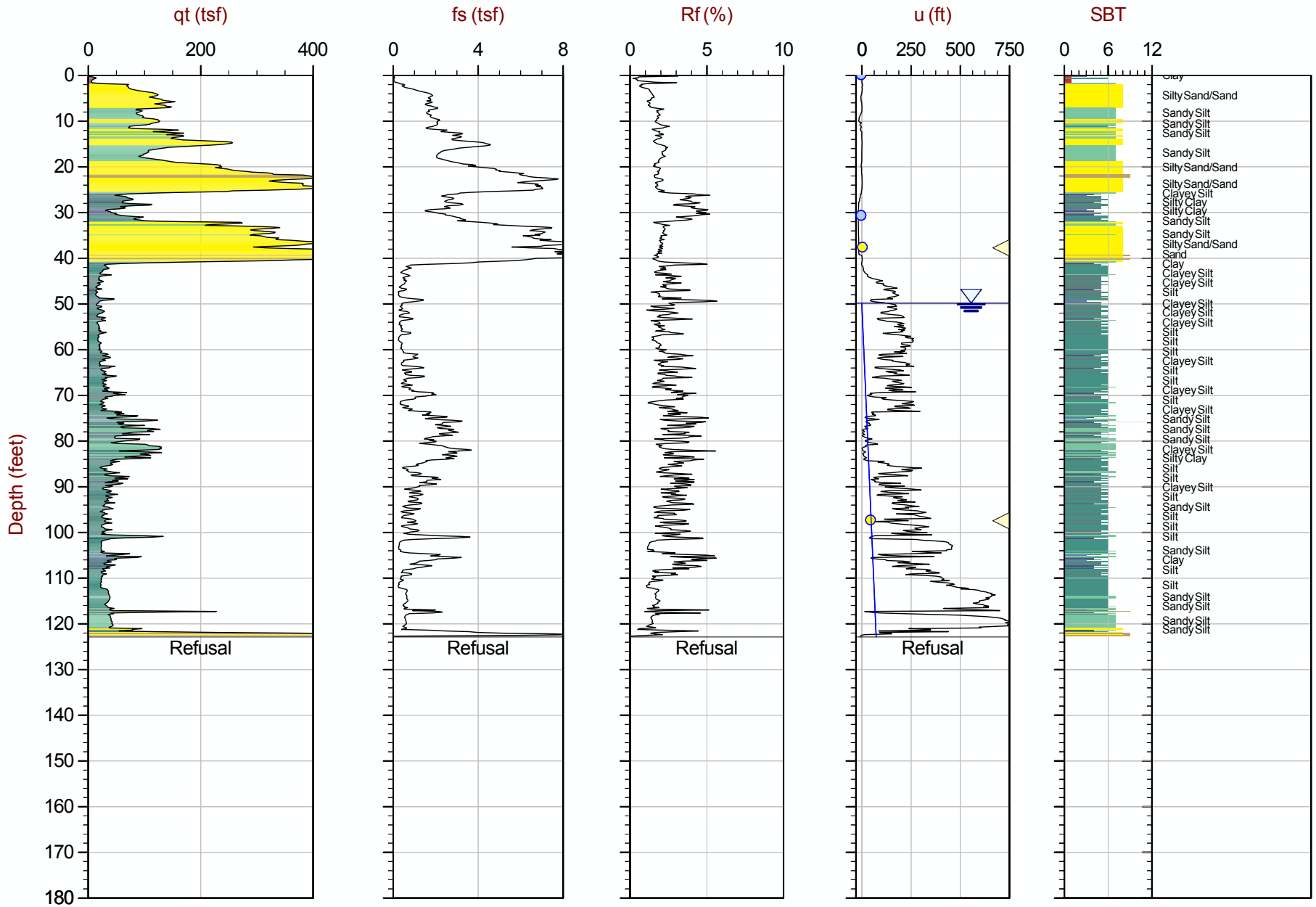
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 08:27
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C3
Cone: 468:T1500F15U500



Max Depth: 37.450 m / 122.87 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C3.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926556m E: 642035m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

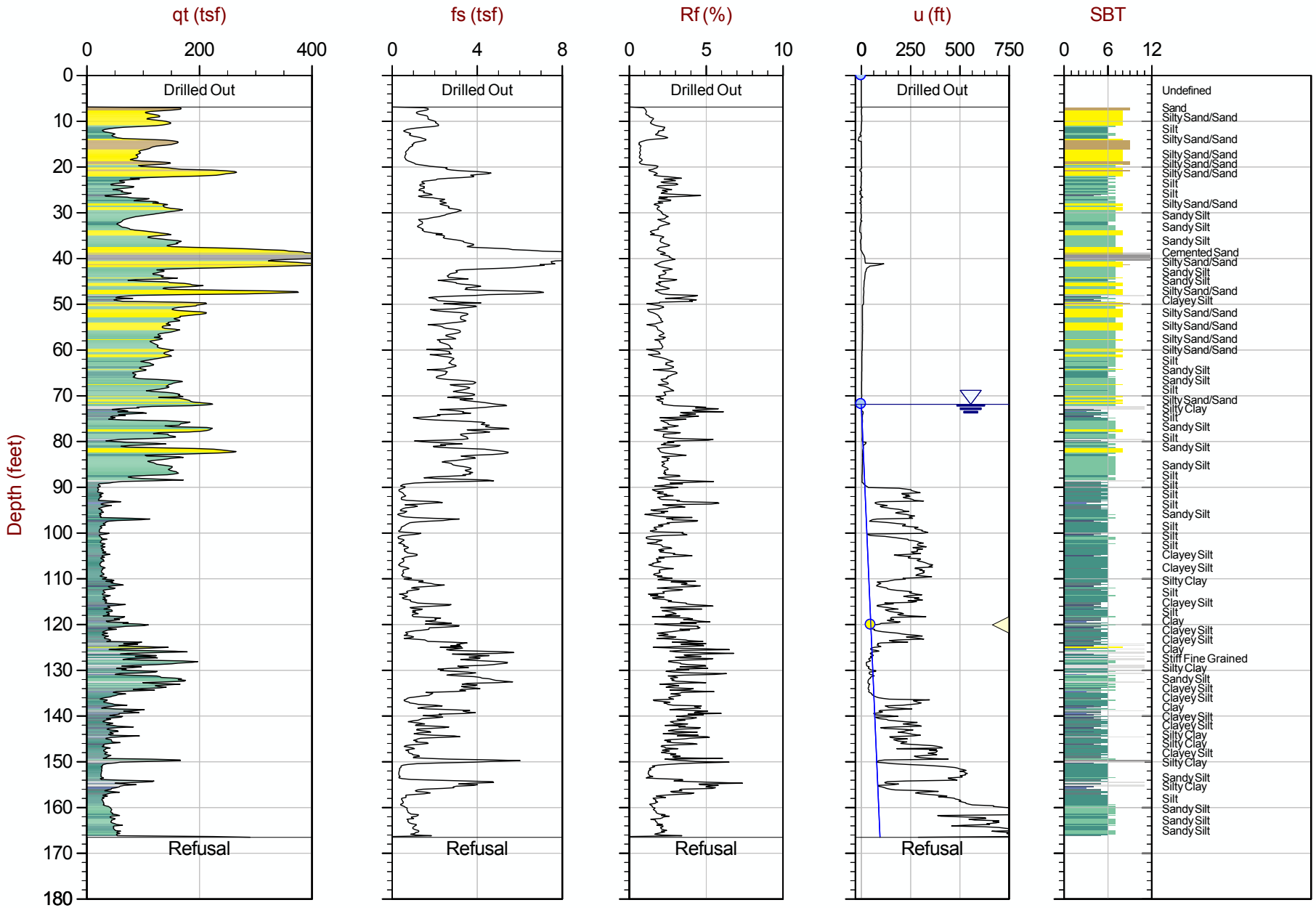
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 18:51
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C4
Cone: 468:T1500F15U500



Max Depth: 50.750 m / 166.50 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C4.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926644m E: 641915m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

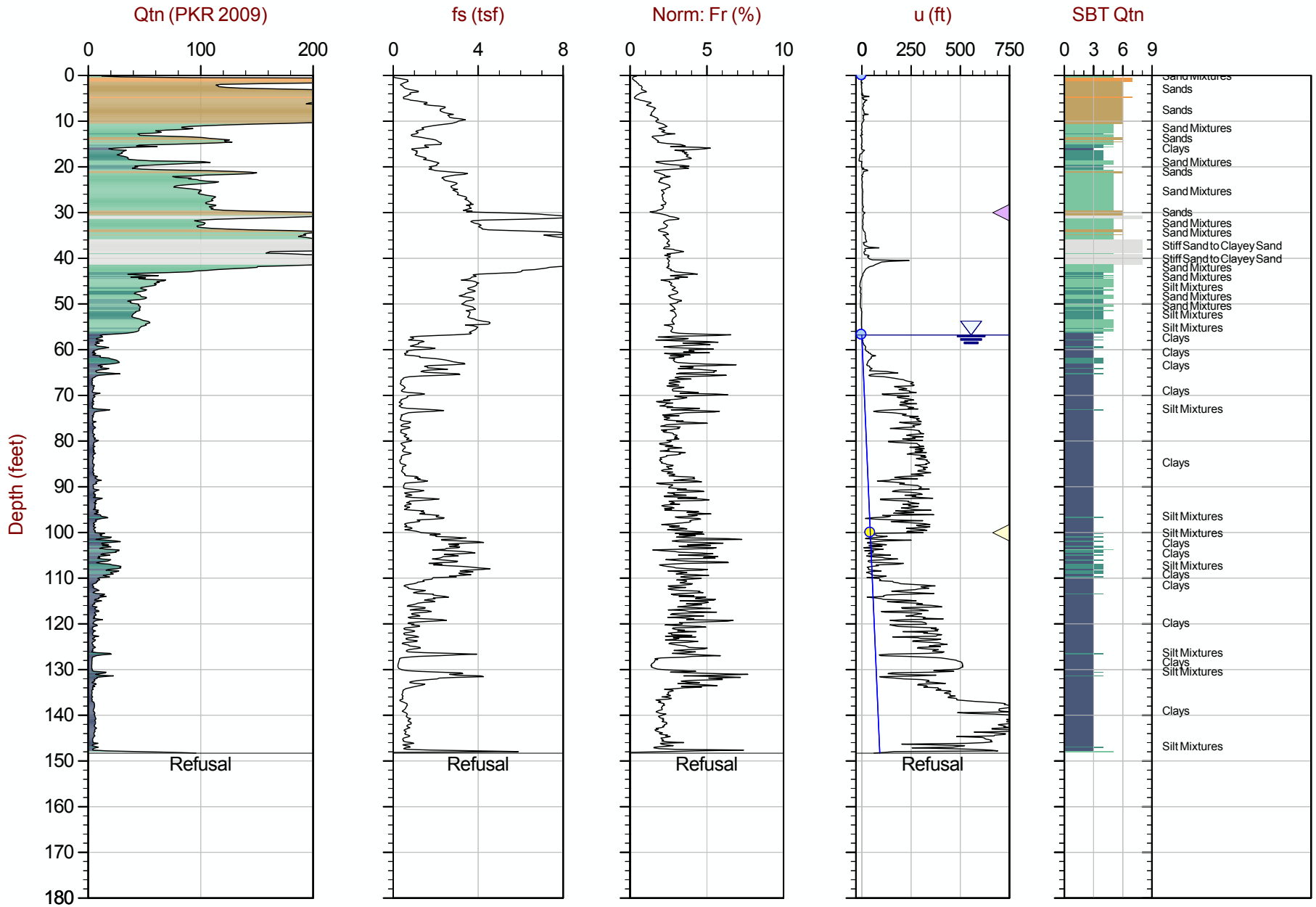
Normalized Cone Penetration Test Plots

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 15:13
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C1
Cone: 468:T1500F15U500



Max Depth: 45.200 m / 148.29 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C1.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4926528m E: 641935m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

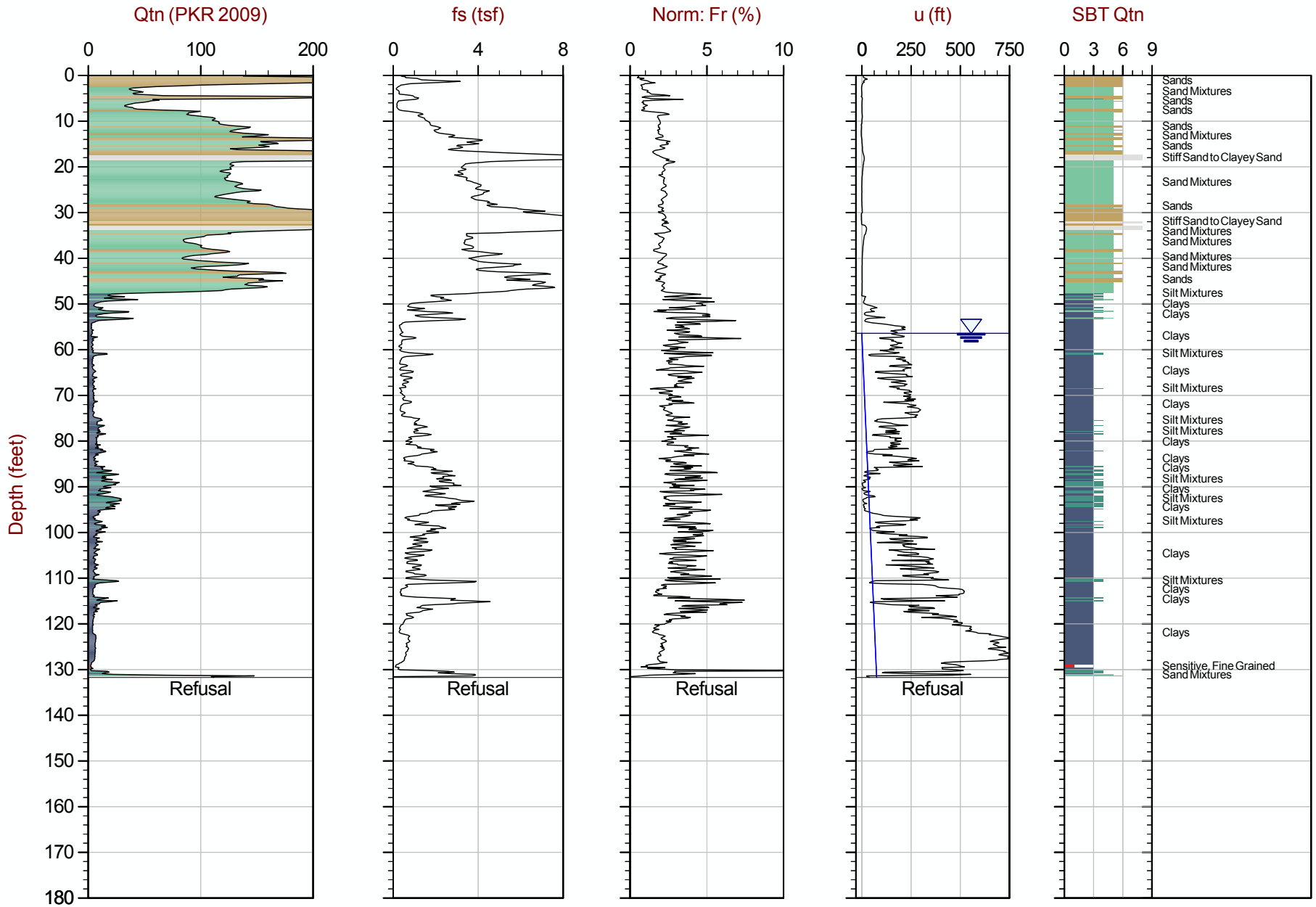
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 12:30
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C2
Cone: 468:T1500F15U500



Max Depth: 40.150 m / 131.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C2.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4926523m E: 641980m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

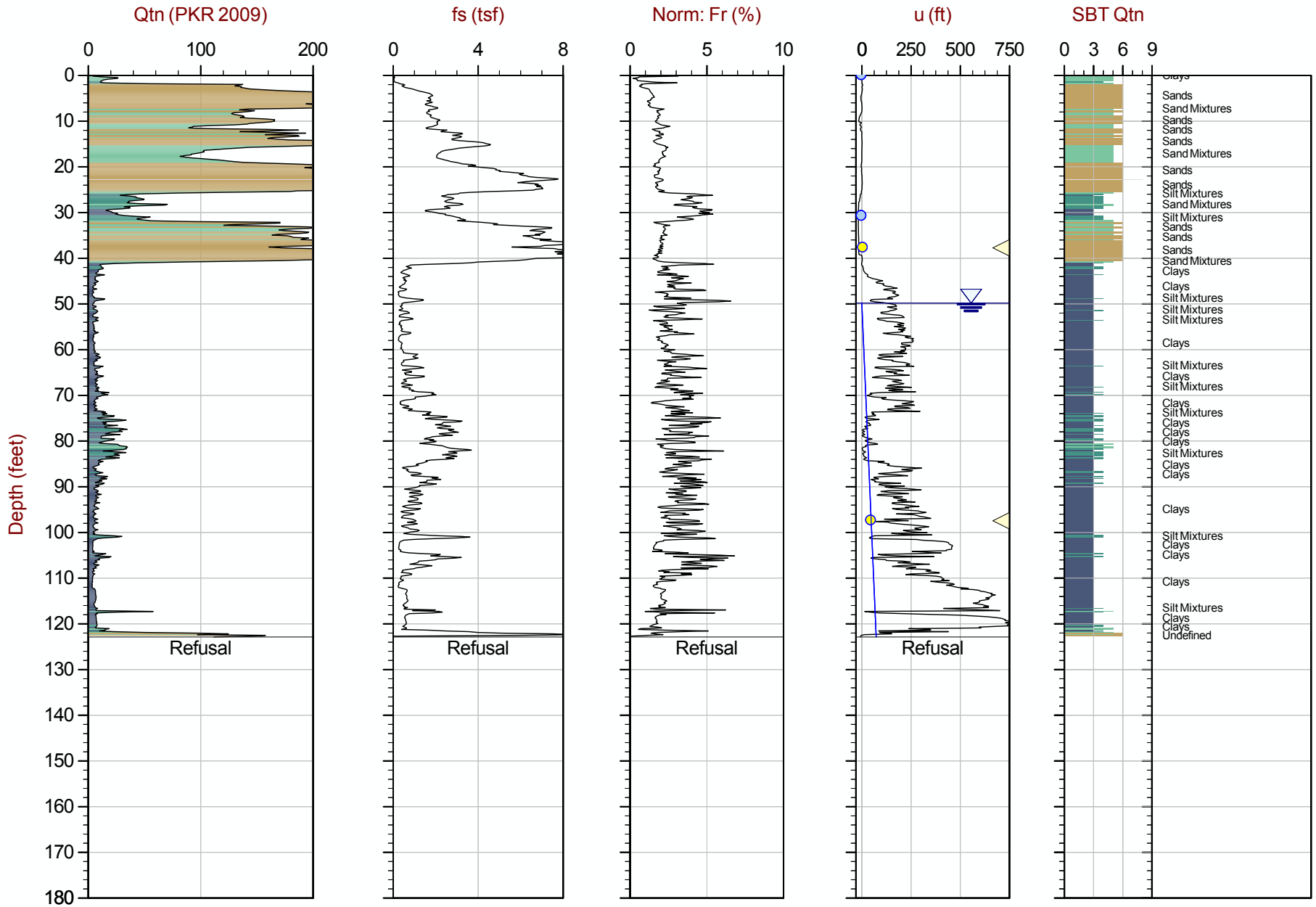
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 08:27
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C3
Cone: 468:T1500F15U500



Max Depth: 37.450 m / 122.87 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C3.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4926556m E: 642035m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

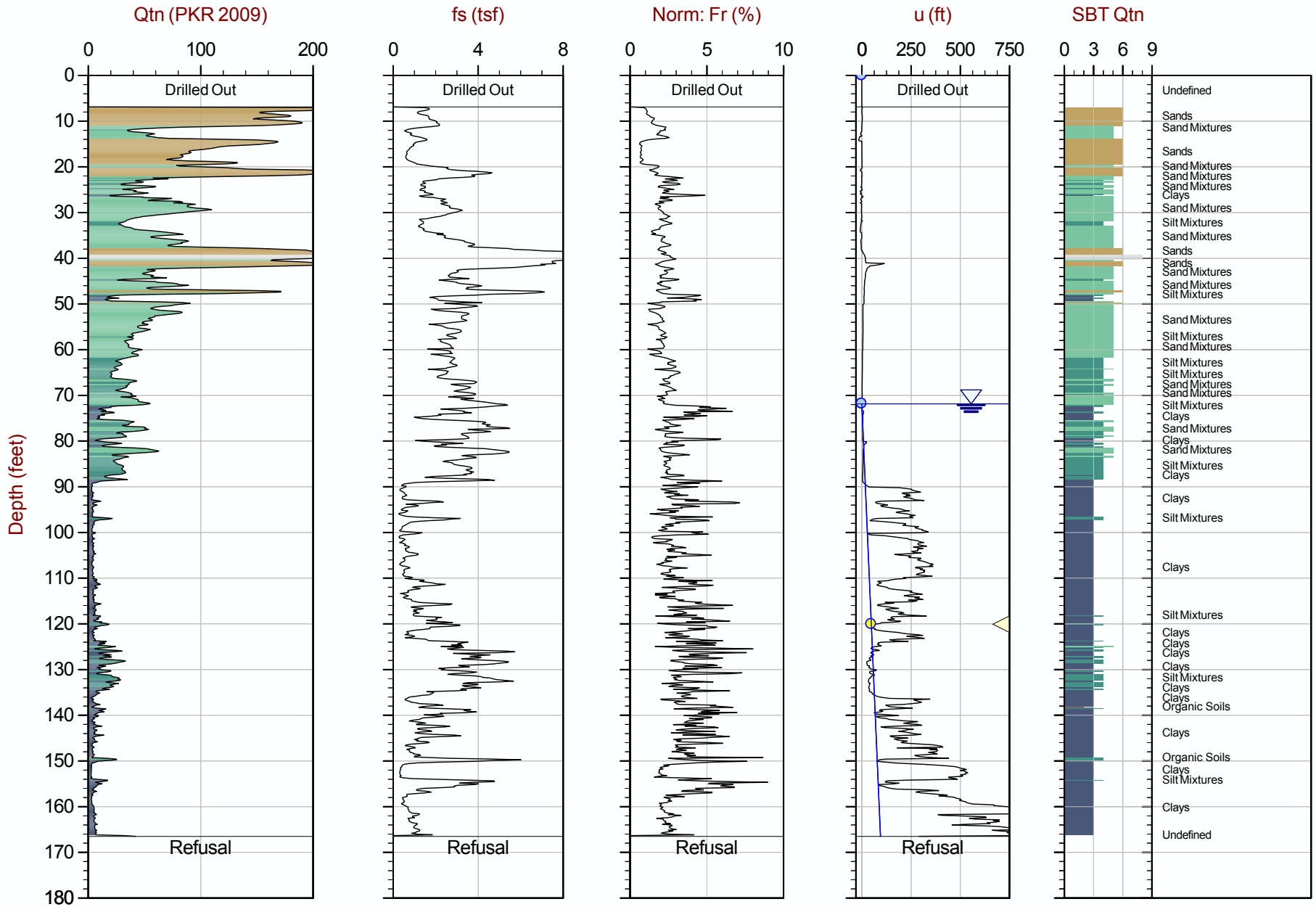
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 18:51
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C4
Cone: 468:T1500F15U500



Max Depth: 50.750 m / 166.50 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C4.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4926644m E: 641915m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Plots

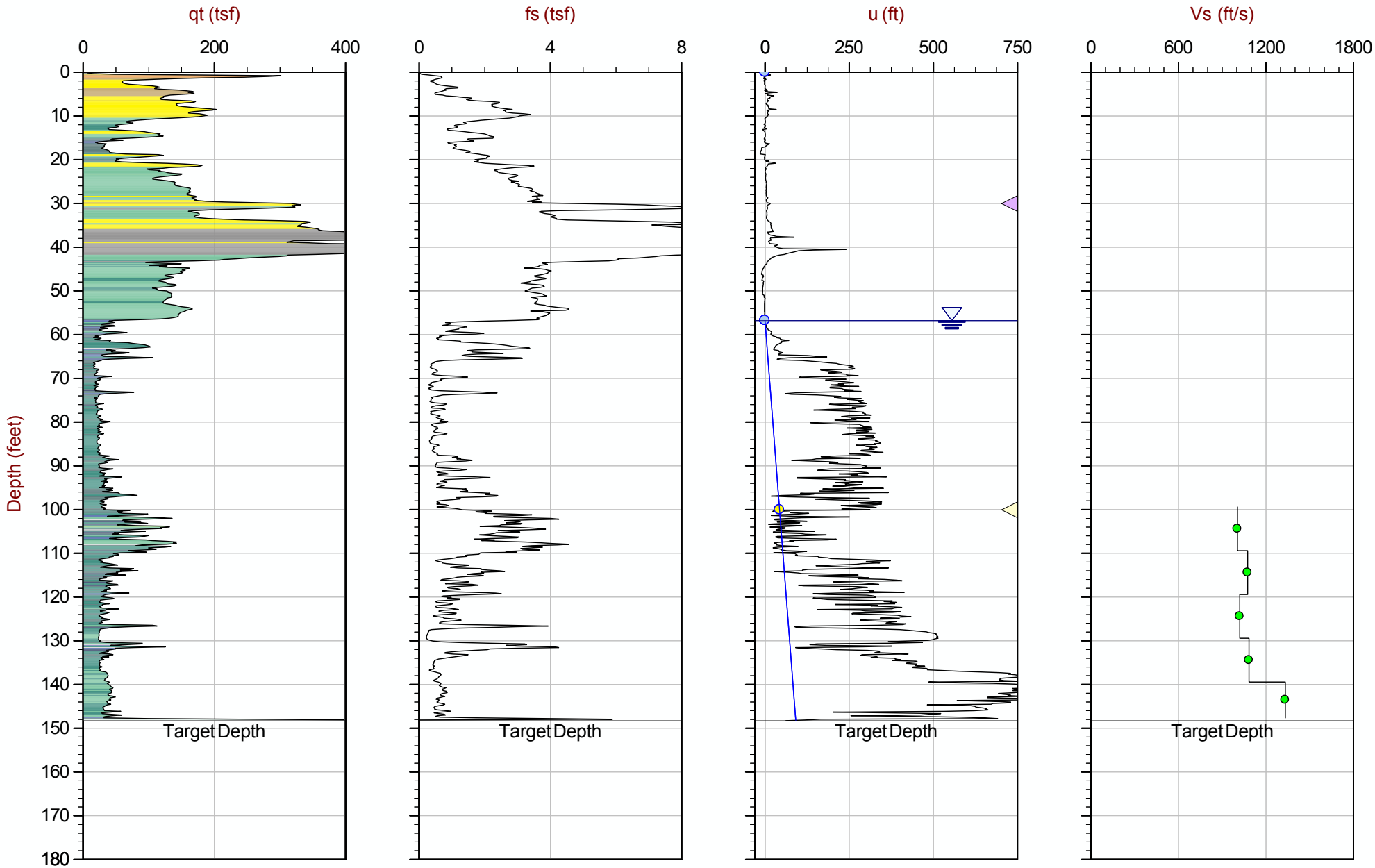
CONETEC

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 15:13
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C1
Cone: 468:T1500F15U500



Max Depth: 45.200 m / 148.29 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C1.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926528m E: 641935m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

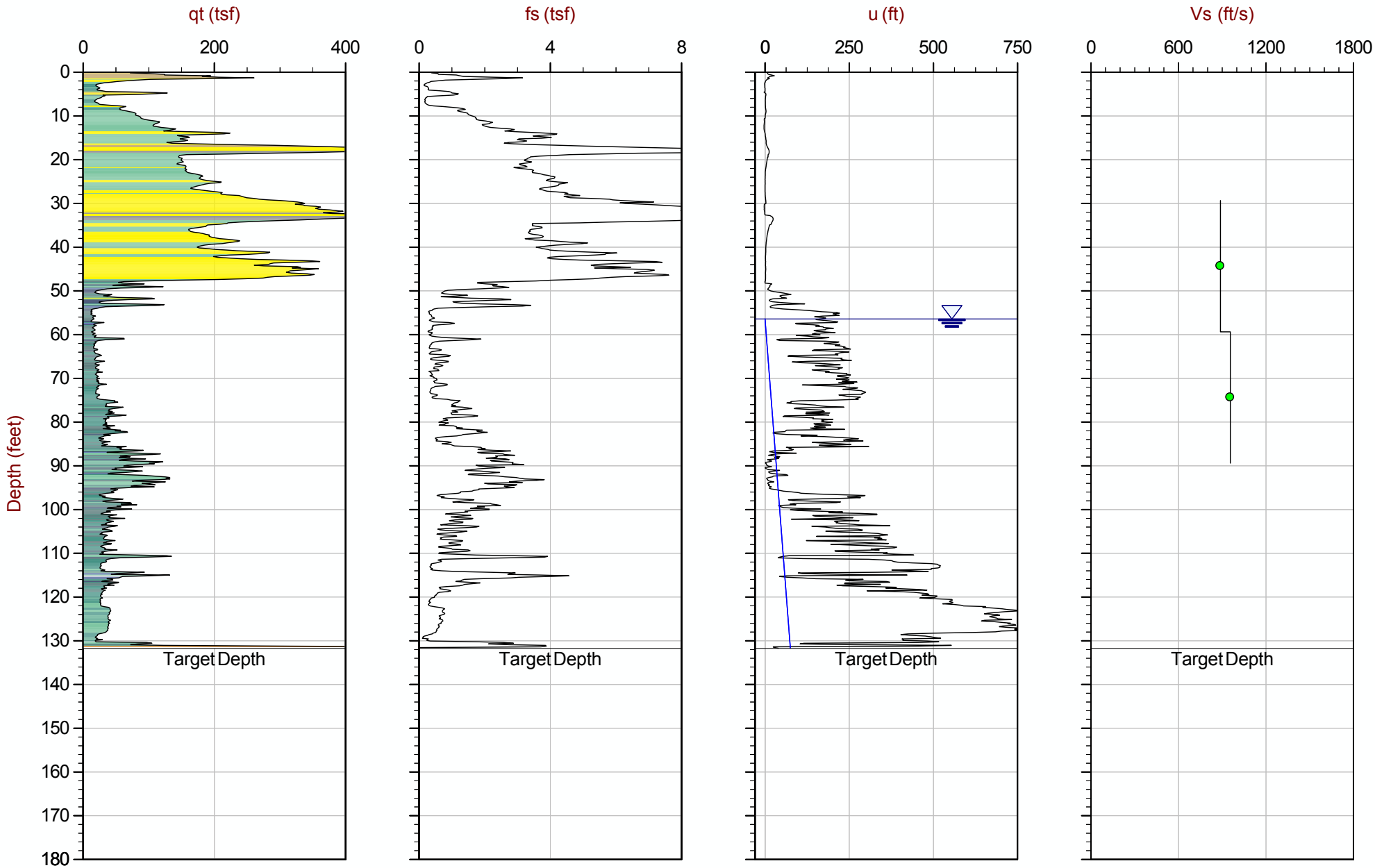
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 12:30
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C2
Cone: 468:T1500F15U500



Max Depth: 40.150 m / 131.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C2.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926523m E: 641980m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

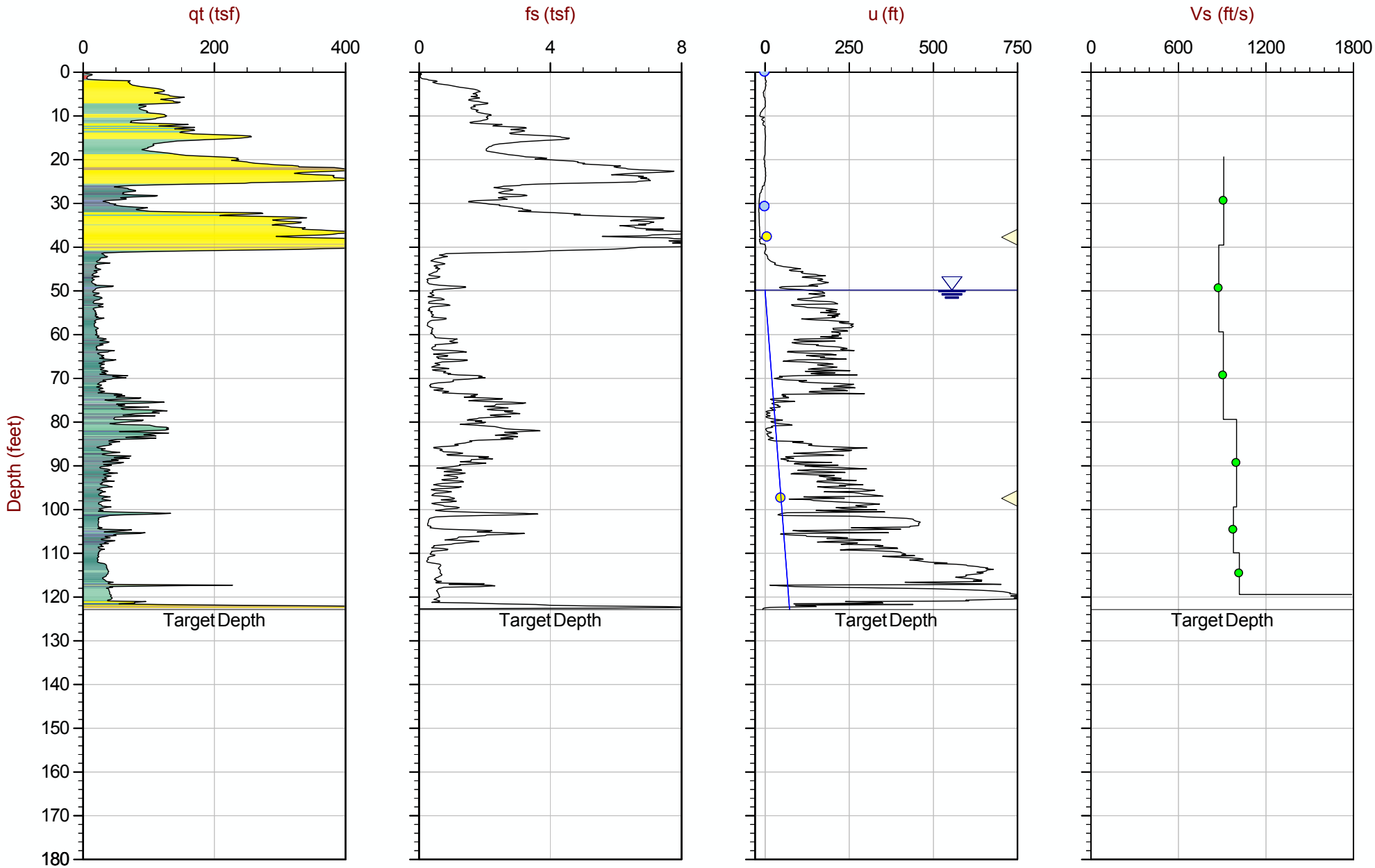
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 08:27
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C3
Cone: 468:T1500F15U500



Max Depth: 37.450 m / 122.87 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C3.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926556m E: 642035m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

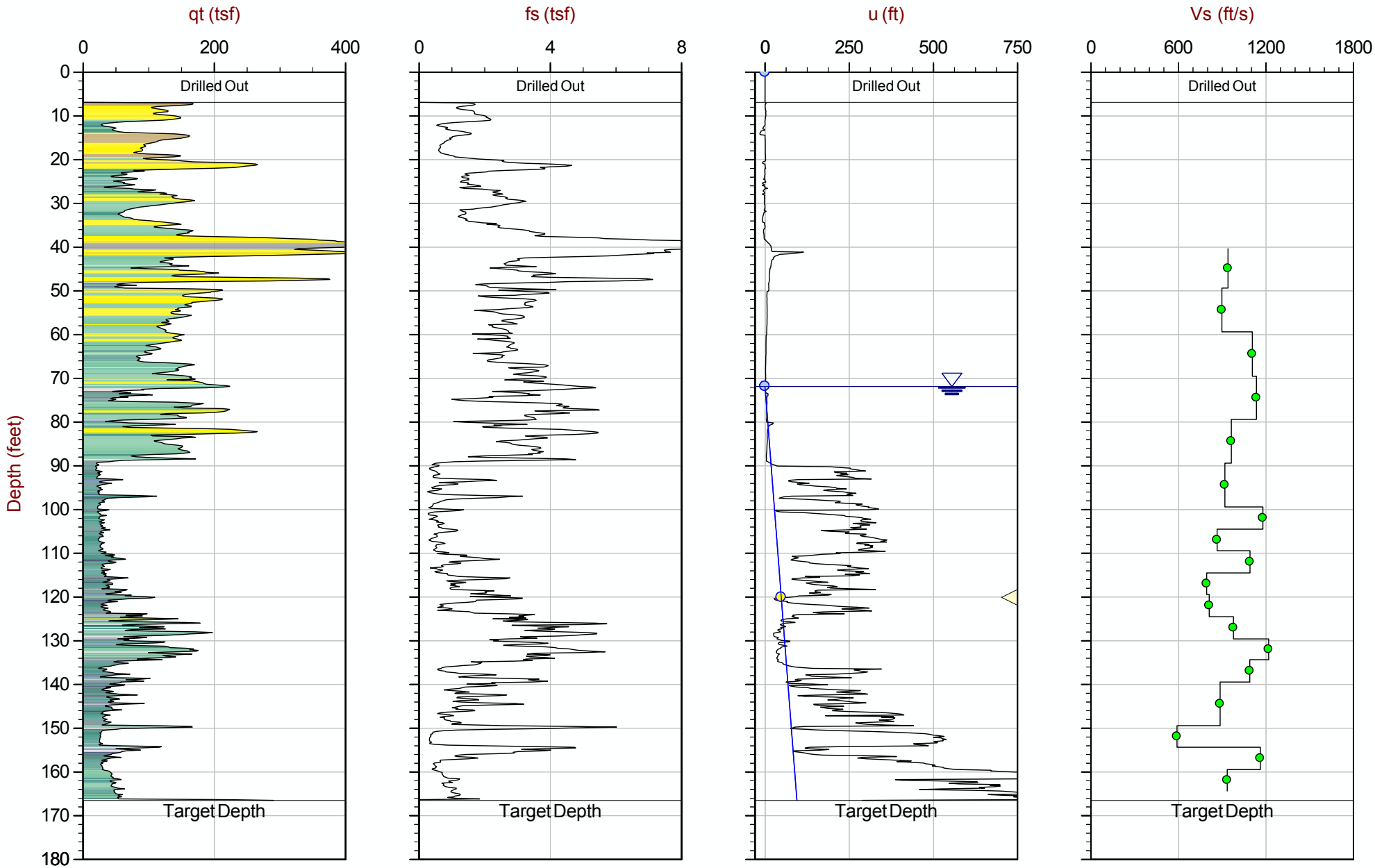
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 18:51
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C4
Cone: 468:T1500F15U500



Max Depth: 50.750 m / 166.50 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C4.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926644m E: 641915m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Tabular Results (Vs)

CONETEC

Job No:	17-53020
Client:	GeoDesign
Project:	Burlington Town Center, Burlington, VT
Sounding ID:	SCPT17-GD-C1
Date:	20-Feb-2017

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
100.07	99.41	99.43			
110.07	109.42	109.43	10.00	9.96	1005
120.08	119.42	119.44	10.01	9.31	1075
130.09	129.43	129.44	10.01	9.80	1021
140.09	139.44	139.45	10.01	9.23	1084
148.29	147.64	147.65	8.20	6.15	1333

Job No:	17-53020
Client:	GeoDesign
Project:	Burlington Town Center, Burlington, VT
Sounding ID:	SCPT17-GD-C2
Date:	20-Feb-2017

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
30.02	29.36	29.43			
60.04	59.38	59.42	29.99	33.77	888
90.06	89.40	89.42	30.01	31.40	956

Job No:	17-53020
Client:	GeoDesign
Project:	Burlington Town Center, Burlington, VT
Sounding ID:	SCPT17-GD-C3
Date:	20-Feb-2017

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
20.01	19.36	19.46			
40.19	39.53	39.58	20.13	22.09	911
60.04	59.38	59.42	19.83	22.61	877
80.05	79.40	79.42	20.00	22.03	908
100.07	99.41	99.43	20.01	20.03	999
110.56	109.91	109.93	10.50	10.75	977
120.08	119.42	119.44	9.51	9.34	1018
122.87	122.21	122.23	2.79	1.48	1881

Job No:	17-53020
Client:	GeoDesign
Project:	Burlington Town Center, Burlington, VT
Sounding ID:	SCPT17-GD-C4
Date:	20-Feb-2017

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
41.01	40.35	40.40			
50.03	49.38	49.42	9.01	9.59	940
60.04	59.38	59.42	10.00	11.13	898
70.21	69.55	69.58	10.17	9.18	1107
80.05	79.40	79.42	9.84	8.67	1135
90.06	89.40	89.42	10.00	10.39	963
100.07	99.41	99.43	10.00	10.88	919
105.15	104.49	104.51	5.08	4.31	1179
110.07	109.42	109.43	4.92	5.69	865
115.16	114.50	114.52	5.08	4.66	1091
120.08	119.42	119.44	4.92	6.20	794
125.16	124.51	124.52	5.08	6.27	811
130.25	129.59	129.61	5.08	5.20	977
135.01	134.35	134.36	4.76	3.90	1219
140.09	139.44	139.45	5.08	4.67	1089
150.10	149.44	149.46	10.01	11.29	886
155.02	154.36	154.38	4.92	8.34	590
160.10	159.45	159.46	5.08	4.37	1162
165.03	164.37	164.38	4.92	5.26	935

Pore Pressure Dissipation Summary and

Pore Pressure Dissipation Plots

CONETEC

Job No:	17-53020
Client:	GeoDesign
Project:	Burlington Town Center, Burlington, VT
Start Date:	20-Feb-2017
End Date:	20-Feb-2017

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
SCPT17-GD-C1	17-53020_SPGD-C1.PPD	15	490	30.02						
SCPT17-GD-C1	17-53020_SPGD-C1.PPD	15	475	100.06	43.27	56.79		25	100	28.54
SCPT17-GD-C3	17-53020_SPGD-C3.PPD	15	440	37.73	6.95	30.78				
SCPT17-GD-C3	17-53020_SPGD-C3.PPD	15	660	97.44	47.64	49.80		28	100	24.70
SCPT17-GD-C4	17-53020_SPGD-C4.PPD	15	900	120.08	48.22	71.86		56	100	12.47
Totals	5 dissipations		49.4 min							

a. Time is relative to where umax occurred

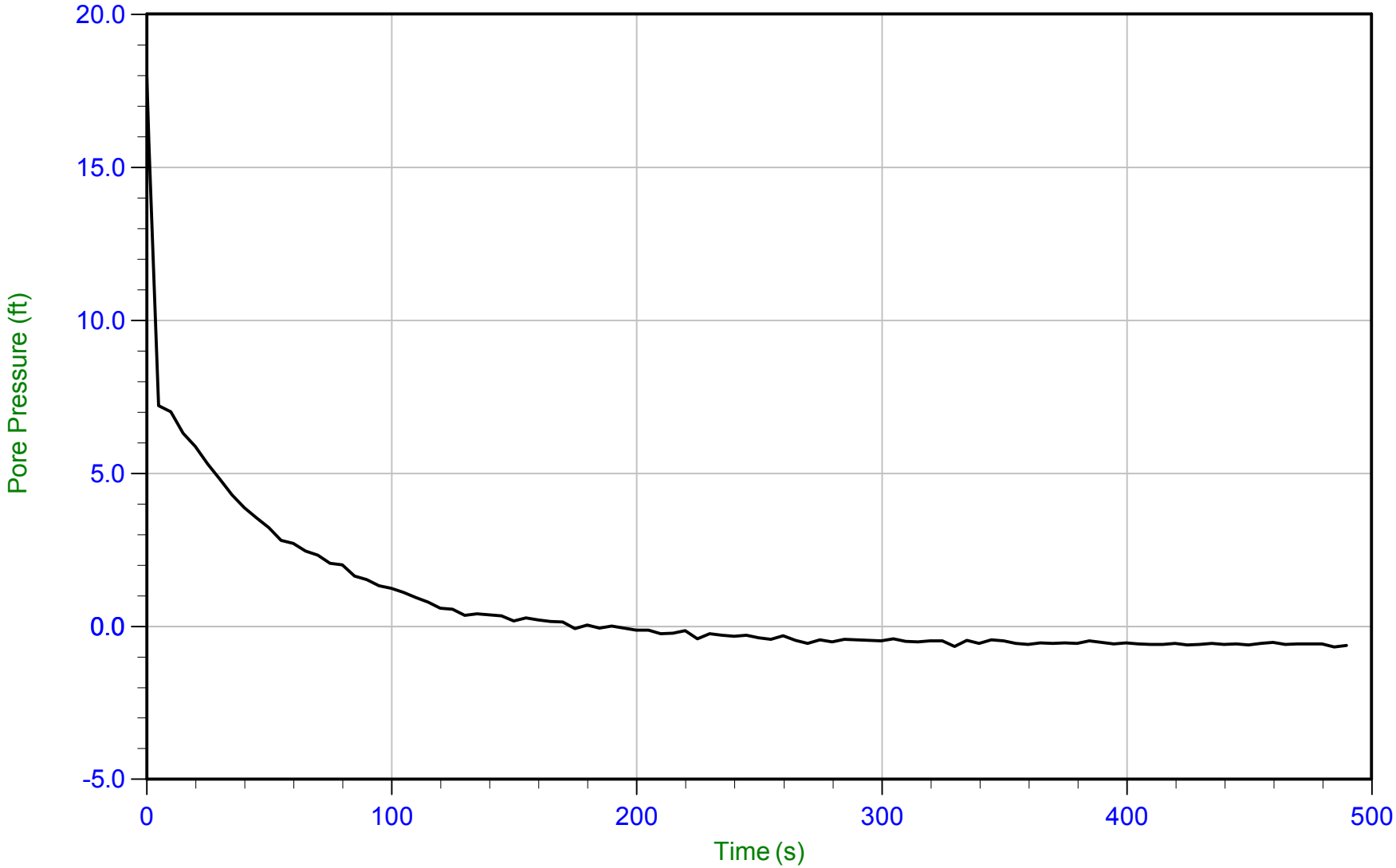
b. Houlsby and Teh, 1991

CONETEC

GeoDesign

Job No: 17-53020
Date: 20-Feb-2017 15:13:59
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C1
Cone: AD468 Area=15 cm²



Trace Summary:

Filename: 17-53020_SPGD-C1.PPD
Depth: 9.150 m / 30.019 ft
Duration: 490.0 s

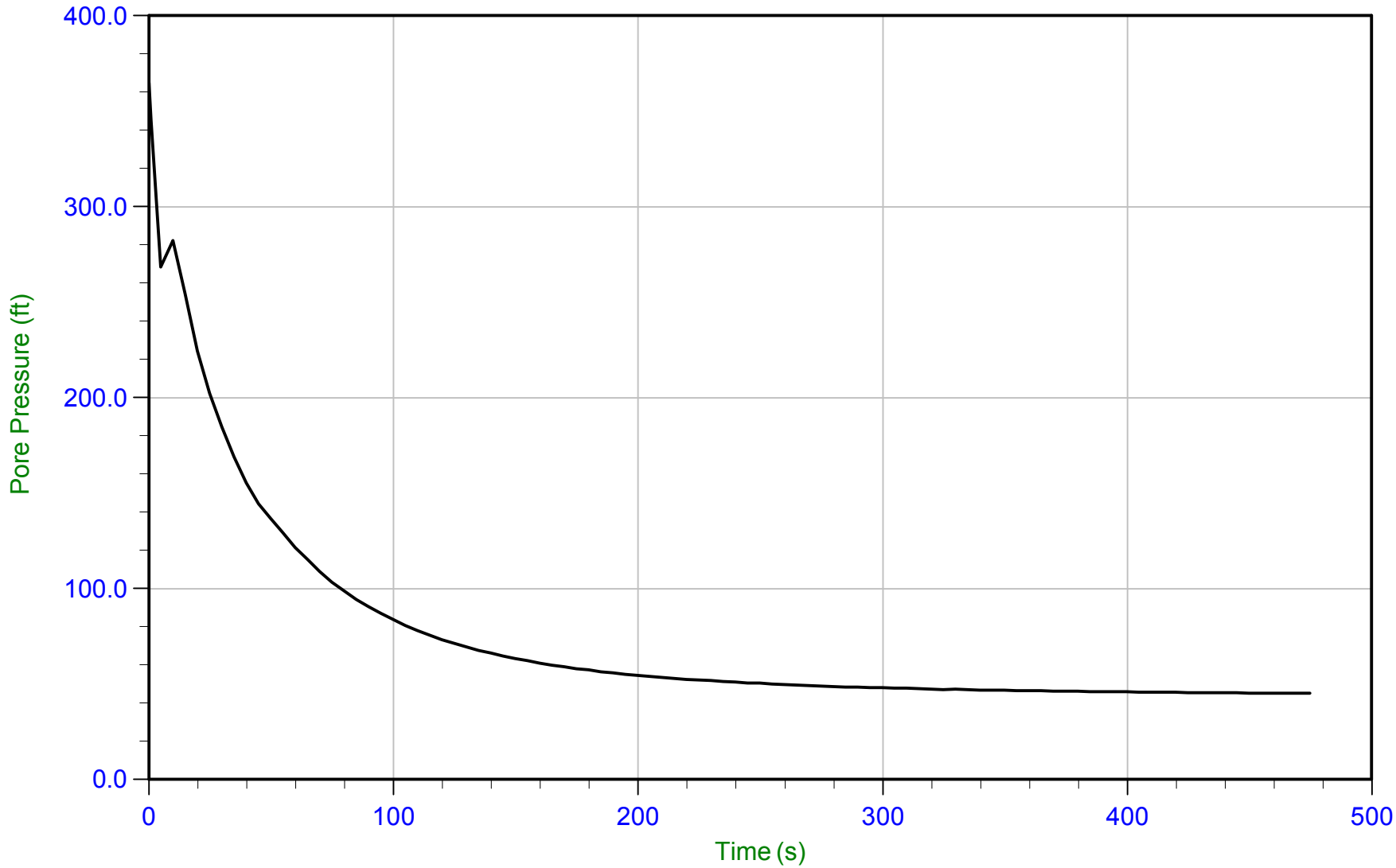
U Min: -0.7 ft
U Max: 17.9 ft

CONETEC

GeoDesign

Job No: 17-53020
Date: 20-Feb-2017 15:13:59
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C1
Cone: AD468 Area=15 cm²



Trace Summary:

Filename: 17-53020_SPGD-C1.PPD
Depth: 30.500 m / 100.064 ft
Duration: 475.0 s

U Min: 45.1 ft
U Max: 364.8 ft

WT: 17.310 m / 56.791 ft
Ueq: 43.3 ft
U(50): 204.04 ft

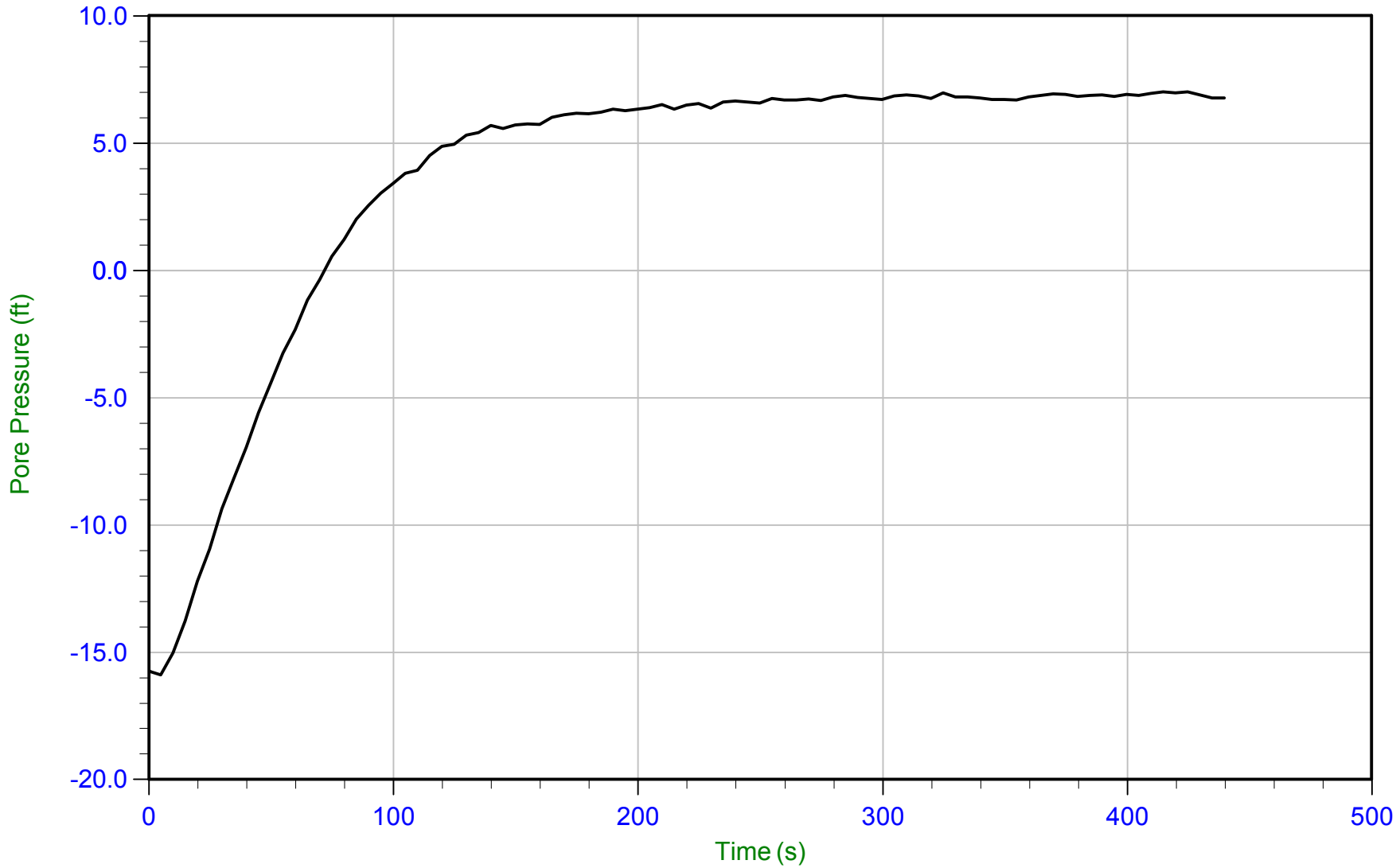
T(50): 24.6 s
Ir: 100
Ch: 28.5 sq cm/min

CONETEC

GeoDesign

Job No: 17-53020
Date: 20-Feb-2017 08:27:56
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C3
Cone: AD468 Area=15 cm²



Trace Summary:

Filename: 17-53020_SPGD-C3.PPD
Depth: 11.500 m / 37.729 ft
Duration: 440.0 s

U Min: -15.9 ft
U Max: 7.0 ft

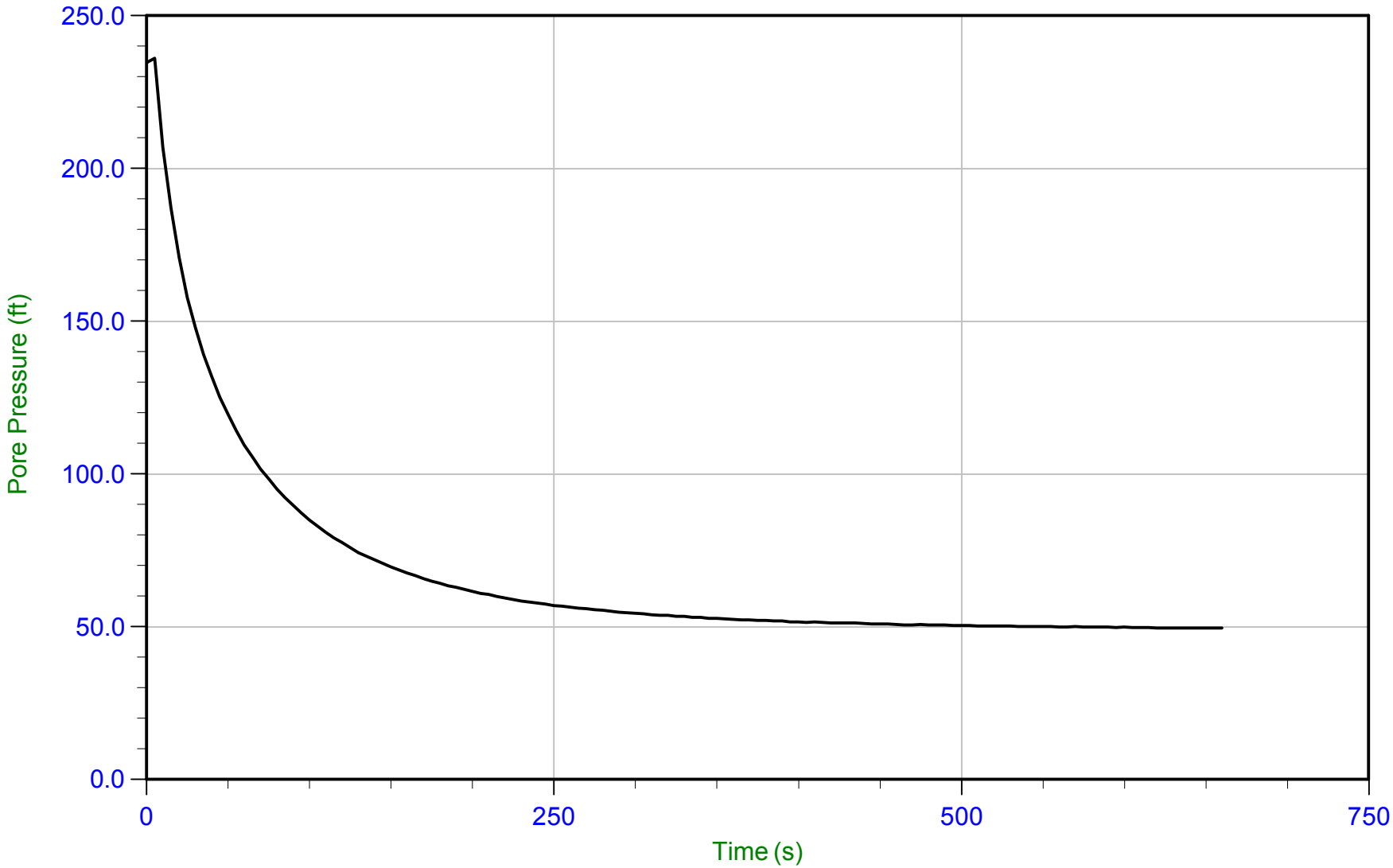
WT: 9.383 m / 30.784 ft
Ueq: 6.9 ft

CONETEC

GeoDesign

Job No: 17-53020
Date: 20-Feb-2017 08:27:56
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C3
Cone: AD468 Area=15 cm²



Trace Summary:

Filename: 17-53020_SPGD-C3.PPD
Depth: 29.700 m / 97.440 ft
Duration: 660.0 s

U Min: 49.5 ft
U Max: 236.2 ft

WT: 15.180 m / 49.804 ft
Ueq: 47.6 ft
U(50): 141.89 ft

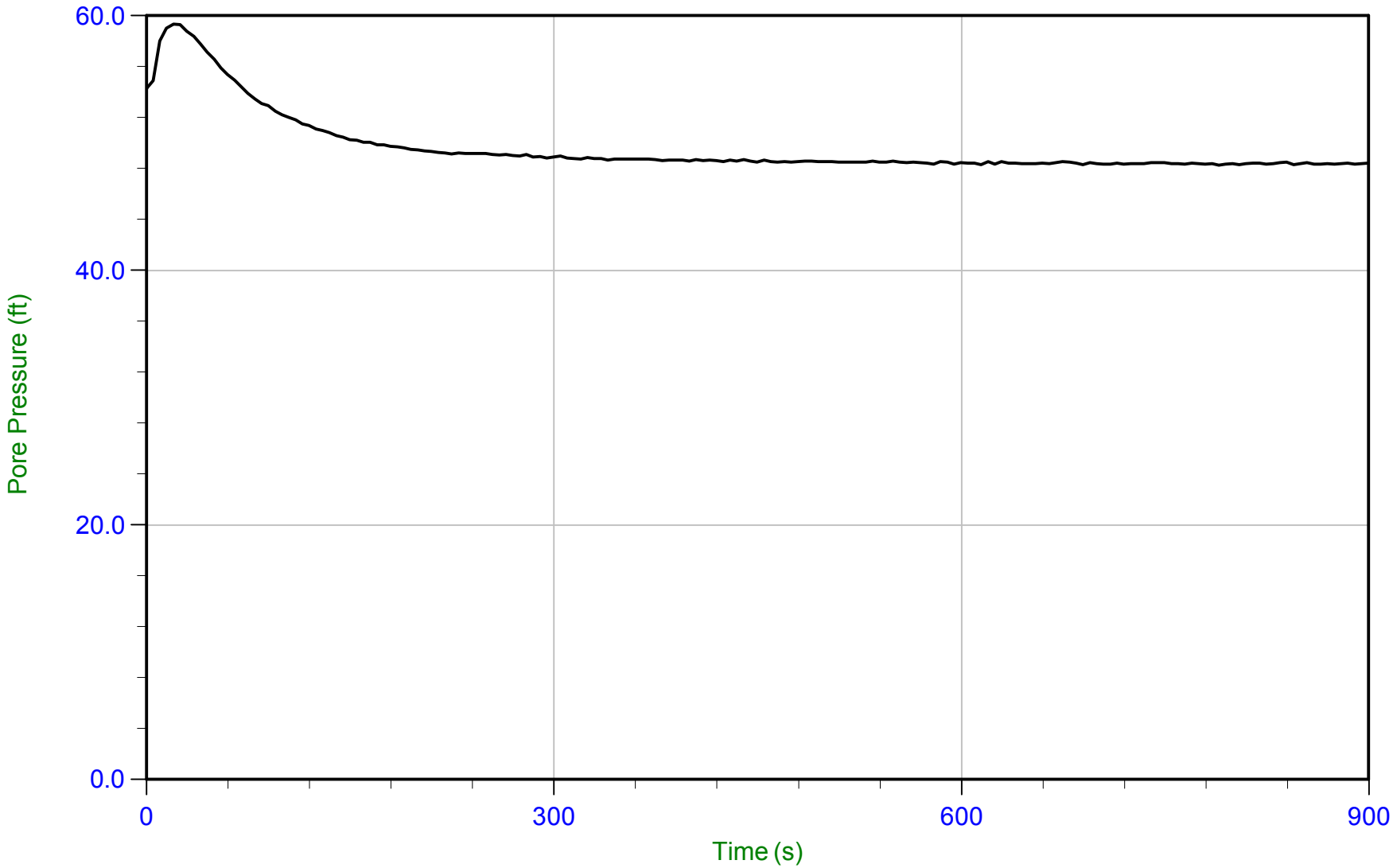
T(50): 28.4 s
Ir: 100
Ch: 24.7 sq cm/min

CONETEC

GeoDesign

Job No: 17-53020
Date: 20-Feb-2017 18:51:45
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C4
Cone: AD468 Area=15 cm²



Trace Summary:

Filename: 17-53020_SPGD-C4.PPD
Depth: 36.600 m / 120.077 ft
Duration: 900.0 s

U Min: 48.3 ft
U Max: 59.4 ft

WT: 21.903 m / 71.860 ft
Ueq: 48.2 ft
U(50): 53.79 ft

T(50): 56.3 s
Ir: 100
Ch: 12.5 sq cm/min

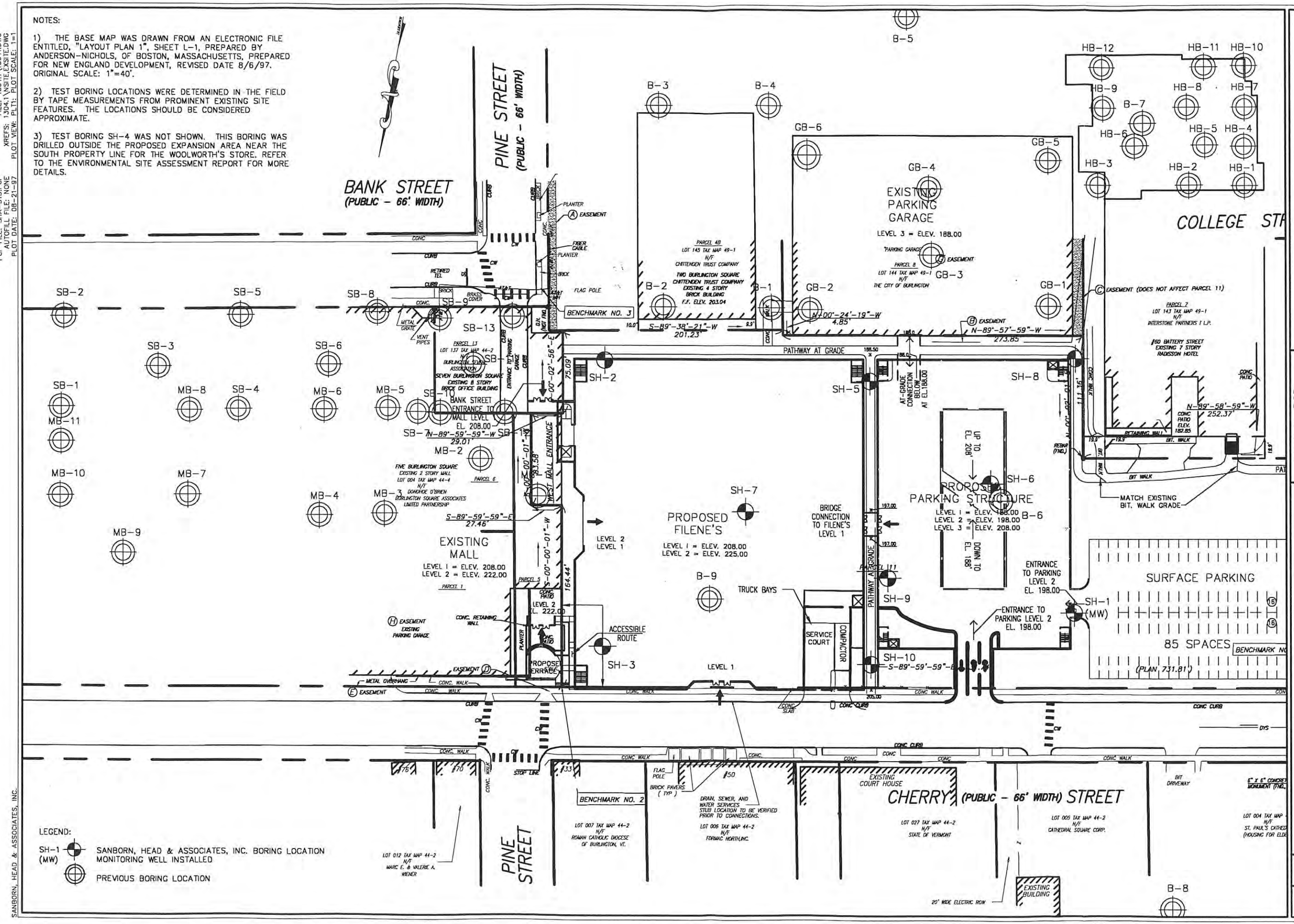
APPENDIX E – BORING DATA FROM 1997 SHA PRELIMINARY REPORT (MACY'S)

NOTES:

1) THE BASE MAP WAS DRAWN FROM AN ELECTRONIC FILE ENTITLED, "LAYOUT PLAN 1", SHEET L-1, PREPARED BY ANDERSON-NICHOLS, OF BOSTON, MASSACHUSETTS, PREPARED FOR NEW ENGLAND DEVELOPMENT, REVISED DATE 8/6/97. ORIGINAL SCALE: 1"=40'.

2) TEST BORING LOCATIONS WERE DETERMINED IN THE FIELD BY TAPE MEASUREMENTS FROM PROMINENT EXISTING SITE FEATURES. THE LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

3) TEST BORING SH-4 WAS NOT SHOWN. THIS BORING WAS DRILLED OUTSIDE THE PROPOSED EXPANSION AREA NEAR THE SOUTH PROPERTY LINE FOR THE WOOLWORTH'S STORE. REFER TO THE ENVIRONMENTAL SITE ASSESSMENT REPORT FOR MORE DETAILS.



GRAPHICAL SCALE
0' 40' 80' 160'

Sanborn, Head & Associates
Consulting Engineers & Scientists

DRAWN BY: PGP
DESIGNED BY: MPH
CHECKED BY: VRK
REVIEWED BY: MAD
PROJECT MGR: VRK
PIC: VRK
DATE: AUG 97

PRELIMINARY GEOTECHNICAL REPORT
BURLINGTON SQUARE
BURLINGTON, VERMONT

EXPLORATION LOCATION PLAN

PROJECT NUMBER: 1304.1

FIGURE NUMBER: 3

FILE: 1304.1\13041.DWG
XREFS: 1304.1\NSITE\XSITE.DWG
PLOT VIEW: PLTS: PLOT SCALE: 1=1
PCP FILE: SHA-STD.PCP
AUTOFILL FILE: NONE
PLOT DATE: 08-21-97

SANBORN, HEAD & ASSOCIATES, INC.

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 14 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-30

DATE 6-22-84

HOLE NO. GB-1

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 1760

DATE STARTED 6-22-84

DATE COMPL. 6-22-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: In paved parking lot

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec
		0 - 1.5	Dry	10	16	19	Dry		2" blacktop into 1" gravel into sand	1	18	15
		5 - 6.5	"	3	4	7	Dry		Medium grain sand	2	18	18
		10 - 11.5	"	6	9	9	Damp		Fine grain sand	3	18	18
		15 - 16.5	"	5	7	10	Damp	20'	Fine grain dry sand into very fine sand damp	4	18	18
		20 - 21.5	"	8	9	11	Dry		Fine grain to very fine grain sand	5	18	18
		25 - 26.5	"	7	17	22	Dry to Damp		Fine grain sand dry with silty sand layers Damp	6	18	18

GROUND SURFACE TO 25' USED Auger CASING: THEN Splitspoon to 26.5'

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test
UT = Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY:
Earth Boring 26.5'
Rock Coring
Samples 6

HOLE NO. GB-1

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 13 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers DATE 6-22-84

SAMPLES SENT TO " " " PROJ. NO. HOLE NO. GB-2

OUR JOB NO. 84-60 LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 1 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	3.25	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 189.5

DATE STARTED 6-22-84

DATE COMPL. 6-22-84

BORING FOREMAN Garneau

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: In front of Chittenden Bank

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0 - 2	Dry	4	5	4	Dry		Sod into light brown silty sand	1	18	18
		5 - 6.5	"	13	16	17	Dry		Fine light brown silty sand	2	18	18
		10 - 11.5	"	5	8	11	Dry		As above	3	18	18
		15 - 16.5	"	14	16	16	Dry		Whitish medium grain sand	4	18	18
		20 - 21.5	"	14	12	14	Moist		As above	5	18	18
		25 - 26.5	"	6	6	9	Wet		Dark brown silty sand	6	18	18
		30 - 31.5	"	6	9	10	Wet		Dark brown silty sand	7	18	18

GROUND SURFACE TO 30' USED 3.25 Auger CASING THEN Splitspoon

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

UT = Undisturbed Thinwall

Proportions Used

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Cohesionless Density

0-10	Loose
10-30	Med. Dense
30-50	Dense
50 +	Very Dense

Cohesive Consistency

0-4	Soft
4-8	M/Stiff
8-15	Stiff
15-30	V-Stiff
30 +	Hard

SUMMARY:

Earth Boring 31.5

Rock Coring

Samples 7

HOLE NO GB-2

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 16 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-30

DATE 6-25-84

HOLE NO. GB-3

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 180.0

DATE STARTED 6-25-84

DATE COMPL. 6-25-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: East lane of parking lot

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0 - 1.5	Dry	14	14	17	Dry		3" blacktop into 6" gravel into fine brown sand	1	18	18
		5 - 6.5	"	8	14	13	Moist		Fine brown silty sand	2	18	18
		10 - 11.5	"	7	8	9	Dry		Medium sand	3	18	18
		15 - 16.5	"	7	7	11	Dry		Medium grain sand	4	18	18
		20 - 21.5	"	10	12	12	Dry to Moist		Med. grain sand w/ moist silty sand layers	5	18	18
		25 - 26.5	"	8	9	11	Damp	26'	Dry layered sand into damp very fine sand	6	18	18
		30 - 31.5	"	9	16	15	Damp		Very fine sand	7	18	18
		35 - 36.5	"	6	11	20	Damp to Dry		Very fine sand with damp & dry layers	8	18	18
		40 - 41.5	"	11	14	15	Damp		Very fine brown sand	9	18	18

GROUND SURFACE TO 40' USED Auger "CASING: THEN Splitspoon to 41.5

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

UT = Undisturbed Thinwall

Proportions Used

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

Cohesionless Density

0-10	Loose
10-30	Med. Dense
30-50	Dense
50 +	Very Dense

Cohesive Consistency

0-4	Soft
4-8	M/Stiff
8-15	Stiff
15-30	V-Stiff
30 +	Hard

SUMMARY:

Earth Boring 41.5

Rock Coring

Samples 8

HOLE NO GB-3

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 15 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

DATE 6-25-84

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

HOLE NO. GB-4

REPORT SENT TO Knight Engineers PROJ. NO.

LINE & STA.

SAMPLES SENT TO " " " OUR JOB NO. 84-30

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 177.5

DATE STARTED 6-25-84

DATE COMPL. 6-25-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: East lane of parking lot

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0 - 1.5	Dry	17	21	25	Dry		3" blacktop into 8" gravel into fine brown sand	1	18	13
		5 - 6.5	"	7	7	10	Moist		Fine brown gray silty sand	2	18	15
		10 - 11.5	"	4	6	10	Moist		Fine brown sand into moist silty sand zone 10.5' - 11.0' into medium sand	3	18	18
		15 - 16.5	"	8	10	12	Moist		Medium sand varved with red layers	4	18	18
		20 - 21.5	"	9	12	18	Moist		Med. sand varved with red layers	5	18	18
		25 - 26.5	"	7	14	17	Moist		Through wet silty layer 25.5'-26.0' into fine brown sand	6	18	18
		30 - 31.5	"	10	13	21	Wet		Medium silty sand	7	18	18

GROUND SURFACE TO 30' USED Auger "CASING: THEN Splitspoon to 31.5'

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

UT = Undisturbed Thinwall

Proportions Used

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density

0-10	Loose
10-30	Med. Dense
30-50	Dense
50 +	Very Dense

Cohesive Consistency

0-4	Soft
4-8	M/Stiff
8-15	Stiff
15-30	V-Stiff
30 +	Hard

SUMMARY:

Earth Boring 31.5

Rock Coring

Samples 7

HOLE NO. GB-4

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 11 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

DATE 6-22-84

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

HOLE NO. GB-5

REPORT SENT TO Knight Engineers PROJ. NO.

LINE & STA.

SAMPLES SENT TO " " " OUR JOB NO. 84-30

OFFSET None

GROUND WATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.	
At None at 0 Hours	Type	Auger	Splitspoon	SURFACE ELEV. 171.5
	Size I. D.	2½"	1 3/8	DATE STARTED 6-22-84
At at Hours	Hammer Wt.		140# BIT	DATE COMPL. 6-22-84
	Hammer Fall		30"	BORING FOREMAN Willard
				INSPECTOR
				SOILS ENGR. R. Dorwart

LOCATION OF BORING: In pavement, parking lot drive

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0 - 1.5	Dry	14	22	24	Dry		2" blacktop approx. 1" gravel into hard packed sand	1	18	15
		5 - 6.5	"	10	13	16	Damp		Very fine brown sand	2	18	18
		10 - 11.5	"	10	11	11	Damp		Very fine brown sand	3	18	18
		15 - 16.5	"	6	9	10	Damp		Very fine brown sand	4	18	18
		20 - 21.5	"	7	9	10	Damp		Very fine brown sand	5	18	18
		25 - 26.5	"	11	17	17	Wet to Damp		Wet silty sand approx. 22'-26' into fine grain damp sand	6	18	18

GROUND SURFACE TO 25' USED Auger "CASING: THEN Splitspoon to 26.5

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test
UT = Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY:
Earth Boring 26.5
Rock Coring
Samples 6

HOLE NO. GB-5

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 12 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-30

DATE 6-22-84

HOLE NO. GB-6

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At 29' at 1 Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	3.25	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 188.5

DATE STARTED 6-22-84

DATE COMPL. 6-22-84

BORING FOREMAN Garneau

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: In front of Chittenden Bank

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0 - 1.5	Dry	4	7	7	Moist		Gravel to 2'	1	18	6
		5 - 6.5	"	19	25	25	Moist		Light brown fine silty sand	2	18	12
		10 - 11.5	"	15	22	25	Moist		Light brown fine silty sand	3	18	18
		15 - 16.5	"	9	11	9	Moist		Dark brown silt and sand	4	18	18
		20 - 21.5	"	15	20	23	Dry		Fine very dark brown silty sand into light medium grain sand	5	18	18
		25 - 26.5	"	10	11	13	Dry		Fine whitish med. grain sand	6	18	18
		30 - 31.5	"	7	7	7	Moist		Fine light brown sand into dark brown silty sand	7	18	12

GROUND SURFACE TO 30' USED 3.25 Augers; THEN Splitspoon

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

UT = Undisturbed Thinwall

Proportions Used

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY:

Earth Boring 31.5

Rock Coring

Samples 7

HOLE NO. GB-6

Green Mountain Boring Co., Inc.

R. D. 2 – BARRE, VERMONT 05641

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " " OUR JOB NO. 84-30

SHEET 10 OF 17

DATE 6-21-84

HOLE NO. HB-2

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

Dry

At 27' at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 168.5

DATE STARTED 6-21-84

DATE COMPL. 6-21-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: On bank next to hotel

DEPTH	Casing Blows per foot	Sample Depths From — To	Type Sample	Blows per 6" on Sampler From 0-6	From 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec
		0 – 1.5	Dry	7	7	3	Dry		2" topsoil into sand w/ a little rubble	1	18	18
		5 – 6.5	"	18	18	17	Damp		Fine brown sand	2	18	18
		10 – 11.5	"	13	8	10	Damp		Fine brown sand	3	18	18
		15 – 16.5	"	6	8	12	Damp		Moist brn. silty sand with fine sand layered dry	4	18	18
		20 – 21.5	"	4	8	9	Damp		Med. sand into fine brown sand	5	18	18
		25 – 26.5	"	10	12	13	Damp		Fine brown sand into med. gray sand	6	18	18
		30 – 31.5	"	12	11	13	Damp		Gray silty sand	7	18	18

GROUND SURFACE TO 30' USED Auger "CASING: THEN Splitspoon to 31.5

Sample Type

D=Dry C=Cored W=Washed

UP=Undisturbed Piston

TP=Test Pit A=Auger V=Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler.

Cohesionless Density

0-10 Loose

10-30 Med. Dense

30-50 Dense

Cohesive Consistency

0-4 Soft

4-8 M/Stiff

30 + Hard

SUMMARY:

Earth Boring 31.5

Rock Coring

Samples 7

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 17 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Madisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-30

DATE 6-25-84

HOLE NO. IIB-3

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 172.5

DATE STARTED 6-25-84

DATE COMPL. 6-25-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: 011 S.E. corner of existing bldg.

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen.	Rec.
		0 - 1.5 X	Dry	7	4	6	Dry		3" topsoil into 2" gravel into med. brown sand w/some pebbles	1	18	15
		X 5 - 6.5	"	6	6	6	Damp		Med. grain brown sand	2	18	16½
		10 - 11.5	"	7	7	8	Damp	9'	Fine grain sand layered	3	18	18
		15 - 16.5	"	8	12	11	Dry to Wet to Dry		Dry very fine sand into 8" layer wet silty sand into medium grain sand	4	18	18
		20 - 21.5	"	7	8	9	Dry		Medium grain brown sand	5	18	18
		25 - 26.5	"	8	12	19	Wet to dry		Wet silty sand into med. grain brown sand	6	18	18

GROUND SURFACE TO 25' USED Auger "CASING: THEN Splitspoon to 26.5'

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

Cohesionless Density

0-10 Loose

10-30 Med. Dense

30-50 Dense

Cohesive Consistency

0-4 Soft 30 + Hard

4-8 M/Stiff

8-15 Stiff

SUMMARY:

Earth Boring 26.5

Rock Coring

Samples 6

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 7 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont DATE 6-21-84

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont HOLE NO. HB-4

REPORT SENT TO Knight Engineers PROJ. NO. LINE & STA.

SAMPLES SENT TO " " " OUR JOB NO. 84-30 OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2¼"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 161

DATE STARTED 6-21-84

DATE COMPL. 6-21-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: In drive next to gate house

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec
		0 - 1.5	Dry	14	18	15	Dry		2" blacktop into gravel fill to 3'	1	18	16
		5 - 6.5	"	5	5	6	Damp	3'	Very fine brown sand	2	18	18
		10 - 11.5	"	10	13	13	Damp		As above	3	18	18
		15 - 16.5	"	16	34	43	Damp		Very fine brown sand layered	4	18	18
		20 - 21.5	"	16	27	25	Damp		As above	5	18	18
		25 - 26.5	"	12	22	22	Super moist		Fine brown sand	6	18	15

GROUND SURFACE TO 25' USED Auger "CASING: THEN Splitspoon to 26.5'

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Cohesionless Density

0-10 Loose

10-30 Med. Dense

30-50 Dense

Cohesive Consistency

0-4 Soft

4-8 M/Stiff

8-15 Stiff

30 + Hard

SUMMARY:

Earth Boring 26.

Rock Coring

Samples 6

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 8 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " " OUR JOB NO. 84-30

DATE 6-21-84

HOLE NO. HB-5

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 163

DATE STARTED 6-21-84

DATE COMPL. 6-21-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: In entrance drive

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec
		0 - 1.5	Dry	8	16	19	Dry		2" blacktop into 3' gravel into sand	1	18	15
		5 - 6.5	"	5	7	7	Dry		Fine brown sand	2	18	18
		10 - 11.5	"	10	11	11	Damp		Fine brown sand	3	18	18
		15 - 16.5	"	7	13	18	Damp		Fine brown sand w/ dark varves and layers	4	18	18
		20 - 21.5	"	13	24	40	Damp	21'	Layered brown sand with dark varves into gray brown sand at 21'	5	18	18
		25 - 26.5	"	7	13	7	Moist		Dark brown fine grain sand moist	6	18	18

GROUND SURFACE TO 25' USED Auger CASING: THEN Splitspoon to 26.5

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density: 0-10 Loose; 10-30 Med. Dense; 30-50 Dense

Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 8-15 Stiff; 30 + Hard

SUMMARY

Earth Boring 26.5

Rock Coring

Samples 6

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 9 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-30

DATE 6-21-84

HOLE NO. HB-6

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 160.5

DATE STARTED 6-21-84

DATE COMPL. 6-21-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: In drive

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0 - 1.5	Dry	12	18	20	Dry		2" blacktop into 6" gravel into brown sand	1	18	15
		5 - 6.5	"	3	6	9	Damp		Very fine brown silty sand	2	18	18
		10 - 11.5	"	5	7	7	Dry		Fine brown sand	3	18	18
		15 - 16.5	"	9	11	11	Wet & Dry		Wet silty sand pocket, approx. 1" deep at 15" into dry layered sand	4	18	18
		20 - 21.5	"	5	10	12	Super Damp		Fine grain silty sand damp	5	18	18
		25 - 26.5	"	7	9	8	Super Damp		Fine grain sand w/ silt varves	6	18	18

GROUND SURFACE TO 25' USED Auger "CASING" THEN Splitspoon to 26.5'

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler
Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
30 + Hard

SUMMARY
Earth Boring 26.5
Rock Coring
Samples 6

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 2 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " " OUR JOB NO. 84-30

DATE 6-20-84

HOLE NO. HB-7

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At 24' at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 601

DATE STARTED 6-20-84

DATE COMPL. 6-20-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: South of drive entrance, as per plan

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0 - 1.5	Dry	2	2	6	Damp		6" topsoil into fine grain sand	1	18	18
		5 - 6.5	"	5	5	6	Damp		Fine grain sand	2	18	18
		10 - 11.5	"	8	9	12	Damp		Medium fine sand	3	18	18
		15 - 16.5	"	5	6	8	Damp		Medium fine sand	4	18	18
		20 - 21.5	"	15	25	37	Damp		As above	5	18	18
		25 - 26.5	"	11	10	10	Wet	23'	Medium fine brown sand	6	18	18

GROUND SURFACE TO 25' USED Auger "CASING: THEN Splitspoon to 26.5'

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density

0-10 Loose

10-30 Med. Dense

30-50 Dense

Cohesive Consistency

0-4 Soft 30 + Hard

4-8 M/Stiff

8-15 Stiff

SUMMARY:

Earth Borings 26.5'

Rock Coring

Samples 6

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " " OUR JOB NO. 84-30

SHEET 1 OF 17

DATE 6-20-84

HOLE NO. HB-8

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At 44' in augers at 0 Hours

Fell in at 26'

At at 0 Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 764.0

DATE STARTED 6-20-84

DATE COMPL. 6-20-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: South of toll booth — edge of parking lot

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0 - 1.5	Dry	3	4	5	Dry		Fine grain sand	1	18	15
		5 - 6.5	"	4	6	7	Damp		Fine grain sand	2	18	18
		10 - 11.5	"	10	15	14	Damp		Fine grain sand	3	18	18
		15 - 16.5	"	15	27	27	Dry		Fine grain sand	4	18	18
		20 - 21.5	"	22	32	100	Damp to Moist	21'	Fine grain sand damp to fine sand moist	5	18	18
		25 - 26.5	"	6	9	12	Wet		Silty sand & medium grain sand layered	6	18	18
		30 - 31.5	"	6	12	12	Wet		Wet silty sand fine	7	18	18
		35 - 36.5	"	4	6	8	Wet	36'	Very fine silty sand with courser layers	8	18	18
		40 - 41.5	"	6	8	10	Wet		As above	9	18	18
		45 - 46.5	"	5	7	7	Wet		Very fine gray silt, medium grain sand & silty sand in layers	10	18	18
		50 - 51.5	"	5	10	11	Wet		Very fine silty sand	11	18	10

GROUND SURFACE TO 50' USED Augers "CASING: THEN Splitspoon to 51.5

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
30 + Hard

SUMMARY:
Earth Boring 51.5
Rock Coring
Samples 11

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 3 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " " OUR JOB NO. 84-30

DATE 6-20-84

HOLE NO. HB-9

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 169.0

DATE STARTED 6-20-84

DATE COMPL. 6-20-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: In grass near bike rack

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0 - 1.5	Dry	1	2	5	Damp		6" topsoil into damp sand	1	18	18
		5 - 6.5	"	4	5	6	Moist		Layered sand medium fine	2	18	18
		10 - 11.5	"	7	9	10	Moist		Fine layered sand	3	18	18
		15 - 16.5	"	15	21	26	Damp		Fine grain sand	4	18	18
		20 - 21.5	"	15	28	30	Dry		Fine layered sand	5	18	18
		25 - 26.5	"	13	13	17	Wet		Silty sand & medium grain sand layered	6	18	18
		30 - 31.5	"	3	13	19	Wet		Silty sand and medium grain sand layered	7	18	18

GROUND SURFACE TO 30' USED 2½" Auger CASING: THEN Splitspoon to 31.5'

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

Cohesionless Density

0-10 Loose

10-30 Med. Dense

30-50 Dense

Cohesive Consistency

0-4 Soft

4-8 M/Stiff

8-15 Stiff

30 + Hard

SUMMARY:

Earth Boring 31.5

Rock Coring

Samples 7

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 6 OF 17
DATE 6-21-84
HOLE NO. HB-10
LINE & STA.
OFFSET 4' South

TO Knight Consulting Engineers ADDRESS Williston, Vermont
PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont
REPORT SENT TO Knight Consulting Engineers PROJ. NO.
SAMPLES SENT TO " " " " " OUR JOB NO. 84-30

GROUND WATER OBSERVATIONS
At None at 0 Hours
At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½'	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 166.5
DATE STARTED 6-21-84
DATE COMPL. 6-21-84
BORING FOREMAN Willard
INSPECTOR
SOILS ENGR. R. Dorwart

LOCATION OF BORING: N.W. corner of gravel parking lot

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec
		0 - 1.5	Dry	1	1	2	Dry		Sandy topsoil	1	18	6
		5 - 6.5	"	4	6	6	Damp		Damp fine brown sand	2	18	18
		10 - 11.5	"	7	8	10	Damp		As above	3	18	18
								31.5				
		15 - 16.5	"	8	15	15	Damp		Very fine brown sand	4	18	18
		20 - 21.5	"	17	34	44	Dry		Very fine brown sand	5	18	18
		25 - 26.5	"	10	13	12	Dry		Very fine brown sand	6	18	18
		30 - 31.5	"	6	8	11	Super Moist		Very fine brown silty sand	7	18	18

GROUND SURFACE TO 30' USED Auger "CASING: THEN Splitspoon to 31.5

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler
Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense

Cohesive Consistency
0-4 Soft 30 + Hard
4-8 M/Stiff
8-15 Stiff

SUMMARY:
Earth Boring 21'
Rock Coring
Samples 7

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 5 OF 12

TO Knight Consulting Engineers ADDRESS Williston, Vermont

DATE 6-21-84

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

HOLE NO. HB-11

REPORT SENT TO Knight Engineers PROJ. NO.

LINE & STA.

SAMPLES SENT TO " " " " OUR JOB NO. 84-30

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	4" Auger	Splitspoon	
Size I. D.	2½"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 170.0

DATE STARTED 6-21-84

DATE COMPL. 6-21-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. W. Dorwart

LOCATION OF BORING: On bank N. of gravel parking lot

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec
		0 - 1.5	Dry	3	7	6	Dry		Topsoil 2" - sand and brick	1	18	10
		5 - 6.5	"	5	7	8	Damp		Fine grain brown sand	2	18	18
		10 - 11.5	"	6	9	11	Damp		Fine grain brown sand	3	18	18
		15 - 16.5	"	6	9	13	Damp		Fine grain brown sand	4	18	18
		20 - 21.5	"	9	17	24	Damp		As above	5	18	18
		25 - 26.5	"	18	25	23	Damp		Fine grain brown sand with discolored layers	6	18	18
		30 - 31.5	"	9	10	12	Damp & Moist		Damp fine grain sand with moist silty sand layers	7	18	18

GROUND SURFACE TO 30' USED Auger "CASING: THEN Splitspoon to 31.5'

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense

Cohesive Consistency
0-4 Soft 30 + Hard
4-8 M/Stiff
8-15 Stiff

SUMMARY:
Earth Boring 31.5'
Rock Coring
Samples 7

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 4 OF 17

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Radisson Expansion LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " " OUR JOB NO. 84-30

DATE 6-20-84

HOLE NO. HB-12

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 173.0

DATE STARTED 6-20-84

DATE COMPL. 6-20-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: N. edge of unpaved parking lot

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0 - 1.5	Dry	7	7	3	Dry	—	3" crushed rock into sand	1	18	18
		5 - 6.5	"	5	8	11	Damp to moist	6'	Medium grain sand into moist sand at 6'	2	18	18
		10 - 11.5	"	7	7	9	Damp	—	layered brown fine sand	3	18	18
		15 - 16.5	"	9	10	11	Damp		as above	4	18	18
		20 - 21.5	"	19	30	32	Damp		Layered brown sand	5	18	18
		25 - 26.5	"	15	26	58	Damp		Layered brown sand	6	18	18
		30 - 31.5	"	12	15	15	Damp		Layered brown sand damp with DENCE hard layers	7	18	18

GROUND SURFACE TO 30' USED Augers "CASING: THEN Splitspoon to 31.5'

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Cohesionless Density

0-10 Loose

10-30 Med. Dense

30-50 Dense

Cohesive Consistency

0-4 Soft 30 + Hard

4-8 M/Stiff

8-15 Stiff

SUMMARY:

Earth Boring 21'

Rock Coring

Samples 7

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 5 OF 11
DATE 6-28-84
HOLE NO. MB-1
LINE & STA.
OFFSET None

TO Knight Consulting Engineers ADDRESS Williston, Vermont
PROJECT NAME Burlington Square LOCATION Burlington, Vermont
REPORT SENT TO Knight Engineers PROJ. NO.
SAMPLES SENT TO " " " OUR JOB NO. 84-34

GROUND WATER OBSERVATIONS
At None at 0 Hours
At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 207.5 ±
DATE STARTED 6-28-84
DATE COMPL. 6-28-84
BORING FOREMAN Willard
INSPECTOR
SOILS ENGR. R. Dorwart

LOCATION OF BORING: Back West side of mall

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec
		0 - 1.5	Dry	4	5	4	Dry		Gravel/small stone	1	18	18
		5 - 6.5	"	2	2	2	Dry		Gravel/small stone	2	18	18
		10 - 11.5	"	3	3	3	Damp		Small stone gravel	3	18	15
		15 - 16.5	"	5	7	9	Damp	16'	Layered fine grain sand into damp very fine sand at 16' with some organic	4	18	18
		20 - 21.5	"	5	10	12	Moist to damp		Moist layer of fine silty sand at 20' into damp silty sand at 26'	5	18	18
		25 - 26.5	"	9	17	23	Damp		Damp layered sand, fine grain brown	6	18	18
		30 - 31.5	"	5	8	10	Moist	30'	Moist layered very fine sand and silt	7	18	18

GROUND SURFACE TO 30' USED Auger "CASING: THEN Splitspoon to 31.5'

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140 lb. Wt. x 30" fall an 2" O. D. Sampler
Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
30 + Hard

SUMMARY:
Earth Boring 5
Rock Coring
Samples 7

Green Mountain Boring Co., Inc.

R. D. 2 – BARRE, VERMONT 05641

SHEET 10 OF 11

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Burlington, Square LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-34

DATE 7-5-84

HOLE NO. MB-2

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type		Splitspoon	
Size I. D.		1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 208

DATE STARTED 7-5-84

DATE COMPL. 7-5-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: As per map - Front of Barrell of Fun

DEPTH	Casing Blows per foot	Sample Depths From – To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
		0 - 2	Dry	10	55	75	Dry		6" concrete slab, gravel small stone			
				50						1	24	15
		2 - 4	"	48	32	31	Dry		Small stone gravel			
				33						2	24	20
		4 - 6	"	24	17	20	Dry	5'	Small stone gravel into very fine silty sand at 5'			
				25						3	24	24
		10 - 12	"	60	42	40	Dry	10.5'	Fine silty sand into medium grain brown sand			
				51						4	24	24
		13 - 15	"	26	24	23	Dry	14'	Medium grain brown sand into fine silty sand @ 14'			
				20						5	24	24

GROUND SURFACE TO USED "CASING: THEN Splitspoon to 15'

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140 lb. Wt. x 30" fall an 2" O. D. Sampler
Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
30 + Hard

SUMMARY:
Earth Boring 15
Rock Coring
Samples 5

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 11 OF 11

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Burlington Square LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO: 84-34

DATE 7-5-84

HOLE NO. MB-3

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.
At None at 0 Hours	Type	Splitspoon	
	Size I. D.	1 3/8"	
At at Hours	Hammer Wt.	140#	BIT
	Hammer Fall	30"	

SURFACE ELEV. 208

DATE STARTED 7-5-84

DATE COMPL. 7-5-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: As per map - Front of Casslers Toys

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
		0 - 2	Dry	9 44	30	41	Dry		6" concrete slab, small stone gravel	1	24	30
		2 - 4	"	23 26	30	24	Dry		Fine grain brown sand	2	24	24
		4 - 6	"	15 20	14	16	Dry		Fine grain brown sand	3	24	24
		10 - 12	"	20 29	22	25	Dry to Damp	9'	Very fine silty sand	4	24	24
		13 - 15	"	45 58	35	54	Damp		Very fine brown silty sand	5	24	24

GROUND SURFACE TO USED "CASING: THEN Splitspoon to 15'

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140 lb. Wt. x 30" fall an 2" O. D. Sampler
Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
30 + Hard

SUMMARY:
Earth Boring 15
Rock Coring
Samples 5

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Burlington Square LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " " OUR JOB NO. 84-34

SHEET 9 OF 11

DATE 7-3-84

HOLE NO. MB-4

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type		Splitspoon	
Size I. D.		1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 208

DATE STARTED 7-3-84

DATE COMPL. 7-3-85

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: As per map Front of "The Limited Shop"

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
		0 - 2	Dry	18	20	39	Dry		6' concrete slab - brown fine layered sand	1	24	18
				57								
		2 - 4	"	47	40	33	Dry		Fine grain brown sand	2	24	18
				31								
		4 - 6	"	16	16	13	Dry		Brown layered sand, fine with some silt	3	24	20
				13								
		10 - 12	"	54	35	77	Dry to Damp	8'	Fine sand to 8' into very fine layered silty sand damp and hard	4	24	24
				57								
		13 - 14	"	75	105		Damp	13'	Very hard packed silty sand w/semi vertical varves spoon refusal	5	12	12

GROUND SURFACE TO USED "CASING: THEN Splitspoon to 14'

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Cohesionless Density

0-10 Loose

10-30 Med. Dense

30-50 Dense

Cohesive Consistency

0-4 Soft

4-8 M/Stiff

8-15 Stiff

30 + Hard

SUMMARY:

Earth Boring 14

Rock Coring

Samples 5

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 1 OF 11
DATE 6-25-84
HOLE NO. MB-5
LINE & STA.
OFFSET None

TO Knight Consulting Engineers ADDRESS Williston, Vermont
PROJECT NAME Burlington Square LOCATION Burlington, Vermont
REPORT SENT TO Knight Engineers PROJ. NO.
SAMPLES SENT TO " " " OUR JOB NO. 84-34

GROUND WATER OBSERVATIONS

At ..... at ..... Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 207.5 ±
DATE STARTED 6-25-84
DATE COMPL. 6-25-84
BORING FOREMAN Willard
INSPECTOR
SOILS ENGR. R. Dorwart

LOCATION OF BORING: Bank Street side on grass

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
		0 - 1.5	Dry	3	5	5	Dry		3" topsoil into fine brown sand	1	18	15
		5 - 6.5	"	3	1	1	Dry		Fine brown sand	2	18	18
		10 - 11.5	"	4	7	12	Dry		Layered fine grain sand into medium grain sand	3	18	18
		15 - 16.5	"	7	9	16	Damp		Small stone gravel into damp fine silty sand	4	18	18
		20 - 21.5	"	5	9	8	Damp to Moist		Layered fine sand into moist fine silty sand	5	18	18
		25 - 26.5	"	21	44	45	Moist to damp		Moist fine silty sand into fine brown sand w/silt layers	6	18	18

GROUND SURFACE TO 25' USED Auger "CASING: THEN Splitspoon to 26.5'

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler
Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
30 + Hard

SUMMARY:
Earth Boring 26.5'
Rock Coring
Samples 6

Green Mountain Boring Co., Inc.

R. D. 2 – BARRE, VERMONT 05641

SHEET 3 OF 11

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Burlington Square LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-34

DATE 6-28-84

HOLE NO. MB-6

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 207.5 ±

DATE STARTED 6-28-84

DATE COMPL. 6-28-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: As per map

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	R
		0 - 1.5	Dry	4	9	10	Dry		3" topsoil into fine brown silty sand	1	18	1
		5 - 6.5	"	13	15	16	Dry		Fine brown sand	2	18	1
		10 - 11.5	"	9	16	33	Damp		Fine brown sand (augered thru boulder @ 12.5')	3	15	1
		15 - 16.5	"	3	6	10	Damp		Fine brown sand	4	18	1
		20 - 21.5	"	7	20	29	Damp		Med. grain and fine grain sand varved together	5	18	1
		25 - 26.5	"	10	16	18	Damp		Med. grain sand varved with fine grain sand	6	18	1
		30 - 31.5	"	15	17	18	Damp to Wet to Damp	30.25	Med. grain sand into wet fine silty sand @ 30.25' into medium grain sand @ 31'	7	18	1

GROUND SURFACE TO 30' USED Auger "CASING: THEN Splitspoon to 31.5"

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace	0 to 10%
little	10 to 20%
some	20 to 35%

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Cohesionless Density

0-10	Loose
10-30	Med. Dense
30-50	Dense

Cohesive Consistency

0-4	Soft
4-8	M/Stiff
8-15	Stiff
30 +	Hard

SUMMARY:

Earth Boring 31

Rock Coring

Samples 7

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 8 OF 11.

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Burlington Square LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-34

DATE 7-3-84

HOLE NO. MB-7

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type		Splitspoon	
Size I. D.		1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 208

DATE STARTED 7-3-84

DATE COMPL. 7-3-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: As per map Front of Walden Book shop

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	R
		0 - 2	Dry	10	40	62	Dry	1'	6" concrete slab-fine silty sand into layered brn. sand	1	24	20
				72								
		2 - 4	"	52	65	76	Dry		Very hard packed dry fine brown sand	2	24	18
				48								
		4 - 6	"	22	24	19	Dry		Fine brown sand layered	3	24	12
				20								
		10 - 12	"	17	16	18	Damp	9'	Damp layer fine silty sand at 9' - 12'	4	24	18
				24								
		13 - 15	"	15	28	33	Damp		Fine brown sand, very little silt	5	24	20
				39								

GROUND SURFACE TO 15' USED "CASING: THEN Splitspoon to 15'

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density

0-10 Loose

10-30 Med. Dense

30-50 Dense

Cohesive Consistency

0-4 Soft

4-8 M/Stiff

8-15 Stiff

30 + Hard

SUMMARY

Earth Boring 15'

Rock Coring

Samples 5

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 2 OF 11

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Burlington Square LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-34

DATE 6-28-84

HOLE NO. MB-8

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 209 ±

DATE STARTED 6-28-84

DATE COMPL. 6-28-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: Next to building

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	From 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
		0 - 1.5	Dry	3	7	11	Dry		6" topsoil into dry silty sand	1	18	15
		5 - 6.5	"	6	11	16	Dry		Brown fine sand	2	18	15
		10 - 11.5	"	6	13	10	Damp		Brown fine sand	3	18	18
		15 - 16.5	"	2	3	4	Damp		Brown fine sand	4	18	18
		20 - 21.5	"	29	37	27	Dry		Very fine brown sand	5	18	18
		25 - 26.5	"	35	76	100	for 4" Damp		Brown very fine sand	6	16	12
		30 - 31.5	"	30	63	100	for 3"	31'	Brown very fine sand into med. grain sand at 31'	7	15	15

GROUND SURFACE TO 30' USED Auger "CASING: THEN Splitspoon to 31.33'

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

Cohesionless Density

0-10 Loose

10-30 Med. Dense

30-50 Dense

Cohesive Consistency

0-4 Soft

4-8 M/Stiff

8-15 Stiff

15-30 Very Stiff

30 + Hard

SUMMARY:

Earth Boring 31.

Rock Coring

Samples 7

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 6 OF 11

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Burlington Square LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-34

DATE 7-2-84

HOLE NO. MB-9

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS		CASING	SAMPLER	CORE BAR.
At None	at 0 Hours	Type	Splitspoon	
		Size I. D.	1 3/8"	
At	at Hours	Hammer Wt.	140#	BIT
		Hammer Fall	30"	

SURFACE ELEV. 208

DATE STARTED 7-2-84

DATE COMPL. 7-2-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: Cherry St. exit inside mall

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	R
									6" Conc Slab			
		0 - 2	Dry	13	28	33	Dry		Brown silty sand	1	24	18
				22								
		4 - 6	"	20	22	29	Dry	3'	Fine brown sand	2	24	24
				40								
		10 - 12	"	24	19	23	Dry		Fine brown sand	3	24	12
				26								
		13 - 15	"	25	26	23	Dry		Fine brown sand	4	24	12

GROUND SURFACE TO 15' USED "CASING: THEN Splitspoons

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
30 + Hard

SUMMARY:
Earth Boring 15
Rock Coring
Samples 4

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 7 OF 11
DATE 7-3-84
HOLE NO. MB-10
LINE & STA.
OFFSET None

TO Knight Consulting Engineers ADDRESS Williston, Vermont
PROJECT NAME Burlington Square LOCATION Burlington, Vermont
REPORT SENT TO Knight Engineers PROJ. NO.
SAMPLES SENT TO " " " OUR JOB NO. 84-34

GROUND WATER OBSERVATIONS

At None at 0 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type		Splitspoon	
Size I. D.		1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 208
DATE STARTED 7-3-84
DATE COMPL. 7-3-84
BORING FOREMAN Willard
INSPECTOR
SOILS ENGR. R. Dorwart

LOCATION OF BORING: As per map Front of Ebenezer Allen shop

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	R
		0 - 2	Dry	14 8	2	13	Dry		Fine brown sand under 6" concrete slab	1	24	18
		2 - 4	"	5 4	5	5	Dry		Fine brown sand	2	24	18
		4 - 6	"	5 18	10	12	Damp	5'	Fine brown sand w/some silt layered	3	24	18
		10 - 12	"	15 25	12	20	Dry to Damp		Fine brown sand w/some silt layered w/dry fine sand 10-11' Damp silty sand 11-12'	4	24	18
		13 - 15	"	22	22	20	Damp		Very fine layered sand with some silt	5	24	24

GROUND SURFACE TO 15' USED "CASING: THEN Splitspoon to 15'

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston
TP = Test Pit A = Auger V = Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
30 + Hard

SUMMARY:
Earth Boring 15'
Rock Coring
Samples 5

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 4 OF 11

TO Knight Consulting Engineers ADDRESS Williston, Vermont

PROJECT NAME Burlington Square LOCATION Burlington, Vermont

REPORT SENT TO Knight Engineers PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 84-34

DATE 6-28-84

HOLE NO. MB-11

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 0 Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Splitspoon	
Size I. D.	2½"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 208 ±

DATE STARTED 6-28-84

DATE COMPL. 6-28-84

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: As per map

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	R
		0 - 1.5	Dry	4	5	6	Dry		8" concrete, 1.5' gravel into fine brown sand (some wood and debris)	1	18	18
		5 - 6.5	"	6	6	9	Moist		Fine brown silty sand	2	18	18
		10 - 11.5	"	7	13	17	Moist	10.75'	Fine brown silty sand into med. grain sand @ 10.75'	3	18	18
		15 - 16.5	"	22	100	for 6"	Dry		Med. grain sand w/silt layers	4	18	18
		20 - 21.5	"	12	14	19	Dry to Moist	21.0'	Med grain sand varved w/silt into fine silty sand @ 21'	5	18	18
		25 - 26.5	"	30	100	for 6"	Dry		Med. grain sand w/some silt	6	12	10
		30 - 31.5	"	33	46	54	Dry to Moist		Med. grain sand w/some silt dry into moist slightly courser sand	7	18	18

GROUND SURFACE TO 30' USED Auger "CASING: THEN Splitspoon to 31.5'

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP = Test Pit A = Auger V = Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Cohesionless Density

0-10 Loose

10-30 Med. Dense

30-50 Dense

Cohesive Consistency

0-4 Soft

4-8 M/Stiff

8-15 Stiff

30 + Hard

SUMMARY:

Earth Boring 31.

Rock Coring

Samples 7

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 10 OF

TO Knight Consulting Engrs. ADDRESS So. Burlington, Vt.

PROJECT NAME Burlington Square, LOCATION Burlington, Vt.

REPORT SENT TO Knight Consulting Engrs. PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 81-69

DATE 10/30/81

HOLE NO. SB 1

LINE & STA.

OFFSET 1' West

GROUND WATER OBSERVATIONS

Hole fell in

At ..... at 28' ~~Hxxxx~~

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Split spoon	
Size I. D.	2½"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 208.2

DATE STARTED 10/30/81

DATE COMPL. 10/30/81

BORING FOREMAN Willar

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: 7' Off Concrete Slab - 10' off East Retaining Wall

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMP No.	SAMP Pen
		0 - 1.5'	Dry	8	20	15	Dry		2" blacktop into 1' of gravel into silty sand	1	18"
		5' - 6.5'		9	9	9	Damp		Fine brown silty sand	2	18"
		10'-11.5'		8	14	15	Damp to dry	11' 11.5'	Silty sand damp w/ silt layers into dry brown sand at 11', back into silty sand, damp	3	18
		15'-16.5'		6	8	25	Damp	16'	Silty sand into very fine grain sand & silt	4	18
		20'-21.5'		32	57	72	Dry		Very fine grain brown sand w/some silt	5	18
		25'-26.5'		13	39	55	Dry to damp	26'	Very fine brown silty sand dry w/silt layers into damp dark silty sand	6	18'
		30'- 31.5'		33	76	115	Wet		Wet dark brown silty sand w/cleaner sand layers	7	18
		35'- 36.5'		17	21	15	Wet	35'	Wet dark sandy silt w/ a gray tint	8	18

GROUND SURFACE TO 35' USED Augers "CASING: THEN Split spoon to 36.5'

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall on 2" O. D. Sampler | Cohesionless Density | Cohesive Consistency | SOIL Earth Ex

Green Mountain Boring Co., Inc.

R. D. 2 – BARRE, VERMONT 05641

SHEET 11 OF
DATE 10/30/81
HOLE NO. SB 2
LINE & STA.
OFFSET None

TO Knight Consulting Engrs. ADDRESS So. Burlington, Vt.
PROJECT NAME Burlington Square, LOCATION Burlington, Vt.
REPORT SENT TO Knight Consult. Engrs. PROJ. NO.
SAMPLES SENT TO " " " OUR JOB NO. 81-69

GROUND WATER OBSERVATIONS
At Fell in at 27' ~~Hours~~ XXXX
At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	Split spoon	
Size I. D.	2½"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 213.5
DATE STARTED 10/30/81
DATE COMPL. 10/30/81
BORING FOREMAN Willard
INSPECTOR
SOILS ENGR. R. Dorwart

LOCATION OF BORING: South End of Road to Loading Dock

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen
		0 - 1.5'	Dry	22	20	10	Dry		2" blacktop into gravel fill	1	18"
		5'-6.5'		10	14	14	Dry	6'	Gravel fill into silty sand	2	18"
		10'-11.5'		11	12	15	Dry		Very fine brown silty sand	3	18"
		15'-16.5'		13	22	32	Dry	16'	Very fine brown silty sand into fine clean sand	4	18"
		20'-21.5'		27	54	90	Dry	21'	Very fine brown silty sand into clean sand	5	18"
		25'-26.5'		32	110		Damp		Damp silty sand very fine w/trac of clay into clean sand	6	12"
		30'-31.5'		36	50	65	Wet	28'	Brown black fine grain sand	7	18"
		35'- 36.5'		7	8	7	Wet		Brown black fine grain sand	8	18

GROUND SURFACE TO 35' USED Augers "CASING: THEN Split spoon to 36.5'

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall on 2" O. D. Sampler | Cohesionless Density | Cohesive Consistency | Earth Bor

Green Mountain Boring Co., Inc.

P. O. 2 - BARRE, VERMONT 05641

SHEET 14 OF

TO Knight Consulting Engrs. ADDRESS So. Burlington, Vt.

PROJECT NAME Burlington Square LOCATION Burlington, Vt.

REPORT SENT TO Knight Consulting Engrs. PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 81-69

DATE 11/2/81

HOLE NO SB 3

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 1 Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	Split spoon	
Size I. D.	3.25"	1 3/8"	
Hammer Wt.	.....	140#	BIT
Hammer Fall	.....	30"	.....

SURFACE ELEV. 213.8

DATE STARTED 11/2/81

DATE COMPL. 11/2/81

BORING FOREMAN Stable

INSPECTOR .....

SOILS ENGR. R. Dorwart

LOCATION OF BORING: Next to Contractor's Trailer & Signs

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAM No.	Pen
		0 - 1.5'	D	5	15	11	Dry	1'	Topsoil into silty sand	1	18
		5'- 6.5'		6	8	14	Dry	5'	Small gravel	2	18
								9'			
		10'- 11.5'		24	30	34	Dry		Medium grained sand w/ trace of silt	3	18
								14'			
		15'-16.5'		5	9	15	Dry		Sand varved w/silt	4	18
		20'-21.5'		17	29	43	Dry		Sand varved w/silt	5	18
		25'--26.5'		32	61	53	Dry	25'	Well graded sand w/trace of silt	6	18
		30'-31.5'		9	17	21	Dry	28'	Sand varved w/silt	7	1
		35'-36.5'		30	50	55	Dry	35'	Fine sand w/trace of silt	8	1
									Augers		

GROUND SURFACE TO 35' USED 3.25" CASING THEN Installed 30'-1½" PVC slott

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall an 2" O. D. Sampler Cohesionless Density | Cohesive Consistency | SUM Earth Sa

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 15 OF

TO Knight Consulting Engrs. ADDRESS So. Burlington, Vt.

DATE 11/2/81

PROJECT NAME Burlington Square LOCATION Burlington, Vt.

HOLE NO. SB 4

REPORT SENT TO Knight Consulting Engrs. PROJ. NO.

LINE & STA.

SAMPLES SENT TO " " " OUR JOB NO. 81-69

OFFSET None

GROUND WATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.	
At None at 1 Hours	Type	Augers	Split spoon	SURFACE ELEV. 208.3
	Size I. D.	3.25"	1 3/8"	DATE STARTED 11/2/81
At ..... at ..... Hours	Hammer Wt.	.....	140# BIT	DATE COMPL. 11/2/81
	Hammer Fall	.....	30"	BORING FOREMAN Stable
				INSPECTOR .....
				SOILS ENGR. R. Dorwart

LOCATION OF BORING: 7' Off Bldg. - Near Ctr.

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMP No.	Pen
		0 - 1.5'	D	2	4	9	Dry	1'	Topsoil into silty sand	1	18"
		5' - 6.5'		6	6	11	Dry		Silty sand	2	18
		10'- 11.5'		4	7	9	Dry	10'	Silt & sand	3	18
		15' - 16.5'		3	3	6	Dry		Silt & sand	4	18
		20' - 21.5'		11	17	23	Dry	19'	Silty sand	5	18"
		25' - 26.5'		8	11	20	Moist	25'	Sand varved w/silt	6	18
		30'-31.5'		15	27	42	Dry	28'	Fine sand w/trace of silt	7	18
		35' - 36.5'		6	10	15	Dry		Silty sand	8	18
								Augers			

GROUND SURFACE TO 35' USED 3.25" XXXXXX: THEN .....

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall an 2" O. D. Sampler Cohesionless Density | Cohesive Consistency | SUM... Earth Bori...

Green Mountain Boring Co., Inc.

R. D. 2 -- BARRE, VERMONT 05641

SHEET 12 OF
DATE 10/30/81
HOLE NO. SB 5
LINE & STA.
OFFSET None

TO Knight Consulting Engrs. ADDRESS So. Burlington, Vt.
PROJECT NAME Burlington Square, LOCATION Burlington, Vt.
REPORT SENT TO Knight Consulting Engrs. PROJ. NO.
SAMPLES SENT TO " " " OUR JOB NO. 81-69

GROUND WATER OBSERVATIONS

At None at 1 Hours
At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	Split spoon	
Size I. D.	3.25"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 210.2
DATE STARTED 10/30/81
DATE COMPL. 10/30/81
BORING FOREMAN Stables
INSPECTOR
SOILS ENGR. R. Dorwart

LOCATION OF BORING: Ctr. of Lot 23' off Bank St.

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMP No.	Pen
		0 - 1.5'	D	6	18	14	Dry	1'	Topsoil into silty sand w/particles of stone	1	18'
		5' - 6.5'		2	2	2	Dry		Silty sand w/small stones	2	18
								9'			
		10'-11.5'		3	4	5	Dry		Sand varved w/silt	3	18
		15'- 16.5'		16	22	35	Dry		Sand varved w/silt	4	18
		20'-21.5'		8	14	16	Dry		Sand varved w/silt	5	18
		25'- 26.5'		21	68	90	Dry		Sand varved w/silt	6	18
		30'-31.5'		35	100	121	Dry		Sand varved w/silt	7	18
		35'-36.5'		30	42	58	Dry		Sand varved w/silt	8	18

Augers

GROUND SURFACE TO 35' USED 3.25" "CASING: THEN XXXX 140 lb. Wt. x 30" fall an 2" O. D. Sampler

Sample Type: D = Dry C = Cored W = Washed
Proportions Used: trace 0 to 10%
Cohesionless Density: 0-10 Loose
Cohesive Consistency: 0-4 Soft 30 + Hard
SUM: Earth Bor Rock Co

Green Mountain Boring Co., Inc.

R. D. 2 -- BARRE, VERMONT 05641

SHEET 9 OF

TO Knight Consulting Engrs. ADDRESS So. Burlington, Vt.

PROJECT NAME Burlington Square, LOCATION Burlington, Vt.

REPORT SENT TO Knight Consulting Engrs. " " " PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 81-69

DATE 10/29/81

HOLE NO. SB 6

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 1 Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	Split spoon	
Size I. D.	3.25"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 207.4

DATE STARTED 10/29/81

DATE COMPL. 10/29/81

BORING FOREMAN Stables

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: Center of Lot

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	SAMPLE Pen
		0 - 1.5'	D	20			Dry		Topsoil	1	6"
		Refusal at 6" on granite					pad				
							Moved		4' South		
		Drilled w/auger and hit granite							(flat surface at 6")		
							Moved		10' East of Stake		
							Dug hole by hand and found no slab				
							Set up rig and got refusal on buried timbers at 2'				

GROUND SURFACE TO ..... USED ..... "CASING: THEN .....

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall an 2" O. D. Sampler | Cohesionless Density | Cohesive Consistency | SUMM... Earth Bori...

Green Mountain Boring Co., Inc.

R. D. 2 -- BARRE, VERMONT 05641

SHEET 8 OF
DATE 10/29/81
HOLE NO SB 7
LINE & STA
OFFSET None

TO Knight Consult. Engrs. ADDRESS So. Burlington, Vt.
PROJECT NAME Burlington Square, LOCATION Burlington, Vt.
REPORT SENT TO Knight Consulting Engrs. PROJ. NO.
SAMPLES SENT TO " " " OUR JOB NO. 81-69

GROUND WATER OBSERVATIONS
At None at 1 Hours
At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	Split spoon	
Size I. D.	3.25"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 207.4
DATE STARTED 10/29/81
DATE COMPL. 10/29/81
BORING FOREMAN Stables
INSPECTOR
SOILS ENGR. R. Dorwart

LOCATION OF BORING: East Side of Entrance to Dean Witter Reynolds

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen
		0 - 1.5'	D	3	9	12	Dry	1'	Topsoil into silty sand	1	18"
		5' -6.5'		9	14	21	Dry		Fine silty sand	2	18"
		10'-11.5'		10	15	21	Dry		Fine silty sand	3	18"
		15'- 16.5'		3	8	12	Moist	14'	Silty sand varved w/silt & trace of clay	4	18"
		20'-21.5'		6	7	9	Moist		Silty sand varved w/silt & trace of clay	5	18"
		25'-26.5'		22	33	25	Dry	25'	Fine sand varved w/silt	6	18"
		30'-31.5'		11	15	18	Dry		Fine sand varved w/silt	7	18"
		35'-36.5'		28	44	39	Moist		Fine sand varved w/silt	8	16"

GROUND SURFACE TO 35' USED 3.25" Augers THEN

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall on 2" O. D. Sampler Cohesionless Density | Cohesive Consistency | SUMMA Earth Form.

Green Mountain Boring Co., Inc.

R. D. 2 - BARRE, VERMONT 05641

SHEET 13 OF
DATE 10/30/81
HOLE NO. SB 8
LINE & STA.
OFFSET None

TO Knight Consulting Engineers ADDRESS So. Burlington, Vt.
PROJECT NAME Burlington Square LOCATION Burlington, Vt.
REPORT SENT TO Knight Consult. Engrs. PROJ. NO.
SAMPLES SENT TO " " " OUR JOB NO. 81-69

GROUND WATER OBSERVATIONS
At None at 1 Hours
At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	Split spoon	
Size I. D.	3.25"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 206.7
DATE STARTED 10/30/81
DATE COMPL. 10/30/81
BORING FOREMAN Stables
INSPECTOR
SOILS ENGR. R. Dorwart

LOCATION OF BORING: 15' West of Walkway into Main Entrance 23' off Street

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	SAMPLE Pen
		0 - 1.5'	D	7	8	10	Dry	1'	Topsoil into silty sand w/ brick particles	1	18"
		5' - 6.5'		7	10	15	Dry	5'	Coarse sand w/stones trace of silt	2	18"
		10'-11.5'		8	11	14	Dry	9'	Silty sand	3	18"
		15'-16.5'		7	11	12	Dry	15'	Fine sand w/trace of silt	4	18
		20'-21.5'		7	8	11	Damp	19'	Silt & fine sand	5	18"
		25'-26.5'		13	16	20	Damp	25'	Fine sand varved w/silt	6	18"
		30'-31.5'		20	33	43	Dry	31'	Fine sand w/trace of silt	7	18"
		35'-36.5'		21	34	56	Dry		Fine sand varved w/ silt	8	18"

GROUND SURFACE TO 35' USED 3.25" "CASING: THEN

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall an 2" O. D. Sampler | Cohesionless Density | Cohesive Consistency | SUMM | Earth Form

Green Mountain Boring Co., Inc.

R. D. 2 – BARRE, VERMONT 05641

SHEET 6 OF

TO Knight Consulting Engineers ADDRESS So. Burlington, Vt.

DATE 10/27/81

PROJECT NAME Burlington Square LOCATION Burlington, Vt.

HOLE NO. SB 9

REPORT SENT TO Knight Consult. Engrs. PROJ. NO.

LINE & STA.

SAMPLES SENT TO " " " OUR JOB NO. 81-69

OFFSET None

GROUND WATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.	
At None at 0 Hours	Type	Auger	Split spoon	
	Size I. D.	3.25"	1 3/8"	
At at Hours	Hammer Wt.		140#	BIT
	Hammer Fall		30"	

SURFACE ELEV. 205.2

DATE STARTED 10/27/81

DATE COMPL. 10/27/81

BORING FOREMAN Willard

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: Near Bank St. Sidewalk - West End

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAM No.	Pen
		0 - 1.5'	Dry	6	9	10	Dry	3"	3" topsoil into gravel	1	16'
		5' - 6.5'		14	18	20	Dry to damp	6'	Gravel into silty sand	2	16
		10' - 11.5'		20	20	26	Dry to damp	11'	Fine brown silty sand into heavy silt layer	3	1
		15' - 16.5'		10	8	10	Damp to dry	15'	Fine brown silty sand w/ silt layers	4	16
		20' - 21.5'		5	12	21	Damp		Fine brown silty sand w/ damp layers	5	1
		25' - 26.5'		7	9	11	Damp		Damp brown silty sand	6	1
		30' - 31.5'		11	16	30	Damp		Brown silty sand w/damper layers	7	
		35' - 36.5'		18	32	50	Damp	34'	Brown gray fine grain sand w/silt	8	

GROUND SURFACE TO 35' USED Auger "CASING: THEN Split spoon to 36.5'

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall an 2" O. D. Sampler Cohesionless Density | Cohesive Consistency | Earth E

Green Mountain Boring Co., Inc.

R. D. 2 -- BARRE, VERMONT 05641

SHEET 7 OF

TO Knight Consulting Engrs. ADDRESS So. Burlington, Vt.

PROJECT NAME Burlington Square LOCATION Burlington, Vt.

REPORT SENT TO Knight Consulting Engrs. PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 81-69

DATE 10/28/81

HOLE NO Sb 10

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 1 Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	Split spoon	
Size I. D.	3.25"	1 3/8"	
Hammer Wt.	.....	140#	BIT
Hammer Fall	.....	30"	.....

SURFACE ELEV. 207.2

DATE STARTED 10/28/81

DATE COMPL. 10/28/81

BORING FOREMAN Stable

INSPECTOR .....

SOILS ENGR. R. Dorwart

LOCATION OF BORING: Just West of Dean Reynolds entrance

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPL No.	SAMPL Pen
		0 - 1.5'	D	3	7	12	Dry	1'	Topsoil into silty sand	1	18"
		5' - 6.5'		12	18	27	Dry		Fine silty sand	2	18
		10' - 11.5'		12	14	25	Dry		Fine silty sand	3	18"
		15'-16.5'		7	11	12	Dry	13'	Very fine sand w/little silt	4	18
		20'-21.5'		9	11	15	Dry	19'	Fine sand varved w/silt	5	18"
		25'-26.5'		14	17	25	Dry	24'	Fine sand w/trace of silt	6	18
		30'-31.5'		25	30	35	Dry	30'	Fine sand varved w/silt	7	18
		35'-36.5'		24	43	52	Dry	35.5'	Fine sand w/trace of silt	8	18
									Augers		

GROUND SURFACE TO 35' USED 3.25" CASING: THEN .....

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall an 2" O. D. Sampler | Cohesionless Density | Cohesive Consistency | Earth Bo

Green Mountain Boring Co., Inc.

R. D. 2 – BARRE, VERMONT 05641

SHEET 5 OF
DATE 10/27/81
HOLE NO GB 11
LINE & STA.
OFFSET None

TO Knight Consulting Engineers ADDRESS S. Burlington, Vt.
PROJECT NAME Burlington Square LOCATION Burlington, Vt.
REPORT SENT TO Knight Consulting Engrs. PROJ. NO.
SAMPLES SENT TO " " " OUR JOB NO. 81-69

GROUND WATER OBSERVATIONS
At None at 0 Hours
At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Auger	Split spoon	
Size I. D.	3.25	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 206.0
DATE STARTED 10/27/81
DATE COMPL. 10/27/81
BORING FOREMAN Stables
INSPECTOR
SOILS ENGR. R. Dorwart

LOCATION OF BORING: Approx. 40' West of Dean Whittier & Reynolds

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPL No.	SAMPL Pen
		0 - 1.5'	Dry	8	9	8	Moist		2" topsoil into gravel	1	18"
		5' - 6.5'		4	7	9	Dry	6'	Gravel into silty fine sand	2	18"
		10' - 11.5'		16	36	50	Dry		Fine brown silty sand w/dark brown silt layers	3	18"
		15'- 16.5'		10	11	13	Dry		Fine brown silty sand w/ silt layers	4	18"
		20' - 21.5'		8	10	19	Damp	19'	Fine brown silty sand into silty sand damp at 19'	5	18"
		25' - 26.5'		18	16	20	Damp to dry		Fine brown silty sand w/silt layers	6	18"
		30' - 31.5'		8	12	15	Dry to damp	31'	Fine brown silty sand, dry into damp at 31'	7	18"
		35'-36.5'		8	22	40		36'	Fine brown silty sand, damp into dry at 36'	8	18"

GROUND SURFACE TO 35' USED "CASING: THEN Split spoon to 36.5'

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall on 2" O. D. Sampler | Cohesionless Density | Cohesive Consistency | SUMM... Earth Boring

Green Mountain Boring Co., Inc.

R. D. 2 – BARRE, VERMONT 05641

SHEET 4 OF

TO Knight Consulting Engrs. ADDRESS So. Burlington, Vt.

PROJECT NAME Burlington Square LOCATION Burlington, Vt.

REPORT SENT TO Knight Consulting Engrs. PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 81-69

DATE 10/22/81

HOLE NO SB 12

LINE & STA.

OFFSET None

GROUND WATER OBSERVATIONS

At None at 1 Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	Split spoon	
Size I. D.	3.25"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 198.9

DATE STARTED 10/22/81

DATE COMPL. 10/22/81

BORING FOREMAN Stables

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: 10' off bldg. – down near auto drive

DEPTH	Casing Blows per foot	Sample Depths From – To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen
		0 – 1.5'	D	4	4	7	Dry	1'	Topsoil into gravel	1	18"
								4'			
		5' – 6.5'		3	2	2	Dry		Fine sand & silt	2	18"
								8'			
		10' – 11.5'		5	8	15	Dry		Fine sand varved w/silt	3	18
								13'			
		15' – 16.5'		4	6	7	Damp		Silt w/little sand	4	18
								20'			
		20' – 21.5'		6	6	10	Damp		Silt & fine sand	5	18
		25' – 26.5'		6	10	14	Dry		Fine sand varved w/silt	6	18"
		30' – 31.5'		8	21	19	Dry		Medium grained sand varved w/silt, signs of oxidation	7	18
		35' – 36.5'		25	25	45	Moist		Sand varved w/silty clay ,	8	18
								Augers			

GROUND SURFACE TO 35' USED 3.25' DIAMETER THEN Installed – 37' – 1½" P. V. C. fittings

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall on 2" O. D. Sampler | Cohesionless Density | Cohesive Consistency | SUM Earth Bo

Green Mountain Boring Co., Inc.

R. D. 2 – BARRE, VERMONT 05641

SHEET 3 OF

DATE 10/22/81

TO Knight Consulting Engrs. ADDRESS So. Burlington, Vt.

PROJECT NAME Burlington Square LOCATION Burlington, Vt.

REPORT SENT TO Knight Consulting Engrs. PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 81-69

HOLE NO SB 13

LINE & STA

OFFSET None

GROUND WATER OBSERVATIONS

At None at 1 Hours

At at Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	Split spoon	
Size I. D.	3.25"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 203.3

DATE STARTED 10/22/81

DATE COMPL. 10/22/81

BORING FOREMAN Stables

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: Just East of Parking Ticket Booth

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMP No.	Pen
		0 - 1.5'	D	5	6	6	Dry	1'	Topsoil into silty sand	1	18"
		5' - 6.5'		7	11	12	Dry	8'	Fine silty sand & tree root	2	18"
		10' - 11.5'		23	33	30	Dry		Well graded sand & trace of silt	3	18"
		15' - 16.5'		8	10	10	Dry	14'	Fine sand & silt	4	18"
		20' - 21.5'		14	16	24	Dry	18'	Sand varved w/silt	5	18"
		25' - 26.5'		4	8	7	Damp	25'	Sand & silt	6	18"
		30' - 31.5'		7	13	16	Dry		Medium graded sand varved w/silt	7	18"
		35' - 36.5'		11	17	21	Dry		Medium fine sand w/trace of silt	8	18"
								Augers			

GROUND SURFACE TO 22' USED 3.25" CASING: THEN

Sample Type

Proportions Used

140 lb. Wt. x 30" fall on 2" O. D Sampler

Cohesionless Density

Cohesive Consistency

Earth Bori

Green Mountain Boring Co., Inc.

R. D. 2 – BARRE, VERMONT 05641

SHEET 2 OF

TO Knight Consulting Engineers ADDRESS So. Burlington, Vt.

PROJECT NAME Burlington Square LOCATION Burlington, Vt.

REPORT SENT TO Knight Consulting Engrs. PROJ. NO.

SAMPLES SENT TO " " " OUR JOB NO. 81-69

DATE 10/21/81

HOLE NO. SB 14

LINE & STA. 206.5

OFFSET None

GROUND WATER OBSERVATIONS

At None at 1 Hours

At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	S. Spoon	
Size I. D.	3.25"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV.

DATE STARTED 10/21/81

DATE COMPL. 10/21/81

BORING FOREMAN Stables

INSPECTOR

SOILS ENGR. R. Dorwart

LOCATION OF BORING: Just off Sidewalk, Near W. Edge of Mall

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen
		0 - 1.5'		3	7	6	Dry		Silty sand, stone & organic matter	1	18"
								4'			
		5' - 6.5'		5	2	3	Dry		Silty sand	2	18"
								10'			
		10' - 11.5'		9	9	11	Dry		Well grained sand, little silt	3	18"
		15' - 16.5'		5	6	8	Dry	15.5'	Fine sand & silt	4	18"
		20' - 21.5'		7	11	13	Dry		Fine sand & silt	5	18"
								24'			
		25' - 26.5'		12	10	15	Damp		Silt & sand w/trace of clay	6	18"
		30' - 31.5'		6	12	15	Damp		Silt & sand w/trace of clay	7	18"
		35' - 36.5'		14	22	27	Dry	35'	Sand varved w/silt	8	18"
								Augers			

GROUND SURFACE TO 35' USED 3.25" CASING: THEN

Sample Type | Proportions Used | 140 lb. Wt. x 30" fall an 2" O. D. Sampler | Cohesionless Density | Cohesive Consistency | SUMMA

Earth Bor

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 1 OF
DATE 10/20/81
HOLE NO. SB 15
LINE & STA.
OFFSET None

TO Knight Consulting Engrs. ADDRESS So. Burlington, Vt.
PROJECT NAME Burlington Square LOCATION Burlington, Vt.
REPORT SENT TO Knight Consulting Engrs. PROJ. NO.
SAMPLES SENT TO " " " OUR JOB NO. 81-69

GROUND WATER OBSERVATIONS

At None at 1 Hours
At ..... at ..... Hours

	CASING	SAMPLER	CORE BAR.
Type	Augers	S. Spoon	
Size I. D.	3.25"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV. 205.0
DATE STARTED 10/20/81
DATE COMPL. 10/20/81
BORING FOREMAN Stables
INSPECTOR
SOILS ENGR. R. Dorwart

LOCATION OF BORING: Just off sidewalk - Front of Chittenden Trust Co.

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	SAMPLE Pen
		1' - 2.5'	D	13	13	13	Dry		Silty sand & small stones	1	18"
								4'			
		5' - 6.5'		8	12	13	Dry		Small gravel	2	18"
								8'			
		10' - 11.5'		25	35	35	Dry		Fine silty sand	3	18"
								15'			
		15' - 16.5'		12	20	27	Dry		Very fine sand varved w/ silt	4	18"
								18'			
		20' - 21.5'		9	7	8	Dry		Coarse sand w/little silt	5	18"
		25' - 26.5'		6	10	18	Dry	25'	Very fine sand varved w/silt	6	18"
								29'			
		30' - 31.5'		5	10	17	Moist		Silt w/trace of clay & trace of sand	7	18"
		35' - 36.5'		10	21	27	Moist		Silt w/trace of clay & trace of sand	8	18"
								augers			

GROUND SURFACE TO 35' USED 3.25" CASING: THEN

Sample Type: D = Dry C = Cored W = Washed
Proportions Used: trace 0 to 10%
140 lb. Wt. x 30" fall on 2" O. D. Sampler — Cohesionless Density: 0-10 loose — Cohesive Consistency: 0-4 Soft
SUMMARY: Earth Boring

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 1 OF 9
DATE 11/20/68
HOLE NO. 1
LINE & STA
OFFSET

TO Knight Laboratories
PROJECT NAME Urban Renewal
REPORT SENT TO Knight Laboratories
SAMPLES SENT TO " "

ADDRESS So. Burlington, Vt.
LOCATION Burlington, Vt.
PROJ NO.
OUR JOB NO. 68-50

GROUND WATER OBSERVATIONS
At ... at ... Hours
At ... at ... Hours

	CASING	SAMPLER	CORE BAR.
Type		Split spoon	
Size I. D.	2½"	2"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	30"	30"	

SURFACE ELEV.
DATE STARTED 11/20/68
DATE COMPL.
BORING FOREMAN Stables
INSPECTOR
SOILS ENGR. Dorwart

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
	Gug out								Concrete Slab Wash water indicated gravel			
	12											
	21											
	31											
5'	30											
	9	5' - 6'6"	D	17	19	33	Dry		Silty sand - brown	1	18"	9"
	38											
	85											
	80											
	70											
10'	25	10'-11'6"	D	19	32	38	Dry		Brown silty sand & small stone	2	18"	10
	72											
	96											
	65											
	48											
15'	24	15' - 16'6"		17	15		20 Dry		Brown silty sand	3	18"	12
	48											
	54											
	55											
	62											
20'	33	20' - 21'6"		19	24	25	Dry		Brown silty sand with oil	4	18	8"
	58											
	60											
	63											
25'	57											
		25' - 26'6"		15	16	18	Damp		Brown silty sand	5	18"	6

GROUND SURFACE TO ... USED ... "CASING: THEN ...

Sample Type
D = Dry C = Cored W = Washed
UP = Undisturbed Piston

Proportions Used
trace 0 to 10%
little 10 to 20%

140 lb. Wt. x 30" fall an 2" O. D. Sampler
Cohesionless Density: 0-10 Loose; 10-30 Med. Dense
Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 30 + Hard

SUMMARY: 2
Earth Boring
Rock Coring 5
Samples 1

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 2 OF 9
DATE 11/22/68
HOLE NO. 2

Knight Laboratory
PROJECT NAME Urban Renewal
REPORT SENT TO Steve Knight
SAMPLES SENT TO " "

ADDRESS So. Burlington, Vt.
LOCATION Pine St.
PROJ NO
OUR JOB NO 68-50

GROUND WATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.
At at Hours	Type	Split Spoon	
NONE	Size I. D.	2½"	2"	
At at Hours	Hammer Wt.	300#	140#	BIT
	Hammer Fall	30"	30"	

SURFACE ELEV. 198
DATE STARTED 11/22/68
DATE COMPL.
BORING FOREMAN Stables
INSPECTOR
SOILS ENGR. Dorwart

LOCATION OF BORING:

Depth	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
	19											
	17											
	14											
	19											
	22											
	19	5'-6'6"	D	13	18	25	Dry		Brown Silty Sand with Stone.	1	18"	8"
	40											
	64											
	82											
	81											
10'	48	10'-11'6"	D	16	18	26	Dry		Brown Sand Silt trace of Oil.	2	18"	6"
	52											
	55											
	74											
	55											
15'	29	15'-16'6"	D	16	8	7	Wet		Brown Sand Silt.	3	18"	12"
	33											
	47											
	53											
	50											
20'	36	20'-21'6"	D	20	20	16	Damp		Brown Silty Sand.	4	18"	8"
	51											
	58											
	65											
	66											
25'		25'-25'6"	D	20	23	23	Damp		Brown Silty Sand.	5	18"	6"

GROUND SURFACE TO 25' USED 2½" "CASING: THEN

Sample Type
D = Dry C = Cored W - Washed
UP - Undisturbed Piston

Proportions Used
trace 0 to 10%
little 10 to 20%

140 lb. Wt. x 30" fall an 2" O. D. Sampler
Cohesionless Density
0-10 Loose
10-30 Med Dense
Cohesive Consistency
0-4 Soft
4-8 M/Stiff
30 + Hard

SUMMARY:
Earth Boring 25'
Rock Coring
Samples 5

Green Mountain Boring Co., Inc.

R. D. 2 - BARRE, VERMONT 05641

SHEET 3 OF 9
DATE 11/25/68
HOLE NO. 3
LINE & STA
OFFSET

TO Knight Laboratory
PROJECT NAME Urban Renewal
REPORT SENT TO Steve Knight
SAMPLES SENT TO " "

ADDRESS So. Burlington, Vt.
LOCATION Pine St., Burlington, Vt.
PROJ. NO
OUR JOB NO 68-50

GROUND WATER OBSERVATIONS

At — at — Hours

NONE

At — at — Hours

	CASING	SAMPLER	CORE BAR.
Type		Split Spoon	
Size I. D.	2½	2"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	30"	30"	

SURFACE ELEV. 195
DATE STARTED 11/25/68
DATE COMPL. 11/25/68
BORING FOREMAN R. Taylor
INSPECTOR
SOILS ENGR. E. Dorsett

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
	36											
	25											
	13											
	12											
5'	15											
	40	5'-6'6"	D	22	22	30	Dry		Wood Sand Silty some Stone.	1	18"	10"
	50											
	112											
	71											
10'	55											
	24	10'-11'6"	D	23	23	21	Dry		Sand Silty	2	18"	6"
	39											
	46											
	45											
15'	33											
	29	15'-16'6"	D	7	7	9	Wet		Sand Silty	3	18"	18"
	31											
	34											
	45											
20'	37											
	24	20'-21'6"	D	14	12	9	Damp		Sand Silty	4	18"	6
	34											
	35											
	41											
25'	32											
		25'-26'6"	D	6	7	11	Damp		Sand Silty	5	18"	10
								None				

GROUND SURFACE TO 25' USED 2½" "CASING: THEN 140 lb. Wt. x 30" fall an 2" O. D. Sampler

Sample Type
D - Dry C - Cored W - Washed
UP - Undisturbed Piston

Proportions Used
trace 0 to 10%
little 10 to 20%

Cohesionless Density
0-10 Loose
10-30 Med. Dense

Cohesive Consistency
0-4 Soft 30 + Hard
4-8 M/Stiff

SUMMARY:
Earth Boring 20
Rock Coring
Samples 5

Green Mountain Boring Co., Inc.

R. D. 2 – BARRE, VERMONT 05641

SHEET 1 OF 1 | DATE 11/26/68

TO Knight Laboratory, Urban Renewal | ADDRESS Pine St., Burlington, Vt. | HOLE NO. 4

PROJECT NAME | LOCATION Burlington, Vt. | LINE & STA

REPORT SENT TO Steve Knight | PROJ NO. | OFFSET

SAMPLES SENT TO " " | OUR JOB NO. 68-20

GROUND WATER OBSERVATIONS

At — at — Hours

NONE

At — at — Hours

	CASING	SAMPLER	CORE BAR.
Type		Split Spoon	
Size I. D.	2½	2"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	30"	30"	

SURFACE ELEV. 85

DATE STARTED 11/26/68

DATE COMPL. 11/26/68

BORING FOREMAN R. Taylor

INSPECTOR

SOILS ENGR. E. Dorsett

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
	17											
	13											
	7											
	11											
5'	21											
	26	5'-6'6"	D	24	45	23	Wet		Gravel with Coal.	1	18"	6"
	60											
	62											
	37											
10'	59											
	22	10'-11'6"	D	29	22	20	Damp		Sandy Silt.	2	18"	6"
	41											
	39											
	45											
15'	52											
	37	15'-16'6"	D	36	21	19	Damp		Silty Sand.	3	18"	8"
	51											
	51											
	37											
20'	42											
	27	20'-21'6"	D	16	11	10	Dry		Sand	4	18"	8"
	42											
	40											
	45											
25'	47											
		25'-26'6"	D	21	28	30	Dry	None	Silty Sand.	5	18"	6"

GROUND SURFACE TO 25' USED 2½

Sample Type: D = Dry C = Cored W = Washed

Proportions Used: trace 0 to 10%

"CASING: THEN 140 lb. Wt. x 30" fall an 2" O. D. Sampler

Cohesionless Density: 0-10 Loose

Cohesive Consistency: 0-4 Soft 30 + Hard

SUMMARY: Earth Boring 20' Rock Coring

Green Mountain Boring Co., Inc.

R. D. 2 -- BARRE, VERMONT 05641

SHEET 5 OF 9
DATE 11/27/68
HOLE NO. 5
LINE & STA
OFFSET

TO Knight Laboratory
PROJECT NAME Urban Renewal
REPORT SENT TO Steve Knight
SAMPLES SENT TO " "

ADDRESS So. Burlington, Vt.
LOCATION Pine St., Burlington, Vt.
PROJ NO.
OUR JOB NO. 68-50

GROUND WATER OBSERVATIONS

At ... at ... Hours

NONE

At ... at ... Hours

	CASING	SAMPLER	CORE BAR.
Type		Split Spoon	
Size I. D.	2½	2"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	30"	30"	

SURFACE ELEV. 178
DATE STARTED 11/27/68
DATE COMPL. 11/29/68
BORING FOREMAN Taylor
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Re
	13											
	21											
	16											
	19											
	15											
5'	10	5'-6'6"	D	5	5	10	Dry		Gray Sand	1	18"	8
	13											
	30											
	33											
	30											
10'	13	10'-11'6"	D	10	10	11	Dry		Gray Sand	2	18"	12
	24											
	28											
	30											
	27											
15'	14	15'-16'6"	D	8	7	8	Wet		Brown Sand	3	18"	8
	26											
	25											
	23											
	23											
20'	21	20'-21'6"	D	11	10	10	Dry		Brown Silty Sand.	4	18"	6
	24											
	35											
	45											
	46											
25'	15	25'-26'6"	D	7	12	9			Nothing retrieved.	5	18"	
	24											
	31											
	40											
	10											
30'	34	30'-31'6"	D	14	16	20	Wet		Brown Sand	6	18"	
	60											
	46											
	50											
	15											
35'	30	35'-36'6"	D	4	9	7	Damp		Brown Sandy Silt.	7	18"	1
	30							33'				
	44											
	42											
40'	33	40'-41'6"	D	7	9	10	Damp		Brown Sandy Silt.	8	18"	

GROUND SURFACE TO 40' USED 2½ "CASING: THEN 140 lb. Wt. x 30" fall an 2" O. D. Sampler

Sample Type D = Dry C = Cored W = Washed

Proportions Used trace 0 to 10%

Cohesionless Density 0-10 Loose

Cohesive Consistency 0-4 Soft 30 + Hard

SUMMAR Earth Boring Rock Coring

Green Mountain Boring Co., Inc.

R D 2 – BARRE, VERMONT 05641

SHEET 6 OF 9
DATE 12/2/68
HOLE NO. B-6
LINE & STA
OFFSET

TO Knight Laboratory
PROJECT NAME Urban Renewal
REPORT SENT TO Steve Knight
SAMPLES SENT TO " "

ADDRESS So. Burlington, Vt.
LOCATION Pine St., Burlington, Vt.
PROJ NO
OUR JOB NO. 68-50

GROUND WATER OBSERVATIONS

At – at – Hours

NONE

At at Hours

	CASING	SAMPLER	CORE BAR.
Type		Split Spoon	
Size I. D.	2½	2"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	30"	30"	

SURFACE ELEV. 200.0
DATE STARTED 12/2/68
DATE COMPL. 12/3/68
BORING FOREMAN Taylor
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From – To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec
	8											
	16											
	6											
	6											
	9											
5'	10	5'–6'6"	D	6	7	9	Damp		Gravel	1	18"	1'
	20											
	20											
	23											
	26											
10'	21	10'–11'6"	D	12	16	12	Damp		Br. Sandy Silt	2	18"	12
	29											
	21											
	29											
	10											
15'	21	15'–15'6"	D	11	11	11	Damp		Br. Sand	3	18"	0
	25											
	30											
	37											
	10											
20'	30	20'–21'6"	D	13	21	18	Dry		Br. Silty Sand.	4	18"	
	29											
	28											
	31											
	34											
25'	31											
	28	25'–26'6"	D	12	11	10	Damp		Br. Sandy Silt.	5	18"	
	28											
	28											
	34											
	31											
30'	36	30'–31'6"	D	19	15	16	Damp		Br. Sandy Silt.	6	18"	
	42											
	42											
	47											
	40											
35'	37	35'–36'6"	D	18	17	23	Damp		Br. Sandy Silt.	7	18"	
	55											
	54											
	60							None				
40'	84	40'–41'6"	D	75	49	41	Dry		Br. Sandy Silt.	8	18"	

GROUND SURFACE TO 40' USED 2½ "CASING: THEN 140 lb. Wt. x 30" fall an 2" O. D. Sampler

Sample Type D – Dry C – Cored W – Washed

Proportions Used trace 0 to 10%

Cohesionless Density 0-10 Loose

Cohesive Consistency 0-4 Soft 30 – Hard

SUMMARY
Earth Boring
Rock Coring

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 7 OF 9
DATE 12/3/68
HOLE NO. 7
LINE & STA
OFFSET

TO Knight Laboratory
PROJECT NAME Urban Reneval
REPORT SENT TO Steve Knight
SAMPLES SENT TO " "

ADDRESS So. Burlington, Vt.
LOCATION Pine St., Burlington, Vt.
PROJ. NO.
OUR JOB NO. 68-50

GROUND WATER OBSERVATIONS

At ____ at ____ Hours

At NONE at ____ Hours

	CASING	SAMPLER	CORE BAR.
Type		Split Spoon	
Size I. D.	2½	2"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	30"	30"	

SURFACE ELEV. 163
DATE STARTED 12/3/68
DATE COMPL. 12/4/68
BORING FOREMAN Taylor
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
	6											
	15											
	17											
	19											
5'	22											
	1	5'-6'6"	D	6	6	15	Dry		Br.Sandy Silt.	1	16"	8"
	28											
	33											
	29											
	35											
10'	20	10'-11'6"	D	10	12	13	Wet		Br. Sandy Silt.	2	16"	6"
	38											
	40											
	41											
	59											
15'	30	15'-16'6"	D	10	10	13	Wet		Br. Sandy Silt.	3	16"	6"
	74											
	53											
	66											
	64											
20'	39	23'-21'6"	D	18	26	29	Wet		Br. Sandy Silt.	4	18"	6
	43											
	46											
	48											
	16											
25'	16	25'-25'6"	D	12	15	12	Dry		Br. Sandy Silt.	5	16"	4
	21											
	38											
	43											
	40											
30'	25	30'-31'6"	D	6	3	4	Damp		Br. Sandy Silt.	6	18"	
	64											
	56											
	51											
	40											
35'	31	35'-36'6"	D	9	7	8	Damp		Br. Sandy Silt.	7	16"	1
	39											
	40											
	41							None				
40'	11	40'-41'6"	D	16	17	17			Br. Sandy Silt.	8	18"	

GROUND SURFACE TO 40' USED 2½ "CASING: THEN 140 lb. Wt. x 30" fall an 2" O. D. Sampler

Sample Type: D ... Washed

Proportions Used: trace 0 to 10%

Cohesionless Density: 0-10 Loose

Cohesive Consistency: 0-4 Soft 30 + Hard

SUMMARY: Earth Boring Rock Coring

Green Mountain Boring Co., Inc.

R. D. 2 — BARRE, VERMONT 05641

SHEET 8 OF 9
DATE 12/4/68
HOLE NO. 8
LINE & STA.
OFFSET

ght Laboratory
Urban Renewal
Steve Knight
SENT TO " "

ADDRESS So. Burlington, Vt.
LOCATION Pine St., Burlington, Vt.
PROJ NO
OUR JOB NO. 68-50

OUND WATER OBSERVATIONS		CASING	SAMPLER	CORE BAR.	
at — Hours	Type		Split Spoon		SURFACE ELEV.
	Size I. D.	2½"	2"		DATE STARTED 12/4/68
NONE at Hours	Hammer Wt.	300#	140#	BIT	DATE COMPL. 12/5/68
	Hammer Fall	30"	30"		BORING FOREMAN Taylor
					INSPECTOR
					SOILS ENGR.

TION OF BORING:

ng ws r ot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
	5'-6'6"	D	4	6	10	Wet		Br. Sandy Silt.	1	18"	4"
	10'-11'6"	D	10	13	9	Damp		Br. Silty Sand.	2	18"	6"
	15'-16'6"	D	7	8	9	Dry		Br. Sand.	3	18"	6'
	20'-21'6"	D	15	14	10	Dry		Br. Sandy Silt.	4	18"	6"
	25'-26'6"	D	10	11	9	Damp		Br. Sandy Silt.	5	18"	6
	30'-31'6"	D	39	25	18	Damp		Br. Sandy Silt.	6	18"	8
	35'-36'6"	D	70	19	16	Dry		Br. Sandy Silt.	7	18"	
							None				
	40'-41'6"	D	120	52	49	Dry		Br. Sandy Silt.	8	18"	

UND SURFACE TO 40'	USED 2½"	"CASING: THEN 140 lb. Wt. x 30" fall an 2" O. D. Sampler	SUMMARY:
Type C = Cored W = Washed	Proportions Used trace 0 to 10%	Cohesionless Density 0-10 Loose	Cohesive Consistency 0-4 Soft 30 + Hard	Earth Boring 4 Rock Coring

Green Mountain Boring Co., Inc.

R. D. 2 - BARRE, VERMONT 05641

SHEET 9 OF 9
DATE 12/5/68
HOLE NO. B-9
LINE & STA.
OFFSET

TO Knight Laboratory
PROJECT NAME Urban Renewal
REPORT SENT TO Steve Knight
SAMPLES SENT TO " "

ADDRESS So. Burlington, Vt.
LOCATION Pine St., Burlington, Vt.
PROJ NO
OUR JOB NO. 68-50

GROUND WATER OBSERVATIONS

At — at — Hours

At NONE at — Hours

	CASING	SAMPLER	CORE BAR.
Type		Split Spoon	
Size I. D.	2½"	2"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	30"	30"	

SURFACE ELEV. 210.5
DATE STARTED 12/5/68
DATE COMPL. 12/9/68
BORING FOREMAN
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	Blows per 6" on Sampler From 6-12	Blows per 6" on Sampler To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	SAMPLE Pen	SAMPLE Re
									First two feet dug.			
	7											
	14											
5'	21											
	24	5'-6'6"	D	55	35	27	Dry		Gravel	1	18"	8"
	49											
	82											
	100											
10'	112											
	40	10'-11'6"	D	14	31	33	Dry		Br. Silty Sand.	2	18"	10"
	102											
	70											
	80											
15'	64											
	47	15'-16'6"	D	14	23	22	Damp		Br. Sandy Silt.	3	18"	6"
	86											
	62											
	65											
20'	21											
	56	20'-21'6"	D	100	70	30	Dry		Br. Sandy Silt.	4	18"	12
	32											
	31											
	30											
25'	26											
	25	25'-26'6"	D	14	15	11			No sample retreived	5	18"	0
	35											
	55											
	43											
30'	43											
	23	30'-31'6"	D	75	50	52	Damp		Br. Sandy Silt with Stone.	6	18"	8
	79											
	56											
	48											
35'	42											
	13	35'-36'6"	D	8	13	16	Damp		Br. Sandy Silt.	7	18"	6
	46											
	57											
	49											
40'	41	40'-41'6"	D	16	22	28	Damp		Br. Sandy Silt.	8	18"	8

GROUND SURFACE TO 40' USED 2½" CASING: THEN

Sample Type
D = Dry C = Cored W = Washed

Proportions Used
trace 0 to 10%

140 lb. Wt. x 30" fall an 2" O. D. Sampler
Cohesionless Density 0-10 Loose
Cohesive Consistency 0-4 Soft 30 + Hard

SUMMARY:
Earth Boring 41

APPENDIX C

LOGS OF RECENT EXPLORATIONS BY SHA

Sanborn, Head & Associates, Inc.

Log of Monitoring Well SH-1

PROJECT: *Burlington Square Mall Expansion*

LOCATION: *Burlington, Vermont*

DRILLING METHOD: *Mobile B-53 w/4 1/4" ID HSA*

DRILLING COMPANY: *Capital Environmental Drilling*

FOREMAN: *Jay Stevens*

LOGGED BY: *M. Heil* CHECKED BY: *V. Kokosa*

PROJECT NO.: *1304.1/1304.2*

DATE STARTED: *05/06/97* DATE FINISHED: *05/07/97*

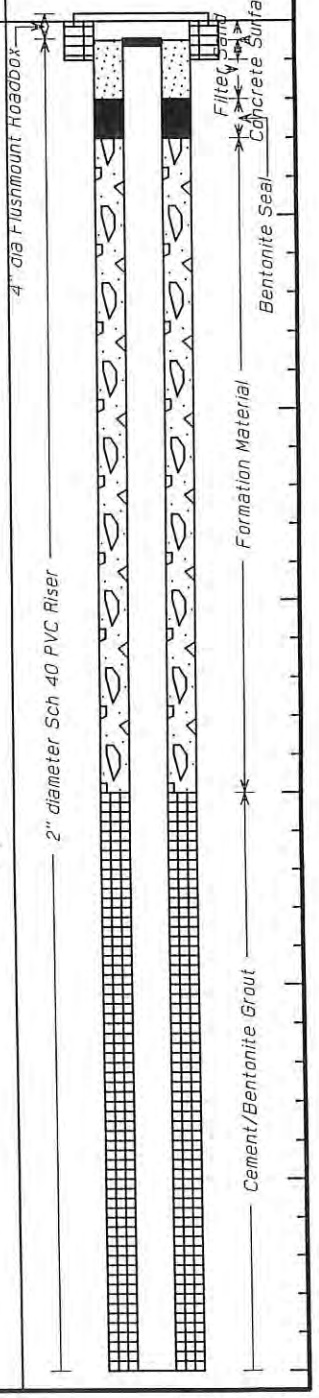
SURFACE ELEVATION: *Approximately 197.3 +/-*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
05/06/97	12:45	Dry	55'	~ 45 min.
05/07/97	16:10	81.91' PVC	well inst.	~ 24 hrs.
05/08/97	09:20	81.93' PVC	well inst.	~ 40 hrs.

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION
	S-1 0.1-2.1'	17-13 14-15	24/14	ND			ASPHALT	S-1: Medium dense, brown, fine SAND, and Silt, little Gravel. Moist.
5	S-2 5-7'	2-2 2-3	24/18	ND				S-2: Very loose, brown, fine SAND, some Silt. Moist. (Stratified w/several dark brown Silt Parting/Lenses).
10	S-3 10-11 S-3A 11-12'	3-5 5-8	24/18	ND				S-3: Loose, brown, fine SAND, and Silt, trace Gravel. Moist. S-3A: Loose, brown, fine to medium SAND, trace Gravel, trace Silt. Moist.
15	S-4 15-17'	6-8 8-9	24/18	ND			STRATIFIED SAND AND SILT	S-4: Medium dense, brown, fine SAND and Silt. Moist. (Stratified)
20	S-5 20-22'	4-6 8-13	24/18	ND				S-5: Stiff, brown, SILT, some fine Sand. Wet. (Stratified w/2" seam, Clayey SILT at ~ 21.5').
25	S-6 25-27'	7-8 7-9	24/22	ND				S-6: Medium dense, brown, fine SAND, some Silt. Moist. (Stratified)
30	S-7 30-32'	10-8 13-19	24/22	ND				S-7: Medium dense, brown, fine SAND, and Silt. Moist. (Stratified w/2" seam, Wet Clayey SILT at ~ 31').
35								

WELL DIAGRAM



Sanborn, Head & Associates, Inc.

Log of Monitoring Well SH-1

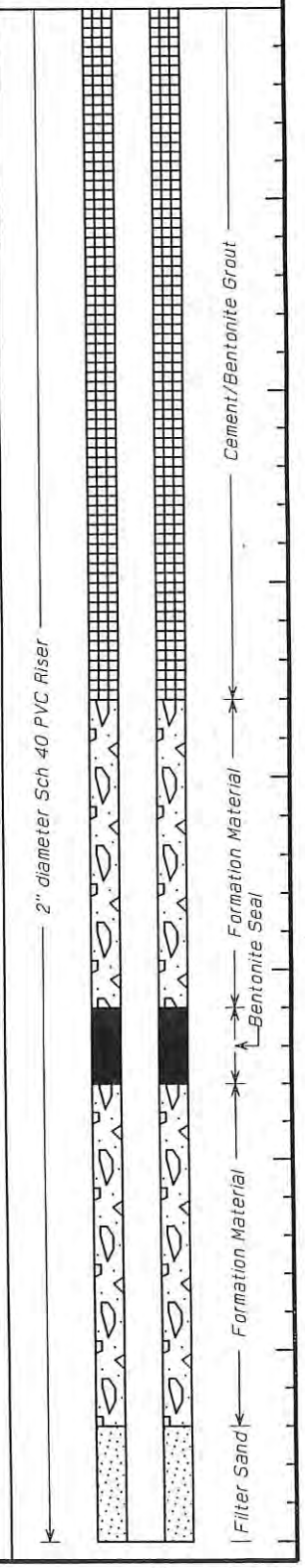
PROJECT NO.: *1304.1/1304.2*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *05/06/97* DATE FINISHED: *05/07/97*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION
	S-8 35-37'	7-11 13-17	24/20	ND				S-8: Medium dense, brown, fine SAND, some Silt. Moist. (Stratified)
40	S-9 40-42'	8-10 13-12	24/20	ND				S-9: Very stiff, brown, SILT, little fine Sand. Moist. (Stratified w/1" seam, Wet Clayey SILT at ~ 41.3').
45	S-10 45-47'	8-10 13-15	24/17	ND				S-10: Very stiff, brown, SILT, little fine Sand. Moist. (Stratified w/4" layer fine SAND at ~45.8').
50	S-11 50-51.2'	WOR 17-20	24/19	ND				S-11: Brown, SILT and fine Sand. Wet. (Stratified).
	S-11A 51.2-52'	See Note #2						S-11A: Brown, fine SAND, little Silt. Moist. (Stratified).
55	S-12 55-57'	7-16 16-17	24/21	ND			STRATIFIED SAND AND SILT	S-12: Hard, brown, Clayey SILT and fine Sand. Wet. (Stratified w/several 1" seams, Wet, fine SAND).
60	S-13 60-62'	6-9 10-16	24/23	ND				S-13: Very stiff, gray-brown, SILT & CLAY, trace fine Sand. Wet. (Stratified).
65	S-14 65-67'	12-15 16-19	24/22	ND				S-14: Dense, gray, fine SAND, some Silt. Moist.
70	S-15 70-72'	WOR See Note #2	24/15	ND				S-15: Gray-brown, fine SAND, and Silt. Moist. (Stratified).
75								

WELL DIAGRAM



Sanborn, Head & Associates, Inc.

Log of Monitoring Well SH-1

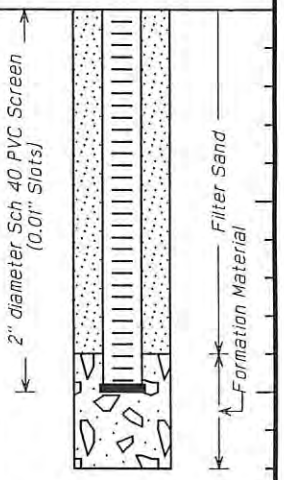
PROJECT NO.: *1304.1/1304.2*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *05/06/97* DATE FINISHED: *05/07/97*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION
	S-16 75-77'	15-18 17-20	24/22	ND				S-16: Dense, same as S-15.
80	S-17 80-81' S-17A 82-82'	WOR See Note #2	24/23	ND			STRATIFIED SAND AND SILT	S-17: brown, fine SAND, some Silt. Moist. S-17A: brown, SILT & CLAY, trace fine Sand. Wet. (Stratified).
85	S-18 85-87'	12-23 37-32	24/23	ND				S-18: Very dense, brown, fine SAND, and Silt. Wet.
								Bottom of Boring at 87'.
90								**NOTES:** 1) Soils were screened for volatile organics compounds (VOCs) using a Photovac Model MP-1000 Microtip Photoionization Detector (PID) with a 10.6 eV lamp calibrated to an isobutylene standard. Typical detection limit is 1 ppm. "ND" is not detected. 2) Split Spoon samples S-11, S-15 and S-17 Weight of Rods (WOR) blow counts indicate that rods were accidentally dropped to bottom of boring and density/consistency is unknown. 3) Bentonite bridging in last auger required augers to be removed from boring prior to establishing lower bentonite seal. Formation material cave-in from 53' to 61' and 63' to 72' from open borehole.
95								
00								
105								
110								
115								

WELL DIAGRAM



Sanborn, Head & Associates, Inc.

Log of Boring SH-2

PROJECT NO.: *1304.1/1304.2*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *05/07/97* DATE FINISHED: *05/08/97*

LOCATION: *Burlington, Vermont*

SURFACE ELEVATION: *Approximately 187.0 +/-*

DRILLING METHOD: *Mobile B-53 w/4 1/4" ID HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
5/7/97		Dry	60'	End Boring

DRILLING COMPANY: *Capital Environmental Drilling*

FOREMAN: *Jay Stevens*

LOGGED BY: *M. Heil* CHECKED BY: *V. Kokosa*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-1 0-0.5' S-1A 0.5-2.0'	6-6 6-10	24/20	ND			TOPSOIL	S-1: Medium dense, dark brown, fine to coarse SAND and Silt, trace Gravel, trace roots. Moist. TOPSOIL. S-1A: Stiff, brown, SILT and fine Sand. Moist.	Notes: 1) Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model MP-1000 Microtip Photoionization Detector (PID) with a 10.6 eV lamp calibrated to an isobutylene standard. Typical detection limit is 1 ppm. "ND" is not detected. 2) Boring backfilled with cement bentonite grout from approximately 0 to 3' and from 18 to 30'. Formation material backfilled in the remaining non-grouted sections. 3) No groundwater encountered.
5	S-2 5-7'	6-7 6-11	24/20	ND				S-2: Medium dense, gray-brown, fine to medium SAND, little Silt. Moist. (Stratified)	
10	S-3 10-12'	11-12 13-14	24/19	ND				S-3: Medium dense, gray-brown, fine to medium SAND, little Silt. Moist.	
15	S-4 15-15.8' S-4A 15.8-17'	7-6 7-8	24/22	ND			STRATIFIED SAND AND SILT	S-4: Medium dense, gray-brown, fine SAND, some Silt, Moist. S-4A: Stiff, brown, Clayey SILT, little fine Sand. Wet. (Statified)	
20	S-5 20-22'	5-8 7-9	24/21	ND				S-5: Medium dense, brown, fine SAND, some Silt. Moist.	
25	S-6 25-27'	5-7 6-8	24/20	ND				S-6: Stiff, brown, SILT and fine Sand. Moist. (Stratified)	
30	S-7 30-32'	5-10 11-15	24/21	ND				S-7: Very stiff, brown, Clayey SILT, some fine Sand. Wet. (Stratified w/several 2" seams, Wet, fine SAND).	
35									

Sanborn, Head & Associates, Inc.

Log of Boring SH-2

PROJECT NO.: *1304.1/1304.2*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *05/07/97* DATE FINISHED: *05/08/97*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-8 35-37'	5-11 14-15	24/15	ND				S-8: Very stiff, brown, SILT and fine Sand. Moist. (Stratified)	
40	S-9 40-42'	9-16 14-15	24/13	ND				S-9: Same as S-8.	
45	S-10 45-47'	12-15 11-12	24/20	ND				S-10: Medium dense, gray-brown, fine SAND, and Silt. Moist. (Stratified)	
							STRATIFIED SAND AND SILT		
50	S-11 50-52'	6-9 12-16	24/22	ND				S-11: Very stiff, gray, SILT & CLAY, trace fine Sand. Wet. (Stratified)	
55	S-12 55-57'	15-20 20-22	24/19	ND				S-12: Dense, gray, fine SAND, little Silt. Moist. (Stratified).	
60	S-13 60-62'	15-24 22-18	24/19	ND				S-13: Dense, gray, fine SAND, little Silt. Moist. (Stratified)	
								Bottom of Boring at 62'.	
65									
70									
75									

Sanborn, Head & Associates, Inc.

Log of Boring SH-3

PROJECT NO.: *1304.1/1304.2*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *05/07/97* DATE FINISHED: *05/08/97*

LOCATION: *Burlington, Vermont*

SURFACE ELEVATION: *Approximately 204.7 +/-*

DRILLING METHOD: *Mobile B-53 w/4 1/4" ID HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
5/7/97		Dry	60'	End Boring

DRILLING COMPANY: *Capital Environmental Drilling*

FOREMAN: *Jay Stevens*

LOGGED BY: *M. Heil* CHECKED BY: *V. Kokosa*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-1 0-1'	2-3 4-7	24/19	ND			FILL	S-1: Medium stiff, dark brown, SILT, little fine to coarse Sand, trace roots, trace glass fragments. Moist. FILL.	Notes:
	S-1A 1-2'							S-1A: Stiff, brown, SILT, some fine Sand. Moist.	1) Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model MP-1000 Microtip Photoionization Detector (PID) with a 10.6 eV lamp calibrated to an isobutylene standard. Typical detection limit is 1 ppm. "ND" is not detected.
5	S-2 5-7'	13-14 21-22	24/18	ND				S-2: Hard, brown, SILT, some fine SAND. Moist. (Stratified)	2) Drilled to 30' and took split spoon S-7 on 5/7/97. Boring completed on 5/8/97.
10	S-3 10-12'	15-27 30-31	24/20	ND				S-3: Same as S-2.	3) Boring backfilled with cement bentonite grout from approximately 0 to 3' and from 20 to 30. Formation material backfilled in the remaining non-grouted sections.
15	S-4 15-17'	7-15 16-16	24/21	ND			STRATIFIED SAND AND SILT	S-4: Dense, brown, fine to medium SAND, some Silt. Moist. (Stratified)	4) No groundwater encountered.
20	S-5 20-22'	6-8 11-11	24/17	ND				S-5: Very stiff, brown, SILT, and fine Sand. Moist. (Stratified w/several 1" seams, fine SAND)	
25	S-6 25-27'	6-9 11-11	24/16	ND				S-6: Medium dense, brown fine SAND, and Silt. Moist. (Stratified)	
30	S-7 30-32'	8-5 9-14	24/16	ND				S-7: Same as S-6.	
35									

Sanborn, Head & Associates, Inc.

Log of Boring SH-3

PROJECT NO.: *1304.1/1304.2*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *05/07/97* | DATE FINISHED: *05/08/97*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-8 35-37'	16-26 20-23	24/19	ND				S-8: Dense, gray-brown, fine SAND, some Silt. Moist. (Stratified w/2" seam, Clayey SILT at ~ 36.5').	
40	S-9 40-42'	15-17 24-40	24/15	ND				S-9: Dense, gray-brown, fine SAND, and Silt. Moist. (Stratified)	
45	S-10 45-47'	15-20 17-16	24/22	ND				S-10: Same as S-9.	
							STRATIFIED SAND AND SILT		
50	S-11 50-52'	11-12 16-23	24/20	ND				S-11: Very stiff, gray-brown, CLAY & SILT, trace fine Sand. Wet. (Stratified w/several fine Sand partings/lenses).	
55	S-12 55-57'	18-19 21-18	24/19	ND				S-12: Dense, gray, fine SAND, little Silt. Moist.	
60	S-13 60-62'	19-21 22-26	24/20	ND				S-13: Same as S-12.	
								Bottom of Boring at 62'.	
65									
70									
75									

Sanborn, Head & Associates, Inc.

Log of Boring SH-4

PROJECT NO.: *1304.2*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *06/13/97* DATE FINISHED: *06/13/97*

LOCATION: *Burlington, Vermont*

SURFACE ELEVATION: *NA*

DRILLING METHOD: *Acker AD-II w/ 4 1/4" ID HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
6/13/97		Dry	25'	End Boring

DRILLING COMPANY: *Green Mountain Boring*

FOREMAN: *Ron Garneau*

LOGGED BY: *M. Heil* CHECKED BY: *V. Kokosa*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION
								Asphalt
	S-1 0.5-2.5'	7-11 11-10	24/19	ND			FILL	S-1: Medium dense, brown, fine to medium SAND, some Silt. Moist. FILL.
5	S-2 5-7'	2-1 1-3	24/16	ND				S-2: Very loose, brown, fine to medium SAND, some Silt, trace brick fragments. Moist. FILL. (possible cinder fragments)
10	S-3 10-10.8' S-3A 10.8-12'	2-1 7-11	24/20	ND			STRATIFIED SAND AND SILT	S-3: Loose, brown, fine to medium SAND, little Silt. Moist. S-3A: Loose, brown, fine SAND and SILT. Moist. (Stratified)
15	S-4 15-17'	4-4 5-8	24/21	ND				S-4: Stiff, Grey-brown, Clayey SILT. Wet.
20	S-5 20-22'	16-25 28-32	24/22	ND				S-5: Very dense, Grey-brown, fine SAND and Silt. Moist. (Stratified)
25	S-6 25-27'	9-12 13-12	24/22	ND				S-6: Medium dense, Grey-brown, fine SAND and Silt. Moist. (Stratified)
30								Bottom of Boring at 27'.
35								

REMARKS

Notes:

1) Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model MP-1000 Microtip Photoionization Detector (PID) with a 10.6 eV lamp calibrated to an isobutylene standard. Typical detection limit is 1 ppm. "ND" is not detected.

2) Boring backfilled with formation material to approximately 9.5' and backfilled to ground surface with cement bentonite grout.

3) No groundwater encountered.

Sanborn, Head & Associates, Inc.

Log of Boring SH-5

PROJECT NO.: *1304.2*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *06/13/97* DATE FINISHED: *06/13/97*

LOCATION: *Burlington, Vermont*

SURFACE ELEVATION: *Approximately 204.0 +/-*

DRILLING METHOD: *Acker AD-II w/ 4 1/4" ID HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
6/13/97		Dry	45'	End Boring

DRILLING COMPANY: *Green Mountain Boring*

FOREMAN: *Ron Garneau*

LOGGED BY: *M. Heil* CHECKED BY: *V. Kokosa*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-1 0-0.5'	4-5 9-5	24/20	ND			TOPSOIL FILL	S-1: Medium dense, brown, fine to medium SAND and Silt, little roots. Dry. TOPSOIL.	Notes: 1) Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model MP-1000 Microtip Photoionization Detector (PID) with a 10.6 eV lamp calibrated to an isobutylene standard. Typical detection limit is 1 ppm. "ND" is not detected.
	S-1A 0.5-1.0' S-1B 1-2'							S-1A: dark brown, fine to coarse SAND, little Gravel, little Silt, trace brick fragments. Moist. FILL.	
								S-1B: Medium dense, orange-brown, fine to medium SAND, trace Silt. Moist.	
5	S-2 5-5.8'	9-11 12-13	24/16	ND				S-2: Medium dense, orange-brown, fine to coarse SAND, some Gravel, trace Silt. Moist.	
	S-2A 5.8-7'							S-2A: Medium dense, brown, fine SAND and Silt. Moist.	
10	S-3 10-12'	7-10 9-9	24/20	ND				S-3: Medium dense, same as S-2A.	2) Boring backfilled with formation material to approximately 10.0' and backfilled to ground surface with cement bentonite grout. 3) No groundwater encountered.
15	S-4 15-17'	5-5 7-7	24/21	ND			STRATIFIED SAND AND SILT	S-4: Stiff, grey-brown, SILT, and fine Sand. Moist. (Stratified).	
20	S-5 20-22'	3-3 7-7	24/19	ND				S-5: Loose, grey-brown, fine SAND, and Silt. Moist. (Stratified).	
25	S-6 25-27'	4-5 5-9	24/17	ND				S-6: Stiff, grey-brown, Clayey SILT. Wet. (Varved with several fine SAND seams).	
30	S-7 30-32'	9-9 10-11	24/20	ND				S-7: Medium dense, grey, fine SAND, and Silt. Moist. (Stratified).	
35									

Sanborn, Head & Associates, Inc.

Log of Boring SH-5

PROJECT NO.: *1304.2*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *06/13/97* DATE FINISHED: *06/13/97*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-8 35-37'	5-5 7-5	24/22	ND				S-8: Stiff. Same as S-6.	
40	S-9 40-42'	6-11 11-12	24/21	ND			STRATIFIED SAND AND SILT	S-9: Medium dense, grey, fine SAND, little Silt. Moist. (Stratified).	
45	S-10 45-47'	7-12 15-15	24/20	ND				S-10: Medium dense, same as S-9.	
								Bottom of Boring at 47'.	
50									
55									
60									
65									
70									
75									

Sanborn, Head & Associates, Inc.

Log of Boring SH-6

PROJECT NO.: *1304.1*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *8/11/97* DATE FINISHED: *8/11/97*

LOCATION: *Burlington Vermont*

SURFACE ELEVATION: *Approximately 188.3 +/-*

DRILLING METHOD: *Mobile B-53 W/4-1/4" I.D. HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
8/11/97		Dry	35'	End Boring

DRILLING COMPANY: *Capital Environmental Drilling*

FOREMAN: *Jay Stevens*

LOGGED BY: *M. Heil* CHECKED BY: *V. Kokosa*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-1 0-2'	3-3 6-7	24/20	-			FILL	S-1: Loose, brown, fine SAND, and Silt, trace Roots. Dry. FILL.	NOTES: 1) "-" indicates that soil samples were not screened for volatile organic compounds (VOCs) with PID. 2) Boring backfilled with formation material to approximately 5'. Cement/bentonite grout placed in remaining 5'. 3) No groundwater encountered.
5	S-2 5-7'	4-5 8-8	24/15	-				S-2: Medium dense, gray-brown, fine to medium SAND, little Silt. Dry.	
10	S-3 10-12'	5-7 7-8	24/15	-				S-3: Medium dense, gray-brown, fine to coarse SAND, some Silt, trace coarse Sand. Moist.	
15	S-4 15-17'	5-6 7-6	24/10	-			STRATIFIED SAND AND SILT	S-4: Medium dense, gray-brown, fine SAND, some Silt. Moist. (Stratified with 2" seam Wet, brown, Silt at 16.8').	
20	S-5 20-22'	5-5 5-5	24/24	-				S-5: Loose, gray-brown, SILT, some fine Sand. Wet. (Stratified).	
25	S-6 25-27'	5-7 7-10	24/20	-				S-6: Stiff, brown, SILT, some fine Sand. Wet. (Stratified).	
30	S-7 30-31' S-7A 31-32'	12-10 11-14	24/20	-				S-7: Medium dense, gray-brown, fine SAND, and Silt. Moist. (Stratified). S-7A: Very Stiff, brown, Clayey SILT. Wet.	
35									

Sanborn, Head & Associates, Inc.

Log of Boring SH-6

PROJECT NO.: *1304.1*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *8/11/97* DATE FINISHED: *8/11/97*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-8 35-37'	5-10 11-14	24/16	-			STRATIFIED SAND AND SILT	S-8: Medium dense, gray-brown, fine SAND, and Silt. Moist. (Stratified).	
								Bottom of boring at 37.'	
40									
45									
50									
55									
60									
65									
70									
75									

Sanborn, Head & Associates, Inc.

Log of Boring SH-7

PROJECT NO.: *1304.1*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *8/11/97* DATE FINISHED: *8/11/97*

LOCATION: *Burlington Vermont*

SURFACE ELEVATION: *Approximately 200.0 +/-*

DRILLING METHOD: *Mobile B-53 W/4-1/4" I.D. HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
8/11/97		Dry	30'	End Boring

DRILLING COMPANY: *Capital Environmental Drilling*

FOREMAN: *Jay Stevens*

LOGGED BY: *M. Heil* CHECKED BY: *V. Kokosa*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-1 0-2'	5-5 7-12	24/18	-			FILL	S-1: Medium dense, brown, fine to coarse SAND, some Silt, trace Roots. Dry. FILL.	NOTES: 1) "-" indicates that soil samples were not screened for volatile organic compounds (VOCs) with PID. 2) Boring backfilled with formation material to approximately 10'. Cement/bentonite grout placed in remaining 10'. 3) No groundwater encountered.
5	S-2 5-7'	14-15 13-13	24/17	-				S-2: Medium dense, gray-brown, fine SAND, and Silt. Moist. (Stratified).	
10	S-3 10-12'	3-4 4-4	24/15	-				S-3: Medium stiff, brown, SILT & CLAY. Wet.	
15	S-4 15-17'	11-16 13-18	24/16	-			STRATIFIED SAND AND SILT	S-4: Medium dense, gray, fine to coarse SAND, little Silt. Wet.	
20	S-5 20-22'	6-8 7-8	24/16	-				S-5: Stiff, brown, SILT, some fine Sand. Wet. (Stratified).	
25	S-6 25-27'	4-3 7-9	24/15	-				S-6: Same as S-5.	
30	S-7 30-32'	4-5 10-12	24/18	-				S-7: Stiff, brown, SILT & CLAY, and fine Sand. Wet. (Stratified).	
35								Bottom of Boring at 32'.	

Sanborn, Head & Associates, Inc.

Log of Boring SH-8

PROJECT NO.: *1304.1*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *8/11/97* DATE FINISHED: *8/12/97*

LOCATION: *Burlington Vermont*

SURFACE ELEVATION: *Approximately 180.1 +/-*

DRILLING METHOD: *Mobile B-53 W/4-1/4" I.D. HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
8/4/97		Dry	40'	End Boring

DRILLING COMPANY: *Capital Environmental Drilling*

FOREMAN: *Jay Stevens*

LOGGED BY: *M. Heil* CHECKED BY: *V. Kokosa*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-1 0-2'	10-8 9-12	24/12	-				S-1: Medium dense, brown, fine SAND, and Silt, little Gravel. Moist.	NOTES: 1) "-" indicates that soil samples were not screened for volatile organic compounds (VOCs) with PID. 2) Drilled to split spoon S-7 on 8-11-97. Continued to completion on 8-12-97. 3) Boring backfilled with formation material to approximately 10'. Cement/bentonite grout placed in remaining 10'. 4) No groundwater encountered.
5	S-2 5-7'	15-22 29-27	24/16	-				S-2: Very dense, same as S-1.	
10	S-3 10-12'	5-7 7-8	24/14	-				S-3: Medium dense, gray, fine to medium SAND, little Silt. Moist.	
15	S-4 15-17'	10-6 7-6	24/18	-			STRATIFIED SAND AND SILT	S-4: Medium dense, gray-brown, fine SAND, and Silt. Moist. (Stratified).	
20	S-5 20-22'	6-8 8-9	24/16	-				S-5: Medium dense, gray, fine SAND, some Silt. Moist.	
25	S-6 25-26.5'	6-6 11-16	24/14	-				S-6: Very stiff, brown, Silty CLAY. Wet. (Stratified).	
	S-6A 26.5-27'							S-6A: Medium dense, gray, fine to medium SAND, little Silt. Moist.	
30	S-7 30-32'	7-13 17-19	24/17	-				S-7: Very stiff, gray-brown, SILT & CLAY. Wet. (Stratified).	
35									

Sanborn, Head & Associates, Inc.

Log of Boring SH-8

PROJECT NO.: *1304.1*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *8/11/97* DATE FINISHED: *8/12/97*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-8 35-37'	11-16 16-13	24/16	-			STRATIFIED SAND AND SILT	S-8: Dense, brown, fine SAND, and Silt. Moist. (Stratified).	
40	S-9 40-42'	9-12 15-15	24/16	-				S-9: Very stiff, brown, SILT, and fine Sand, trace Gravel. Moist. (Stratified).	
								Bottom of Boring at 42'.	
45									
50									
55									
60									
65									
70									
75									

Sanborn, Head & Associates, Inc.

Log of Boring SH-9

PROJECT NO.: *1304.1*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *8/12/97* DATE FINISHED: *8/12/97*

LOCATION: *Burlington Vermont*

SURFACE ELEVATION: *Approximately 199.4 +/-*

DRILLING METHOD: *Mobile B-53 W/4-1/4" I.D. HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
8/12/97		Dry	50'	End Boring

DRILLING COMPANY: *Capital Environmental Drilling*

FOREMAN: *Jay Stevens*

LOGGED BY: *M. Heil* CHECKED BY: *V. Kokosa*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-1 0-2'	15-17 25-16	24/12	-				S-1: Medium dense, brown, fine to coarse SAND, some Gravel, some Silt. Moist.	NOTES: 1) "-" indicates that soil samples were not screened for volatile organic compounds (VOCs) with PID. 2) Boring backfilled with formation material to approximately 10'. Cement/bentonite grout placed in remaining 10'. 3) No groundwater encountered.
5	S-2 5-7'	5-7 10-14	24/22	-				S-2: Medium dense, gray, fine to medium SAND, little Silt. Dry.	
10	S-3 10-12'	8-11 11-9	24/17	-				S-3: Same as S-2.	
15	S-4 15-17'	8-11 14-14	24/19	-			STRATIFIED SAND AND SILT	S-4: Medium dense, gray, fine to medium SAND, little Silt, trace Gravel. Moist. (Stratified).	
20	S-5 20-22'	8-10 7-10	24/18	-				S-5: Medium dense, brown, fine SAND, and Silt. Moist. (Stratified).	
25	S-6 25-27'	7-11 12-11	24/22	-				S-6: Same as S-5.	
30	S-7 30-31.2' S-7A 31.2-32'	5-11 14-14	24/18	-				S-7: Very stiff, brown, SILT, and fine Sand. Moist. S-7A: Medium dense, brown, fine to medium SAND, some Silt. Moist.	
35									

Sanborn, Head & Associates, Inc.

Log of Boring SH-9

PROJECT NO.: *1304.1*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *8/12/97* DATE FINISHED: *8/12/97*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-8 35-37'	11-14 14-18	24/20	-				S-8: Medium dense, brown, fine SAND, some Silt. Moist. (Stratified).	
40	S-9 40-42'	8-11 17-15	24/17	-				S-9: Very stiff, brown, SILT, some fine Sand. Moist. (Stratified with 3" seam SILT & CLAY at ~40.3').	
							STRATIFIED SAND AND SILT		
45	S-10 45-47'	10-9 12-18	24/18	-				S-10: Medium dense, brown, fine SAND and Silt. Moist. (Stratified).	
50	S-11 50-52'	7-9 9-14	24/18	-				S-11: Very stiff, gray-brown, SILT & CLAY. Wet. (Stratified).	
								Bottom of Boring at 52'.	
55									
60									
65									
70									
75									

Sanborn, Head & Associates, Inc.

Log of Boring SH-10

PROJECT NO.: *1304.1*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *8/12/97* DATE FINISHED: *8/12/97*

LOCATION: *Burlington Vermont*

SURFACE ELEVATION: *Approximately 200.8 +/-*

DRILLING METHOD: *Mobile B-53 W/4-1/4" I.D. HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
8/12/97		Dry	30'	End Boring

DRILLING COMPANY: *Capital Environmental Drilling*

FOREMAN: *Jay Stevens*

LOGGED BY: *M. Heil* CHECKED BY: *V. Kokosa*

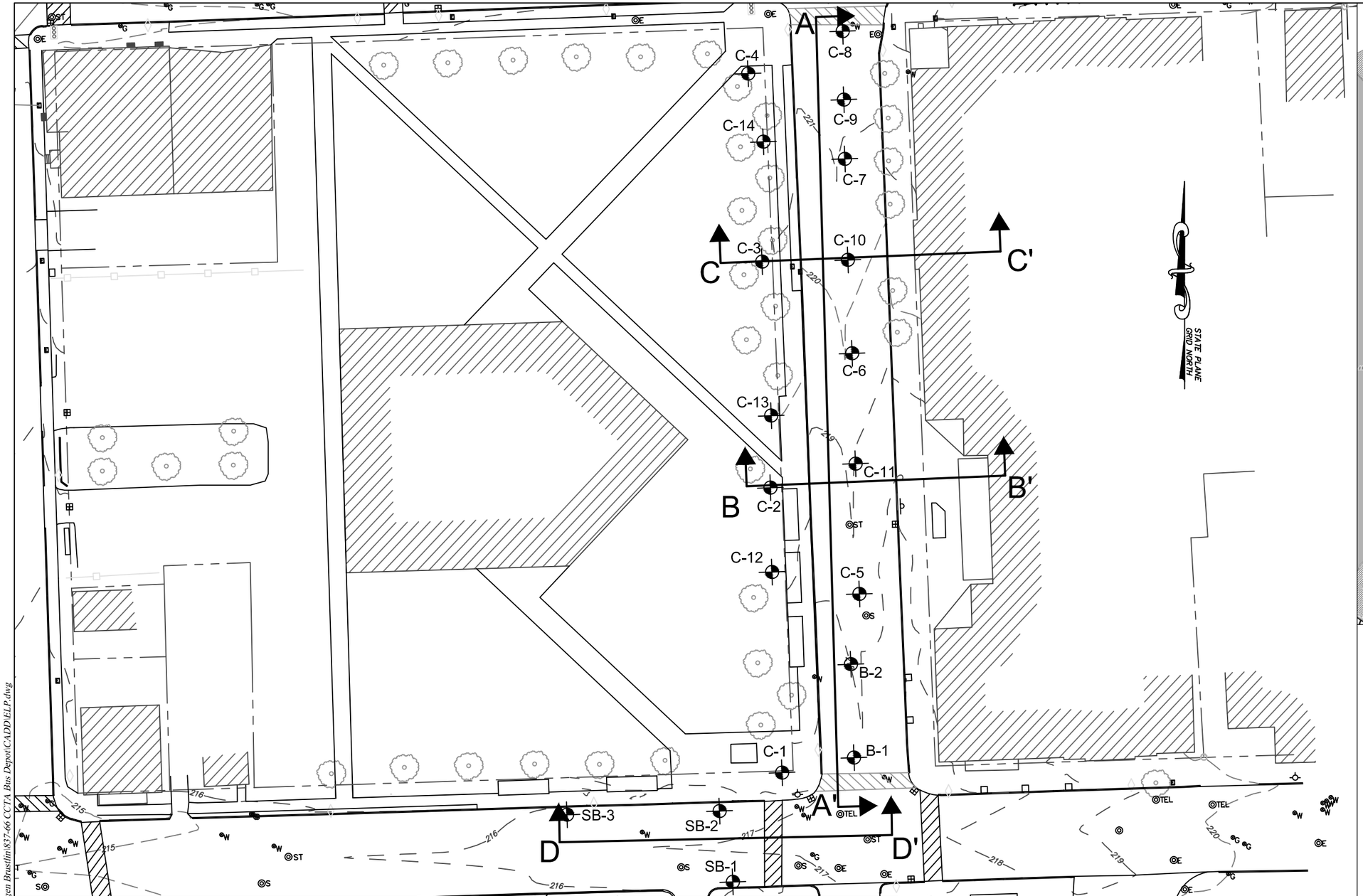
DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-1 0-0.5'	7-5 6-7	24/16	-			FILL	S-1: Medium dense, gray-brown, fine to coarse SAND, trace Gravel, trace Concrete Fragments. Dry.	NOTES:
	S-1A 0.5-2.0							S-1A: Medium dense, gray, fine SAND, some Silt. Dry.	1) "-" indicates that soil samples were not screened for volatile organic compounds (VOCs) with PID.
5	S-2 5-7'	10-10 9-9	24/20	-				S-2: Medium dense, gray-brown, fine SAND, some Silt. Dry. (Stratified).	2) Boring backfilled with formation material to approximately 10'. Cement/bentonite grout placed in remaining 10'.
									3) No groundwater encountered.
10	S-3 10-11.2'	5-7 7-7	24/17	-				S-3: Medium dense, brown, fine SAND, and Silt. Moist. (Stratified).	
	S-3A 11.2-12'							S-3A: Medium dense, gray, fine to medium SAND, little Silt. Moist. (Stratified).	
15	S-4 15-17'	7-6 9-8	24/18	-			STRATIFIED SAND AND SILT	S-4: Medium dense, gray, fine to coarse SAND, little Silt. Wet.	
20	S-5 20-22'	7-8 9-8	24/21	-				S-5: Stiff, brown, SILT, some fine Sand. Wet. (Stratified).	
25	S-6 25-27'	5-8 5-6	24/18	-				S-6: Same as S-5.	
30	S-7 30-32'	6-7 8-7	24/18	- -				S-7: Stiff, brown, SILT & CLAY and fine Sand. Wet. (Stratified).	
								Bottom of Boring at 32'.	
35									

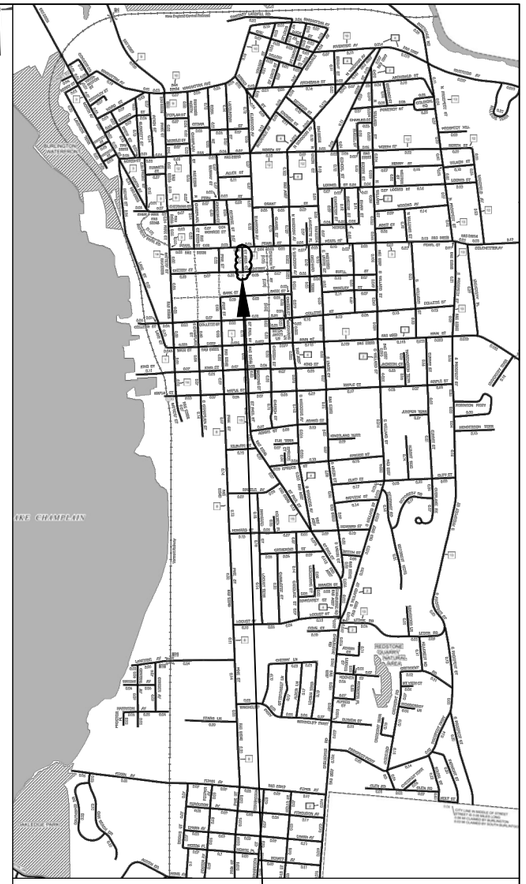
APPENDIX F – NEARBY BORING DATA FROM PREVIOUS GEODESIGN PROJECTS

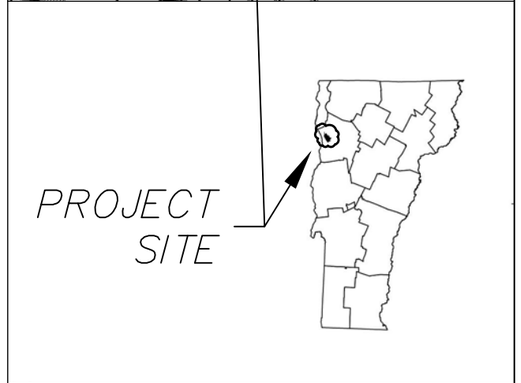
837-66 Downtown Transit Center

- Map of project area
- Exploration Location Plan
- Boring Logs
- CPT Logs


837-66 Downtown
Transit Center Project
Proposed
Project
Battery Park
Park St
N Champlain St
George St
Elmwood Ave
Clarke St
Pearl St
S Winooski Ave
S Union St
Lake St
Cathedral Church
of St. Paul
Burlington Paint
and Sip Studio
Cherry St
Hotel Vermont
Battery St
Hilton Burlington
Pine St
Church Street
Marketplace
City Market/
Onion River Co-op
Center St
College St
Skinny Pancake
New City Galerie
American Flatbread
City Hall Park







Notes:
1. Exploration Location Plan derived from an electronic site plan provided by VHB titled, "S01R02.dwg" provided via email on February 28, 2013.
2. All B-Series and C-Series explorations with the exception of C-1 and C- through C-7 were performed by Platform Drilling on February 1 and 1, 2013. C-1 and C- through C-7 were performed by ConeTec on February 1, 2013.
3. SB-Series soil borings were performed by Platform Drilling on February 23, 2013.
4. All explorations were observed and logged in the field by GeoDesign, Inc. personnel.
3. B-Series and C-Series exploration locations shown are surveyed locations provided by Summit Engineering, Inc.
4. SB-Series exploration locations shown were taped from existing features by GeoDesign, Inc. personnel in the field. SB-Series locations shown should be considered approximate.
 Exploration locations shown should be considered accurate only to the degree implied by the method of exploration location used.

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MIDDLEBURY, CT BURLINGTON, VT

DRAWN BY: JFW | REVIEWED BY: SPK

SITE & EXPLORATION LOCATION PLAN
CCTA TRANSIT CENTER
BURLINGTON, VT

FILE NO. 837-66

SCALE IN FEET
1" = 50'
0 25 50 100

DATE: 03/05/13

FIGURE NO. 1

O:\Client related\CL-800 to 899\837-Vanasse Hangen Brustlin\837-66 CCTA Bus Depot\CADD\ELP.dwg

GEODESIGN INCORPORATED
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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **B-1**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company: Platform Drilling
Foreman: Chris Aldrich
GeoDesign Rep.: Alan Baribault
Date Started: February 16, 2013 Date Finished: February 16, 2013
N. Coordinate: 722280.4 E. Coordinate: 1453984.7
Ground Surface Elevation (feet): 217.55
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	IR A-300 Truck	
Hammer Type:	Wireline Safety	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/16/13, 0:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System:)
													3" Asphalt 217.3		
													1.5 Pavement Base		
													Fill 216.05		
		S1	SS	24	15	2	12	8	8	9		1.3			S1) Medium dense, light brown fine to coarse SAND, trace Silt, trace (-) fine Gravel, moist.
													4		
5		S2	SS	24	17	4	7	13	16	16		1.2	Silty Sand 213.55 (With Silt Layers)		S2) Medium dense, tan fine SAND, some Silt (layer 4" at bottom fine SAND and SILT), moist.
		S3	SS	24	15	6	7	8	10	15		1.5			S3) Medium dense, tan SILT and fine SAND, moist.
		S4	SS	24	16	8	6	8	15	13		3.8			S4) Medium dense, light brown / olive brown fine SAND, some Silt (2" seam fine SAND, trace Silt at bottom), moist.
10		S5	SS	24	19	10	6	8	11	14		4.9			S5) Medium dense, light brown fine SAND, some Silt, moist. (some layers with trace Silt)
15		S6	SS	24	17	15	8	11	12	11		A: 3.6 B: 1.5			S6) Medium dense; S6A (upper 13"): light brown SILT and fine SAND, moist. S6B (lower 4"): light brown SILT, little fine Sand, very moist to wet.
20		S7	SS	24	19	20	7	13	20	22		2.1			S7) Dense, tan/grayish-tan with orange (1/2-inch band approximately 8" from bottom) fine to medium SAND, little Silt, moist.
25		S8	SS	24	18	25	8	12	12	14		1.7			S8) Medium dense, tan with orange bands (3) fine to medium SAND, little Silt (mostly in layers at top and bottom), moist.
													27		
													Bottom of Exploration at 27.0 ft 190.55		
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) Augered to 2 feet through pavement and base material, no sample.
3) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

GEODESIGN INCORPORATED
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So. Burlington, VT 05403
Phone: 802-652-5140

BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **B-2**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company: Platform Drilling
Foreman: Chris Aldrich
GeoDesign Rep.: Alan Baribault
Date Started: February 16, 2013 Date Finished: February 16, 2013
N. Coordinate: 722323.8 E. Coordinate: 1453983.2
Ground Surface Elevation (feet): 217.89
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	IR A-300 Truck	
Hammer Type:	Wireline Safety	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/16/13, 0:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System:)
													3" Asphalt 217.64		
													1.5 Pavement Base		
													Fill 216.39		
		S1	SS	24	17	2	15	13	13	14		0.2			S1) Medium dense, brown fine to medium SAND, little Silt, trace fine Gravel (some angular), moist.
5		S2	SS	24	13	4	8	7	7	10		0.3			S2) Medium dense, light brown to tan fine to coarse SAND, some fine to coarse Gravel, little (-) Silt, moist.
													6		
		S3	SS	24	19	6	10	14	16	18		0.2	Silty Sand 211.89 (possible Fill)		S3) Dense, tan fine SAND, some Silt (layers visible), moist.
		S4	SS	24	20	8	10	11	12	10		0.2			S4) Medium dense, tan fine to medium SAND, some Silt, trace Roots moist. [2 bands of f-c SAND and SILT, apparently layered, in middle].
10													10		
		S5	SS	24	18	10	7	7	7	8		0.2	Silty Sand 207.89 (With Silt Layers)		S5) Medium dense, light brown to tan SILT, some fine Sand, moist. At 4" and 9" from bottom, 2 bands of wet Silt.
15															
		S6	SS	24	17	15	20	21	20	21		0.1			S6) Dense, tan fine to medium SAND, little Silt, moist.
20															
		S7	SS	24	18	20	13	12	13	13		0.3			S7) Medium dense; S7A (upper 4"): grayish-tan fine to medium SAND, trace Silt, moist. S7B (lower 14"): tan fine SAND and SILT, moist.
25															
		S8	SS	24	19	25	12	9	10	9		0.9			S8) Medium dense, tan with orange staining (lower 1") fine SAND and SILT, moist (to wet, bottom 1").
													27		
													Bottom 190.89 of Exploration at 27.0 ft		
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) Augered to 2 feet through pavement and base material, no sample.
3) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **C-2**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company: Platform Drilling
Foreman: Chris Aldrich
GeoDesign Rep.: Alan Baribault
Date Started: February 15, 2013 Date Finished: February 15, 2013
N. Coordinate: 722405.7 E. Coordinate: 1453945.9
Ground Surface Elevation (feet): 219.85
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	IR A-300 Truck	
Hammer Type:	Wireline Safety	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/15/13, 14:20	21.0	198.9	Perched zone.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System:)
		S1	A	24	24	0						0.2	Topsoil Fill 219.35 (Gravelly Sand)		S1) Brown fine to coarse SAND, little (+) Silt, little fine Gravel, trace Roots, frozen.
		S2	SS	24	8	2	21	15	24	26		0.3	4		S2) Dense, light brown fine to coarse SAND, some (+) fine to coarse Gravel (angular), little Silt, moist.
5		S3	SS	24	19	4	6	7	11	12		0.2	Silty Sand 215.85 (Possible Fill)		S3) Medium dense, light brown fine to coarse SAND, trace Silt, moist.
		S4	SS	24	18	6	14	13	14	18		0.2	6 Silty Sand 213.85 (With Silt Layers)		S4) Medium dense, light brown fine to medium SAND, some Silt, moist. [top and bottom SAND, little (-) Silt, middle 6" fine SAND and SILT]
		S5	SS	24	24	8	11	24	25	25		0.6			S5) Dense, tan fine to medium SAND, some Silt, moist.
10		S6	SS	24	18	10	11	17	17	20		0.4			S6) Dense, tan fine to medium SAND, little (+) Silt, moist. [1" seam of SILT and fine SAND at top]
15		S7	SS	24	17	15	5	5	7	7		0.5			S7) Medium dense, fine SAND, some Silt (1/4" seam at 3" and 3/4" seam at 10-11" from bottom, moist to wet), moist.
20		S8	SS	24	17	20	4	3	5	10		0.3	22 Bottom 197.85 of Exploration at 22.0 ft	▼	S8) Loose, tan SILT, some fine Sand, trace (-) Clayey Silt, trace (-) fine Gravel, very moist to wet (layered, with 1-2" seams of fine SAND, moist).
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) Augered through approximately 18 inches of frozen ground (S1 is an auger sample).
3) Noted auger grinding from 1 to 4 feet.
4) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **C-3**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company: Platform Drilling
Foreman: Chris Aldrich
GeoDesign Rep.: Alan Baribault
Date Started: February 15, 2013 Date Finished: February 15, 2013
N. Coordinate: 722510.5 E. Coordinate: 1453942
Ground Surface Elevation (feet): 220.82
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	IR A-300 Truck	
Hammer Type:	Wireline Safety	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/15/13, 9:00	16.0	204.8	Perched zone.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System:)
		S1	SS	24	24	0	26	43	41	15		A: 0.2 B:0.1	Topsoil Fill (Sand) 220.32		S1) Very dense (frozen); S1A(upper 6"): brown fine to coarse SAND and SILT, trace fine Gravel, trace (+) Roots, frozen. S1B (lower 18"): light brown to tan fine to coarse SAND, little (-) Silt, trace (-) fine Gravel, trace Roots, partially frozen.
		S2	SS	24	18	2	7	7	7	7		0.3			
5		S3	SS	24	14	4	3	4	4	7		0.2			S2) Medium dense, light brown to tan coarse SAND, trace (-) Silt, moist.
													6		
		S4	SS	24	15	6	6	10	10	8		0.3	Silty Sand 214.82 (Possible Fill)		S3) Loose, light brown fine to medium SAND, little Silt, moist.
		S5	SS	24	19	8	6	7	8	13		A: 0.2 B;0.4			S4) Medium dense, light brown fine to medium SAND, trace fine Gravel (in 1-inch layer at top 1-2 inches), trace Silt, moist.
10													10		
		S6	SS	24	17	10	8	14	18	18		0.2	Silty Sand 210.82 (With Silt Layers)		S5) Medium dense; S5A (0-8, 13-19" from bottom): light brown fine to medium SAND, little Silt, moist. S5B (8-13" from bottom): light brown SILT and fine SAND, moist.
15															S6) Dense, gray fine SAND, little Silt, moist.
		S7	SS	24	13	15	4	4	6	13		0.2		▼	S7) Medium dense, gray fine to medium SAND and SILT (two, 2-inch seams of SILT and fine SAND, very moist to wet), moist.
20															
		S8	SS	24	18	20	6	7	5	11		0.2			S8) Medium dense, gray/tan fine to medium SAND, little Silt, moist.
													22		
													Bottom of Exploration at 22.0 ft 198.82		
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) Upper 18" frozen.
3) Sample S2 SPT N-values not per ASTM D-1586 (hole not cleaned out prior to sampling).
4) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **C-4**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company: Platform Drilling
Foreman: Chris Aldrich
GeoDesign Rep.: Alan Baribault
Date Started: February 15, 2013 Date Finished: February 15, 2013
N. Coordinate: 722597.8 E. Coordinate: 1453935.5
Ground Surface Elevation (feet): 222.12
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	IR A-300 Truck	
Hammer Type:	Wireline Safety	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/15/13, 10:40	11.0	211.1	Perched zone.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description: Depth & Elevation(feet)	Symbol	Sample Description: Classification System:
		S1	SS	24	24	0	32	63	91	56		A: 0.2 B: 0.3	0.9 Topsoil Fill 221.22		S1) Very dense (Frozen); S1A (upper 11"): dark brown SILT and fine to coarse SAND, trace fine Gravel, trace Roots, frozen. S1B (lower 13"): light brown fine to coarse SAND, little Silt, little (+) Brick Fragments (at about 18" from top), moist.
		S2	SS	24	19	2	26	11	6	14		0.2			
5		S3	SS	24	3	4	17	19	49	14		0.3	6		
		S4	SS	24	18	6	8	9	9	13		0.2	Silty Sand 216.12 (With Silt Layers)		S2) Medium dense, brown / light brown fine to coarse SAND, little Silt, trace fine to coarse Gravel (1 angular pc at 3" up from bottom), moist.
		S5	SS	24	20	8	10	12	14	15		0.2			S3) Very dense, brown and purple/red, fine to coarse SAND and fine to coarse GRAVEL (angular, purple), little (+) Silt, trace Roots, moist.
10		S6	SS	24	18	10	8	12	9	13		0.2		▼	S4) Medium dense, light brown, brown, tan, and orange mottling SILT and fine SAND, trace (-) fine Gravel, trace (-) Roots, moist.
															S5) Medium dense, light brown with orange mottling/layering (bottom 6" tan) fine SAND and SILT (layering observed), moist. Bottom 6" fine SAND, little Silt (not a separate sample).
15		S7	SS	24	20	15	6	7	9	13		0.2			S6) Medium dense, light brown / tan fine SAND, some Silt (two seams of fine SAND and SILT at 4-6" and 11-12" up from bottom, wet/very moist), moist.
															S7) Medium dense, light brown to tan fine SAND, some Silt, moist.
20		S8	SS	24	20	20	8	12	14	14		0.2			S8) Medium dense, tan fine to coarse SAND, trace fine Gravel, trace (-) Silt, moist.
													22		
													Bottom 200.12 of Exploration at 22.0 ft		
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) Upper 30" frozen.
3) Sample S2 SPT N-values not per ASTM D-1586 (hole not cleaned out prior to sampling).
4) Encountered possible old foundation from 4.5 to 5.5 feet; auger chattering and brick / cobblestones came out on auger flights.
5) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **C-8**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company:	Platform Drilling		
Foreman:	Chris Aldrich		
GeoDesign Rep.:	Alan Baribault		
Date Started:	February 16, 2013	Date Finished:	February 16, 2013
N. Coordinate:	722617.4	E. Coordinate:	1453979.4
Ground Surface Elevation (feet):	221.64		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	IR A-300 Truck	
Hammer Type:	Wireline Safety	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/16/13, 0:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System:)
													Asphalt 221.39		
													1.5 Pavement Base		
		S1	SS	24	15	2	12	14	13	14		0.3	Fill 220.14 (sand)		S1) Medium dense, brown fine to medium SAND, trace Silt, trace (-) fine Gravel (in top, possibly slough), moist.
5		S2	SS	24	16	4	6	13	13	12		0.3			S2) Medium dense, light brown fine to coarse SAND, trace Silt, moist.
		S3	SS	24	16	6	5	10	14	17		0.2			S3) Medium dense, light brown fine to coarse SAND (sorted, in 1-3" layers), some Silt, moist.
													8		
		S4	SS	24	17	8	7	12	12	14		0.2	Silty Sand 213.64 (With Silt Layers)		S4) Medium dense, light brown / olive brown fine SAND and SILT (layered), moist.
10		S5	SS	24	17	10	7	14	12	12		0.2			S5) Medium dense, tan / light gray fine to medium SAND, little Silt, slightly moist.
15		S6	SS	24	20	15	7	7	5	6		0.3			S6) Medium dense; S6A (upper 11"): tan fine to coarse SAND, little (-) fine Gravel, trace Silt, slightly moist. S6B (lower 9"): olive brown fine SAND, some Silt, very moist.
20		S7	SS	24	18	20	5	10	10	11		0.2			S7) Medium dense, light brown to tan fine to medium SAND, little Silt, moist.
													22		
													Bottom 199.64 of Exploration at 22.0 ft		
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) Augered to 2 feet through pavement and base material, no sample.
3) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **C-9**
Page No.: 1 of 1
File No.: 837-66
Checked By: AJB

Boring Company:	Platform Drilling		
Foreman:	Mike Jordan		
GeoDesign Rep.:	Jacob Wimett		
Date Started:	February 16, 2013	Date Finished:	February 16, 2013
N. Coordinate:	722585.7	E. Coordinate:	1453980
Ground Surface Elevation (feet):	221.21		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	None	Geo
I.D.:	N/A in.	1.5 in.
Hammer Wt.:	N/A	-
Hammer Fall:	N/A	-
Rig Type:	Geoprobe 7822DT	
Hammer Type:	Pneumatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/16/13, 0:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System:)
		S1	D	54	48	0.5						0.3	Asphalt 220.91		
													Fill		S1) S1A (0.5' to 1.5'): Dark brown fine to coarse SAND and fine to coarse GRAVEL, little (-) Silt, dry. S1B (1.5' to 5'): Tan / brown fine to coarse SAND, trace Silt, slightly moist.
5															
		S2	D	60	60	5						A: 0.3 B: 0.2 C: 0.3	7.3		S2) S2A (upper 27"): Tan fine to coarse SAND, trace Silt, trace (-) fine Gravel, slightly moist. S2B (middle 22"): Tan / olive fine to medium SAND, some (+) Silt, layered, slightly moist. S2C (lower 11"): Tan fine SAND, trace Silt, slightly moist.
													Silty Sand 213.91 (With Silt Layers)		
10													10		
													Bottom 211.21 of Exploration at 10.0 ft		
15															
20															
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) Augered through asphalt and to 6" deep prior to sampling.
3) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

GEODESIGN INCORPORATED
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1233 Shelburne Rd., Suite 360
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Phone: 802-652-5140

BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **C-10**
Page No.: 1 of 1
File No.: 837-66
Checked By: AJB

Boring Company:	Platform Drilling		
Foreman:	Mike Jordan		
GeoDesign Rep.:	Jacob Wimett		
Date Started:	February 16, 2013	Date Finished:	February 16, 2013
N. Coordinate:	722511.3	E. Coordinate:	1453981.8
Ground Surface Elevation (feet):	220.31		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	None	Geo
I.D.:	N/A in.	1.5 in.
Hammer Wt.:	N/A	-
Hammer Fall:	N/A	-
Rig Type:	Geoprobe 7822DT	
Hammer Type:	Pneumatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/16/13, 0:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System:)
		S1	D	54	48	0.5						0.7	Asphalt Fill (sand) 220.01		S1) Brown with occasional black and tan fine to coarse SAND, trace (+)Silt, trace (-) fine Gravel, slightly moist.
5													5		
		S2	D	60	54	5						A: 0.4 B: 0.6	Silty Sand 215.31 (Possible Fill)		S2) S2A (upper 36"): Tan fine to coarse SAND, little (-) fine Gravel, trace Silt, slightly moist. S2B (lower 18"): Tan to light brown fine to medium SAND, some (+) Silt (in 2 layers), slightly moist.
													8		
													Silty Sand 212.31 (With Silt Layers)		
10													10		
													Bottom 210.31 of Exploration at 10.0 ft		
15															
20															
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) Augered through asphalt and to 6" deep prior to sampling.
3) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **C-11**
Page No.: 1 of 1
File No.: 837-66
Checked By: AJB

Boring Company:	Platform Drilling		
Foreman:	Mike Jordan		
GeoDesign Rep.:	Jacob Wimett		
Date Started:	February 16, 2013	Date Finished:	February 16, 2013
N. Coordinate:	722416.8	E. Coordinate:	1453985.4
Ground Surface Elevation (feet):	218.86		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	None	Geo
I.D.:	N/A in.	1.5 in.
Hammer Wt.:	N/A	-
Hammer Fall:	N/A	-
Rig Type:	Geoprobe 7822DT	
Hammer Type:	Pneumatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/16/13, 0:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System:)
		S1	D	54	42	0.5						A: 0.7 B: 0.2	Asphalt Fill (sand) 218.56		S1) S1A (upper 16"): Brown to black fine to coarse SAND and fine to coarse GRAVEL, Trace (+) Silt, trace coal slag, dry. S1B (lower 26"): Brown fine to medium SAND, little (-) fine to coarse Gravel, trace Silt, trace coal slag, dry.
5													5		
		S2	D	60	46	5						A: 0.3 B: 0.4	Silty Sand 213.86 (Possible Fill)		S2) S2A (upper 27"): Tan fine to medium SAND, trace Silt, dry. S2B (lower 19"): Tan with brown layering fine to medium SAND, trace Silt, slightly moist.
													7.3 Silty Sand 211.56 (With Silt Layers)		
10															
		S3	D	60	48	10						A: 0.5 B: 0.3			S3) S3A (upper 27"): Tan fine to medium SAND, trace Silt, slightly moist. S3B (lower 21"): Tan / olive brown fine to medium SAND, little Silt (layered), moist.
15													15 Bottom 203.86 of Exploration at 15.0 ft		
20															
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) Augered through asphalt and to 6" deep prior to sampling.
3) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **C-12**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company:	Platform Drilling		
Foreman:	Chris Aldrich		
GeoDesign Rep.:	Alan Baribault		
Date Started:	February 15, 2013	Date Finished:	February 15, 2013
N. Coordinate:	722366.5	E. Coordinate:	1453946.6
Ground Surface Elevation (feet):	219.16		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	IR A-300 Truck	
Hammer Type:	Wireline Safety	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/15/13, 0:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System:)
		S1	A	24	24	0.5						0.3	Topsoil		
													Fill (Sand) 218.66		S1) Fine to coarse SAND, little Silt, moist.
		S2	A	30	30	2.5						0.3			S2) Fine to medium SAND, little Silt, trace (-) Brick Fragments (at 4 feet), moist.
													4		
5													Silty Sand 215.16 (Possible Fill)		
		S3	SS	24	16	5	9	12	13	15		0.2			S3) Medium dense, Light brown fine to coarse SAND, little (-) Silt, trace (-) fine Gravel, moist.
													7		
		S4	A	36	36	7						0.3	Silty Sand 212.16 (With Silt Layers)		S4) Brown fine SAND, little Silt, moist.
10													10		
													Bottom 209.16 of Exploration at 10.0 ft		
15															
20															
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **C-13**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company: Platform Drilling
Foreman: Chris Aldrich
GeoDesign Rep.: Alan Baribault
Date Started: February 15, 2013 Date Finished: February 15, 2013
N. Coordinate: 722439.1 E. Coordinate: 1453946.3
Ground Surface Elevation (feet): 220.03
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	IR A-300 Truck	
Hammer Type:	Wireline Safety	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/15/13, 0:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System:)
		S1	A	24	24	0.5						0.4	Topsoil		
													Fill (sand) 219.53		S1) Light brown fine to medium SAND, some Silt, trace Roots, moist.
		S2	A	30	30	2.5						0.3			S2) Brown fine to medium SAND, little Silt, moist.
5													5		
		S3	SS	24	16	5	7	12	11	14		0	Silty Sand (Possible Fill) 215.03		S3) Medium dense, light brown fine to coarse SAND, trace Silt, trace Roots, moist.
													7		
													Bottom of Exploration at 7.0 ft 213.03		
10															
15															
20															
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **C-14**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company:	Platform Drilling		
Foreman:	Chris Aldrich		
GeoDesign Rep.:	Alan Baribault		
Date Started:	February 15, 2013	Date Finished:	February 15, 2013
N. Coordinate:	722566.1	E. Coordinate:	1453942.6
Ground Surface Elevation (feet):	221.6		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	IR A-300 Truck	
Hammer Type:	Wireline Safety	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/15/13, 0:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System:)
		S1	A	24	24	0.5						0.1	Topsoil		
													Fill (sand) 221.1		S1) Light brown fine to medium SAND, some Silt, moist.
		S2	A	30	30	2.5						0.1			S2) Brown fine to coarse SAND, little Silt, trace fine Gravel, trace Brick Fragments, trace Roots, moist.
5													4.5		
		S3	SS	24	14	5	6	7	6	9		0	Silty Sand (Possible Fill) 217.1		S3) Medium dense, light brown fine to coarse SAND, little Silt, trace Roots, moist.
													7		
													Bottom of Exploration at 7.0 ft 214.6		
10															
15															
20															
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are as surveyed by Summit Engineering, Inc. and provided by VHB via an electronic site plan.
2) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **SB-1**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company: Platform Drilling
Foreman: Chris Aldrich
GeoDesign Rep.: Alan Baribault
Date Started: February 23, 2013 Date Finished: February 23, 2013
N. Coordinate: 722223 E. Coordinate: 1453928
Ground Surface Elevation (feet): 217
Station: Offset: ft

	Casing:	Sampler:
Type:	None	Geo
I.D.:	N/A in.	1.5 in.
Hammer Wt.:	N/A	-
Hammer Fall:	N/A	-
Rig Type:	Geoprobe 7822DT	
Hammer Type:	Pneumatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/23/13, 8:05	8.5	208.5	Perched zone.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description
		S1	D	60	50	0						A = 0.4 B=0.1 C=0.1	Asphalt 216.7 1.5 Pavement Base Fill 215.5 3 (Gravelly Sand) Silty Sand 214 (With Silt Layers)		S1) S1A (upper 4-18") gray and black fine to coarse GRAVEL and fine to coarse SAND, trace Silt, dry (milled asphalt and pavement base). S1B (middle 18-36") brown fine to coarse SAND, some fine to coarse Gravel, trace Silt, moist. S1C (lower 36-50") light brown to tan fine to medium SAND, little Silt, moist.
5		S2	D	60	51	5						A=0.0 B=0.1 C=0.1			S2) S2A (upper 25") light brown fine to medium SAND, some Silt (layered), moist. S2B (middle 25-36") SILT, some fine Sand, wet. S2C (lower 26-51") 8" layer fine to medium SAND, trace Silt, slightly moist; over fine SAND, some (+) Silt, moist.
10		S3	D	60	52	10						A=0.1 B=0.2			S3) Layered fine to coarse SAND (alternating layers of fine to coarse Sand and just fine Sand), some Silt: S3A (Sandy composite, 7-18" and 28-40") fine to coarse SAND, trace Silt, slightly moist. S4B (Silty composite, 0-7", 18-28", and 40-52") fine SAND and SILT, moist.
15													15 Bottom 202 of Exploration at 15.0 ft		
20															
25															
30															

Remarks

1) Located on south side of Cherry st, 50.5' across road to hydrant, 19' to NE corner of shelter. Northing, easting, and ground surface elevation shown are estimated from an electronic site plan provided by VHB.
2) Wet layer observed at 35-36" from top of sample S2, estimated between 8 and 8.5 feet below grade.
3) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes: 1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual

Boring No.: **SB-1**

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **SB-2**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company: Platform Drilling
Foreman: Chris Aldrich
GeoDesign Rep.: Alan Baribault
Date Started: February 23, 2013 Date Finished: February 23, 2013
N. Coordinate: 722256 E. Coordinate: 1453922
Ground Surface Elevation (feet): 217
Station: Offset: ft

	Casing:	Sampler:
Type:	None	Geo
I.D.:	N/A in.	1.5 in.
Hammer Wt.:	N/A	-
Hammer Fall:	N/A	-
Rig Type:	Geoprobe 7822DT	
Hammer Type:	Pneumatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/23/13, 8:30	8.0	209.0	4" thick perched zone.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System:)
		S1	D	60	41	0						A=0.1 B=0.1	Asphalt 216.5		S1)
													1.5 Pavement Base		S1A (6-18") gray to brown fine to coarse SAND and fine to coarse GRAVEL, trace Silt, moist.
													Silty Sand 215.5 (With Silt Layers)		S1B (18-41") light brown fine to medium SAND, little Silt (layered), moist.
5															
		S2	D	60	47	5						A=0.1 B=0.1 C=0.3			S2)
															S2A (upper 34") tan fine to medium SAND, some Silt (layered), moist except wet 30-34".
														▼	S2B (34-36") tan SILT, little fine Sand, wet.
															S2C (36-47") tan fine to medium SAND, trace Silt, moist.
10															
		S3	D	60	53	10						A=0.2 B=0.1			S3) Layered fine to coarse SAND (Alternating between fine to coarse Sand and just fine Sand), some Silt:
															S3A (Sandy composite, 3-12", 16-45", 45-53") light brown fine SAND, little Silt, slightly moist.
15															S3B (Silty composite, 0-3", 12-16", 45-49") light brown fine SAND and SILT, moist.
		S3	D	60	52	15						A=1.2 B=0.1			S4) Layered fine to medium SAND (Alternating layers of fine to medium Sand and just fine Sand), some Silt:
															S4A (Sandy composite, 0-31" and portions of 34 to 52") tan fine SAND, little Silt, slightly moist.
20													20		S4B (Silty composite, 31-34" and portions of 34 to 52") light brown to olive brown layered SILT and Clayey Silt (up to 1/2-inch layers), interbedded with S4A, moist.
													Bottom of Exploration at 20.0 ft 197		
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are estimated from an electronic site plan provided by VHB.
2) Wet layer observed at 30-34" from top of sample S2, estimated between 7.5 and 8.5 feet below grade.
3) Penetration rate slowed significantly between 12 to 12.5 feet, through assumed denser soil.
4) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes:
1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

GEODESIGN INCORPORATED
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BORING LOG

Project Name

CCTA Transit Center
St Paul Street
Burlington, VT

Boring No.: **SB-3**
Page No.: 1 of 1
File No.: 837-66
Checked By: JFW

Boring Company: Platform Drilling
Foreman: Chris Aldrich
GeoDesign Rep.: Alan Baribault
Date Started: February 23, 2013 Date Finished: February 23, 2013
N. Coordinate: 722254 E. Coordinate: 1453852
Ground Surface Elevation (feet): 216
Station: Offset: ft

	Casing:	Sampler:
Type:	None	Geo
I.D.:	N/A in.	1.5 in.
Hammer Wt.:	N/A	-
Hammer Fall:	N/A	-
Rig Type:	Geoprobe 7822DT	
Hammer Type:	Pneumatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 2/23/13, 9:00	6.5	209.5	23" thick perched zone.
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System:)
		S1	D	60	57	0						A=2.3 B=3.5 C=4.0	Asphalt		S1)
													Road Base 215.5		S1A (9-24") light brown fine to coarse SAND and fine to coarse GRAVEL, little (-) Silt, slightly moist.
													2		S1B (24-50") light brown fine to medium SAND, little Silt, moist.
													Silty Sand 214 (With Silt Layers)		S1C (50-57") light brown SILT and fine SAND, very moist to wet.
5															
		S2	D	60	44	5						A=3.0 B=4.4 C=4.6			S2)
														▼	S2A (upper 14") light brown fine SAND and SILT, moist.
															S2B (14-37") light brown fine SAND and SILT, wet.
10															S2C (37-44") light brown to tan fine to coarse SAND, trace (-) Silt, slightly moist.
		S3	D	60	48	10						A=4.5 B=5.1			S3)
															S3A (top 33") gray to tan fine to medium SAND, trace Silt, slightly moist.
															S3B (33 to 48") gray to tan fine SAND, some Silt, slightly moist.
15															
		S3	D	60	54	15						A=5.5 B=4.0			S4)
															S4A (Sandy composite, 0-25", 34-35", 39-43", 46-54") tan to gray fine to coarse SAND, little Silt, slightly moist.
															S4B (Silty composite, 25-34", 35-39", 43-46") tan to olive brown SILT, some fine Sand, very moist.
20													20		
													Bottom of Exploration at 20.0 ft 196		
25															
30															

Remarks

1) Northing, easting, and ground surface elevation shown are estimated from an electronic site plan provided by VHB.
2) Attempted 6-inch penetration but encountered possible cobblestone (Monkton Quartzite) just below pavement. Offset 6 inches east and completed to 20 feet without further obstruction.
3) Wet layer observed at 14-37" from top of sample S2, estimated between 6.5 and 8.5 feet below grade.
4) All samples screened in the field using an Ion Science Phocheck Model 1000 PID calibrated onsite to a 100 ppm isobutylene standard.

Notes:
1) Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. N.D. = None Detected; N. R. = Not Recorded; N.A. = Not Applicable; O.R. = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A = Auger; C = Core; D = Driven; G = Grab; PS = Piston Sample; SS = Split Barrel (Split Spoon); ST = Shelby Tube; Geo = Geoprobe; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual

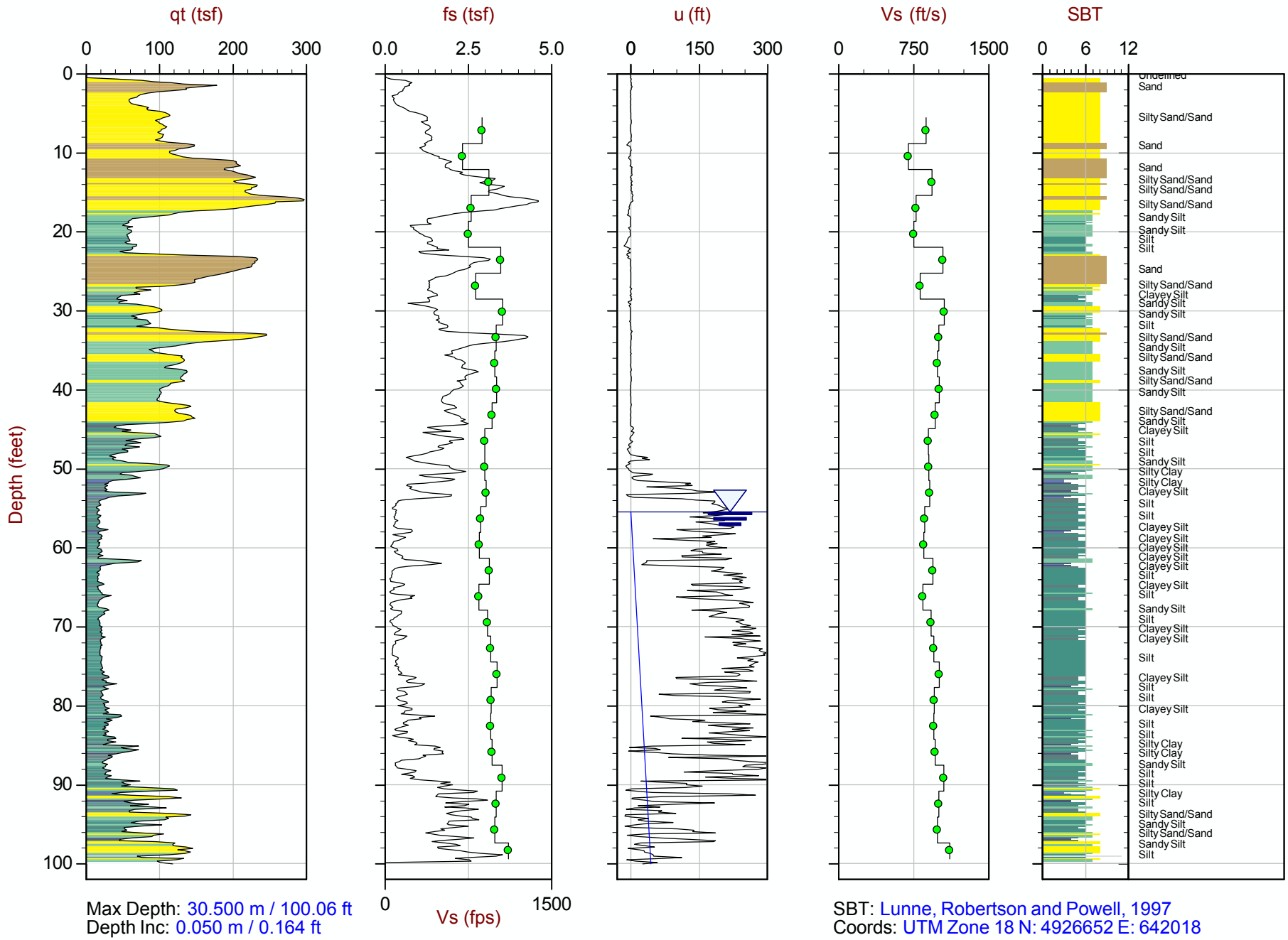
VT BORING LOG PID 5/21/04 837-66 CCTA TRANSIT CENTER PID.GPJ GEODESIGN PIDAFTER7-12-04.GDT 4/29/13

CONETEC

GeoDesign

Job No: 13-53012
Date: 02:16:13 08:12
Site: Burlington, VT

Sounding: SCPT-C-01
Cone: 02:T1500F15U500S



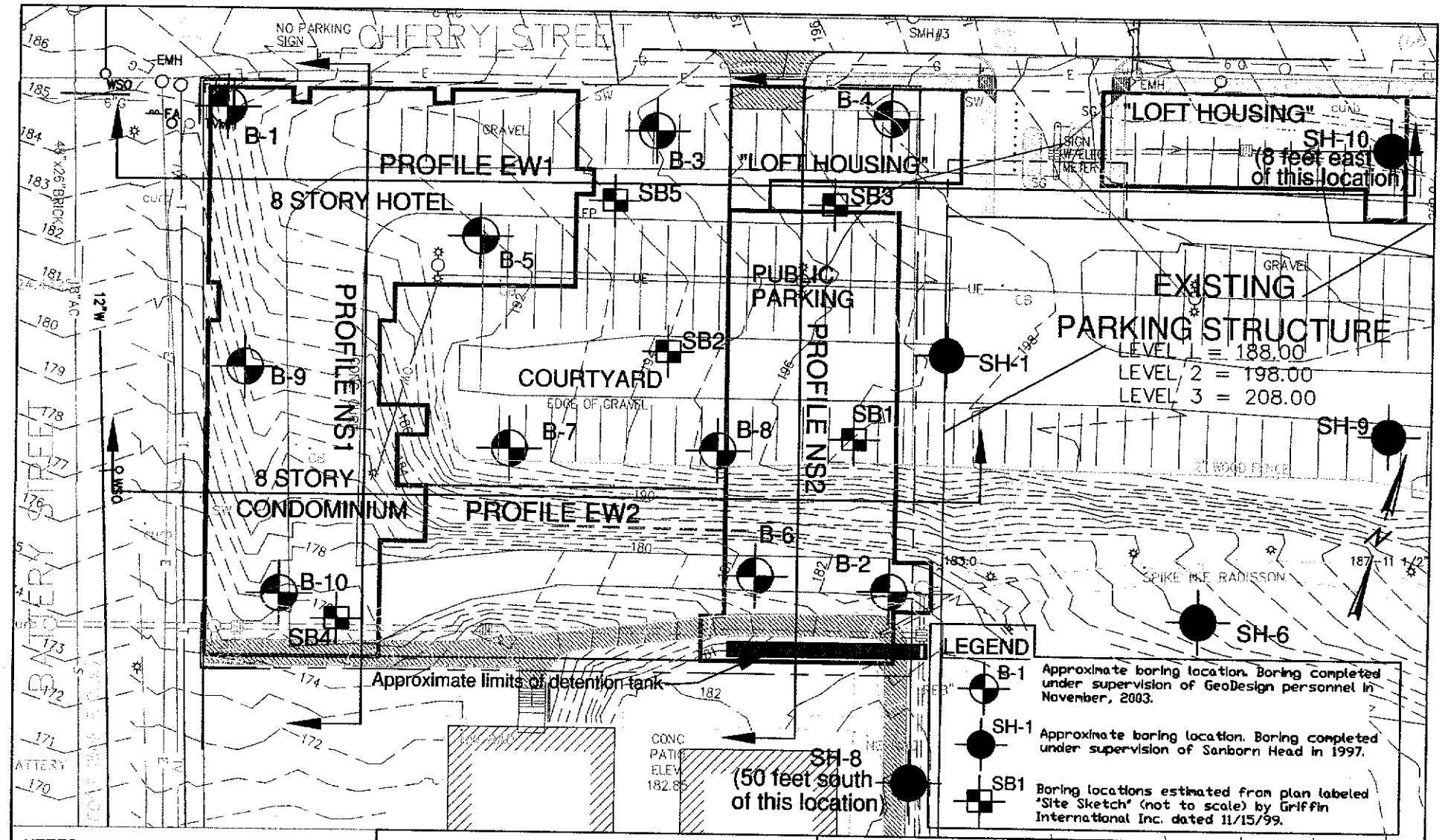
Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft

SBT: Lunne, Robertson and Powell, 1997
Coords: UTM Zone 18 N: 4926652 E: 642018

935-01 Battery & Cherry St

- Map of project area
- Exploration Location Plan
- Boring Logs


Battery Park
Park St
N Champlain St
George St
Elmwood Ave
Clarke St
Pearl St
Pearl St
Pearl St
Pearl St
S Winooski Ave
S Union St
Lake St
Cathedral Church of St. Paul
Battery St
Pine St
935-01 Battery & Cherry Project
Burlington Paint and Sip Studio
Cherry St
Cherry St
Proposed Project
Hotel Vermont
Church Street Marketplace
City Market/ Onion River Co-op
Hilton Burlington
Battery St
Pine St
Center St
Lake St
Skinny Pancake
College St
College St
College St
New City Galerie
American Flatbread
City Hall Park
Center
mplain



NOTES
1. Soil borings completed on 11/17-21/03 by Environmental Drilling NY under supervision of GeoDesign personnel.
2. Base plan derived from Civil Engineering Associates plan 'C-3' revised 1-5-99 and modified by GeoDesign to show approximate boring locations and approximate proposed building footprint.
3. Approximate boring locations shown based on taping from existing features.

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MIDDLEBURY, CT BURLINGTON, VT

DRAWN BY: AMH
REVIEWED BY: JEL

Exploration Location Plan
Battery & Cherry
Burlington, VT

FILE NO. 935-01

SCALE IN FEET
1" = 50' (approximately)
0 25 50 100

DATE: 01-16-2004

FIGURE NO. 2

GEODESIGN INCORPORATED

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-1
Page No.: 1 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 17, 2003 Date Finished: November 17, 2003
N. Coordinate: 200.0 ft E. Coordinate: 20.0 ft
Ground Surface Elevation (feet): 188.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/17/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
															Possible FILL
5		1	SS	24.0	17.0	4.0	2	2	2	4		ND	S-1) Loose, brown, fine to medium SAND, trace Silt with Root Fibers and Organics (leaves). Dry.		182.0 6.0 SAND
		2	SS	24.0	14.0	8.0	3	5	5	7		ND	S-2) Medium dense, brown, fine to medium SAND, trace Silt. Dry.		
10															
		3	SS	24.0	17.0	12.0	7	8	8	8		ND	S-3) Medium dense, brown, fine to medium SAND, little Silt, trace fine Gravel. Dry.		174.0
15		4	SS	24.0	16.0	14.0	4	5	5	6		ND	S-4) Medium dense, brown, layered SILT and fine SAND. Dry.		14.0 Layered SILT and SAND
		5	SS	24.0	20.0	18.0	7	9	8	11		-	S-5) Medium dense. Top 6": Similar to S-4. Bottom 14": Brown, fine to medium SAND, trace Silt. Dry.		
		6	SS	24.0	19.0	18.0	7	11	9	7		-			
20													S-6) Medium dense. Top 12": Similar to bottom of S-5. Bottom 7": Similar to S-4.		
		7	SS	24.0	17.0	20.0	5	10	8	8		-			
		8	SS	24.0	20.0	22.0	10	9	7	9		-	S-7) Medium dense. Top 12": Similar to bottom of S-5. Bottom 5": Similar to S-4, except moist.		
25		9	SS	24.0	20.0	24.0	6	8	9	11		-	S-8) Medium dense. 3" alternating layers of fine to medium SAND, trace Silt, dry, and brown, layered SILT and fine SAND. Moist.		
													S-9) Similar to S-8.		
		10	SS	24.0	20.0	28.0	6	9	10	9		-	S-10) Medium dense. Top 12": Similar to bottom of S-5. Bottom 8": Similar to S-4, except moist.		
30															

Remarks: (0'): Ground surface elevations based on taping from existing features and interpolation from plan titled "C-3" by Civil Engineering Associates (revised 1-5-99). Elevation should be considered accurate only to the degree implied by the method used.

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: B-1

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-1
Page No.: 2 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 17, 2003 Date Finished: November 17, 2003
N. Coordinate: 200.0 ft E. Coordinate: 20.0 ft
Ground Surface Elevation (feet): 188.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/17/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
															Layered SILT and SAND *(Continued)*
		11	SS	24.0	15.0	33.0	5	7	15	14		-	S-11) Medium dense. Top 4": Similar to bottom of S-5. Bottom 11": Similar to S-4, except moist.		
35															
40		12	SS	24.0	16.0	39.0	7	10	11	10		-	S-12) Medium dense, brown, fine to medium SAND, little Silt. Dry.		
		13	SS	24.0	18.0	43.0	8	12	14	13		-	S-13) Medium dense, layered SILT and fine SAND. Moist.		
45															
		14	SS	24.0	19.0	48.0	13	20	16	14		-	S-14) Dense, layered SILT and fine SAND. Dry.		
50															138.0 / 50.0 Bottom of Borehole at 50.0 ft
55															
60															

Remarks

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-1**

OFFICES.LOG 935-01.GPJ GEODSGN.GDT 11/4/04

BORING LOG

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Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-2
Page No.: 1 of 1
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 19, 2003 Date Finished: November 19, 2003
N. Coordinate: 34.0 ft E. Coordinate: 245.0 ft
Ground Surface Elevation (feet): 182.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/19/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description: Elevation & Depth (feet)
															Possible FILL
5		1	SS	24.0	18.0	4.0	-	-	-	-		115	S-1) Brown, fine to medium SAND, little (+) Silt. Dry.		176.0
															6.0 Bottom of Borehole at 6.0 ft
10															
15															
20															
25															
30															

Remarks

(0'): Ground surface elevations based on taping from existing features and interpolation from plan titled "C-3" by Civil Engineering Associates (revised 1-5-99). Elevation should be considered accurate only to the degree implied by the method used.
(4') Drillers note strong fuel odor. PID at top of borehole= 50 ppm, 0 ppm in breathing space. Took 1 sample (4'-6') for screening purposes. Abandoned hole, cleaned auger and sampler. No SPT-"N" counts recorded during sampling.

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: B-2

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

GEODESIGN INCORPORATED

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-3
Page No.: 1 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 18, 2003 Date Finished: November 19, 2003
N. Coordinate: 187.0 ft E. Coordinate: 163.0 ft
Ground Surface Elevation (feet): 195.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/18/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
															SAND
5		1	SS	24.0	21.0	4.0	4	5	6	7		3	S-1) Medium dense. Top 10": Brown, fine to medium SAND, little Silt. Dry. Bottom 11": Gray, fine to coarse SAND, trace Silt. Dry.		
10		2	SS	24.0	17.0	9.0	3	5	7	8		ND	S-2) Medium dense, brown, fine to medium SAND, little Silt. Dry.		
15		3	SS	24.0	17.0	14.0	4	8	6	7		ND	S-3) Medium dense, gray, fine to medium SAND, trace Silt. Dry.		
20		4	SS	24.0	21.0	19.0	5	6	7	7		ND	S-4) Medium dense, brown, fine to medium SAND, little (+) Silt. Dry.		
		5	SS	24.0	18.0	21.0	9	10	16	30		ND	S-5) Medium dense, gray, fine to medium SAND, trace Silt. Dry.		
		6	SS	24.0	19.0	23.0	7	7	9	8		-	S-6) Medium dense. Top 12": Similar to S-5. Bottom 7": Brown, layered SILT and fine SAND. Dry.		170.5
25		7	SS	24.0	17.0	25.0	5	9	10	9		-	S-7) Medium dense. Alternating 3" layers of gray-brown, fine to medium SAND, little Silt, and brown layered SILT and fine SAND. Dry.		24.5 Layered SILT and SAND
		8	SS	24.0	22.0	27.0	13	8	17	17		-			
30		9	SS	24.0	18.0	29.0	7	7	8	9		-	S-8) Medium dense. Top 6" and		

Remarks: (0'): Ground surface elevations based on taping from existing features and interpolation from plan titled "C-3" by Civil Engineering Associates (revised 1-5-99). Elevation should be considered accurate only to the degree implied by the method used.

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-3
Page No.: 2 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 18, 2003 Date Finished: November 19, 2003
N. Coordinate: 187.0 ft E. Coordinate: 163.0 ft
Ground Surface Elevation (feet): 195.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/18/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description: Elevation & Depth (feet)
													Bottom 4": Gray-brown, fine to medium SAND, trace (+) Silt. Dry. Middle 12": Brown, layered SILT and fine SAND. Moist.		Layered SILT and SAND *(Continued)*
													S-9) Medium dense, gray, fine to medium SAND, trace (+) Silt. Dry.		
35															
		10	SS	24.0	22.0	35.0	9	8	10	10		-	S-10) Medium dense. Alternating 3" layers of fine to medium SAND, trace (+) Silt, dry, and brown, layered SILT and fine SAND. Moist.		
40															
		11	SS	24.0	22.0	40.0	4	8	10	9		-	S-11) Similar to S-10.		
45															
		12	SS	24.0	23.0	45.0	5	8	12	14		-	S-12) Medium dense, brown, layered SILT and fine SAND, moist, with 1" layers of gray, fine to medium SAND, little Silt, dry @ approximately 4"-5" spacing.		148.0
															47.0 Bottom of Borehole at 47.0 ft
50															
55															
60															

Remarks

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: B-3

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-4
Page No.: 1 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 21, 2003 Date Finished: November 21, 2003
N. Coordinate: 196.0 ft E. Coordinate: 245.0 ft
Ground Surface Elevation (feet): 197.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/21/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
															Possible FILL
5															
		1	SS	24.0	11.0	5.0	3	2	3	2		14	S-1) Loose, brown, fine to medium SAND, little Silt, trace fine Gravel. Dry.		190.0
															7.0 SAND
10															
		2	SS	24.0	14.0	10.0	4	6	9	12		ND	S-2) Medium dense, gray, fine to medium SAND, trace Silt. Dry.		
15															
		3	SS	24.0	17.0	15.0	6	10	8	7		ND	S-3) Medium dense, gray, fine to medium SAND, little Silt. Dry.		
20															
		4	SS	24.0	17.0	20.0	8	8	8	9		ND	S-4) Similar to S-3.		
		5	SS	24.0	21.0	22.0	11	10	12	9		ND	S-5) Similar to S-3.		173.0
25		6	SS	24.0	19.0	24.0	4	4	6	6		ND	S-6) Medium dense. Alternating 3" layers of gray, fine to medium SAND, dry, and layered SILT and fine SAND, moist.		24.0 Layered SILT and SAND
		7	SS	24.0	16.0	26.0	7	3	3	9		ND	S-7) Loose. Top 4": Similar to S-3. Bottom 12": Brown, layered SILT and fine SAND. Moist.		
		8	SS	24.0	19.0	28.0	4	11	15	19		-	S-8) Medium dense. Top 4":		
30															

Remarks: (0'): Ground surface elevations based on taping from existing features and interpolation from plan titled "C-3" by Civil Engineering Associates (revised 1-5-99). Elevation should be considered accurate only to the degree implied by the method used.

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

OFFICES LOG 935-01.GPJ GEODSGN.GDT 1/14/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-4
Page No.: 2 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 21, 2003 Date Finished: November 21, 2003
N. Coordinate: 196.0 ft E. Coordinate: 245.0 ft
Ground Surface Elevation (feet): 197.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/21/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
		9	SS	24.0	18.0	30.0	8	14	14	16		-	Similar to bottom of S-7. Bottom 15": Gray, fine to medium SAND, trace (+) Silt. Dry. S-9) Medium dense, brown-gray, fine to medium SAND, trace (+) Silt, dry.		Layered SILT and SAND *(Continued)*
35															
		10	SS	24.0	18.0	35.0	6	8	10	12		-	S-10) Similar to S-9.		
40															
		11	SS	24.0	19.0	40.0	7	10	10	12		-	S-11) Similar to S-9.		
45															
		12	SS	24.0	18.0	45.0	4	4	8	8		-	S-12) Similar to S-9.		150.0
50															47.0 Bottom of Borehole at 47.0 ft
55															
60															

Remarks

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected. - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types. Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated. Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-4**

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-5
Page No.: 1 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 20, 2003 Date Finished: November 20, 2003
N. Coordinate: 153.0 ft E. Coordinate: 100.0 ft
Ground Surface Elevation (feet): 192.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/20/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description: Elevation & Depth (feet)
						0.0							Top 1": ASPHALT		0.1 ASPHALT
															SAND
5															
		1	SS	24.0	3.0	5.0	8	13	12	15		ND	S-1) Medium dense, fine to coarse GRAVEL, little fine to coarse Sand, trace (-) Silt. Dry.		
10															
		2	SS	24.0	10.0	10.0	11	9	11	12		ND	S-2) Medium dense, brown, fine to medium SAND, trace Silt, trace fine Gravel. Dry.		
15															
		3	SS	24.0	19.0	15.0	3	8	7	8		ND	S-3) Medium dense, brown, fine to medium SAND, little Silt. Dry.		
		4	SS	24.0	20.0	17.0	6	6	6	6		ND	S-4) Similar to S-3.		
20		5	SS	24.0	21.0	19.0	5	6	6	7		ND	S-5) Medium dense. Top 4" and Bottom 10": Similar to S-3. Middle 7": Brown, layered SILT and fine SAND. Moist.		170.7
		6	SS	24.0	18.0	21.0	5	4	3	4		ND	S-6) Medium dense. Top 8": Similar to S-3. Bottom 10": Brown, layered SILT and fine SAND. Moist.		21.3 Layered SILT and SAND
		7	SS	24.0	20.0	23.0	5	5	12	9		-			
25															
		8	SS	24.0	19.0	25.0	7	9	8	8		-	S-7) Medium dense. Brown, fine to medium SAND, little (-) Silt. Dry.		
													S-8) Medium dense. Top 6": Similar to S-7. Bottom 13": Similar to bottom of S-6.		
30															

Remarks: (0'): Ground surface elevations based on taping from existing features and interpolation from plan titled "C-3" by Civil Engineering Associates (revised 1-5-99). Elevation should be considered accurate only to the degree implied by the method used.

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

BORING LOG

GEODESIGN INCORPORATED

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Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-5
Page No.: 2 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 20, 2003 Date Finished: November 20, 2003
N. Coordinate: 153.0 ft E. Coordinate: 100.0 ft
Ground Surface Elevation (feet): 192.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations			
Date and Time	Depth (ft)	Elevation (ft)	Notes
11/20/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
		9	SS	24.0	22.0	30.0	7	11	11	11		-	S-9) Medium dense. Top 15" and bottom 3": Similar to S-7. Middle 4": Brown, layered SILT and fine SAND. Dry.		Layered SILT and SAND *(Continued)*
35		10	SS	24.0	19.0	35.0	6	7	10	9		-	S-10) Medium dense. Top 6": Similar to S-7. Bottom 13": Similar to bottom of S-6.		
40		11	SS	24.0	18.0	40.0	8	11	12	10		-	S-11) Medium dense, brown, layered SILT and fine SAND. Moist.		
45		12	SS	24.0	17.0	45.0	9	12	8	5		-	S-12) Similar to S-11, except dry.		
50		13	SS	24.0	23.0	50.0	8	11	12	15		-	S-13) Medium dense, brown-gray, layered SILT and fine SAND. Dry.		
55		14	SS	24.0	22.0	55.0	18	35	47	39		-	S-14) Very dense, brown-gray, fine to medium SAND, little (+) Silt, with some orange oxidation. Dry.		
		15	SS	24.0	21.0	67.0	21	33	42	37		-	S-15) Similar to S-14.		133.0
60															59.0 Bottom of Borehole at 59.0 ft

Remarks

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-5**

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

BORING LOG

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Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-6
Page No.: 1 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 21, 2003 Date Finished: November 21, 2003
N. Coordinate: 34.0 ft E. Coordinate: 197.0 ft
Ground Surface Elevation (feet): 181.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/21/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
															SAND
5		1	SS	24.0	13.0	5.0	4	6	4	5		ND	S-1) Medium dense, brown-gray, fine to medium SAND, little Silt. Dry.		
		2	SS	24.0	14.0	8.0	4	7	7	7		ND	S-2) Similar to S-1, except with some orangish oxidized layering.		
10		3	SS	24.0	18.0	10.0	4	7	7	5		ND	S-3) Similar to S-1.		
		4	SS	24.0	19.0	12.0	7	6	6	5		ND	S-4) Medium dense. Top 7": Similar to S-1. Bottom 12": Brown, layered SILT and fine SAND. Dry.		168.0
15		5	SS	24.0	18.0	14.0	4	4	4	6		ND	S-5) Similar to S-1, except loose.		13.0 Layered SILT and SAND
		6	SS	24.0	17.0	16.0	8	6	8	9		ND	S-6) Similar to S-1.		
		7	SS	24.0	16.0	18.0	3	5	6	9		ND	S-7) Similar to S-1.		
20		8	SS	24.0	17.0	20.0	6	7	7	9		-	S-8) Similar to S-1.		
25		9	SS	24.0	19.0	25.0	8	11	14	13		-	S-9) Similar to S-2.		
30															

Remarks: (0'): Ground surface elevations based on taping from existing features and interpolation from plan titled "C-3" by Civil Engineering Associates (revised 1-5-99). Elevation should be considered accurate only to the degree implied by the method used.

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
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4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-6**

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-6
Page No.: 2 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 21, 2003 Date Finished: November 21, 2003
N. Coordinate: 34.0 ft E. Coordinate: 197.0 ft
Ground Surface Elevation (feet): 181.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations			
Date and Time	Depth (ft)	Elevation (ft)	Notes
11/21/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
		10	SS	24.0	19.0	30.0	4	8	11	10		ND	S-10) Medium dense, brown layered SILT and fine SAND. Moist.		Layered SILT and SAND *(Continued)*
35		11	SS	24.0	22.0	35.0	5	10	8	20		-	S-11) Medium dense. Top 19": Similar to S-1. Bottom 3": Similar to S-10, except dry.		
40		12	SS	24.0	20.0	40.0	8	9	8	7		-	S-12) Medium dense. Alternating 3" layers of brown, fine to medium SAND, little Silt, dry, and brown, layered SILT and fine SAND, moist.		
45		13	SS	24.0	18.0	45.0	8	11	10	10		-	S-13) Similar to bottom of S-11.		
50		14	SS	24.0	17.0	50.0	5	6	13	14		-	S-14) Similar to S-12.		129.0
55															52.0 Bottom of Borehole at 52.0 ft
60															

Remarks

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-6**

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-7
Page No.: 1 of 3
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 18, 2003 Date Finished: November 18, 2003
N. Coordinate: 79.0 ft E. Coordinate: 111.0 ft
Ground Surface Elevation (feet): 192.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations			
Date and Time	Depth (ft)	Elevation (ft)	Notes
11/18/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
															SAND
5		1	SS	24.0	12.0	4.0	4	7	14	16		ND	S-1) Medium dense, brown, fine to medium SAND, trace Silt. Dry.		
10		2	SS	24.0	12.0	10.0	4	7	6	11		ND	S-2) Medium dense, gray-brown, fine to coarse SAND, trace fine Gravel, trace Silt. Dry.		
15		3	SS	24.0	14.0	15.0	6	10	12	15		ND	S-3) Similar to S-1.		
		4	SS	24.0	19.0	17.0	7	6	11	9		ND	S-4) Medium dense, brown, fine to medium SAND, little Silt. Dry.		
20		5	SS	24.0	14.0	19.0	8	11	10	8		-	S-5) Medium dense. Top 6": Gray-brown, fine to medium SAND, trace Silt. Bottom 8": Brown, fine SAND, little Silt. Dry.		
		6	SS	24.0	20.0	21.0	11	11	11	9		-	S-6) Medium dense. Top 6": Gray-brown, fine to medium SAND, trace Silt. Dry. Bottom 14": Gray-brown, layered SILT and fine SAND. Dry.		
25		7	SS	24.0	16.0	23.0	6	12	13	12		-			
		8	SS	24.0	15.0	25.0	9	11	10	10		-	S-7) Medium dense, brown-gray, fine to medium SAND, trace Silt with two 2" thick layers of brown, fine SAND with little Silt (spaced 4" apart). Dry.		
		9	SS	24.0	17.0	27.0	11	11	11	11		-			
30		10	SS	24.0	16.0	29.0	9	12	12	13		-	S-8) Medium dense, gray-brown, fine to medium SAND, trace Silt.		163.0
															29.0

Remarks

(0'): Ground surface elevations based on taping from existing features and interpolation from plan titled "C-3" by Civil Engineering Associates (revised 1-5-99). Elevation should be considered accurate only to the degree implied by the method used.

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-7**

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-7
Page No.: 2 of 3
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 18, 2003 Date Finished: November 18, 2003
N. Coordinate: 79.0 ft E. Coordinate: 111.0 ft
Ground Surface Elevation (feet): 192.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/18/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
													Dry.		Layered SILT and fine SAND *(Continued)*
		11	SS	24.0	19.0	31.0	17	15	16	14		-	S-9) Medium dense, gray-brown, fine to medium SAND, little Silt. Dry.		
		12	SS	24.0	18.0	33.0	8	13	19	17		-	S-10) Medium dense. Top 12": Similar to S-9. Bottom 4": Brown, layered SILT and fine SAND. Dry.		
35													S-11) Dense. Top 7": Similar to S-9. Bottom 12": Similar to bottom of S-10.		
													S-12) Dense. Top 9": Similar to bottom of S-10. Bottom 9": Similar to S-9.		
40															
		13	SS	24.0	18.0	40.0	5	10	11	10		-	S-13) Medium dense. Top 6": Similar to bottom of S-10, except moist. Bottom 10": Similar to S-9.		
45															
		14	SS	24.0	19.0	45.0	4	4	9	9		-	S-14) Medium dense, alternating 3" layers of gray, fine to medium SAND, little Silt, drier, and brown, layered SILT and fine SAND. Moist.		
50															
		15	SS	24.0	18.0	50.0	6	8	13	12		-	S-15) Similar to S-14.		
55															
		16	SS	24.0	21.0	55.0	6	12	16	18		-	S-16) Medium dense, gray-brown, layered SILT and fine SAND. Dry.		
60															

Remarks

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: B-7

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-7
Page No.: 3 of 3
File No.: 935-01
Checked By: JAG

Boring Company:	Environmental Drilling NY		
Foreman:	Duane Drew		
GeoDesign Rep.:	Aaron Humphrey		
Date Started:	November 18, 2003	Date Finished:	November 18, 2003
N. Coordinate:	79.0 ft	E. Coordinate:	111.0 ft
Ground Surface Elevation (feet):	192.0		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations			
Date and Time	Depth (ft)	Elevation (ft)	Notes
11/18/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
		17	SS	24.0	19.0	60.0	4	12	12	11		-	S-17) Similar to S-16.		Layered SILT and fine SAND
															130.0 *(Continued)*
															62.0 Bottom of Borehole at 62.0 ft
65															
70															
75															
80															
85															
90															

Remarks:

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-8
Page No.: 1 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 19, 2003 Date Finished: November 19, 2003
N. Coordinate: 79.0 ft E. Coordinate: 186.0 ft
Ground Surface Elevation (feet): 195.5
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations			
Date and Time	Depth (ft)	Elevation (ft)	Notes
11/19/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
															SAND
5		1	SS	24.0	18.0	5.0	11	12	13	14		ND	S-1) Medium dense, brown, fine to medium SAND, trace Silt. Dry.		
10		2	SS	24.0	15.0	10.0	3	6	14	14		ND	S-2) Medium dene, brown, fine to medium SAND, little Silt, with 1" thick SILT seams (spaced approximately 4" apart). Dry.		
15		3	SS	24.0	17.0	15.0	2	4	4	5		ND	S-3) Medium dense, gray, fine to medium SAND, trace Silt. Dry.		
20		4	SS	24.0	18.0	19.0	8	10	8	9		ND	S-4) Medium dense, bown-gray, fine to medium Sand, little Silt. Dry.		174.5
		5	SS	24.0	19.0	21.0	11	8	9	9		-	S-5) Medium dense. Alternating 3" layers of brown-gray, fine to medium SAND, little Silt, dry, and brown layered SILT and fine SAND. Dry.		21.0 Layered SILT and SAND
25		6	SS	24.0	17.0	23.0	4	4	8	13		ND	S-6) Similar to S-4.		
		7	SS	24.0	15.0	25.0	10	11	12	10		-	S-7) Similar to S-4.		
		8	SS	24.0	18.0	27.0	7	8	12	16		-	S-8) Similar to S-4.		
30		9	SS	24.0	15.0	29.0	5	15	16	14		ND	S-9) Dense, brown, fine to		

Remarks: (0'): Ground surface elevations based on taping from existing features and interpolation from plan titled "C-3" by Civil Engineering Associates (revised 1-5-99). Elevation should be considered accurate only to the degree implied by the method used.

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: B-8

OFFICES LOG 935-01.GPJ GEODSGN.GDT 1/14/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-8
Page No.: 2 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 19, 2003 Date Finished: November 19, 2003
N. Coordinate: 79.0 ft E. Coordinate: 186.0 ft
Ground Surface Elevation (feet): 185.5
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations			
Date and Time	Depth (ft)	Elevation (ft)	Notes
11/19/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
													medium SAND, little Silt, dry with 1/4" brown SILT seams in upper 6".		Layered SILT and SAND *(Continued)*
		10	SS	24.0	18.0	31.0	15	14	18	22		-	S-10) Similar to S-4, except dense.		
		11	SS	24.0	19.0	33.0	7	10	14	16		-	S-11) Similar to S-4.		
35															
40		12	SS	24.0	20.0	39.0	12	10	12	19		-	S-12) Similar to S-4.		
45		13	SS	24.0	21.0	44.0	5	7	8	8		-	S-13) Medium dense, brown, layered SILT and fine SAND. Moist.		149.5
															46.0 Bottom of Borehole at 46.0 ft
50															
55															
60															

Remarks

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-8**

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-9
Page No.: 1 of 1
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 17, 2003 Date Finished: November 17, 2003
N. Coordinate: 105.0 ft E. Coordinate: 12.0 ft
Ground Surface Elevation (feet): 183.0
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations			
Date and Time	Depth (ft)	Elevation (ft)	Notes
11/17/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description: Elevation & Depth (feet)
															SAND
5		1	SS	24.0	19.0	4.0	5	7	10	10		ND	S-1) Medium dense, brown, fine to medium SAND, trace Silt. Dry.		
		2	SS	24.0	17.0	6.0	10	11	11	14		ND	S-2) Similar to S-1, except with trace (+) Silt.		
		3	SS	24.0	18.0	8.0	5	8	8	7		ND	S-3) Similar to S-2.		
10		4	SS	24.0	18.0	10.0	8	9	9	8		ND	S-4) Medium dense. Top 9": Similar to S-2. Bottom 9": Gray, fine SAND, little Silt with occasional brown SILT layers (1/8" -1/4" thick @ 1" spacing), trace Root fibers. Dry.		
		5	SS	24.0	17.0	12.0	9	10	10	10		-			
15		6	SS	24.0	16.0	14.0	7	7	9	8		-	S-5) Medium dense. Top 4": Similar to bottom of S-4 (without Root fibers). Bottom 13": Gray-brown, fine to medium SAND, trace (+) Silt. Dry.		
		7	SS	24.0	17.0	16.0	8	9	9	12		-			
		8	SS	24.0	16.0	18.0	7	11	10	9		-	S-6) Medium dense. Similar to bottom of S-5.		
20															163.0
		9	SS	24.0	19.0	20.0	6	6	7	12		-	S-7) Medium dense, gray, fine to medium SAND, trace Silt with occasional brown Silt layers(1/2" thick @ 2'-3' spacing). Dry.		20.0 Layered SILT and fine SAND
		10	SS	24.0	19.0	22.0	18	12	10	12		-	S-8) Similar to S-7.		
25		11	SS	24.0	18.0	24.0	8	8	8	12		-	S-9) Medium dense, gray, layered SILT and fine SAND. Dry.		
													S-10) Similar to S-9.		
													S-11) Similar to S-9, except moist.		
		12	SS	24.0	17.0	26.0	6	12	14	13		-	S-12) Similar to S-11.		
30															153.0
															30.0 Bottom of Borehole at 30.0 ft

Remarks: (0'): Ground surface elevations based on taping from existing features and interpolation from plan titled "C-3" by Civil Engineering Associates (revised 1-5-99). Elevation should be considered accurate only to the degree implied by the method used.

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-9**

OFFICES.LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-10
Page No.: 1 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 20, 2003 Date Finished: November 20, 2003
N. Coordinate: 27.0 ft E. Coordinate: 27.0 ft
Ground Surface Elevation (feet): 176.5
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations			
Date and Time	Depth (ft)	Elevation (ft)	Notes
11/20/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description: Elevation & Depth (feet)
		1	SS	24.0	12.0	0.0	3	9	3	4		ND	S-1) Medium dense. Top 1": TOPSOIL. Bottom 11": Brown, fine to coarse SAND, little Silt, little fine to coarse Gravel, trace Root fibers. Moist.		FILL
		2	SS	24.0	12.0	2.0	3	4	3	3		ND			174.0
															2.5 SAND
5		3	SS	24.0	14.0	4.0	5	5	6	5		ND	S-2) Loose. Top 2": Similar to bottom of S-1. Bottom 10": Gray, fine to medium SAND, little (-) Silt. Moist.		172.5
		4	SS	24.0	15.0	6.0	7	6	5	6		ND	S-3) Medium dense, brown, layered SILT and fine SAND. Dry.		4.0 Layered SILT and SAND
		5	SS	24.0	16.0	8.0	4	5	5	5		ND	S-4) Similar to S-3, except with occasional oxidized orange layers.		
10		6	SS	24.0	18.0	10.0	3	5	5	6		ND	S-5) Similar to S-3.		
		7	SS	24.0	17.0	12.0	6	6	7	9		ND	S-6) Medium dense. Top 6": Similar to S-3. Bottom 12": Brown, fine to medium SAND, trace (+) Silt. Dry.		
15		8	SS	24.0	19.0	14.0	5	6	7	5		ND	S-7) Medium dense. Similar to bottom of S-6.		
		9	SS	24.0	20.0	18.0	7	7	11	14		ND	S-8) Medium dense. Top 6" and bottom 4": Similar to S-7. Middle 9": Similar to S-3.		
20		10	SS	24.0	19.0	18.0	7	7	8	8		ND	S-9) Medium dense. Top 7": Similar to S-3. Bottom 13": Similar to S-7.		
		11	SS	24.0	17.0	20.0	6	7	7	6		-	S-10) Medium dense. Top 8": Similar to S-7. Bottom 11": Similar to S-3.		
													S-11) Similar to S-3, except moist.		
25		12	SS	24.0	18.0	25.0	6	6	7	6		-	S-12) Similar to S-11.		
30															

Remarks: (0'): Ground surface elevations based on taping from existing features and interpolation from plan titled "C-3" by Civil Engineering Associates (revised 1-5-99). Elevation should be considered accurate only to the degree implied by the method used. (0') bricks found in hole up to 2.5' deep while augering and granite block ~2'x2'x6".

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Augor; C = Core; PS = Piston Sampler: SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

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BORING LOG

Project Name

Battery and Cherry
Battery and Cherry Streets
Burlington, VT

Boring No.: B-10
Page No.: 2 of 2
File No.: 935-01
Checked By: JAG

Boring Company: Environmental Drilling NY
Foreman: Duane Drew
GeoDesign Rep.: Aaron Humphrey
Date Started: November 20, 2003 Date Finished: November 20, 2003
N. Coordinate: 27.0 ft E. Coordinate: 27.0 ft
Ground Surface Elevation (feet): 176.5
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D./O.D.:	4.25 in.	2.0 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Acker Truck 82	
Other:		

Groundwater Observations

Date and Time	Depth (ft)	Elevation (ft)	Notes
11/20/03 12:00 AM			None

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Result	Sample Description (Classification System: Burmister)	Symbol	Strata Description (Elevation & Depth (feet))
		13	SS	24.0	20.0	30.0	4	8	6	10		-	S-13) Medium dense. Alternating 3" layers of brown, fine to medium SAND, little Silt, dry, and brown, layered SILT and fine SAND, moist.		Layered SILT and SAND *(Continued)*
35															
		14	SS	24.0	20.0	35.0	8	10	12	12		-	S-14) Medium dense, brown, fine to medium SAND, little Silt. Dry.		
40															
		15	SS	24.0	17.0	40.0	5	6	12	8		-	S-15) Medium dense, brown, layered SILT and fine SAND. Moist.		
45															
		16	SS	24.0	16.0	45.0	6	10	15	14		-	S-16) Medium dense, brown, fine to medium SAND, little Silt. Dry.		
50															
		17	SS	24.0	18.0	50.0	9	15	17	14		-	S-17) Similar to S-16.		
55															
		18	SS	24.0	18.0	55.0	9	10	12	16		-	S-18) Medium dense, brown, layered SILT and fine SAND. Moist.		
		19	SS	24.0	17.0	67.0	19	18	17	16		-	S-19) Dense, brown, fine to medium SAND, little (-) Silt. Dry.		
60															117.5 59.0 Bottom of Borehole ~~at 59.0 ft~~

Remarks

Notes:
1) Soil Samples screened in the field using a thermal Environmental Systems Model 580S Photoionization Detector. The meter was calibrated relative to a benzene-in-air standard. ND = None Detected, - = Sample Not Screened
2) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
3) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. AC = After Coring
4) Sample Type Coding: A = Auger; C = Core; PS = Piston Sampler; SS = Split Barrel (Split Spoon); ST = Shelby Tube; V = Vane
5) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-10**

OFFICES LOG 935-01.GPJ GEODSGN.GDT 11/4/04

BORING LOG

Boring no: SB1

Project: New City of Burlington Parking Garage

Griffin Project #:	69941563	Drilling Method:	HSA
Drilled by :	T&K Drilling	Pilot Boring Dia.:	6.25"
Driller:	Steve Legere	Final Boring Dia.:	6.25"
Supervised by:	Griffin International, Inc.	DTW from grade:	N/A
Logged by:	T. Kelly	DTW Date/Time:	N/A
Date Started:	10-28-99	Total Depth:	37' - spoon
Date Finished:	10-28-99	PID:	PI-101
Protection Level:	D		

Time	Sample No.	Depth (ft)	Blows/ 6" (140 lb.)	Pen/ Rec (")	PID (ppm)	Description and Comments
09:47	1	0 - 2	9-15-14-9	24/6	0	SILTY SAND WITH GRAVEL (SM)-- light brown, moist
09:51	2	2 - 4	8-12-16-19	24/14	0	SILTY SAND (SM)-- light brown, moist
09:55	3	4 - 6	10-11-13-14	24/17	0	SILTY SAND (SM)-- light brown, moist
10:00	4	6 - 8	11-19-14-14	24/20	5.2	SILTY SAND (SM)-- light brown, moist, silt interbed at 6.2' - 6.3', slight petroleum odor
10:07	5	8 - 10	5-7-13-13	24/18	0	SILTY SAND (SM)-- light olive brown, moist
10:10	6	10 - 12	10-13-12-11	24/17	0	SILTY SAND (SM)-- light brown, moist
10:13	7	12 - 14	10-8-12-18	24/15	0	POORLY GRADED SAND (SP) -- light brown, moist
10:24	8	14 - 16	7-10-9-9	24/14	0.2	POORLY GRADED SAND (SP) -- light brown, moist
10:27	9	16 - 18	11-13-14-15	24/16	0	POORLY GRADED SAND (SP) -- light brown, moist

Prepared by: TJK

GRIFFIN INTERNATIONAL

BORING LOG

Boring no: SB1

Griffin Project #: 69941563

Project: New City of Burlington Parking Garage

Time	Sample No.	Depth (ft)	Blows/ 6" (140 lb.)	Pen/ Rec (")	PID	Description and Comments
10:29	10	18 - 20	13-17-15-15	24/16	0	POORLY GRADED SAND (SP) -- light brown, moist
10:51	11	25 - 27	6-10-13-16	24/16	0	POORLY GRADED SAND (SP) -- light brown, moist
10:58	12	30 - 32	4-12-16-19	24/17	0	POORLY GRADED SAND (SP) -- light brown, moist
11:08	13	35 - 37	12-18-22-33	24/16	0	SILTY SAND (SM)-- light brown to light olive brown, moist to wet locally.

Prepared by: TJK

GRIFFIN INTERNATIONAL

BORING LOG

Boring no: SB2

Project: New City of Burlington Parking Garage

Griffin Project #:	69941563	Drilling Method:	HSA
Drilled by :	T&K Drilling	Pilot Boring Dia.:	6.25"
Driller:	Steve Legere	Final Boring Dia.:	6.25"
Supervised by:	Griffin International, Inc.	DTW from grade:	N/A
Logged by:	T. Kelly	DTW Date/Time:	N/A
Date Started:	10-28-99	Total Depth:	37' - spoon
Date Finished:	10-28-99	PID:	PI-101
Protection Level:	D		

Time	Sample No.	Depth (ft)	Blows/ 6" (140 lb.)	Pen/ Rec (")	PID (ppm)	Description and Comments
11:48	1	0 - 2	10-6-8-12	24/13	0	SILTY SAND (SM)-- light to medium brown, moist
11:50	2	2 - 4	10-15-12-12	24/16	0	SILTY SAND (SM)-- light to medium brown, moist
11:53	3	4 - 6	4-5-6-8	24/16	0	SILTY SAND (SM)-- light brown, moist
11:57	4	6 - 8	9-9-11-12	24/18	0	SILTY SAND (SM)-- light brown, moist
12:06	5	8 - 10	11-8-10-10	24/15	0	POORLY GRADED SAND (SP) -- light grayish brown, moist
12:10	6	10 - 12	6-10-13-14	24/15	0	WELL-GRADED SAND (SW)-- light grayish brown, moist
12:12	7	12 - 14	10-12-12-14	24/20	0	SILTY SAND (SM)-- light grayish brown, moist
12:20	8	14 - 16	9-9-9-8	24/15	0	SILTY SAND (SM)-- light brown to light olive, moist
12:21	9	16 - 18	11-12-12-11	24/13	0	SILTY SAND (SM)-- light brown, moist

Prepared by: TJK

GRIFFIN INTERNATIONAL

BORING LOG

Boring no: SB2

Griffin Project #: 69941563

Project: New City of Burlington Parking Garage

Time	Sample No.	Depth (ft)	Blows/ 6" (140 lb.)	Pen/ Rec (")	PID	Description and Comments
12:23	10	18 - 20	11-13-13-18	24/19	0	SILTY SAND (SM)-- light brown to light olive brown, moist
12:36	11	25 - 27	6-9-11-12	24/18	0	POORLY GRADED SAND (SP) -- light brown, moist
12:45	12	30 - 32	7-9-12-12	24/19	0	SILTY SAND (SM)-- light brown to olive, moist, silt in layers
12:54	13	35 - 37	7-10-13-12	24/16	0	SILTY SAND (SM)-- light olive brown, moist

Prepared by: TJK

GRIFFIN INTERNATIONAL

BORING LOG

Boring no: SB3

Project: New City of Burlington Parking Garage

Griffin Project #:	69941563	Drilling Method:	HSA
Drilled by :	T&K Drilling	Pilot Boring Dia.:	6.25"
Driller:	Steve Legere	Final Boring Dia.:	6.25"
Supervised by:	Griffin International, Inc.	DTW from grade:	N/A
Logged by:	T. Kelly	DTW Date/Time:	N/A
Date Started:	10-28-99	Total Depth:	37' - spoon
Date Finished:	10-28-99	PID:	PI-101
Protection Level:	D		

Time	Sample No.	Depth (ft)	Blows/ 6" (140 lb.)	Pen/ Rec (")	PID (ppm)	Description and Comments
13:48	1	0 - 2	10-8-11-12	24/17	0	SILTY SAND (SM)-- light olive brown, moist
13:50	2	2 - 4	7-6-8-7	24/18	0	SILTY SAND (SM)-- light olive brown, moist
13:54	3	4 - 6	4-6-7-10	24/19	0	SILTY SAND (SM)-- light olive brown, moist
13:56	4	6 - 8	8-7-8-7	24/18	0	SILTY SAND (SM)-- light olive brown, moist, trace fine gravel
13:58	5	8 - 10	10-13-13-20	24/15	0	POORLY GRADED SAND (SP) -- light grayish brown, moist
14:02	6	10 - 12	9-13-12-12	24/16	0	POORLY GRADED SAND (SP) -- light grayish brown, moist
14:06	7	12 - 14	12-13-13-12	24/16	0.1	POORLY GRADED SAND WITH SILT (SP-SM) light grayish brown, moist
14:16	8	14 - 16	6-9-6-7	24/18	0	SANDY SILT (ML)-- light olive brown, moist
14:18	9	16 - 18	8-8-9-10	24/17	0	SILTY SAND (SM)-- light olive brown, moist

Prepared by: TJK

GRIFFIN INTERNATIONAL

BORING LOG

Boring no: SB3

Griffin Project #: 69941563

Project: New City of Burlington Parking Garage

Time	Sample No.	Depth (ft)	Blows/ 6" (140 lb.)	Pen/ Rec (")	PID	Description and Comments
14:23	10	18 - 20	13-10-10-12	24/19	0	POORLY GRADED SAND (SP) -- light grayish brown, moist
14:36	11	25 - 27	6-9-11-15	24/17	0	POORLY GRADED SAND (SP) -- light brown, moist
14:45	12	30 - 32	9-12-14-18	24/16	0.1	SILTY SAND (SM)-- light grayish brown to olive, moist
15:00	13	35 - 37	8-12-15-17	24/17	0	SILTY SAND (SM)-- light olive brown, moist

Prepared by: TJK

GRIFFIN INTERNATIONAL

BORING LOG

Boring no: SB4

Project: New City of Burlington Parking Garage

Griffin Project #:	69941563	Drilling Method:	HSA
Drilled by :	T&K Drilling	Pilot Boring Dia.:	6.25"
Driller:	Steve Legere	Final Boring Dia.:	6.25"
Supervised by:	Griffin International, Inc.	DTW from grade:	N/A
Logged by:	T. Kelly	DTW Date/Time:	N/A
Date Started:	10-28-99	Total Depth:	37' - spoon
Date Finished:	10-28-99	PID:	PI-101
Protection Level:	D		

Time	Sample No.	Depth (ft)	Blows/ 6" (140 lb.)	Pen/ Rec (")	PID (ppm)	Description and Comments
15:31	1	0.5 - 2	11-12-11	18/9	0	SILTY SAND (SM)-- light brown, moist
15:33	2	2 - 4	12-12-11-13	24/17	0	POORLY GRADED SAND (SP) -- light grayish brown, moist
15:40	3	4 - 6	7-8-9-9	24/13	0.2	POORLY GRADED SAND (SP) -- light grayish brown, moist
15:42	4	6 - 8	8-7-9-10	24/13	0.1	SILTY SAND (SM)-- light grayish brown, moist
15:44	5	8 - 10	9-8-9-10	24/15	0	SILTY SAND (SM)-- light grayish brown, moist
15:48	6	10 - 12	9-7-9-9	24/16	0	POORLY GRADED SAND WITH SILT (SP-SM) light grayish brown, moist
15:50	7	12 - 14	8-8-9-11	24/16	0	SILTY SAND (SM)-- light grayish brown, moist
15:53	8	14 - 16	9-9-9-12	24/17	0	SILTY SAND (SM)-- light brown, moist
16:02	9	16 - 18	13-11-11-9	24/20	0	SILTY SAND (SM)-- light olive brown, moist

Prepared by: TJK

GRIFFIN INTERNATIONAL

BORING LOG

Boring no: SB4

Griffin Project #: 69941563

Project: New City of Burlington Parking Garage

Time	Sample No.	Depth (ft)	Blows/ 6" (140 lb.)	Pen/ Rec (")	PID	Description and Comments
16:05	10	18 - 20	11-12-17-16	24/16	0	SILTY SAND (SM)-- light olive brown, moist
16:21	11	25 - 27	7-10-11-13	NR	0	SILTY SAND (SM)-- light olive brown, moist
16:31	12	30 - 32	4-7-9-11	24/21	0	SANDY CLAYEY SILT (CL/ML) light olive brown to gray, moist, perched water
16:44	13	35 - 37	9-13-14-16	24/18	0	SILTY SAND (SM)-- light olive brown, moist

Prepared by: TJK

GRIFFIN INTERNATIONAL

BORING LOG

Boring no: SB5

Project: New City of Burlington Parking Garage

Griffin Project #:	69941563	Drilling Method:	HSA
Drilled by :	T&K Drilling	Pilot Boring Dia.:	6.25"
Driller:	Steve Legere	Final Boring Dia.:	6.25"
Supervised by:	Griffin International, Inc.	DTW from grade:	N/A
Logged by:	T. Kelly	DTW Date/Time:	N/A
Date Started:	10-29-99	Total Depth:	37' - spoon
Date Finished:	10-29-99	PID:	PI-101
Protection Level:	D		

Time	Sample No.	Depth (ft)	Blows/ 6" (140 lb.)	Pen/ Rec (")	PID (ppm)	Description and Comments
07:00	1	0 - 2	25-24-14-13	24/14	0	SILTY SAND WITH GRAVEL (SM)-- medium brown, moist
07:02	2	2 - 4	4-7-16-12	24/12	0	SILTY SAND (SM)-- light brown, moist, geo-textile membrane
07:05	3	4 - 6	10-11-15-11	24/7	0	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM) -- light brown, moist
07:15	4	6 - 8	10-11-12-12	24/7	0	SILTY SAND WITH GRAVEL (SM)-- light brown, moist
07:27	5	8 - 10	12-11-9-10	24/14	0	SILTY SAND (SM)-- light brown, moist
07:35	6	10 - 12	13-13-11-9	24/14	0	POORLY GRADED SAND (SP) light grayish brown, moist
07:42	7	12 - 14	9-5-4-8	24/0	NM	NO RECOVERY
07:47	8	14 - 16	5-7-7-12	24/15	0.2	SILTY SAND (SM)-- light brown, moist
08:00	9	16 - 18	15-15-12-13	24/19	0	SILTY SAND (SM)-- light to medium brown, moist

Prepared by: TJK

GRIFFIN INTERNATIONAL

BORING LOG

Boring no: SB5

Griffin Project #: 69941563

Project: New City of Burlington Parking Garage

Time	Sample No.	Depth (ft)	Blows/ 6" (140 lb.)	Pen/ Rec (")	PID	Description and Comments
08:08	10	18 - 20	11-11-10-9	24/19	0	SILTY SAND (SM)-- light to medium brown, moist
08:19	11	25 - 27	7-9-11-10	24/19	0	SANDY SILT (ML) -- light brown to light olive brown, moist
08:25	12	30 - 32	8-10-13-16	24/18	0.1	SILTY SAND (SM)-- light brown, moist
08:35	13	35 - 37	7-9-10-11	24/19	0	SANDY SILT (ML) -- olive brown, moist

Prepared by: TJK

GRIFFIN INTERNATIONAL

Sanborn, Head & Associates, Inc.

Log of Monitoring Well SH-1

PROJECT NO.: 1304.1/1304.2

PROJECT: Burlington Square Mall Expansion

DATE STARTED: 05/06/97 | DATE FINISHED: 05/07/97

LOCATION: Burlington, Vermont

SURFACE ELEVATION: Approximately 197.3 +/-

DRILLING METHOD: Mobile B-53 w/4 1/4" ID HSA

DRILLING COMPANY: Capital Environmental Drilling

FOREMAN: Jay Stevens

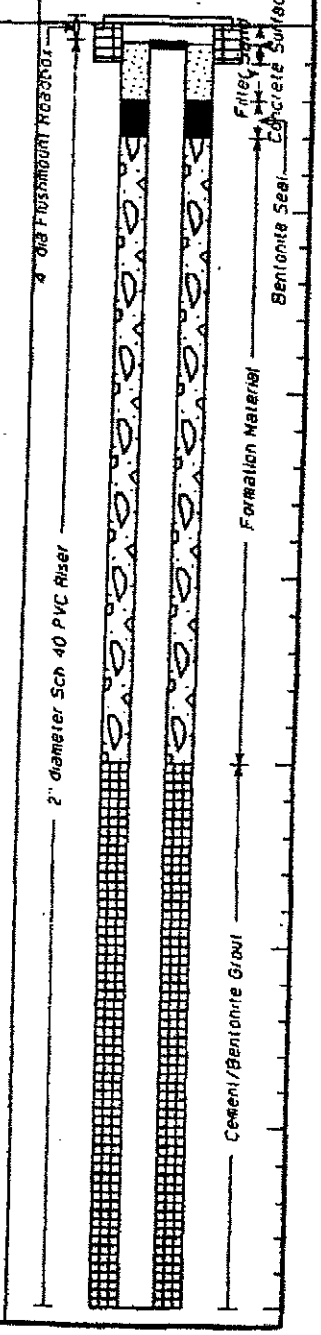
LOGGED BY: M. Heil | CHECKED BY: V. Kokosa

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
05/06/97	12:45	Dry	55'	~ 45 min
05/07/97	16:10	81.91' PVC	well inst.	~ 24 hrs.
05/08/97	09:20	81.93' PVC	well inst.	~ 40 hrs

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION
							ASPHALT	
	S-1 0.1-2.1'	17-13 14-15	24/14	ND				S-1: Medium dense, brown, fine SAND, and Silt, little Gravel. Moist.
5	S-2 5-7'	2-2 2-3	24/16	ND				S-2: Very loose, brown, fine SAND, some Silt. Moist. (Stratified w/several dark brown Silt Parting/Lenses).
10	S-3 10-11 S-3A 11-12'	3-5 5-8	24/18	ND				S-3: Loose, brown, fine SAND, and Silt, trace Gravel. Moist. S-3A: Loose, brown, fine to medium SAND, trace Gravel, trace Silt. Moist.
15	S-4 15-17'	6-8 8-9	24/18	ND			STRATIFIED SAND AND SILT	S-4: Medium dense, brown, fine SAND and Silt. Moist. (Stratified)
20	S-5 20-22'	4-6 8-13	24/18	ND				S-5: Stiff, brown, SILT, some fine Sand. Wet. (Stratified w/2" seam, Clayey SILT at ~ 21.5').
25	S-6 25-27'	7-8 7-9	24/22	ND				S-6: Medium dense, brown, fine SAND, some Silt. Moist. (Stratified)
30	S-7 30-32'	10-8 13-18	24/22	ND				S-7: Medium dense, brown, fine SAND, and Silt. Moist. (Stratified w/2" seam, Wet Clayey SILT at ~ 31').
35								

WELL DIAGRAM



Sanborn, Head & Associates, Inc.

Log of Monitoring Well SH-1

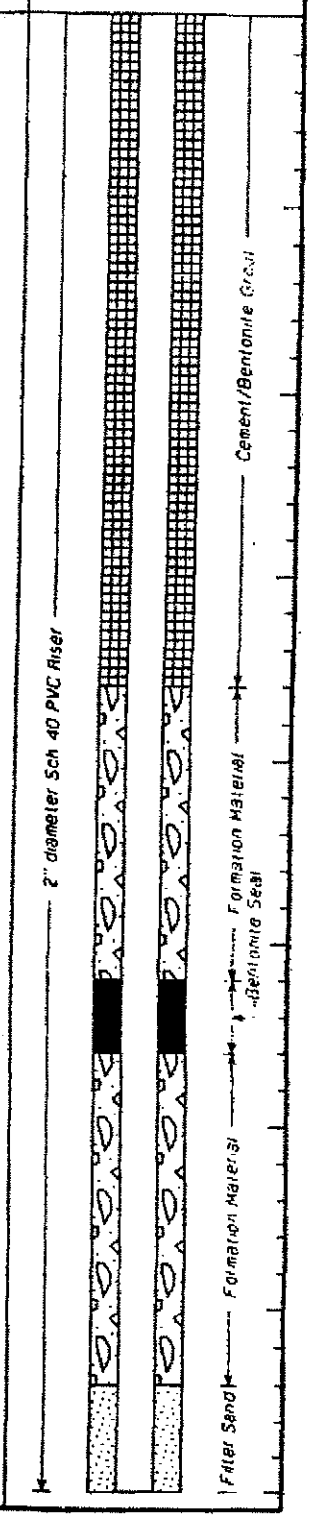
PROJECT NO.: 1304.1/1304.2

PROJECT: Burlington Square Mall Expansion

DATE STARTED: 05/06/97 | DATE FINISHED: 05/07/97

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION
	S-8 35-37'	7-11 13-17	24/20	ND				S-8: Medium dense, brown, fine SAND, some Silt. Moist. (Stratified)
40	S-9 40-42'	8-10 13-12	24/20	ND				S-9: Very stiff, brown, SILT, little fine Sand. Moist. (Stratified w/1" seam, Wet Clayey SILT at ~ 41.3').
45	S-10 45-47'	8-10 13-15	24/17	ND				S-10: Very stiff, brown, SILT, little fine Sand. Moist. (Stratified w/4" layer fine SAND at ~45.8').
50	S-11 50-51.2'	WOR 17-20	24/19	ND				S-11: Brown, SILT and fine Sand. Wet. (Stratified).
	S-11A 51.2-52'	See Note #2						S-11A: Brown, fine SAND, little Silt. Moist. (Stratified).
55	S-12 55-57'	7-16 16-17	24/21	ND			STRATIFIED SAND AND SILT	S-12: Hard, brown, Clayey SILT and fine Sand. Wet. (Stratified w/several 1" seams, Wet, fine SAND).
60	S-13 60-62'	6-9 10-18	24/23	ND				S-13: Very stiff, gray-brown, SILT & CLAY, trace fine Sand. Wet. (Stratified).
65	S-14 65-67'	12-15 16-19	24/22	ND				S-14: Dense, gray, fine SAND, some Silt. Moist.
70	S-15 70-72'	WOR See Note #2	24/15	ND				S-15: Gray-brown, fine SAND, and Silt. Moist. (Stratified).
75								

WELL DIAGRAM



Sanborn, Head & Associates, Inc.

Log of Monitoring Well SH-1

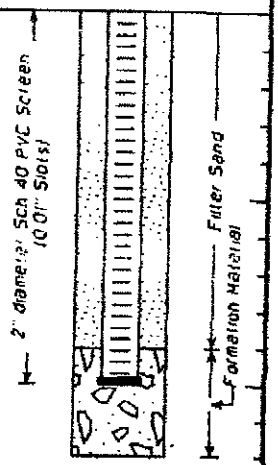
PROJECT NO.: 1304.1/1304.2

PROJECT: Burlington Square Mall Expansion

DATE STARTED: 05/06/97 | DATE FINISHED: 05/07/97

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION
	S-16 75-77'	15-18 17-20	24/22	ND				S-16: Dense, same as S-15.
80	S-17 80-81' S-17A 82-82'	WOR See Note #2	24/23	ND			STRATIFIED SAND AND SILT	S-17: brown, fine SAND, some Silt, Moist. S-17A: brown, SILT & CLAY, trace fine Sand. Wet. (Stratified)
85	S-18 85-87'	12-23 37-32	24/23	ND				S-18: Very dense, brown, fine SAND, and Silt. Wet.
								Bottom of Boring at 87'. EL. 110.5±
90								**NOTES:** 1) Soils were screened for volatile organics compounds (VOCs) using a Photovac Model MP-1000 Microtip Photoionization Detector (PID) with a 10.6 eV lamp calibrated to an isobutylene standard. Typical detection limit is 1 ppm. "ND" is not detected. 2) Split Spoon samples S-11, S-15 and S-17 Weight of Rods (WOR) blow counts indicate that rods were accidentally dropped to bottom of boring and density/consistency is unknown. 3) Bentonite bridging in last auger required augers to be removed from boring prior to establishing lower bentonite seal. Formation material cave-in from 53' to 61' and 63' to 72' from open borehole.
95								
100								
105								
110								
115								

WELL DIAGRAM



Sanborn, Head & Associates, Inc.

Log of Boring SH-6

PROJECT NO.: 1304.1

PROJECT: Burlington Square Mall Expansion

DATE STARTED: 8/11/97 | DATE FINISHED: 8/11/97

LOCATION: Burlington Vermont

SURFACE ELEVATION: Approximately 188.3 +/-

DRILLING METHOD: Mobile B-53 W/4-1/4" I.D. HSA

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB TIME
8/11/97		Dry	35'	End Boring

DRILLING COMPANY: Capital Environmental Drilling

FOREMAN: Jay Stevens

LOGGED BY: M. Heil | CHECKED BY: V. Kokosa

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-1 0-2'	3-3 6-7	24/20	-			FILL	S-1: Loose, brown, fine SAND, and Silt, trace Roots. Dry. FILL.	NOTES: 1) "-" indicates that soil samples were not screened for volatile organic compounds (VOCs) with PID. 2) Boring backfilled with formation material to approximately 5'. Cement/bentonite grout placed in remaining 5'. 3) No groundwater encountered
5	S-2 5-7'	4-5 8-8	24/15	-				S-2: Medium dense, gray-brown, fine to medium SAND, little Silt. Dry.	
10	S-3 10-12'	5-7 7-8	24/15	-				S-3: Medium dense, gray-brown, fine to coarse SAND, some Silt, trace coarse Sand. Moist.	
15	S-4 15-17'	5-8 7-8	24/10	-				S-4: Medium dense, gray-brown, fine SAND, some Silt. Moist. (Stratified with 2" seam Wet, brown, SIR at 16.8').	
20	S-5 20-22'	5-5 5-5	24/24	-			STRATIFIED SAND AND SILT	S-5: Loose, gray-brown, SILT, some fine Sand. Wet. (Stratified).	
25	S-6 25-27'	5-7 7-10	24/20	-				S-6: Stiff, brown, SILT, some fine Sand. Wet. (Stratified).	
30	S-7 30-31' S-7A 31-32'	12-10 11-14	24/20	-				S-7: Medium dense, gray-brown, fine SAND, and Silt. Moist. (Stratified). S-7A: Very Stiff, brown, Clayey SILT. Wet.	
35									

Sanborn, Head & Associates, Inc.

Log of Boring SH-6

PROJECT NO.: *1304.1*

PROJECT: *Burlington Square Mall Expansion*

DATE STARTED: *8/11/97* DATE FINISHED: *8/11/97*

DEPTH (feet)	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-8 35-37'	5-10 11-14	24/18	-			STRATIFIED SAND AND SILT	S-8: Medium dense, gray-brown, fine SAND, and Silt. Moist. (Stratified).	
								Bottom of boring at 37'.	
								El. 1913±	

40
45
50
55
60
65
70
75

Sanborn, Head & Associates, Inc.

Log of Boring SH-9

PROJECT NO.: 1304.1

PROJECT: Burlington Square Mall Expansion

DATE STARTED: 8/12/97 DATE FINISHED: 8/12/97

LOCATION: Burlington Vermont

SURFACE ELEVATION: Approximately 199.4 +/-

DRILLING METHOD: Mobile B-53 W/4-1/4" I.D. HSA

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
8/12/97		Dry	50'	End Boring

DRILLING COMPANY: Capital Environmental Drilling

FOREMAN: Jay Stevens

LOGGED BY: M. Heil CHECKED BY: V. Kokosa

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION
0	S-1 0-2	15-17 25-18	24/12	-				S-1: Medium dense, brown, fine to coarse SAND, some Gravel, some Silt. Moist.
5	S-2 5-7'	5-7 10-14	24/22	-				S-2: Medium dense, gray, fine to medium SAND, little Silt. Dry.
10	S-3 10-12'	8-11 11-9	24/17	-				S-3: Same as S-2.
15	S-4 15-17'	8-11 14-14	24/19	-			STRATIFIED SAND AND SILT	S-4: Medium dense, gray, fine to medium SAND, little Silt, trace Gravel. Moist. (Stratified).
20	S-5 20-22'	8-10 7-10	24/18	-				S-5: Medium dense, brown, fine SAND, and Silt. Moist. (Stratified).
25	S-6 26-27'	7-11 12-11	24/22	-				S-6: Same as S-5.
30	S-7 30-31.2 S-7A 31.2-32'	5-11 14-14	24/18	-				S-7: Very stiff, brown, SILT, and fine Sand. Moist. S-7A: Medium dense, brown, fine to medium SAND, some Silt. Moist.
35								

REMARKS

NOTES:

1) "-" indicates that soil samples were not screened for volatile organic compounds (VOCs) with PID.

2) Boring backfilled with formation material to approximately 10'. Cement/bentonite grout placed in remaining 10'.

3) No groundwater encountered.

Sanborn, Head & Associates, Inc.

Log of Boring SH-9

PROJECT NO.: 1304.1

PROJECT: Burlington Square Mall Expansion

DATE STARTED: 8/12/97 | DATE FINISHED: 8/12/97

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
	S-8 35-37'	11-14 14-18	24/20	-				S-8: Medium dense, brown, fine SAND, some Silt. Moist. (Stratified).	
40	S-9 40-42'	8-11 17-15	24/17	-				S-9: Very stiff, brown, SILT, some fine Sand. Moist. (Stratified with 3" seam SILT & CLAY at ~40.3').	
							STRATIFIED SAND AND SILT		
45	S-10 45-47'	10-9 12-18	24/18	-				S-10: Medium dense, brown, fine SAND and Silt. Moist. (Stratified).	
50	S-11 50-52'	7-9 9-14	24/18	-				S-11: Very stiff, gray-brown, SILT & CLAY. Wet. (Stratified).	
								Bottom of Boring at 52'. EL. 147.4±	
55									
60									
65									
70									
75									

Sanborn, Head & Associates, Inc.

Log of Boring SH-10

PROJECT NO.: 1304.1

PROJECT: Burlington Square Mall Expansion

DATE STARTED: 8/12/97 DATE FINISHED: 8/12/97

LOCATION: Burlington Vermont

SURFACE ELEVATION: Approximately 200.8 +/-

DRILLING METHOD: Mobile B-53 W/4-1/4" I.D. HSA

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
8/12/97		Dry	30'	End Boring

DRILLING COMPANY: Capital Environmental Drilling

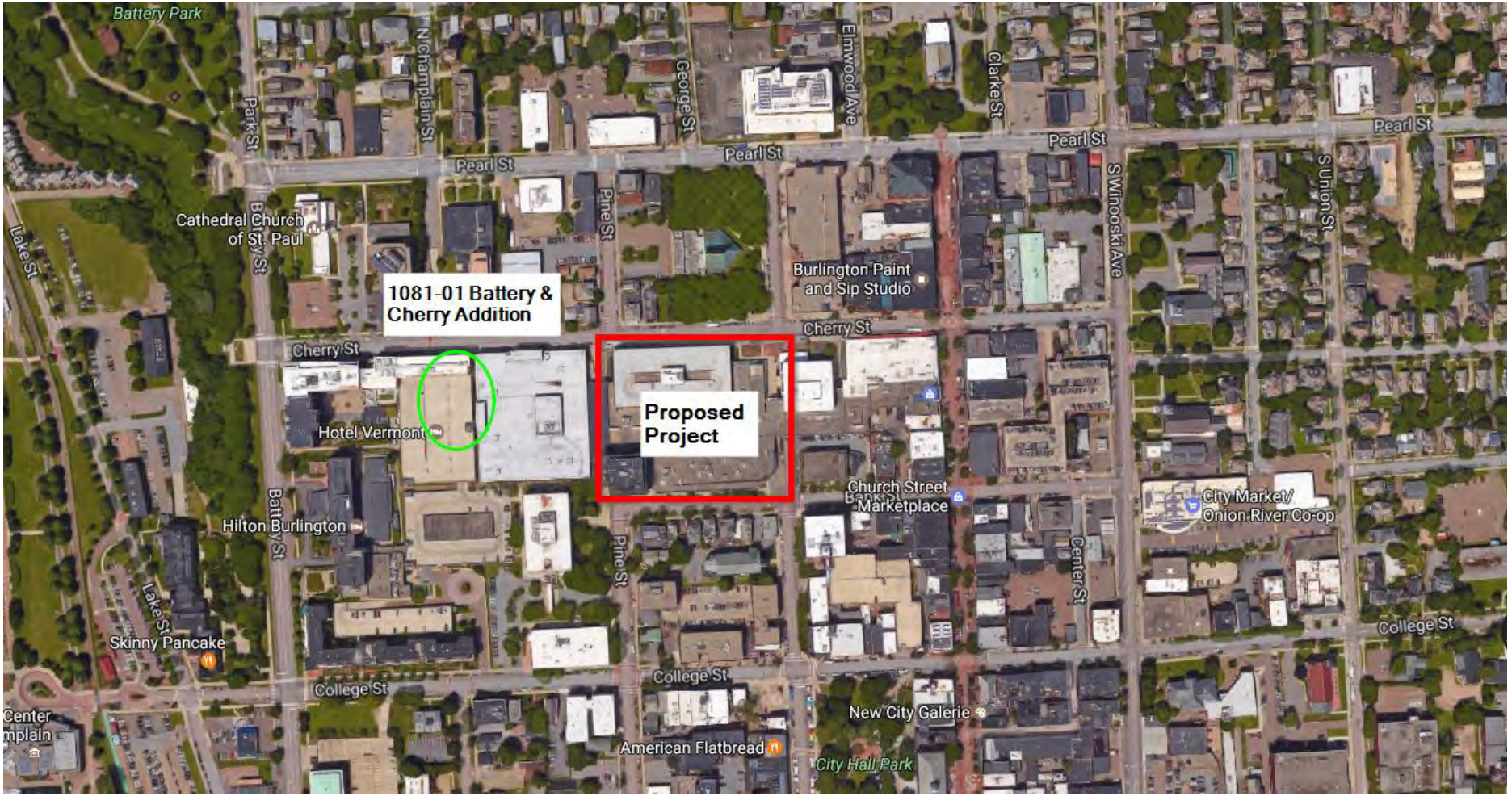
FOREMAN: Jay Stevens

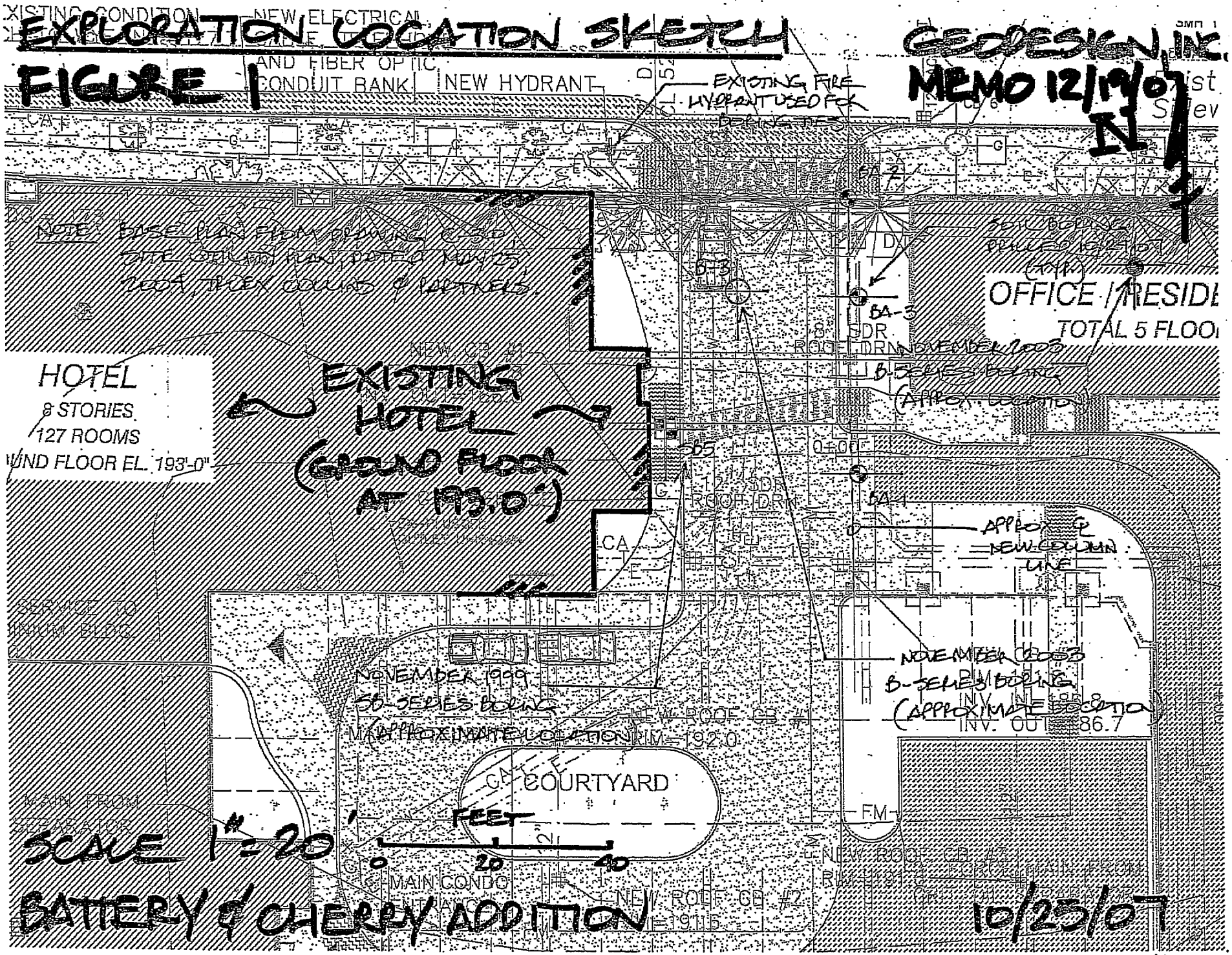
LOGGED BY: M. Heil CHECKED BY: V. Kokosa

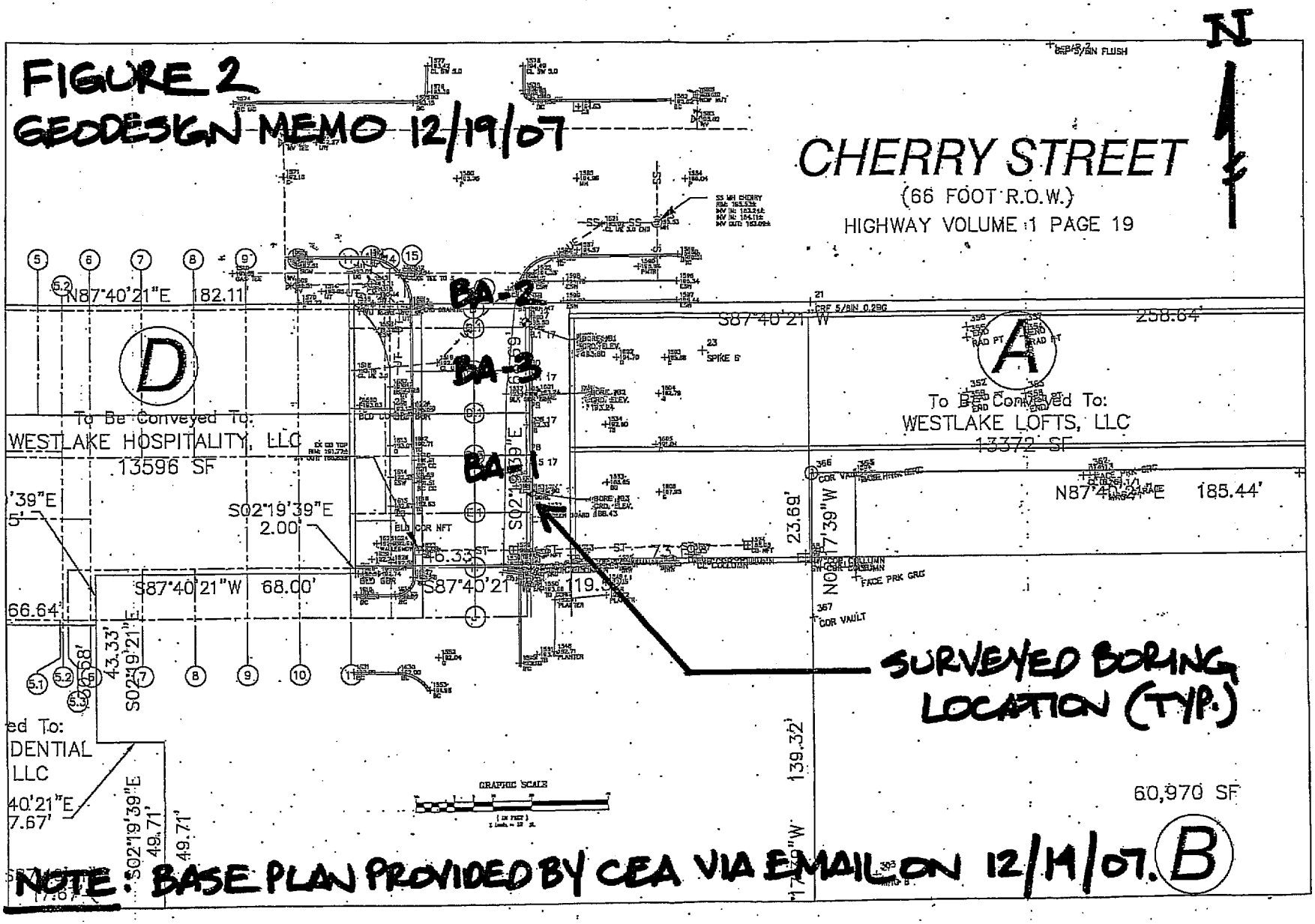
DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION	REMARKS
0	S-1 0-0.5'	7-5 6-7	24/18	-			FILL	S-1: Medium dense, gray-brown, fine to coarse SAND, trace Gravel, trace Concrete Fragments. Dry.	NOTES:
	S-1A 0.5-2.0							S-1A: Medium dense, gray, fine SAND, some Silt. Dry.	1) "-" indicates that soil samples were not screened for volatile organic compounds (VOCs) with PID.
5	S-2 5-7'	10-10 9-9	24/20	-				S-2: Medium dense, gray-brown, fine SAND, some Silt. Dry. (Stratified).	2) Boring backfilled with formation material to approximately 10'. Cement/bentonite grout placed in remaining 10'.
10	S-3 10-11.2'	5-7 7-7	24/17	-				S-3: Medium dense, brown, fine SAND, and Silt. Moist. (Stratified).	3) No groundwater encountered.
	S-3A 11.2-12'							S-3A: Medium dense, gray, fine to medium SAND, little Silt. Moist. (Stratified).	
15	S-4 15-17'	7-8 9-8	24/18	-			STRATIFIED SAND AND SILT	S-4: Medium dense, gray, fine to coarse SAND, little Silt. Wet.	
20	S-5 20-22'	7-8 9-8	24/21	-				S-5: Stiff, brown, SILT, some fine Sand. Wet. (Stratified).	
25	S-6 25-27'	5-8 5-8	24/18	-				S-6: Same as S-5.	
30	S-7 30-32'	6-7 8-7	24/18	- -				S-7: Stiff, brown, SILT & CLAY and fine Sand. Wet. (Stratified).	
35								Bottom of Boring at 32'. el. 168.8'	

1081-01 Battery & Cherry St Addition

- Map of project area
- Exploration Location Plans
- Boring Logs


Battery Park
N Champlain St
Park St
George St
Elmwood Ave
Clarke St
Pearl St
Pearl St
Pearl St
Pearl St
S Winooski Ave
S Union St
Pine St
Cathedral Church of St. Paul
Lake St
Burlington Paint and Sip Studio
1081-01 Battery & Cherry Addition
Cherry St
Cherry St
Proposed Project
Hotel Vermont
Church Street Marketplace
City Market/ Onion River Co-op
Battery St
Hilton Burlington
Pine St
Center St
Lake St
Skinny Pancake
College St
College St
College St
New City Galerie
American Flatbread
City Hall Park


EXPLORATION LOCATION SKETCH
GEODESIGN, INC.
FIGURE 1
MEMO 12/19/07
EXISTING CONDITION
NEW ELECTRICAL
AND FIBER OPTIC
CONDUIT BANK
NEW HYDRANT
EXISTING FIRE HYDRANT USED FOR BORING
NOTE: BASE PLAN FROM PLANNING CORP
SITE GRADING PLAN, DATED MAY 25, 2007, INCLUDES BUILDINGS & UTILITIES.
HOTEL
8 STORIES
127 ROOMS
TOP OF ROOF EL. 193'-0"
EXISTING HOTEL
(GROUND FLOOR AT 173.0')
OFFICE / RESIDE
TOTAL 5 FLOO
NOVEMBER 1999
B-SERIES BORING
(APPROXIMATE LOCATION)
NOVEMBER 2003
B-SERIES BORING
(APPROXIMATE LOCATION)
APPROX. LOCATION OF NEW COLUMN FOOTING
COURTYARD
NEW ROOF
MAIN CONDO
SCALE 1" = 20'
FEET
0
20
40
BATTERY & CHERRY ADDITION
10/25/07


FIGURE 2
GEODESIGN MEMO 12/19/07
CHERRY STREET
(66 FOOT R.O.W.)
HIGHWAY VOLUME 1 PAGE 19
N
BA-2
BA-3
BA-1
D
A
B
To Be Conveyed To:
WESTLAKE HOSPITALITY, LLC
13596 SF
To Be Conveyed To:
WESTLAKE LOFTS, LLC
13372 SF
N87°40'21"E 182.11'
S87°40'21"W 258.64'
N87°41'24"E 185.44'
S02°19'39"E 2.00'
S87°40'21"W 68.00'
S87°40'21" 119.5'
S02°19'39"E 139.32'
N00°19'39"W 23.69'
S02°19'39"E 43.33'
S02°19'39"E 49.71'
66.64'
60,970 SF
SURVEYED BORING LOCATION (TYP.)
GRAPHIC SCALE
NOTE: BASE PLAN PROVIDED BY CEA VIA EMAIL ON 12/14/07.

BORING LOG

Boring No.:	BA-1
Page No.:	1 of 1
File No.:	1081-01
Checked By:	JAG

GEODESIGN INCORPORATED
Geotechnical Engineers and Environmental Consultants
P.O. Box 699, Windsor, VT 05089, Phone: 802-674-2033/Fax: 802-674-5943
1233 Shelburne Rd., Suite 360, So. Burlington, VT 05403, Phone: 802-652-5140

Project Name: Battery & Cherry Addition, Burlington, Vermont

Boring Company:	Specialty Drilling & Investigation
Foreman:	Chris Aldrich
GeoDesign Rep.:	Jason Gaudette
Date Started:	October 24, 2007
Date Finished:	October 24, 2007
N. Coordinate:	
E. Coordinate:	
Ground Surface Elevation (feet):	188.43
Station:	Offset: ft

	Casing	Sampler
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Simco 2800	
Hammer Type:	Wire Safety	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 10/24/07, 10:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description: Depth & Elevation (feet)	Symbol	Sample Description (Classification System: Burmister)
		S1	SS	24	4	0	2	1	3	3			Fill		S1) Very loose, light brown, fine to coarse SAND, some fine Gravel, little Silt, moist.
		S2	SS	24	6	2	3	2	2	2					S2) Very loose, light brown, fine to medium SAND, little fine to coarse Gravel, trace Silt, with trace root fibers.
5		S3	SS	24	8	4	2	2	1	2					S3) Very loose, brown fine SAND, some Silt, trace fine Gravel, with trace root fibers, damp.
		S4	SS	24	10	6	2	1	3	2					S4) Very loose, brown, fine to medium SAND, little Silt, little fine to coarse Gravel, damp.
		S5	SS	24	16	8	2	3	4	4					S5) Loose, similar to S4.
10		S6	SS	24	11	10	5	3	5	6					S6) Loose, similar to S4.
		S7	SS	24	12	12	4	3	4	3					S7) Loose, similar to S4.
15													15		
		S7	SS	24	10	16	6	7	7	7			Sand 173.4		S8) Medium dense, gray brown, fine to medium SAND, trace fine Gravel, trace Silt, damp. Piece of plastic noted midway through sample (possibly from augers).
20		S9	SS	24	12	20	8	12	10	11					S9) Medium dense, similar to S8, except with no plastic.
													22		
													Bottom of Exploration at 22.0 ft 166.4		
25															
30															

Remarks:
1) Ground surface elevation provided to GeoDesign by CEA via email on December 14, 2007.
2) Coarse gravel inferred during HSA advance to 4' deep.
3) Piece of plastic bottle observed in HSA cuttings during advance to 15'. Driller noted it was possibly "pushed" from higher elevation.

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After casing; N.R. = Not Recorded.
3) Sample Type Codings: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: BA-1

VT BORING LOG MC 5/21/04 1081-01 BATTERY & CHERRY.GPJ GEODESIGN STANDARD.GDT 12/19/07

BORING LOG

GEODESIGN INCORPORATED
Geotechnical Engineers and Environmental Consultants
P.O. Box 699, Windsor, VT 05089, Phone: 802-674-2033/Fax: 802-674-5943
1233 Shelburne Rd., Suite 360, So. Burlington, VT 05403, Phone: 802-652-5140

Project Name: Battery & Cherry Addition, Burlington, Vermont

Boring No.: BA-2
Page No.: 1 of 1
File No.: 1081-01
Checked By: JAG

Boring Company: Specialty Drilling & Investigation
Foreman: Chris Aldrich
GeoDesign Rep.: Jason Gaudette
Date Started: October 24, 2007 Date Finished: October 24, 2007
N. Coordinate: E. Coordinate:
Ground Surface Elevation (feet): 193.6
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Simco 2800	
Hammer Type:	Wire Safety	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 10/24/07, 12:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description: Depth & Elevation (feet)	Symbol	Sample Description (Classification System: Burmister)
		S1	SS	24	14	0	15	14	14	9			Fill		S1) Medium dense, light brown, fine to medium SAND, little fine tocoarse Gravel, little Silt, damp, with piece of white plastic.
		S2	SS	24	14	2	11	11	7	7			4		S2) Medium dense, similar to S1, except with piece of concrete.
5		S3	SS	24	12	4	6	4	4	4			Silty Sand (possibly disturbed) 189.6		S3) Loose, similar to S1, except no plastic.
		S4	SS	24	16	6	5	4	6	7			7		S4) Loose, gray-brown, fine to medium SAND, trace Silt with 4" layer of fine Sand and Silt, parted, moist.
		S5	SS	24	18	8	5	7	7	8			Sand 186.6		S5) Medium dense, similar to S4, except fine SAND and SILT layer 6" thick.
10		S6	SS	24	18	10	5	5	6	7					S6) Medium dense, similar to S4 without SAND and SILT layer.
		S7	SS	24	18	12	8	10	12	9					S7) Medium dense, similar to S4, finely parted with orange oxidations.
15		S8	SS	24	18	15	6	9	8	7			16		S8) Medium dense, similar to top 6". Bottom 10" gray-brown, fine SAND, little to some Silt, damp.
													Silty Sand (Layered) 177.6		
20		S9	SS	24	8	20	8	13	15	11					S9) Medium dense, similar to S4, with piece of coarse Gravel.
25		S10	SS	24	17	25	4	10	10	11			27		S10) Medium dense, similar to bottom 10" of S8, damp.
													Bottom of Exploration at 27.0 ft 166.6		
30															

Remarks: 1) Ground surface elevation provided to GeoDesign by CEA via email on December 14, 2007.

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: BA-2

VT BORING LOG MC 5/21/04 1081-01 BATTERY & CHERRY.GPJ GEODESIGN STANDARD.GDT 12/19/07

BORING LOG

GEODESIGN INCORPORATED

Geotechnical Engineers and Environmental Consultants

P.O. Box 699, Windsor, VT 05089, Phone: 802-674-2033/Fax: 802-674-5943
1233 Shelburne Rd., Suite 360, So. Burlington, VT 05403, Phone: 802-652-5140

Project Name: Battery & Cherry Addition, Burlington, Vermont

Boring No.: BA-3
Page No.: 1 of 1
File No.: 1081-01
Checked By: JAG

Boring Company: Specialty Drilling & Investigation
Foreman: Chris Aldrich
GeoDesign Rep.: Jason Gaudette
Date Started: October 24, 2007 Date Finished: October 24, 2007
N. Coordinate: E. Coordinate:
Ground Surface Elevation (feet): 193.24
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	2.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	Simco 2800	
Hammer Type:	Wire Safety	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 10/24/07, 14:00			None Observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0-6	6-12	12-18	18-24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Burmister)
		S1	SS	24	12	0	7	11	15	17			Fill		S1) Medium dense, brown fine to coarse SAND, some fine to coarse Gravel, little Silt, with wood piece in spoon tip, damp.
		S2	SS	24	14	2	17	19	17	21			3		S2) Light grayish brown, fine to medium SAND, little Silt, trace fine Gravel, damp. Wood noted at top of sample.
													Silty Sand 190.2		
5		S3	SS	24	10	4	12	9	10	10					S3) Medium dense, brown, fine to medium SAND, little Silt, trace fine Gravel, damp.
		S4	SS	24	12	6	10	10	10	10					S4) Medium dense, similar to S3.
		S5	SS	24	14	8	12	7	7	11					S5) Medium dense, similar to S3, except little fine to coarse Gravel.
10															
		S6	SS	24	16	10	7	11	13	10			11.5		S6) Medium dense. Top 10" SAND. Middle 2": Layered fine SAND and SILT, moist. Bottom 4" gray-brown fine to medium SAND, trace Silt, damp.
													Sand 181.7 (layered with Silt fine Sand)		
		S7	SS	24	16	12	11	10	9	7					S7) Medium dense similar to bottom 4" of S6, except drier.
15															
		S8	SS	24	16	16	8	10	11	9					S8) Medium dense, similar to bottom 4" of S6.
20															
		S9	SS	24	12	20	9	8	10	10					S9) Medium dense, similar to S8 with 1" layer of fine SAND and SILT, moist.
25															
		S10	SS	24	0	25	11	14	20	19			27		S10) No recovery. Possibly pushing piece of coarse gravel/cobble.
													Bottom of Exploration 166.2 at 27.0 ft		
30															

Remarks:

1) Ground surface elevation provided to GeoDesign by CEA via email on December 14, 2007.
2) Wood splinters observed in auger cuttings during HSA advance to 4' deep.
3) Higher blow counts (i.e., SPT N values) due possibly to pushing piece of coarse gravel or cobble while sampling at 25' deep.

Notes:

1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated; Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

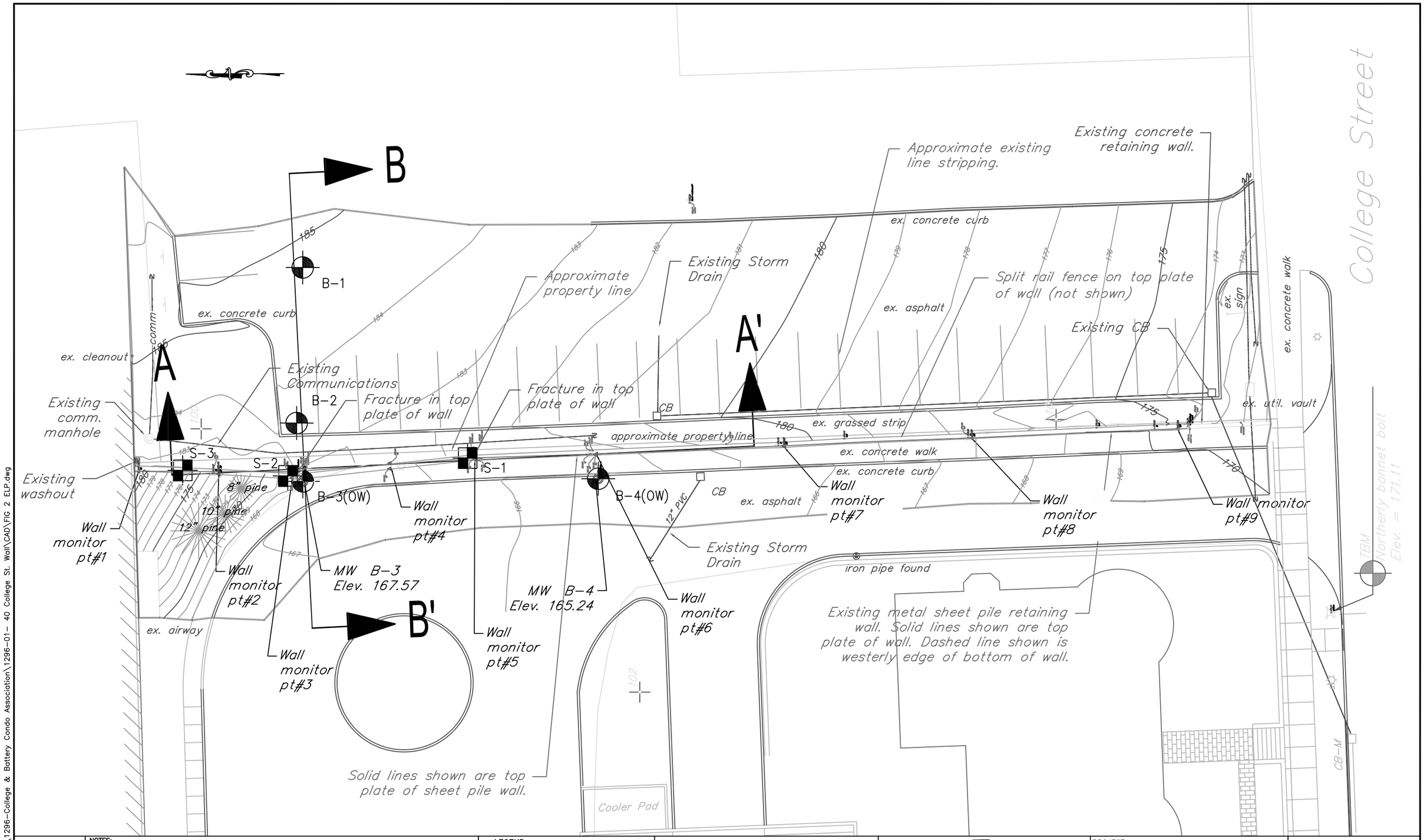
Boring No.: BA-3

VT BORING LOG MC 5/21/04 1081-01 BATTERY & CHERRY.GPJ GEODESIGN STANDARD.GDT 12/13/07

1296-01 College St Retaining Wall

- Map of project area
- Exploration Location Plan
- Boring Logs


Battery Park
N Champlain St
Park St
George St
Elmwood Ave
Clarke St
Pearl St
Pearl St
Pearl St
Pearl St
S Winooski Ave
S Union St
Cathedral Church of St. Paul
Battery St
Lake St
Pine St
Burlington Paint and Sip Studio
Cherry St
Cherry St
Proposed Project
Hotel Vermont
Church Street Marketplace
City Market/ Onion River Co-op
Hilton Burlington
Battery St
Pine
Center St
1296-01 College St Retaining Wall Project
Lake St
Skinny Pancake
College St
College St
College St
New City Galerie
American Flatbread
City Hall Park
Center
mplain



CAD FILE No. O:\CN\1296-College & Battery Condo Association\1296-01- 40 College St. Wall\CAD\FIG 2 ELP.dwg

DRAWN BY: AJB

CHECKED BY: SPK

NOTES:
1) BASE MAP DEVELOPED FROM AN ELECTRONIC FILE PROVIDED BY KREBS & LANSING CONSULTING ENGINEERS, INC. ENTITLED 'ACAD07-X-Base.dwg' VIA EMAIL ON DECEMBER 16, 2015. ORIGINAL SCALE 1" = 20'.
2) BORINGS WERE PERFORMED BY QCQA LABORATORIES, INC. AND OBSERVED AND LOGGED BY GEODESIGN PERSONNEL.
3) THE LOCATIONS OF THE BORINGS WERE DETERMINED BY KREBS & LANSING SURVEY. LOCATIONS OF SEISMIC REFLECTION TESTS WERE DETERMINED BY TAPING AND VISUAL ESTIMATES FROM EXISTING SITE FEATURES. THESE LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
4) UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE, BASED ON MARKS BY DIG SAFE AND LOCATED BY SURVEY. LOCATION AND DEPTHS SHOULD BE VERIFIED IN THE FIELD.

LEGEND
B-1 — TEST BORING / OBSERVATION WELL NO. AND LOCATION BY GEODESIGN, INC.
S-1 — SEISMIC REFLECTION TEST AREA AND LOCATION BY NDT, INC.
A A' — SUBSURFACE PROFILE AND LOCATION

SCALE 1"= 20'
0 10 20 40

GEODESIGN INCORPORATED
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MIDDLEBURY, CT BURLINGTON, VT

PROJECT
EXPLORATION LOCATION PLAN
COLLEGE & BATTERY RETAINING WALL
BURLINGTON, VERMONT
FILE NO. 1296-01

FILE NO. 1296-01
SCALE 1" = 20'
DATE 1/7/16
FIGURE NO. 2

GEODESIGN INCORPORATED
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S. Burlington, VT 05403
Phone: 802-652-5140

BORING LOG

Project Name

College & Battery Assoc. Retaining Wall
40 College St
Burlington, VT

Boring No.: **B-1**
Page No.: 1 of 1
File No.: 1296-01
Checked By: JFW

Boring Company:	QC/QA Laboratories, Inc.				Casing:	Sampler:	
Foreman:	John Leonhardt			Type:	H.S.A.	SS	
GeoDesign Rep.:	Alan Baribault/Hilary Jones			I.D.:	3.25 in.	1.38 in.	
Date Started:	November 18, 2015	Date Finished:	November 18, 2015	Hammer Wt.:	NA	140 lbs	
N. Coordinate:	721653.1	E. Coordinate:	1453332.6	Hammer Fall:	NA	30 in.	
Ground Surface Elevation (feet):	184.78			Rig Type:	CME 550X ATV		
Station:		Offset:	ft	Hammer Type:	Automatic		

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 11/18/15, 0:00			None observed
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Modified Burmister)
													Asphalt 184.5		
		S1	SS	18	1	0.5	8	6	4				Fill (Sand and Gravel Base) 2		S1) Medium dense, light brown fine to coarse SAND and GRAVEL, little Silt, slightly moist to dry.
		S2	SS	24	18	2	8	10	15	16			Silty Sand (Possible Fill) 182.8		
													4		S2) Medium dense, tan fine SAND, some Silt, trace fine Gravel (mainly upper 6"), moist.
5		S3	SS	24	19	4	6	14	14	17			Layered Sand & Silt 180.8		
															S3) Medium dense, tan fine SAND and SILT, moist.
		S4	SS	24	22	6	14	14	17	16					S4) Dense, tan and gray fine SAND and SILT, slightly moist to dry.
10		S5	SS	24	20	9	5	5	8	9					S5) Medium dense, tan faintly layered fine SAND and SILT, moist.
		S6	SS	24	22	11	8	9	11	11					S6) Medium dense, tan fine SAND and SILT, moist.
15		S7	SS	24	24	14	4	14	14	12					S7) Medium dense, tan fine SAND, some Silt, slightly moist to dry.
		S8	SS	24	17	16	6	7	8	7					S8) Medium dense, tan SILT and fine SAND, with fine SAND, little Silt (2" layer at top, similar to S7), moist (top 2" dry).
20		S9	SS	24	22	19	4	5	4	5					S9) Loose, tan SILT, some fine Sand (upper 16") with fine SAND and SILT (lower 8"), moist.
													24		
25		S10	SS	24	19	24	1	3	7	10			Fine to Medium Sand 160.8		S10) Medium dense, tan and gray with occasional orange banding fine to medium SAND, trace Silt with 1.5" thick layer (near top) of fine to medium SAND, some Silt, moist.
30		S11	SS	24	20	29	3	6	6	7					S11) Medium dense, tan fine to medium SAND, little Silt, moist.
													31		
													Bottom of Exploration at 31.0 ft 153.8		
35															

Remarks

1) Boring location (northing, easting, elevation) based on survey by Krebs&Lansing, Inc. on 11/24/15.
2) Samples S2. S4, S6, and S8 SPT N-values not performed according to ASTM D1586 (borehole not cleaned out prior to sampling).
3) Boring backfilled with cuttings, compacted in upper 5 feet with augers, and patched in parking log with asphalt cold patch.
4) Borehole terminated at 31 feet deep without refusal.

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

VT BORING LOG MC 5/21/04 1296-01 - COLLEGE AND BATTERY ASSOC RETAINING WALL.GPJ GEODESIGN STANDARD.GDT 8/3/16

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Phone: 802-652-5140

BORING LOG

Project Name

College & Battery Assoc. Retaining Wall
40 College St
Burlington, VT

Boring No.: **B-2**
Page No.: 1 of 2
File No.: 1296-01
Checked By: JFW

Boring Company:	QC/QA Laboratories, Inc.		
Foreman:	John Leonhardt		
GeoDesign Rep.:	Alan Baribault/Hilary Jones		
Date Started:	November 18, 2015	Date Finished:	November 18, 2015
N. Coordinate:	721654.5	E. Coordinate:	1453297.7
Ground Surface Elevation (feet):	183.7		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	CME 550X ATV	
Hammer Type:	Automatic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 11/18/15, 12:10	21.0	162.7	Wet sample (perched)
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
		S1	SS	18	11	0.5	1	2	3				Asphalt 183.4		
													Layered Sand & Silt		S1) Loose, brown fine to coarse SAND, some Silt, trace fine Gravel (mainly upper half), moist.
		S2	SS	24	14	2	3	4	5	6					S2) Loose, light brown to tan with 1" thick orange layer fine to coarse SAND, some Silt, trace fine Gravel, moist.
5		S3	SS	24	20	4	4	4	6	5					S3) Medium dense, light brown SILT and fine SAND, moist.
		S4	SS	24	19	6	5	6	6	5					S4) Medium dense, light brown to tan fine SAND and SILT, moist.
10		S5	SS	24	22	9	5	7	7	8					S5) Medium dense, light brown to tan fine SAND, some Silt, moist.
		S6	SS	24	22	11	8	9	8	6					S6) Medium dense, light brown to tan with occasional faint layering fine SAND, some Silt, moist.
15		S7	SS	24	21	14	3	4	4	3					S7) Loose, light brown to tan fine SAND and SILT, with 2" thick layer SILT, some fine Sand (at bottom), moist.
		S8	SS	24	20	16	5	5	5	4					S8) Medium dense, faintly layered / varved (1/4" to 3/4") fine SAND and SILT, moist.
20		S9	SS	24	18	19	2	3	2	2					S9) Loose, tan / light brown fine SAND and SILT grading to SILT, some fine Sand (lower 4"), moist (sand) to wet (silt).
		S10	SS	24	16	21	3	4	5	5			21.5 ▼ Fine to Medium Sand 162.2		S10) Loose,
25		S11	SS	24	18	24	2	5	5	4					S10A - Upper 6": Light brown SILT, some fine Sand, wet. S10B - Lower 10": Tan and gray fine SAND, little Silt, moist. S11) Medium dense tan and gray fine SAND, trace Silt, moist.
30		S12	SS	24	20	29	4	5	7	4					S12) Medium dense, gray with slight orange layering fine to medium SAND, trace Silt, moist.
35		S13	SS	24	24	34	3	4	4	5			35		S13) Loose, tan to light brown,

Remarks

1) Boring location (northing, easting, elevation) based on survey by Krebs&Lansing, Inc. on 11/24/15.
2) Samples S2. S4, S6, S8, and S10 SPT N-values not performed according to ASTM D1586 (borehole not cleaned out prior to sampling).
3) Boring backfilled with cuttings, compacted in upper 5 feet with augers, and patched in parking log with asphalt cold patch.
4) Borehole terminated at 61 feet deep without refusal.

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

VT BORING LOG MC 5/21/04 1296-01 - COLLEGE AND BATTERY ASSOC RETAINING WALL.GPJ GEODESIGN STANDARD.GDT 8/3/16

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40 Farrell Street
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Phone: 802-652-5140

BORING LOG

Project Name

College & Battery Assoc. Retaining Wall
40 College St
Burlington, VT

Boring No.: **B-2**
Page No.: 2 of 2
File No.: 1296-01
Checked By: JFW

Boring Company:	QC/QA Laboratories, Inc.		
Foreman:	John Leonhardt		
GeoDesign Rep.:	Alan Baribault/Hilary Jones		
Date Started:	November 18, 2015	Date Finished:	November 18, 2015
N. Coordinate:	721654.5	E. Coordinate:	1453297.7
Ground Surface Elevation (feet):	183.7		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	CME 550X ATV	
Hammer Type:	Automatic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 11/18/15, 12:10	21.0	162.7	Wet sample (perched)
▼			
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Modified Burmister)
													Layered Silt & Sand with Clayey Seams 148.7		S13A - Upper 12": Fine to medium SAND, trace Silt, moist. S13B - Lower 12": SILT, some fine Sand, with one 1/2" seam of Clay & Silt, very moist to wet.
40		S14	SS	24	24	39	3	4	5	7					S14) Loose, brown to light brown SILT and fine SAND, very moist to wet. With 2" thick layers of fine SAND, trace Silt and two 1/2" thick layers of Silt & Clay.
45		S15	SS	24	24	44	4	5	6	8					S15) Medium dense, brown and gray with occasional orange layering SILT and fine SAND, with Clayey SILT layers to 1.5" thick, moist.
50		S16	SS	24	22	49	1	4	6	8					S16) Medium dense, brown and gray with occasional orange layering fine SAND and SILT with 1" thick layers of Clayey SILT, moist (sand) to wet (silt).
55		S17	SS	24	22	54	2	3	5	9					S17) Loose, brown and gray with occasional orange layering SILT, some fine Sand with layers of fine SAND, some Silt, and 1/8" seam of Silt & Clay, moist to wet.
60		S18	SS	24	19	59	5	6	11	12					S18) Medium dense, brown and gray fine SAND and SILT with layers of SILT, some Sand, moist (sand) to wet (silt).
													61 Bottom of Exploration at 61.0 ft 122.7		
65															
70															

Remarks

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-2**

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S. Burlington, VT 05403
Phone: 802-652-5140

BORING LOG

Project Name

College & Battery Assoc. Retaining Wall
40 College St
Burlington, VT

Boring No.: **B-3**
Page No.: 1 of 2
File No.: 1296-01
Checked By: JFW

Boring Company:	QC/QA Laboratories, Inc.		
Foreman:	John Leonhardt		
GeoDesign Rep.:	Alan Baribault/Hilary Jones		
Date Started:	November 19, 2015	Date Finished:	November 19, 2015
N. Coordinate:	721653.1	E. Coordinate:	1453284.7
Ground Surface Elevation (feet):	167.57		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	CME 550X ATV	
Hammer Type:	Automatic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 11/19/15, 8:35	19.0	148.6	Wet sample (perched)
▼ 11/19/15, 9:10	39.0	128.6	Wet sample (perched)
▼ 11/19/15, 9:40	49.0	118.6	Wet sample
▼ 12/14/15, 12:45	Dry	0.0	

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Modified Burmister)	Well Log
		S1	SS	24	16	0	2	3	3	2			Topsoil 167.3 Fill (Silty Sand with Gravel)		S1) Loose, brown/reddish-pink/light brown fine to coarse SAND, some Silt, little fine Gravel, trace Roots, moist.	
		S2	SS	24	8	2	4	6	9	11					S2) Medium dense, brown/reddish-pink fine to coarse SAND, some fine to coarse Gravel, some Silt, moist.	
													3.8			
5		S3	SS	24	14	4	8	6	5	5			Layered Sand & Silt 163.8		S3) Medium dense, brown with occasional dark brown mottling fine SAND and SILT with 2 layers ~2" thick SILT and fine SAND, moist.	
		S4	SS	24	16	6	4	4	4	3					S4) Loose, gray and tan with orange layers fine SAND, some Silt, moist.	
10		S5	SS	24	15	9	2	2	4	4					S5) Loose, gray and tan fine SAND, little Silt, moist. Silty varves/partings 1/4" to 1" apart, faint orange layering.	
		S6	SS	24	17	11	4	3	4	4					S6) Loose, gray (top) to gray-brown (bottom) fine SAND, little SILT grading to fine SAND and SILT, moist to wet (lower 2").	
15		S7	SS	24	20	14	3	3	5	5					S7) Loose, gray with tan and orange layering fine SAND, some Silt, moist.	
		S8	SS	24	18	16	4	6	6	7					S8) Medium dense, gray with faint tan and orange layering fine SAND, some Silt, moist. With ~1" thick layer at 5" from bottom fine SAND and SILT.	
													19 ▼			
20		S9	SS	24	22	19	2	3	4	6			Layered Silt & Sand with Clayey Seams 148.6		S9) Loose, gray and gray-brown with occasional orange partings SILT, some fine Sand, moist to wet. Alternating 1/2" to 2" layers SILT, little fine Sand with fine SAND and SILT. With one 1" thick layer of Clayey SILT.	
25		S10	SS	24	19	24	3	3	6	8					S10) Loose, gray and brown SILT, little fine Sand (~1"-3" layers) with fine SAND, little Silt (~1/2"-1" layers), moist (sand) to wet (silt).	
30		S11	SS	24	24	29	5	6	7	7					S11) Medium dense, light brown and gray	

Remarks

1) Boring location (northing, easting, elevation) based on survey by Krebs&Lansing, Inc. on 11/24/15.
2) Samples S2. S4, S6, and S8 SPT N-values not performed according to ASTM D1586 (borehole not cleaned out prior to sampling).
3) Instrumentation standpipe / 2" I.D. Monitoring Well installed in borehole, with flush mounted cover.
4) Borehole terminated at 51 feet deep without refusal.

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

VT BORING LOG MC 5/21/04 1296-01 - COLLEGE AND BATTERY ASSOC RETAINING WALL.GPJ GEODESIGN STANDARD .GDT 8/3/16

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40 Farrell Street
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BORING LOG

Project Name

College & Battery Assoc. Retaining Wall
40 College St
Burlington, VT

Boring No.: **B-3**
Page No.: 2 of 2
File No.: 1296-01
Checked By: JFW

Boring Company:	QC/QA Laboratories, Inc.		
Foreman:	John Leonhardt		
GeoDesign Rep.:	Alan Baribault/Hilary Jones		
Date Started:	November 19, 2015	Date Finished:	November 19, 2015
N. Coordinate:	721653.1	E. Coordinate:	1453284.7
Ground Surface Elevation (feet):	167.57		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	CME 550X ATV	
Hammer Type:	Automatic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
▼ 11/19/15, 8:35	19.0	148.6	Wet sample (perched)
▼ 11/19/15, 9:10	39.0	128.6	Wet sample (perched)
▼ 11/19/15, 9:40	49.0	118.6	Wet sample
▼ 12/14/15, 12:45	Dry	0.0	

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation (feet))	Symbol	Sample Description (Classification System: Modified Burmister)	Well Log
													Layered Silt & Sand with Clayey Seams *(Continued)*		with occasional orange layering fine SAND, little Silt (2" to 8" layers) with SILT, little fine Sand (1" to 3" layers), moist (sand) to very moist (silt).	
35		S12	SS	24	18	34	2	5	7	6					S12) Medium dense, gray with gray-brown and occasional orange partings fine SAND, some Silt with occasional 1/2" to 1.5" layers SILT, little fine Sand and one (1/4" layer) clayey Silt, moist (sand) to very moist (silt).	
40		S13	SS	24	24	39	3	4	6	8			▼		S13) Medium dense, light brown with occasional gray and orange layering SILT, some fine Sand with two ~1" thick layers fine SAND, little Silt, and a 1/4" thick layer of gray Silt & Clay, very moist (sand) to wet (silt).	
45		S14	SS	24	19	44	2	8	12	11					S14) Medium dense, gray with light brown and occasional orange layering fine SAND, some Silt, with two, ~1" thick layers SILT, little fine Sand, moist (sand) to very moist (silt).	
50		S15	SS	24	15	49	4	7	10	12			▼		S15) Medium dense, brown with orange layering fine SAND and SILT, wet.	
													51 Bottom of Exploration at 51.0 ft 116.6			
55																
60																

Remarks

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-3**

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BORING LOG

Project Name

College & Battery Assoc. Retaining Wall
40 College St
Burlington, VT

Boring No.: **B-4**
Page No.: 1 of 2
File No.: 1296-01
Checked By: JFW

Boring Company:	QC/QA Laboratories, Inc.		
Foreman:	John Leonhardt		
GeoDesign Rep.:	Alan Baribault/Hilary Jones		
Date Started:	November 19, 2015	Date Finished:	November 19, 2015
N. Coordinate:	721586.9	E. Coordinate:	1453285.3
Ground Surface Elevation (feet):	165.24		
Station:		Offset: ft	

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	NA	140 lbs
Hammer Fall:	NA	30 in.
Rig Type:	CME 550X ATV	
Hammer Type:	Automatic	

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 11/19/15, 0:00			None observed
▼ 12/14/15, 12:45	45.3	119.9	
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)	Well Log
													Asphalt 165.0			
													Fill (Silty Sand with Gravel) (Inferred from B-3)			
													3.8			
5													Layered Sand & Silt 161.4 (Inferred from B-3)			
10																
15																
													19			
20													Layered Silt & Sand with Clayey Seams 146.2 (Inferred from B-3)			
25																
30																

Remarks

1) Boring location (northing, easting, elevation) based on survey by Krebs&Lansing, Inc. on 11/24/15.
2) Stratigraphy inferred from Boring B-3.
3) Instrumentation standpipe / 2" I.D. Monitoring Well installed in borehole, with flush mounted cover.
4) Borehole terminated at 49 feet deep without refusal.

Notes:

1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

VT BORING LOG MC 5/21/04 1296-01 - COLLEGE AND BATTERY ASSOC RETAINING WALL.GPJ GEODESIGN STANDARD .GDT 8/3/16

GEODESIGN INCORPORATED
Geotechnical / Construction / Environmental Engineers and Scientists
P.O. Box 699
Windsor, VT 05089
Phone: 802-674-2033/Fax: 802-674-5943
40 Farrell Street
S. Burlington, VT 05403
Phone: 802-652-5140

BORING LOG

Project Name

College & Battery Assoc. Retaining Wall
40 College St
Burlington, VT

Boring No.: **B-4**
Page No.: 2 of 2
File No.: 1296-01
Checked By: JFW

Boring Company:	QC/QA Laboratories, Inc.				Casing:	Sampler:	
Foreman:	John Leonhardt			Type:	H.S.A.	SS	
GeoDesign Rep.:	Alan Baribault/Hilary Jones			I.D.:	3.25 in.	1.38 in.	
Date Started:	November 19, 2015	Date Finished:	November 19, 2015	Hammer Wt.:	NA	140 lbs	
N. Coordinate:	721586.9	E. Coordinate:	1453285.3	Hammer Fall:	NA	30 in.	
Ground Surface Elevation (feet):	165.24			Rig Type:	CME 550X ATV		
Station:		Offset:	ft	Hammer Type:	Automatic		

Groundwater Observations			
Date	Depth (ft)	Elev. (ft)	Notes
▼ 11/19/15, 0:00			None observed
▼ 12/14/15, 12:45	45.3	119.9	
▼			
▼			

Depth (ft)	Casing Blows/ft	Sample Information: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	Moisture Content (%)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)	Well Log
													Layered Silt & Sand with Clayey Seams (Inferred from B-3) *(Continued)*			
35																
40																
45													▼			
50													51			
													Bottom 114.2 of Exploration at 49.0 ft			
55																
60																

Remarks

Notes:
1) Stratification Lines Represent Approximate Boundary Between Material Types, Transitions May Be Gradual.
2) Water Level Readings Have Been Made At Times And Under Conditions Stated, Fluctuations Of Groundwater May Occur Due To Other Factors Than Those Present At The Time Measurements Were Made. A.C. = After coring; N.R. = Not Recorded.
3) Sample Type Coding: A=Auger; C=Core; D=Driven; G=Grab; PS=Piston Sampler; SS=Split Barrel (Split Spoon); ST=Shelby Tube; Geo=GeoProbe V=Vane; WOR/H=Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%

Boring No.: **B-4**

APPENDIX G - LIMITATIONS

GEOTECHNICAL LIMITATIONS

Explorations

1. The analyses and recommendations submitted in this report are based in part upon the data obtained from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the boring logs.

3. Water level readings and moisture conditions have been made in the explorations, and from the samples at times and under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater and moisture condition may occur due to variations in rainfall, temperature, and other factors occurring since the time measurements were made.

Review

4. In the event that any changes in the nature, design or location of the proposed structures is planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by Geo**Design**, Inc. We recommend that we be provided the opportunity to review and comment on the finalized project design and relevant construction specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

Use of Report

5. This report has been prepared for the exclusive use of Client, for specific application to the project, as described in Geo**Design**'s scope of services/ contract and related documents, in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

6. This report has been prepared for this specific project by Geo**Design**, Inc. This report is for design purposes only and is not sufficient to prepare an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only, unless otherwise specified in the report.

7. Unless otherwise noted, the scope of our services did not include environmental assessment or investigation for the presence of hazardous or toxic materials in the soil, surface water, groundwater or air, on, below, or around this site.

ATTACHMENT 3 – GEODESIGN FOUNDATIONS OPTIONS EVALUATION MEMO

MEMORANDUM

To: Mr. Don Sinex – Devonwood Investors, LLC

Cc: Art Klugo – PC Construction Company

From: Shawn Kelley, Ph.D., P.E. – Geo**Design**, Inc.

Date: April 28, 2017

Re: Foundation Options Evaluation – Burlington Town Center, Burlington, VT

File No.: 1332-01

Attachments: 1) Conceptual Foundation Design Option Schematics (Figures 1 through 5)
2) Option 2 – GeoPier settlement and budget estimates
3) Option 4 – Pile "Zones"
4) Option 5 – Estimated settlement Output (Figures 6 and 7)

SUMMARY

This memo summarizes our evaluation of several conceptual foundation alternatives for the Burlington Town Center Project in Burlington, VT. These alternatives were presented to the design team on April 13, 2017 during a conference call that occurred after the release of our Geotechnical Data Report (issued on April 12, 2017). These foundation alternatives were presented because preliminary settlement estimates of a mat foundation on grade using the 30% design drawings were on the order of 6 to 12 inches (and up to 18 inches). This foundation alternative is listed as Option 1 below.

Given the excessive predicted settlements, we presented four alternative options to the design team. Schematic profiles (west to east along Bank Street) of the five options are included as Figures 1 through 5 in Attachment 1, and summarized below:

- Option 1 – Mat Footing; Schematically showing the increased stress due to the building footprint;
- Option 2 – GeoPier ground improvement; installation of GeoPiers increases soil strength in the sand layer, and uses individual spread footings to support building loads;
- Option 3 – Friction Piles; Individual footings (pile caps) with pipe- type piles driven into either the sand or clay layers (i.e., terminating above the glacial till);

- Option 4 –End bearing Piles; Individual pile caps with H-piles driven into glacial till, utilizing friction and end bearing resistance of the soil;
- Option 5a – Load Reduction; Reduce load by excavating soil and installing a basement level with a slab; and,
- Option 5b (not presented during April 13, 2017 conference call) – Load Reduction; Reduce load by excavating soil and installing a basement level using individual column footings.

We performed a preliminary evaluation of each option at your request, so that the design team can select the most cost and time effective option. It should be noted that these options are only a preliminary evaluation. The selected option will require additional engineering for final construction drawings. It is also important to note that quantities estimated (e.g., settlement or pile length) are not 'maximum' quantities, but an estimate of what could be expected from a final design.

It is our opinion that Option 4 will be the most effective at limiting settlement, but Options 2 and 5 may be valid (from a cost and time perspective), depending on the structural requirements and the Owner's assumption of risk.

OBJECTIVE

Geo**Design** evaluated conceptual foundation options and summarize our analysis and recommendations for each.

OPTION 1: MAT SLAB (30% DESIGN)

We performed preliminary analysis of the mat footing assuming several different loading conditions. Hardy Structural Engineering provided a plan view of the proposed BTC building with 4 different zones (Office tower, Residential tower, 5- and 7- Story structure). We understand that column spacing was estimated on a 27-foot grid, and column loads were provided by Hardy as follows:

Office Tower: 1360 kips
- Dead Load: 970 kips
- Live Load: 361 kips
- Snow Load: 29 kips

Residential Tower: 1406 kips
- Dead Load: 1100 kips
- Live Load: 277 kips
- Snow Load: 29 kips

7-Story Structure: 777 kips
- Dead Load: 485 kips
- Live Load: 292 kips
- Snow Load: not supplied

5- Story Structure: 565 kips
- Dead Load: 346 kips
- Live Load: 219 kips
- Snow Load: not supplied

We have assumed that these loads have already been factored (i.e., per IBC 2015 or ASCE 7) and for the purpose of geotechnical analysis, the live, dead, and snow loads are additive to obtain total column loads.

We created a computer model using the collected subsurface data and inserted a 340-foot square mat footing using Settle3D (a settlement analysis modeling program) for the analysis. We assumed 2000 psf as the bearing pressure applied to the subgrade directly below the mat. The immediate, elastic settlement we estimated for a rigid mat was approximately 6 inches.

This building loading will also cause settlements beyond the proposed building walls (due to soil pressure at the bearing elevation and the zone of influence beneath that elevation – see Option 1 sketch in Attachment 1 for a visual depiction). We analyzed what the estimated settlements will be 25 and 100 feet beyond the proposed building edge (as a range of distance beyond building edge to evaluate zone of influence reach). There will be 5 inches of estimated settlement 25 feet beyond the building edge and 1 inch of estimated settlement 100 feet beyond the building edge.

Using a flexible mat model, the settlement estimate ranges from about 4 inches at the building edges to over 12 inches at the center of the building. The proposed building loads will results in estimated settlement of 4 inches 25 feet beyond the building edge and ¾ of an inch 100 feet beyond the proposed building edge.

It should be expected that the estimated settlement beyond the edges of the proposed BTC structure would likely cause differential settlement to the surrounding structures and underground utilities. At the design meeting on April 13, 2017, we recommended that other foundation alternatives be evaluated.

If individual footings are used instead of a mat foundation, estimated settlements will range from about 6 inches to 18 inches, with similar settlements expected beyond the edge of the proposed building as described above with rigid and flexible mat foundations.

For comparison to typically acceptable settlements for buildings similar to the proposed BTC structure, mat footing loads would need to be reduced to about 250 to 300 psf in order to limit settlement to an inch or less. Therefore, we do not recommend the mat foundation (with finished floor elevations as noted) as a viable option for the foundation.

OPTION 2: GEOPIER GROUND IMPROVEMENT (WITH DUCTILE IRON PIPE PILES IN SOME AREAS)

We sent the geotechnical data report and 30% foundation plans to the local design-build installer of GeoPiers for their review, recommendations, and preliminary cost estimate on April 14, 2017. Per their initial review, GeoPier ground improvement will reduce estimated settlements using individual column footings, but estimated settlements will range from about 1 ¾ inch to 2 ½ inches and over 3 inches beneath the towers. For the area adjacent to 100 Bank Street (i.e., the existing 8-story office building in the southwest corner of the proposed BTC project), anticipated settlement may range

from about ¼ inch to 1½ inches using GeoPier reinforcement. These excessive (differential) settlements would likely cause some distress to the existing structure.

Therefore, GeoPier evaluated an alternative for a 'buffer' zone adjacent to 100 Bank Street (i.e., columns approximately south of 7.5 Line and west of T line). Within that zone, individual column footings could be supported using Ductile Iron Piles (DIPs) instead of GeoPier ground improvement. The DIPs may be either friction (ending above the clay/silt stratum) or end bearing (on glacial till). Using end bearing DIPs, preliminary estimates by GeoPier suggest that within the footprint of the existing 100 Bank Street buidling, settlements due to proposed BTC construction would generally be ½" or less (friction DIPs would not be as effective).

Another alternative to DIPs in the area adjacent to 100 Bank Street could be driven H-piles but that may add additional cost due to the mobilization of the different contractor.

Based on preliminary estimates, GeoPier has provided a concept-phase budget for improvement options summarized above. That outline is included in Attachment 2.

OPTION 3: FRICTION PILES (TERMINATING IN CLAY/SAND)

We performed a preliminary pile estimate using friction piles, driven 60 to 80 feet deep into the clay strata. While these may be a reasonable option for isolated columns, the potential for consolidation settlement is high in the clay layer and differential settlements would be difficult to avoid. We therefore do not recommend friction piles that bear in the clay or sand layers.

While reviewing this option, we spoke with a manufacturer of steel friction pipe piles (i.e., Monotube) and after a preliminary review of the subsurface data, they recommended that their pipe pile system was not suitable for the existing soil conditions.

OPTION 4: END BEARING PILES (TERMINATING IN GLACIAL TILL)

We performed a preliminary pile estimate that would terminate end bearing H-piles in the very dense, glacial till stratum. We assumed that individual pile caps will support each building column (with assumed column loads ranging from 565 to 1406 kips as noted in the table listed in Option 1, above) and that approximately 4 to 10 piles is appropriate per pile cap. We did not analyze moment or shear capacities of the piles, but we believe that there will likely be sufficient reserve beyond the axial capacities we estimated to allow for modest moment and shear resistance. If piles are selected as the foundation option, lateral loading, driveability (i.e., WEAP), and refined static analysis (with revised building loads) would still need to be performed for final design drawings.

It is expected that there will be some elastic deflection with these long piles that will be driven on average about 150 feet to glacial till. We estimate that deflection will be on the order of a ¾ of an inch and it should occur during construction (when all majority of the dead load is applied to the building).

For our estimates, we used somewhat conservative frictional resistance values to develop a soil-pile profile in each of the four quadrants of the building (Zones A through D on Sheets S-100A through S-100D and Figures 6 and 7 in Attachment 3). We compared four typical pile sections (HP12x53, 12x74, 14x73, and 14x89) to provide a range of capacities for the design team to consider. Our average estimate is that piles will be driven approximately 10 feet into the glacial till, although some piles may need to be driven deeper to achieve the capacity noted in Table 1 through 4, below.

		Axial Structural Capacity (kips)		Estimated Geotech Axial Capacity (kips)	
Pile Section	Area[1]	IBC $(0.35F_y)$[2]	IBC $(0.5F_y)$[3]	Qu[4]	Q_{DESIGN}[5]
HP 12x53	11	192.5	275	460	155
HP 12x74	17.1	299.25	427.5	500	165
HP 14x73	16.1	281.75	402.5	555	185
HP 14x89	20.9	365.75	522.5	585	195

Table 1. Estimated pile capacity for selected HP sections – Zone A.

		Axial Structural Capacity (kips)		Estimated Geotech Axial Capacity (kips)	
Pile Section	Area[1]	IBC $(0.35F_y)$[2]	IBC $(0.5F_y)$[3]	Qu[4]	Q_{DESIGN}[5]
HP 12x53	11	192.5	275	285	95
HP 12x74	17.1	299.25	427.5	325	110
HP 14x73	16.1	281.75	402.5	355	120
HP 14x89	20.9	365.75	522.5	380	125

Table 2. Estimated pile capacity for selected HP sections – Zone B.

		Axial Structural Capacity (kips)		Estimated Geotech Axial Capacity (kips)	
Pile Section	Area[1]	IBC $(0.35F_y)$[2]	IBC $(0.5F_y)$[3]	Qu[4]	Q_{DESIGN}[5]
HP 12x53	11	192.5	275	380	125
HP 12x74	17.1	299.25	427.5	420	140
HP 14x73	16.1	281.75	402.5	465	155
HP 14x89	20.9	365.75	522.5	495	165

Table 3. Estimated pile capacity for selected HP sections – Zone C.

		Axial Structural Capacity (kips)		Estimated Geotech Axial Capacity (kips)	
Pile Section	Area[1]	IBC ($0.35F_y$)[2]	IBC ($0.5F_y$)[3]	Qu[4]	Q_{DESIGN}[5]
HP 12x53	11	192.5	275	480	160
HP 12x74	17.1	299.25	427.5	515	170
HP 14x73	16.1	281.75	402.5	575	190
HP 14x89	20.9	365.75	522.5	605	200

Table 4. Estimated pile capacity for selected HP sections – Zone D.

Notes (Tables 1 through 4):

1) Area of steel, with 1/16" reduced thickness for corrosion allowance
2) IBC assuming 0.35*Fy for 50ksi steel
3) IBC assuming 0.5*Fy for 50ksi steel
4) Geotechnical design capacity, assuming a factor of safety FS=3 (may be reduced to FS = 2 for pile estimation after a discussion with design team to discuss risk of only using 6 borings and limited soil testing)
5) Piles will be driven to 2.25 X Q_{ALLOW} assuming dynamic testing is performed on suitable percentage of piles
6) Estimated average penetration depths into Glacial Till to achieve design capacity is approximately 10 feet.
7) Actual penetration into glacial till required to achieve the design capacities may be greater than the average depending on PDA results.
8) All piles must be driven into glacial till (minimum tip elevations are required for each building zone).

To estimate pile quantities, the information above must be coupled with an estimated depth to the glacial till layer and input from the Structural Engineer regarding loading on each pile cap. Existing geotechnical data is limited to 1 to 2 deep explorations per building Zone, and the depth to glacial till has been interpolated between those points. Differences in assumptions on depth to glacial till, and the localized resistance of the soil can lead to significant differences in depth where piles reach design capacity. If additional lab and field tests are performed, a more aggressive friction pile resistance could be used. Dynamic testing (i.e., PDA including CAPWAP) including re-strikes must be performed across the site on the number of piles recommended by IBC building code. Piles must be driven into glacial till (i.e., end bearing) even if design capacity using PDA is achieved from friction in upper soil layers to eliminate future settlement.

We recommend that the structural engineer review these pile sizes and we perform in an iterative process with them to refine column loads (axial, moment, and shear) in order to perform additional analyses of typical pile caps. Further refinement of estimate lengths may be possible, but additional engineering effort would be required.

OPTION 5: LOAD REDUCTION (BASEMENT OPTION)

To reduce the calculated estimated settlements, excavating soil (and building a basement) to reduce overall net bearing pressure on the soil below is a potential foundation option. We estimated that

one level of new basement would be approximately 10 feet below the proposed 30% plan set (which we have assumed matches the existing floor elevations).

We analyzed three cases:

- 5a – Mat foundation at an average footing depth of about 20 feet below grade surrounding the building (i.e., 10 feet below existing lowest floor elevations)
- 5b – Individual spread footings at the same elevation above
- 5c – Mat foundation with finished floor 15 feet below existing lowest floor elevation

Estimated settlement is around a 1 ½ inches for both a flexible and rigid mat footing for Option 5a. As with Option 2, settlement of the adjacent 8-story office building on 100 Bank Street will experience (differential) settlement ranging from about ½" to 1¼". A plan showing these estimated settlements is included as Figure 8 in Attachment 4. If the differential settlement in the proposed building can be structurally isolated between the towers and the low rise structures and settlements can be reduced around 100 Bank Street (i.e., install pile foundations for the adjacent part of the low rise structure – similar to the DIP concept presented in Option 2), perhaps this option may be feasible. Additional costs associated with this option will be the temporary earth support and underpinning requirements of 100 Bank Street. At least one level of tiebacks will probably be necessary.

We evaluated another foundation option (Option 5b) of using isolated column footings with the basement excavation of 10 feet and present estimated settlements for that case in Figure 9 of Attachment 4. Those values range between 1½" to 2 ½" inches of estimated settlement.

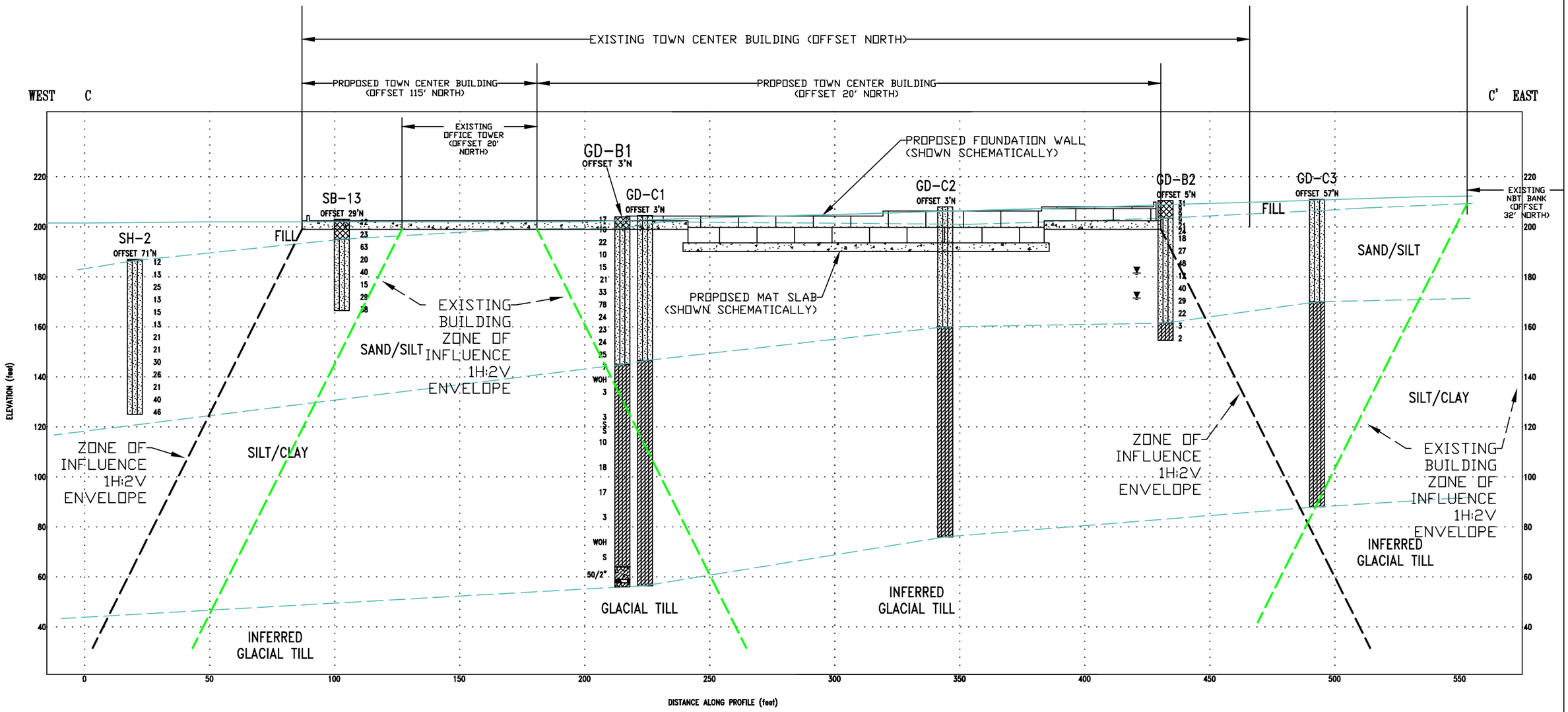
Finally, option 5c, presented on Figure 8, would result in acceptable settlement (on the order of 1 inch), but the excavation may be prohibitively expensive. Support of excavation would likely include soldier pile and lagging with two rows of tiebacks around a majority of the excavation. In addition, underpinning of the existing 100 Bank Street office building would be required. Therefore, while potentially feasible, the basement load reduction / load balancing option is not likely to be cost effective.

CONCLUSIONS

We recommend that the design team should evaluate the risk (i.e., due to settlement) and costs for options 2, 4, and 5. We expect that the foundation system of H-piles driven into the glacial till layer are the most reliable methods to mitigate long-term settlement. Additional design analysis on the selected foundation option will be required prior to final design documents are created.

ATTACHMENTS

ATTACHMENT 1: Schematic Figures



CAD FILE No. M:\CI\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 ELP.dwg

PRELIMINARY
NOT FOR CONSTRUCTION

MAT FOOTING SCHEMATIC

NOTE: OPTION NOT RECOMMENDED

GEODESIGN INCORPORATED
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TELEPHONE: 802.652.5140 • FACSIMILE: 802.674.5943
MIDDLEBURY, CT NEW YORK, NY NEWARK, NJ WINDSOR, VT

DRAWN BY: AJB

REVIEWED BY: SPK

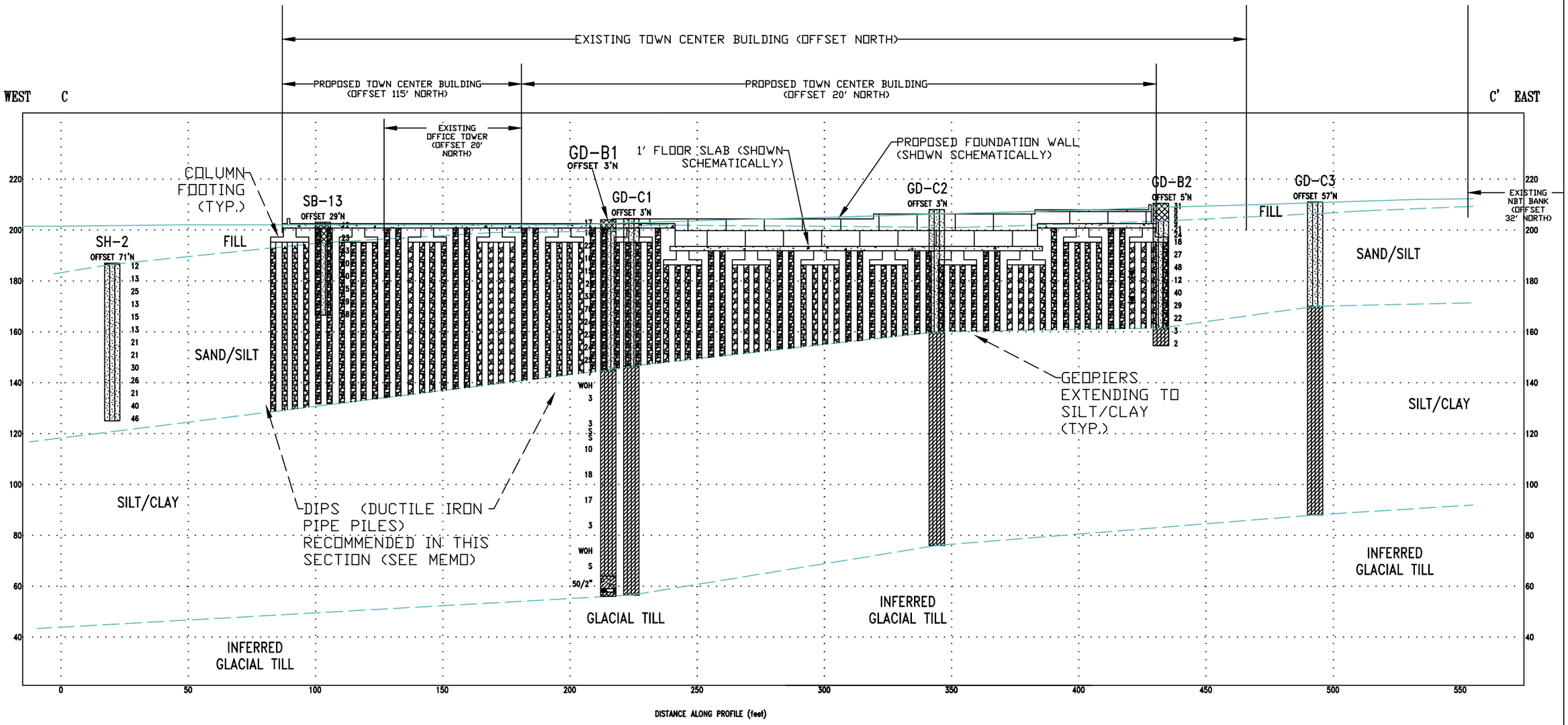
SCHEMATIC CROSS SECTION 1
BURLINGTON TOWN CENTER
BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET
1" = 40'
0 20 40 80

DATE: APRIL 28, 2017

FIGURE NO. 1



CAD FILE No. M:\C\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 ELP.dwg

PRELIMINARY
NOT FOR CONSTRUCTION

GEOPIER IMPROVEMENT OPTION (CONCEPTUAL)

GEODESIGN INCORPORATED
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MIDDLEBURY, CT NEW YORK, NY NEWARK, NJ WINDSOR, VT

DRAWN BY: AJB | REVIEWED BY: SPK

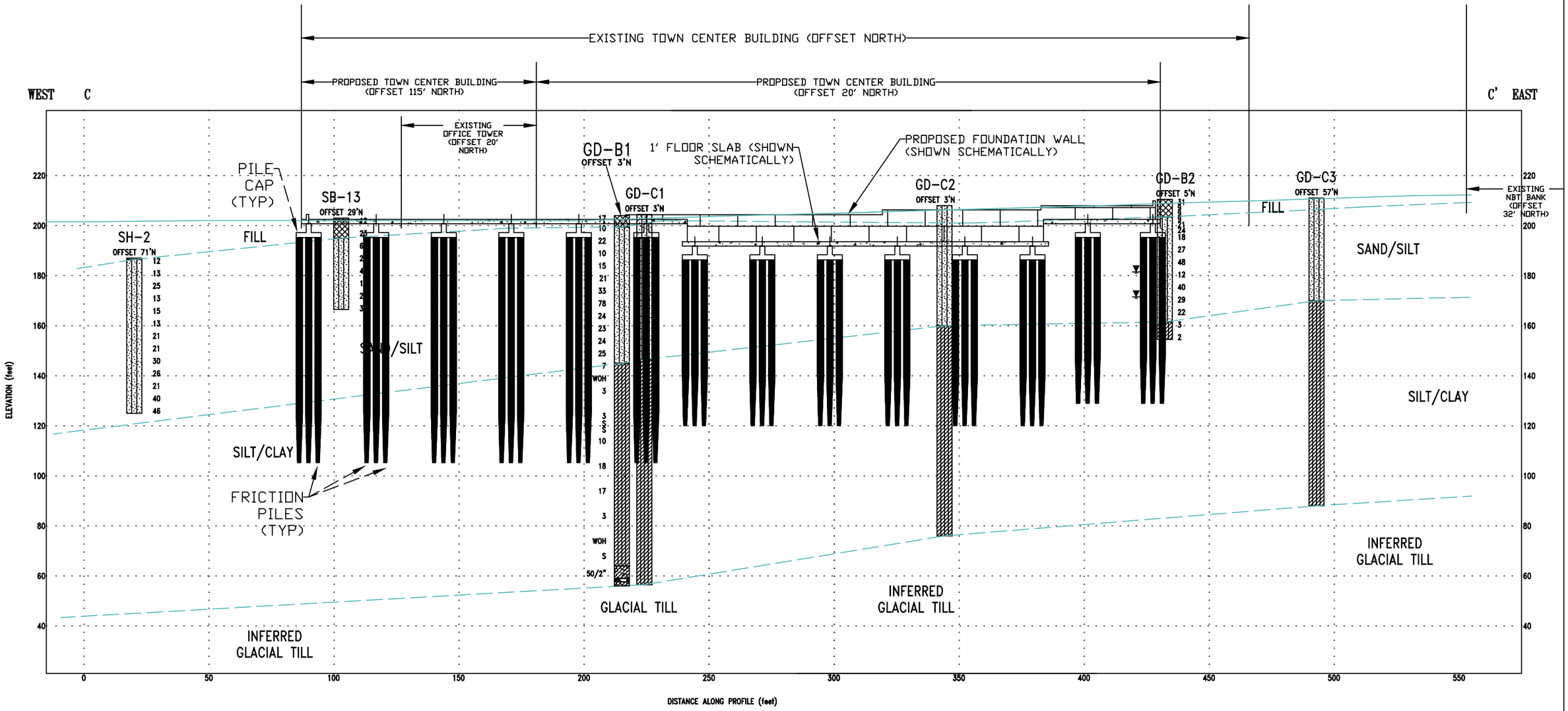
SCHEMATIC CROSS SECTION 2
BURLINGTON TOWN CENTER
BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET
1" = 40'
0 20 40 80

DATE: APRIL 28, 2017

FIGURE NO. 2



CAD FILE No. M:\C\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 ELP.dwg

PRELIMINARY
NOT FOR CONSTRUCTION

FRICTION PILES INTO SILT/CLAY LAYER (CONCEPTUAL)

NOTE: OPTION NOT RECOMMENDED

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TELEPHONE: 802.652.5140 • FACSIMILE: 802.674.5943
MIDDLEBURY, CT NEW YORK, NY NEWARK, NJ WINDSOR, VT

DRAWN BY: AJB

REVIEWED BY: SPK

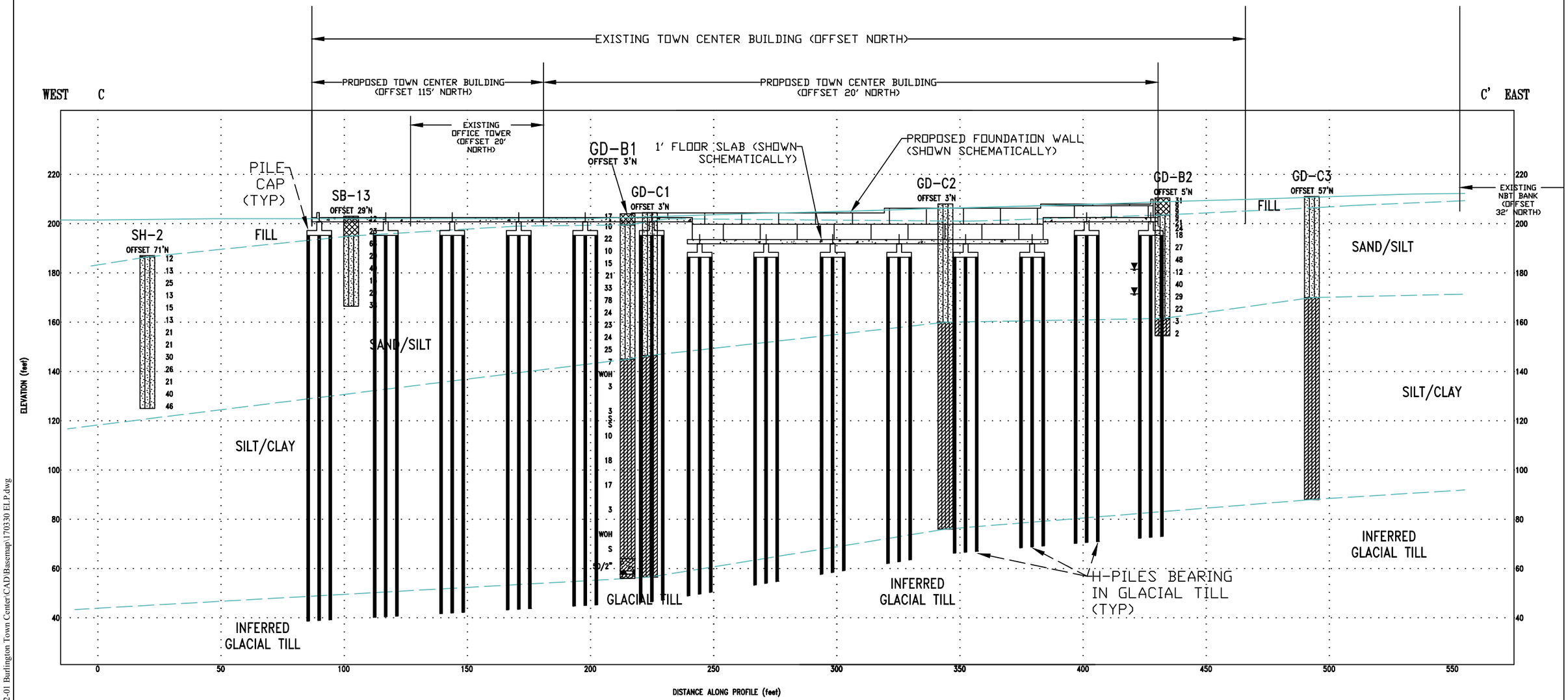
SCHEMATIC CROSS SECTION 3
BURLINGTON TOWN CENTER
BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET
1" = 40'
0 20 40 80

DATE: APRIL 28, 2017

FIGURE NO. 3



CAD FILE No. M:\Cli\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 ELP.dwg

PRELIMINARY
NOT FOR CONSTRUCTION

H-PILES DRIVEN INTO GLACIAL TILL LAYER (CONCEPTUAL)

GEODESIGN INCORPORATED
Geotechnical | Construction | Environmental Engineers and Scientists
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TELEPHONE: 802.652.5140 • FACSIMILE: 802.674.5943
MIDDLEBURY, CT NEW YORK, NY NEWARK, NJ WINDSOR, VT

DRAWN BY: AJB

REVIEWED BY: SPK

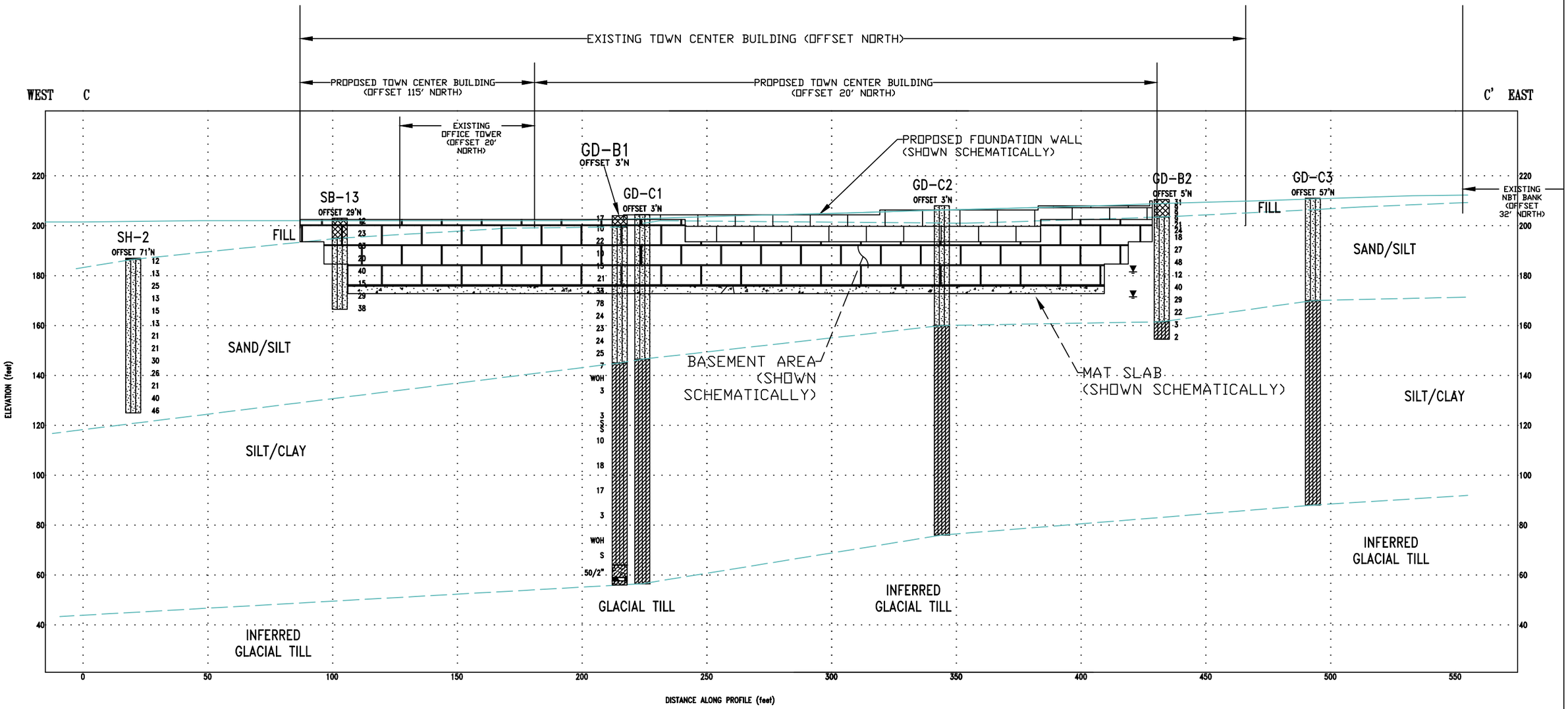
SCHEMATIC CROSS SECTION 4
BURLINGTON TOWN CENTER
BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET
1" = 40'
0 20 40 80

DATE: APRIL 28, 2017

FIGURE NO. 4



CAD FILE No. M:\CI\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 El P.dwg

PRELIMINARY
NOT FOR CONSTRUCTION

BASEMENT UNLOADING OPTION (CONCEPTUAL)

GEODESIGN INCORPORATED
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MIDDLEBURY, CT NEW YORK, NY NEWARK, NJ WINDSOR, VT

DRAWN BY: AJB

REVIEWED BY: SPK

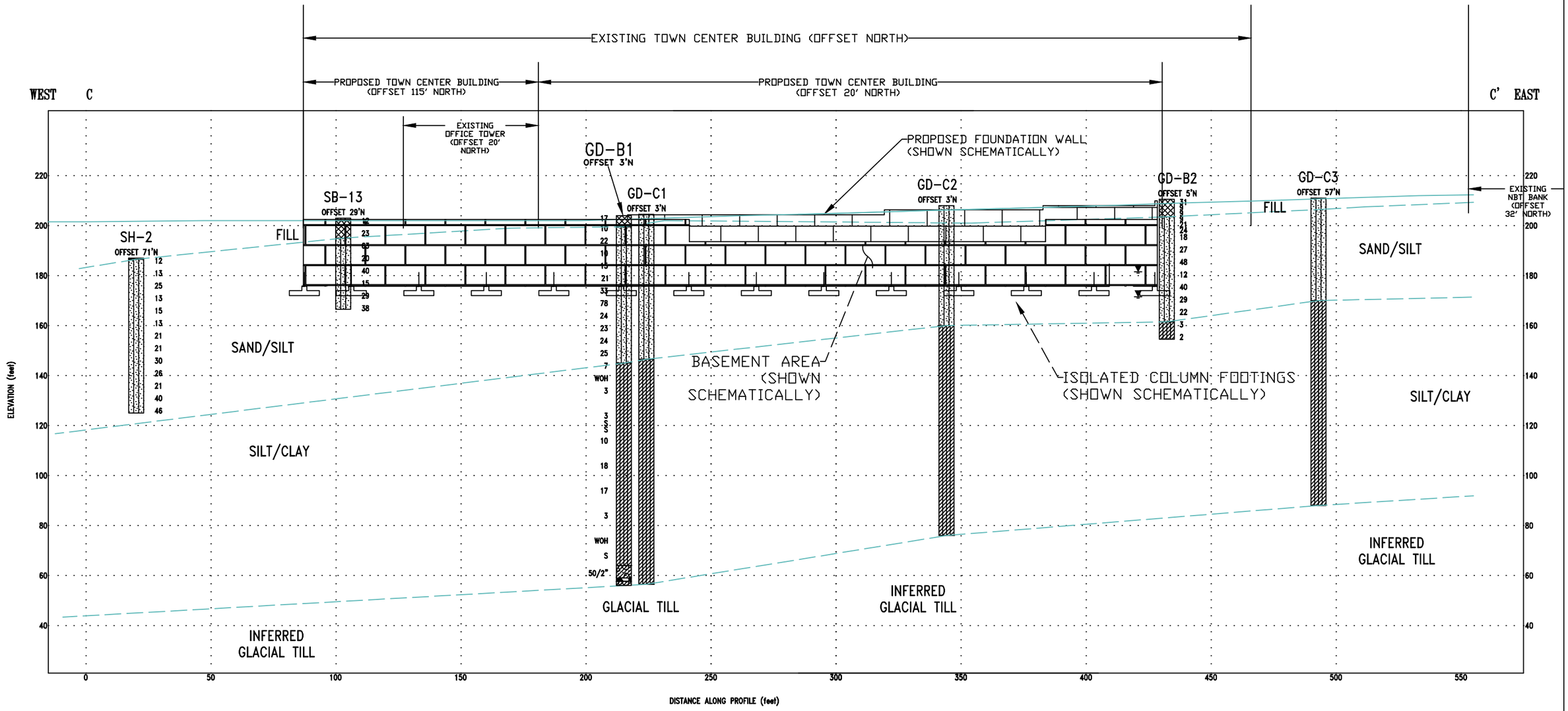
SCHEMATIC CROSS SECTION 5A
BURLINGTON TOWN CENTER
BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET
1" = 40'
0 20 40 80

DATE: APRIL 28, 2017

FIGURE NO. 5A



CAD FILE No. M:\Cli\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 ELP.dwg

PRELIMINARY
NOT FOR CONSTRUCTION

BASEMENT UNLOADING OPTION (CONCEPTUAL)

GEODESIGN INCORPORATED
Geotechnical | Construction | Environmental
Engineers and Scientists
40 FARRELL ST • SOUTH BURLINGTON, VERMONT 05403
TELEPHONE: 802.652.5140 • FACSIMILE: 802.674.5943
MIDDLEBURY, CT NEW YORK, NY NEWARK, NJ WINDSOR, VT

DRAWN BY: AJB

REVIEWED BY: SPK

SCHEMATIC CROSS SECTION 5B
BURLINGTON TOWN CENTER
BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET
1" = 40'
0 20 40 80

DATE: APRIL 28, 2017

FIGURE NO. 5B

ATTACHMENT 2: GeoPier Settlement Estimates and Conceptual Budget

We reviewed the preliminary information provided to us and developed an early concept-phase budget for Geopier ground improvement. Geopier ground improvement would allow for conventional shallow footings and a slab-on-grade at a high bearing pressure. This will likely provide significant savings on concrete and steel versus a mat foundation, as well as limit stress influence on the neighboring structures while still providing settlement control.

We would be happy to provide you with a formal proposal after the ground improvement scope, foundation plans, grading plans, and structural loads are finalized.

Please note that there are many unknowns at this time (chosen structural framing scheme and associated loading, working subgrade elevation, pre and post construction settlement tolerances, etc). As such, this early budgeting is reasonably conservative to help capture such unknowns.

Preliminary Reference Information:

- Preliminary Geotechnical Data Report by GeoDesign, Inc. dated April 12, 2016
- Draft laboratory test results from UMass Amherst Testing Labs dated April 21, 2017
- Electronic CAD plan titled "BTC - Structural Schematic Foundation Plan_2017-04-17"
- Electronic PDF plans titled "Structural 30% Fdn-1st floor.pdf"
- Electronic PDF plans titled "BTC Low Roof Area_7 Floors.pdf" and "BTC Low Roof Area_5 Floors.pdf"

Project Understanding and Assumptions:

- 5 to 14-Story structure over an approximately 106,000 SF ground level footprint
- Neighboring 5 story structure to the southeast to remain
- The subsurface conditions generally consisted of 2 to 8 feet of medium dense Fill, underlain by 40 to 90 feet of medium dense Sand, underlain by soft Silt/Clay 80 to 90 feet thick (with stiff mid-zone 20-30 feet thick), underlain by Glacial till 150 to 175 feet below grade. Groundwater was encountered 40 to 75 feet below grade

General Summary of Geopier Ground Improvement by Helical Drilling:

- We would provide a PE-stamped design submittal and shop drawings.
- We would install Rammed Aggregate Piers Geopier elements for footing support. Slab support would be provided by others.
- For now, we have assumed Geopier elements would be installed to depths up to about 25 feet down into the natural Sand underlying the Fill.
- Geopier ground support would be designed to provide a maximum allowable bearing pressure of **8** kips per square foot (ksf)
- Please refer to Mike Pockoski's email from earlier today for settlement estimates and important considerations such as:
    - We are using assumed loads and expect they'll be refined, and possibly decreased. We'll also want to break out during construction and post-construction loading so we can provide better settlement timelines to the project team.
    - This is a preliminary/feasibility analysis. We need to do a deep dive into the CPTs and process them with the SPTs and really nail down the compressibility of this site. The intent of this exercise was feasibility and ballpark orders of magnitude for settlement. We'll spend much time moving forward on soil characterization and really nail down these estimates once we have loads and foundation plans that match that level of detail.
    - To that end, we may want to get more consols and site exploration (more CPTs?). We'll be in touch on that point as we continue to move forward through the available data and compare load areas with potential gaps in the exploration.
    - It'll be critical to consider differential settlement between DIP areas and RAP areas. We do this all the time, so it's not a huge concern. But for a tall building, the differential effects become magnified so we'll need to work with the structural engineer to design a compliant building system. Here, we might look to transition from end bearing DIPs to friction DIPs to RAPs as we move away from the structure in order to soften the switch from system to system. We can work with Brendan on some ideas there.
    - Construction sequencing will be important here. As we discussed yesterday, this building will see most of its settlement as immediate settlement. So tailoring the construction schedule to match compression from 14-story portions with 5 and 7 story portions will be important. A RAP solution will add some flexibility here as we can tailor shaft lengths and area ratios as we discussed yesterday to reduce differential across the footprint as the building contact pressures are changing.
- An area has been excluded (attached image) which will be founded on Ductile Iron Piles (DIPs) which are described in the next section

Approach and Estimated Price for DIPs adjacent to building to remain:

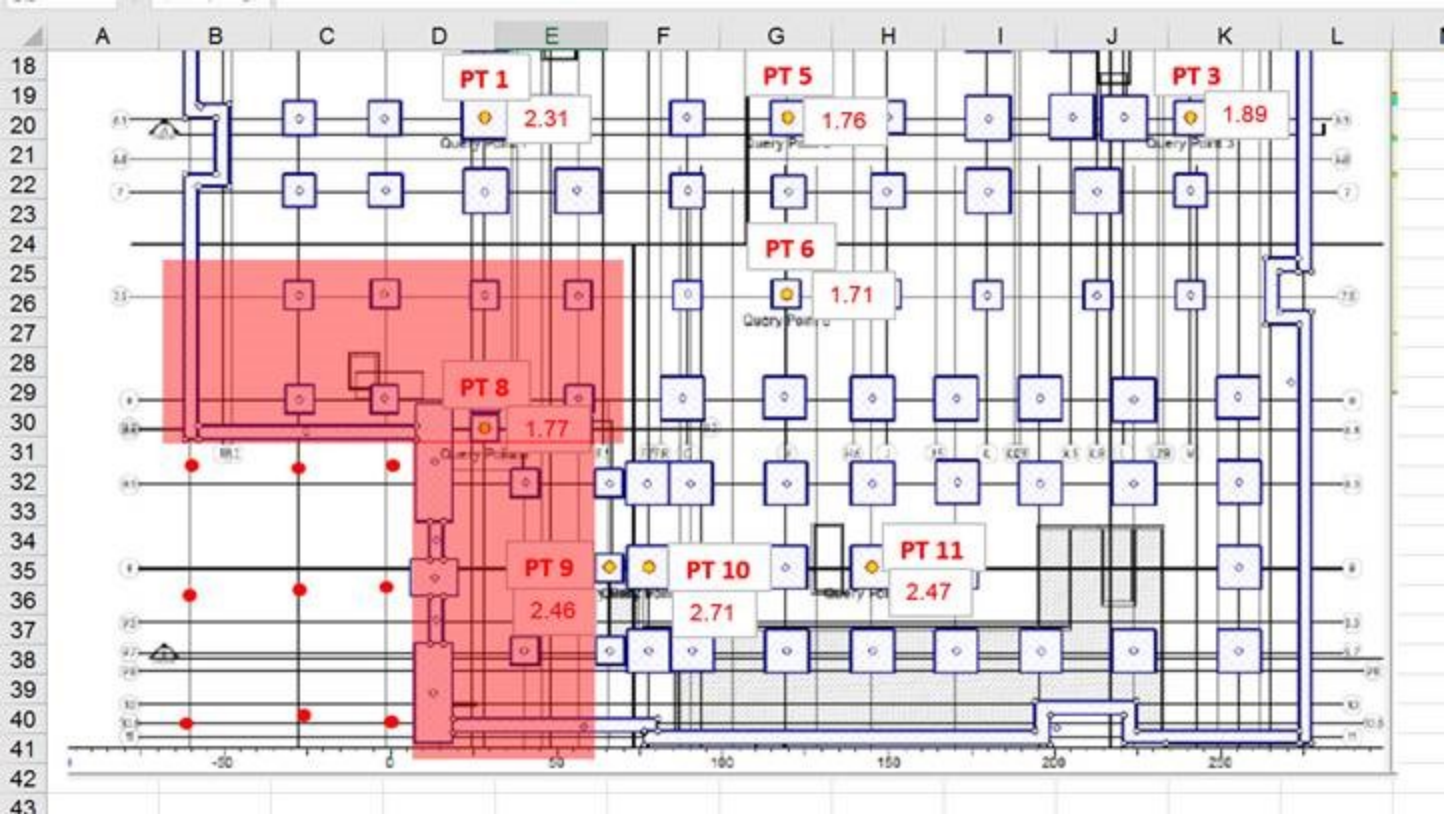
Based on a very rough review of the potential pile work up against the existing building, we have come up with some very rough DIP pricing based on an educated guess on quantities of 75 to 150 piles. We have preliminarily assumed using 50 ton allowable compression piles. It is certainly possible to evaluate a higher capacity pile closer to 80-90 tons, but we need to have a much better understanding of the actual load demand per pile, anticipated termination depths and internally need to evaluate the drivability through the very dense sand/silt for the potential larger diameter piles in either end bearing or friction.

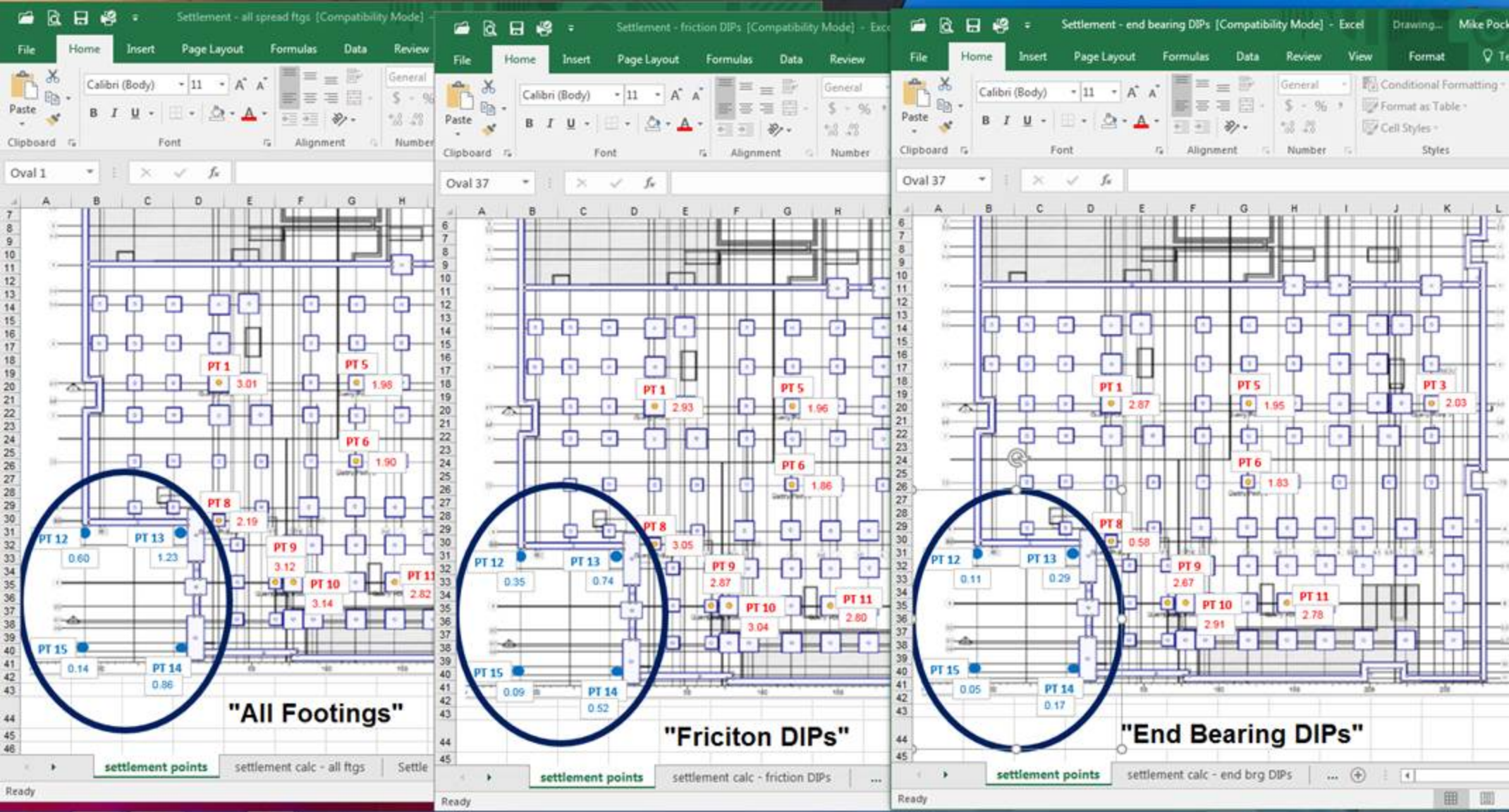
We first looked at driving the DIPs deep (about 140-ft) to terminate into very dense glacial till/bedrock and then to install shallow friction DIPs into the upper very dense sand/silt at a pile length closer to 32-ft to float the load above the over consolidated clays (similar to the Geopier approach). Based on these assumptions, we estimate that a per pile price range would vary between $5,200 to $6,100 for the deeper end bearing option and $2,500 to $3,500 for the shallower friction option. These price ranges include one full scale mob/demob and a single compression test. We have not included any survey in our estimated price or a need to resist uplift loading. It should be noted that the higher unit price is associated with the lower pile quantity.

Ground Improvement Budget:

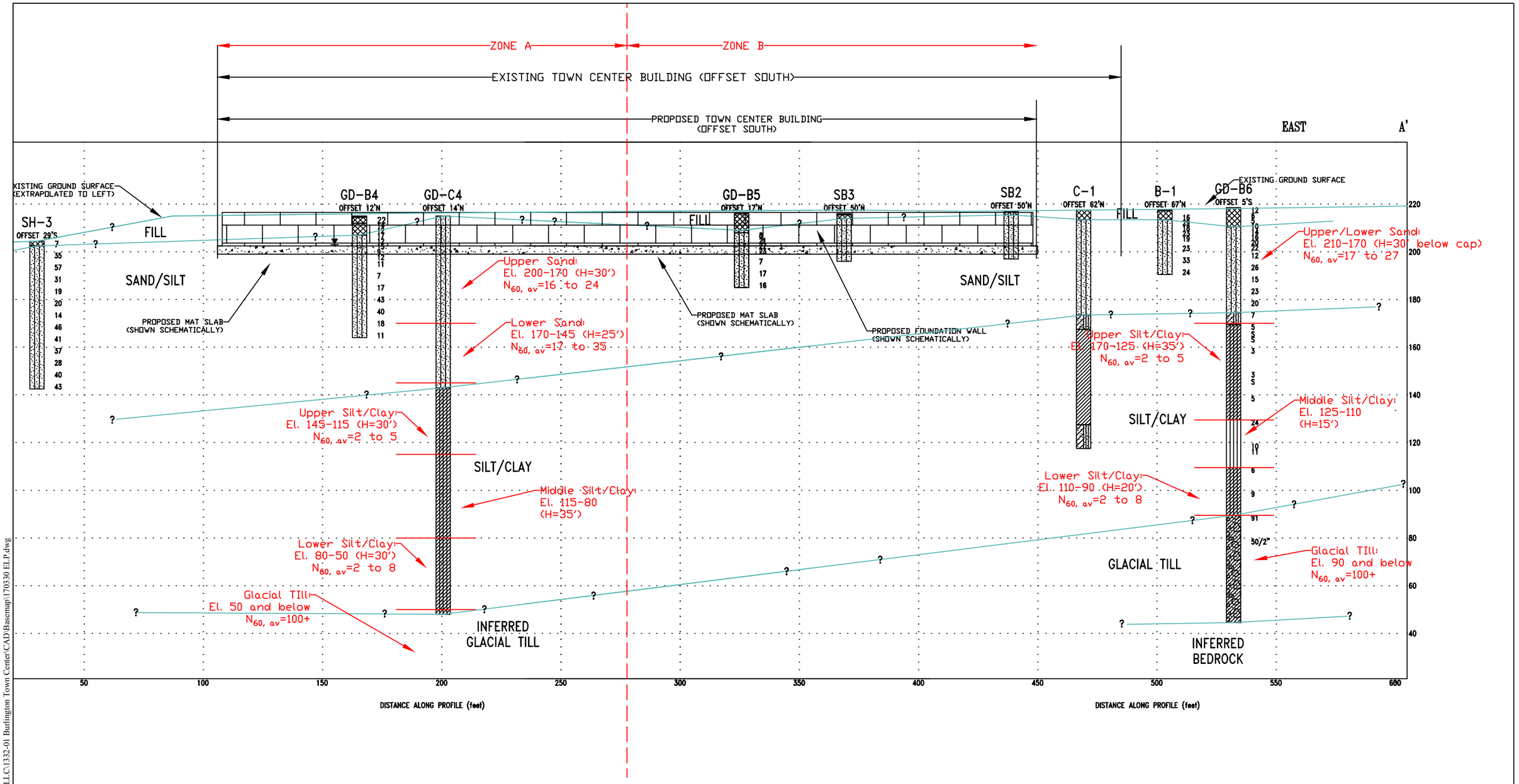
Based on an evaluation of the preliminary information provided, we estimate that the Geopier footing/slab support system for this project could be designed and constructed at a rough cost of about $1,275,000 to $1,520,000 (RAPs only, not including DIPs). This price would include paying Vermont prevailing wage, one mobilization, 2 modulus tests, P.E. stamped design submittal and shop drawing. This budget does not include obstruction removal or survey layout of the RAP elements prior to installation.

Again this price does not include the DIP price listed above. Please add that amount to this value, which is only for the RAPs.


PT 1
2.31
PT 5
1.76
PT 3
1.89
PT 6
1.71
PT 8
1.77
PT 9
2.46
PT 10
2.71
PT 11
2.47


"All Footings"
PT 1 3.01
PT 5 1.98
PT 6 1.90
PT 8 2.19
PT 9 3.12
PT 10 3.14
PT 11 2.82
PT 12 0.60
PT 13 1.23
PT 14 0.86
PT 15 0.14
"Friciton DIPs"
PT 1 2.93
PT 5 1.96
PT 6 1.86
PT 8 3.05
PT 9 2.87
PT 10 3.04
PT 11 2.80
PT 12 0.35
PT 13 0.74
PT 14 0.52
PT 15 0.09
"End Bearing DIPs"
PT 1 2.87
PT 5 1.95
PT 3 2.03
PT 6 1.83
PT 8 0.58
PT 9 2.67
PT 10 2.91
PT 11 2.78
PT 12 0.11
PT 13 0.29
PT 14 0.17
PT 15 0.05

ATTACHMENT 3: Pile “Zones”



CAD FILE No. M:\CI\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 ELP.dwg

NOTES:

1) N60 VALUES BASED ON GD– SERIES SOIL BORING DATA, NEAR AND BELOW FFE; CALCULATED ON "FBMP input–Iowa DOT estimates dth edits.xlsx" SAVED IN : M:\CI\1332 – Devonwood LLC\1332–01 Burlington Town Center\engineering\Pile Estimates

2) DEPTH AND TRANSITION OF LAYERS BASED ON CPT SOUNDING DATA, GENERALLY SUMMARIZED IN "Composite File for CPT Modeling Parameters.xls" SAVED IN: M:\CI\1332 – Devonwood LLC\1332–01 Burlington Town Center\engineering\Soil Properties

H-PILES DRIVEN INTO GLACIAL TILL LAYER (CONCEPTUAL)

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MIDDLEBURY, CT NEW YORK, NY NEWARK, NJ WINDSOR, VT

DRAWN BY: AJB

REVIEWED BY: SPK

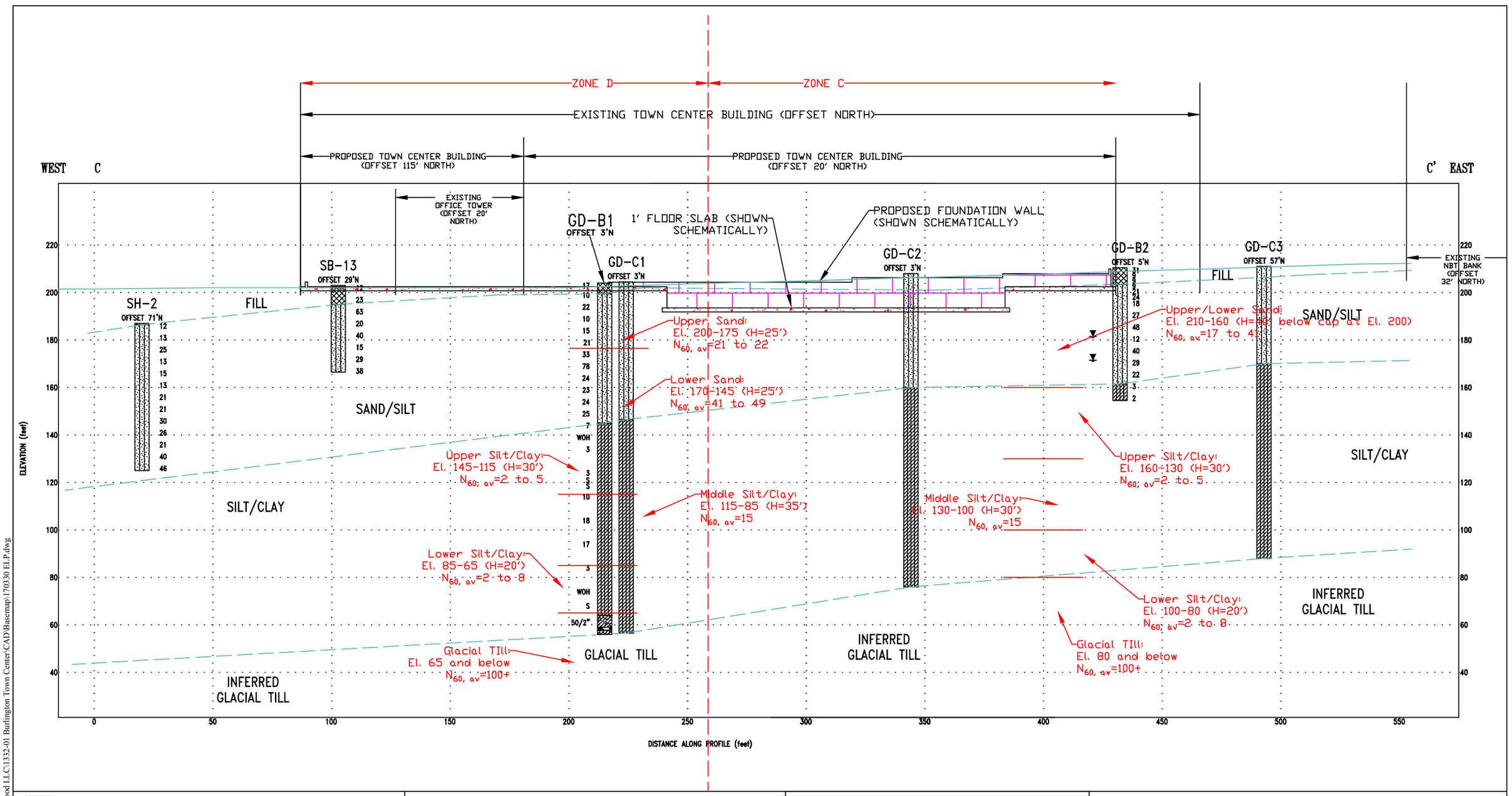
SCHEMATIC SOIL PROFILE ZONES A-B BURLINGTON TOWN CENTER BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET
1" = 40'
0 20 40 80

DATE: APRIL 25, 2017

FIGURE NO. 6



NOTES:

1) N60 VALUES BASED ON GD– SERIES SOIL BORING DATA, NEAR AND BELOW FFE; CALCULATED ON "FBMP input–Iowa DOT estimates dth edits.xlsx" SAVED IN : M:\CI\1332 – Devonwood LLC\1332–01 Burlington Town Center\engineering\Pile Estimates

2) DEPTH AND TRANSITION OF LAYERS BASED ON CPT SOUNDING DATA, GENERALLY SUMMARIZED IN "Composite File for CPT Modeling Parameters.xls" SAVED IN: M:\CI\1332 – Devonwood LLC\1332–01 Burlington Town Center\engineering\Soil Properties

H-PILES DRIVEN INTO GLACIAL TILL LAYER (CONCEPTUAL)

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SCHEMATIC SOIL PROFILE ZONES C-D BURLINGTON TOWN CENTER BURLINGTON, VERMONT

FILE NO. 1332-01

SCALE IN FEET 1" = 40'

0 20 40 80

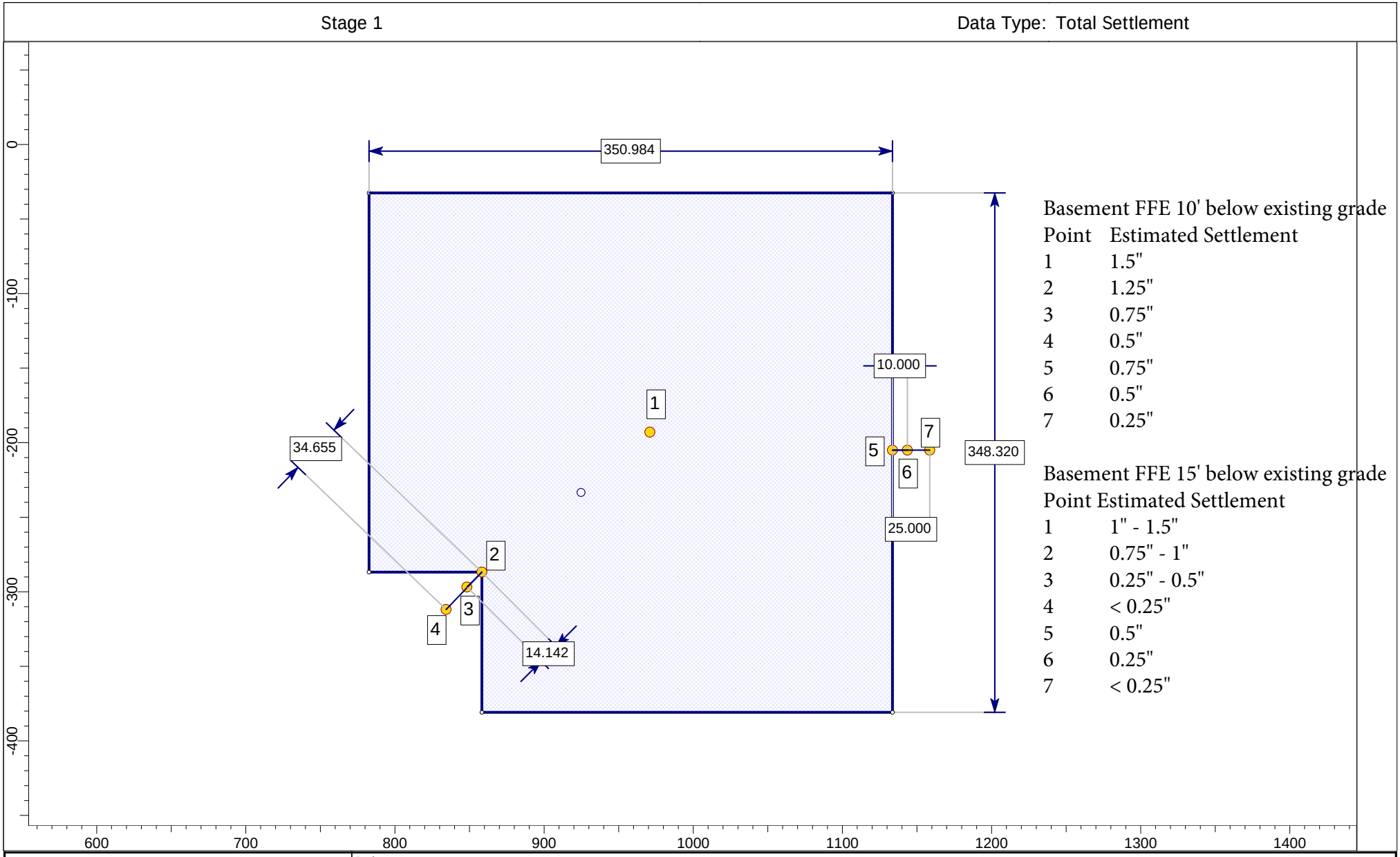
DATE: APRIL 25, 2017

FIGURE NO. 7

CAD FILE No. M:\CI\1332 - Devonwood LLC\1332-01 Burlington Town Center\CAD\Basemap\170330 El P.dwg

ATTACHMENT 4: Option 5 Estimated Settlements

Figure 8: Option 5 Estimated Settlement



Basement FFE 10' below existing grade

Point	Estimated Settlement
1	1.5"
2	1.25"
3	0.75"
4	0.5"
5	0.75"
6	0.5"
7	0.25"

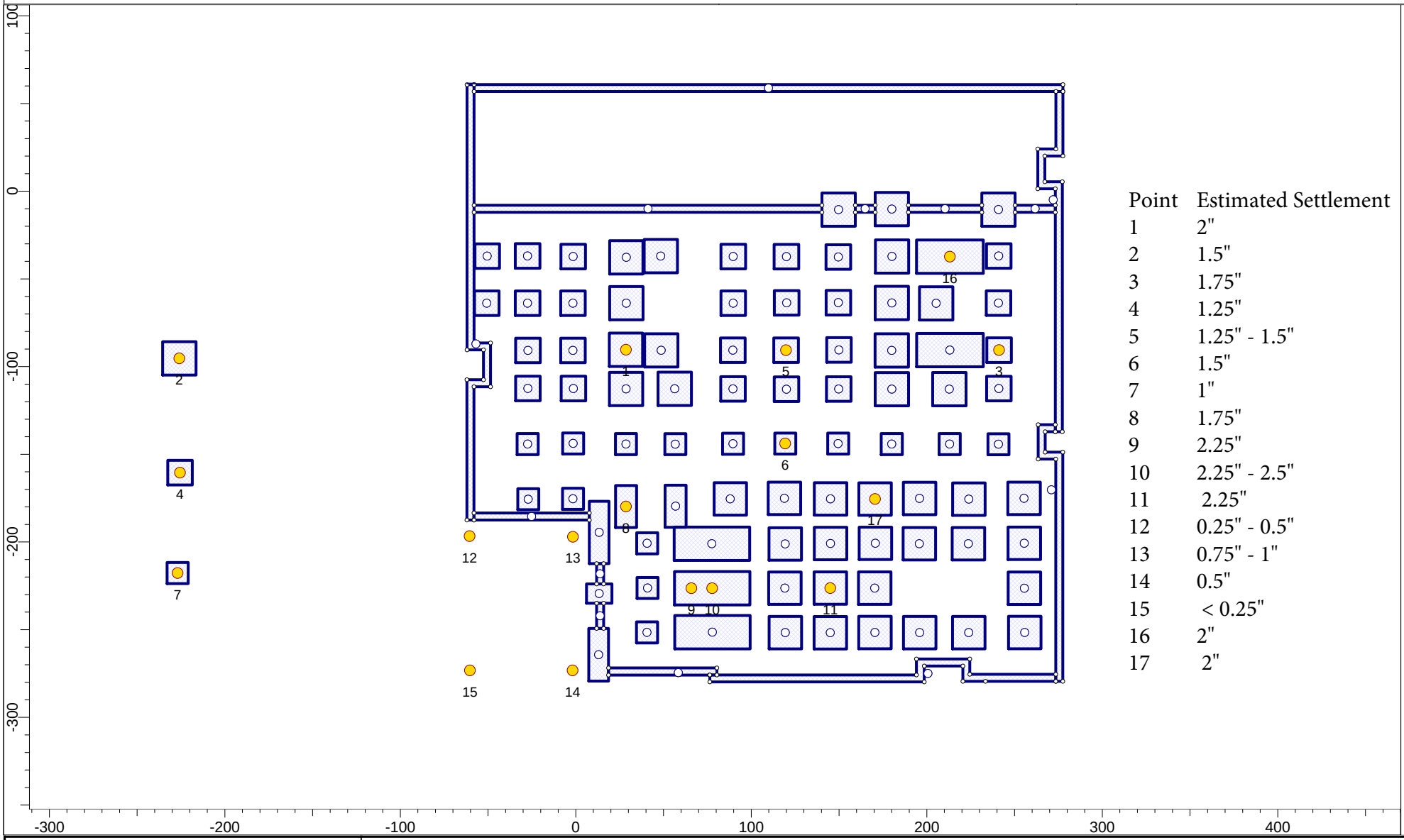
Basement FFE 15' below existing grade

Point	Estimated Settlement
1	1" - 1.5"
2	0.75" - 1"
3	0.25" - 0.5"
4	< 0.25"
5	0.5"
6	0.25"
7	< 0.25"

SETTLE3D 2.019	Project	Flexible Mat - 2000 PSF - 10' Basement below current Finish Floor	
	Analysis Description	Elastic Only In Sand - Consolidation Only in Clays	
	Drawn By	JFW	Company: GeoDesign
	Date	4/28/17	File Name: Preliminary Mat Analysis (FLEXIBLE).s3z

Figure 9: Option 5 Estimated Settlement

Stage 1 Data Type: None



Point	Estimated Settlement
1	2"
2	1.5"
3	1.75"
4	1.25"
5	1.25" - 1.5"
6	1.5"
7	1"
8	1.75"
9	2.25"
10	2.25" - 2.5"
11	2.25"
12	0.25" - 0.5"
13	0.75" - 1"
14	0.5"
15	< 0.25"
16	2"
17	2"

rocscience

SETTLE3D 2.019

Project	Basement Option - Spread Footings		
Analysis Description	4000 Psf Spread Footings - 10' Below current finish floor (20BGS)		
Drawn By	JFW	Company	GeoDesign
Date	4/27/17	File Name	Spread Footings - Elastic.s3z

ATTACHMENT 4 – GEODESIGN SITE SPECIFIC GROUND MOTION STUDY

GEODESIGN INCORPORATED

GEOTECHNICAL | CONSTRUCTION | ENVIRONMENTAL
ENGINEERS and SCIENTISTS

SITE SPECIFIC SEISMIC GROUND MOTION STUDY

BURLINGTON TOWN CENTER
BURLINGTON, VERMONT

Prepared for:
Don Sinex
Devonwood Investors, LLC
101 Cherry St, Suite 440
Burlington, VT 05401

Prepared By:
Geo**Design**, Inc.
54 Main Street
Windsor, VT 05089

Geo**Design** File No. 1332-001
March 2017

GEODESIGN
INCORPORATED

GEOTECHNICAL | CONSTRUCTION | ENVIRONMENTAL
ENGINEERS and SCIENTISTS

March 2, 2017
File No. 1332-001

Mr.Don Sinex
Devonwood Investors, LLC
101 Cherry St, Suite 440
Burlington, VT 05401

Re: Site specific seismic ground motion study report
Burlington Town Center, Burlington, VT

Cc: Art Klugo, PC Construction

Dear Don:

Geo**Design**, Inc. (GeoDesign) is pleased to submit this site specific ground motion study report for the referenced project site.

We appreciate the opportunity to work with you. Please call if you have any questions.

Sincerely,

Geo**Design**, Inc.



Shawn Kelley, Ph.D., P.E.
Senior Associate

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2.4 SITE RESPONSE ANALYSIS RESULTS 6

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Figure 2 – Design Rock Response Spectrum

Figure 3 – Seed and Matched Time Histories, Saguenay Earthquake – Site 2, Motion 051

Figure 4 – Seed and Matched Time Histories, Saguenay Earthquake – Site 16, Motion 124

Figure 5 – Seed and Matched Time Histories, Mineral, VA Earthquake – RSN5585, Northeast

Figure 6 – Seed and Matched Time Histories, Mineral, VA Earthquake – RSN8571, North 1

Figure 7 – Seed and Matched Time Histories, ValDesBois Earthquake – RSN3982, North

Figure 8 – Seed and Matched Time Histories, Val Quebec Earthquake – ORIOHHE

Figure 9 – Seed and Matched Time Histories, Conway Springs, Earthquake – KAN01, Northeast

Figure 10 – Spectrum Matching Results

Figure 11 – Shear Wave Velocity Profile

Figure 12 – Response Spectra – Foundation Level

Figure 13 – Recommended Design Response Spectra

List of Appendices

Appendix A – CPT Logs

1.0 – INTRODUCTION

1.1 GENERAL

This report provides the results of a site specific ground motion study for the proposed redevelopment of Burlington Town Center in Burlington, Vermont. The methodology and recommendations presented herein are in general accordance with the 2015 International Building Code (Code) and the American Society of Civil Engineers 7-10 (ASCE7-10) manual.

The project site is the Burlington Town Center (BTC) located between Cherry and Bank Street in Burlington, VT (see Figure 1). The site is currently occupied by a mixed use mall development.

It is proposed demolish the existing structures and construct a new 14 story commercial and residential mixed use building with one cellar level.

1.2 OBJECTIVES AND SCOPE OF SERVICES

The objectives of this investigation were to evaluate the subsurface conditions at the site and perform a site specific seismic ground motion study. The following services were performed to achieve these objectives:

- Obtained in-situ shear wave velocity data of the soil;
- Developed a design bedrock response spectrum and matched acceleration time histories from actual east coast earthquakes to the design spectrum;
- Developed a soil profile based on the in-situ shear wave velocity data;
- Performed site response analyses and developed a recommended design response spectrum.
- Prepared this report.

1.3 REPORT ORGANIZATION

This report is divided into three sections. Section 1 presents an introduction and the objectives of the study. Section 2 includes a description of the seismic ground motion method and results. Limitations of the ground motion study results and recommendations are included in Section 3. Tables and Figures are provided at the end of the text.

2.0 – SEISMIC GROUND MOTION STUDY

2.1 METHODOLOGY

A site specific seismic ground motion study provides estimates of the earthquake ground motions that might occur at a site. In some cases, the ground motions from the site response analyses are different than those based on the seismic site classification and the corresponding response spectrum. This section presents the results of a site specific seismic ground motion study that was performed to obtain an estimate of the ground motions at the site. The study included the following:

- Selection of a rock response spectrum and development of rock acceleration time histories;
- Review of in-situ shear wave velocity data obtained from cone penetration testing (CPT, see Appendix A).
- Evaluation of the site stratigraphy, estimation of key soil parameters (e.g., shear wave velocity) for the various subsurface strata, and development of a soil profile;
- Performance of site response analyses to estimate how the site soils might modify the seismic motions emanating from the bedrock;
- Comparison of the site specific response spectra to the Code based site classification response spectrum and development of a design response spectrum.

2.2 ROCK MOTIONS

Seismic ground motions can vary significantly around the world and are dependent on many factors including the size of the earthquake and the distance away from the earthquake source. A design rock response spectrum is needed to define the earthquake motions at a site. The United States Geological Survey (USGS) has developed seismic hazard maps for the United States based on a 2,500 year return period. Many building codes, including ASCE7-10, multiply the ground motions by two-thirds. The USGS spectral values, multiplied by two-thirds, the ASCE7-10 Site Class A and Site Class B response spectra and the recommended design rock response spectrum are shown in Figure 2.

Rock acceleration time histories are also needed to evaluate the effect of the soil conditions on the motions emanating from the bedrock. The acceleration time histories were developed by taking existing earthquake acceleration time histories (i.e., seed time histories) and adjusting them to match the design rock response spectrum. This technique is referred to as spectral matching. The computer program RSPMATCH was used to perform the spectral matching. Acceleration time histories from several east coast earthquakes were used as the "seed" time histories in the spectral matching. The target and computed acceleration time histories from seven recording stations are shown in Figures 3 through 9. As shown in Figure 10, the matched rock response spectra from the seven time histories are consistent with the design rock spectrum.

2.3 SOIL PROFILE

The site soils can result in modification of the rock motions as the seismic waves travel through the soils. In order to evaluate this effect, the software program SHAKE is used. SHAKE is based on one dimensional wave propagation theory. It is used to calculate horizontal earthquake motions at specified depths below the ground surface and at the foundation level resulting from the input bedrock motion. The SHAKE analyses require the rock motions developed in Section 2.2 and idealized soil profiles consisting of layer thickness, dynamic soil properties (shear wave velocities), and soil unit weight are needed. The shear wave velocities of the soil are based on the CPT testing results. The idealized soil profile used in the site response analyses was as follows and as shown in Figure 11:

Soil Type	Stratum Thickness (ft)	Unit Weight (pcf)	Shear Wave Velocity (fps)	Shear Modulus and Damping Ratio Curves	
				Reference	Parameter
Medium Dense Fill/Silty Sand	45	120	910	EPRI (1933)	Varies depending on depth
Medium to Stiff Silty Clay	105	115	980	Vucetic & Dorby (1991)	PI = 15
Rock[1]	NA	145	2500	EPRI (1933)	Varies depending on depth

1. The rock level was estimated based on CPT refusal and subsurface data surrounding the project site.

2.4 SITE RESPONSE ANALYSIS RESULTS

Based on the shear wave velocity measurements and the procedures given in the Code, the seismic site classification is Site Class D.

The response spectra at the foundation level are shown in Figure 12 for the seven time histories. Also shown on this figure is the average response spectrum, which was calculated by taking the average of the surface-to-base response spectral ratios (calculated period by period), as obtained from the site response analyses, and multiplying them by the design rock response spectrum (i.e., the base motion). The Code based response spectrum for Site Class D and 80% of the Site Class D response spectrum are also shown in Figure 12.

In accordance with the Code, the design response spectrum cannot be less than 80% of the Code specified response spectra for the specified seismic site classification. In addition, the Code specifies that the site specific S_{ds} value (spectral acceleration at 0.2 sec) cannot be less than 90% of the peak ground acceleration at any period larger than 0.2 sec and the site specific S_{d1} value (spectral acceleration at 1.0 sec) shall be taken as the greater of the spectral acceleration at a period of 1 sec or two times the spectral acceleration at a period of 2 sec. Based on these limitations, a recommended design response spectrum was developed and is shown in Figure 13. The corresponding spectral acceleration values are provided in Table 1.

The recommended Sds and Sd1 design values are 0.325g and 0.127g, respectively. Based on these values, and assuming that the building is Risk Category I&II or III, the Seismic Design Category is "B". The project architect or structural engineer should confirm the Risk Category for the building.

3.0 – LIMITATIONS

Explorations

1. The analysis and recommendations submitted in this report are based in part upon the data obtained from widely spaced subsurface explorations.
2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the boring logs.

Review

3. In the event that any changes in the nature, design, or location of the proposed structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by Geo**Design**. It is recommended that this firm be provided the opportunity for a general review of final design and specifications.

Uses of Report

4. This report has been prepared for the exclusive use of Devenwood Investors, LLC for specific application to the proposed redevelopment of the Burlington Town Center in Burlington, VT in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

TABLES

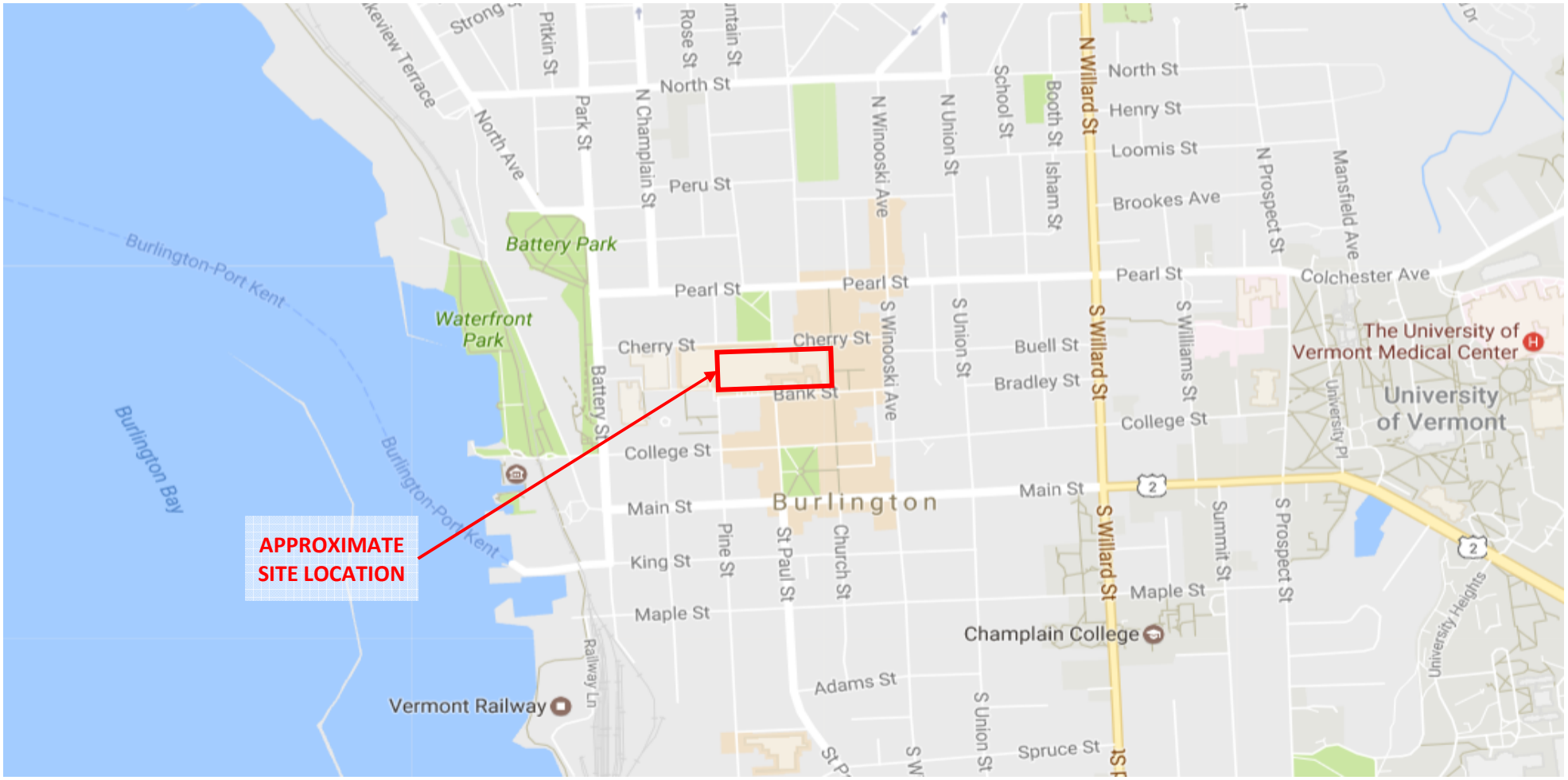
TABLE 1
RECOMMENDED DESIGN RESPONSE SPECTRUM
BURLINGTON TOWN CENTER
BURLINGTON, VT

Period (sec)	Spectral Acceleration (g)
0.010	0.140
0.020	0.162
0.030	0.185
0.040	0.207
0.050	0.229
0.060	0.251
0.070	0.273
0.080	0.295
0.090	0.325
0.100	0.325
0.200	0.325
0.300	0.325
0.400	0.325
0.455	0.325
0.500	0.295
0.600	0.245
0.700	0.207
0.800	0.180
0.900	0.150
1.000	0.127
1.100	0.110
1.200	0.098
1.400	0.084
1.600	0.074
1.800	0.065
2.000	0.059
3.000	0.039
4.000	0.029
5.000	0.024
6.000	0.020

S_{DS} = 0.325

S_{D1} = 0.127

FIGURES



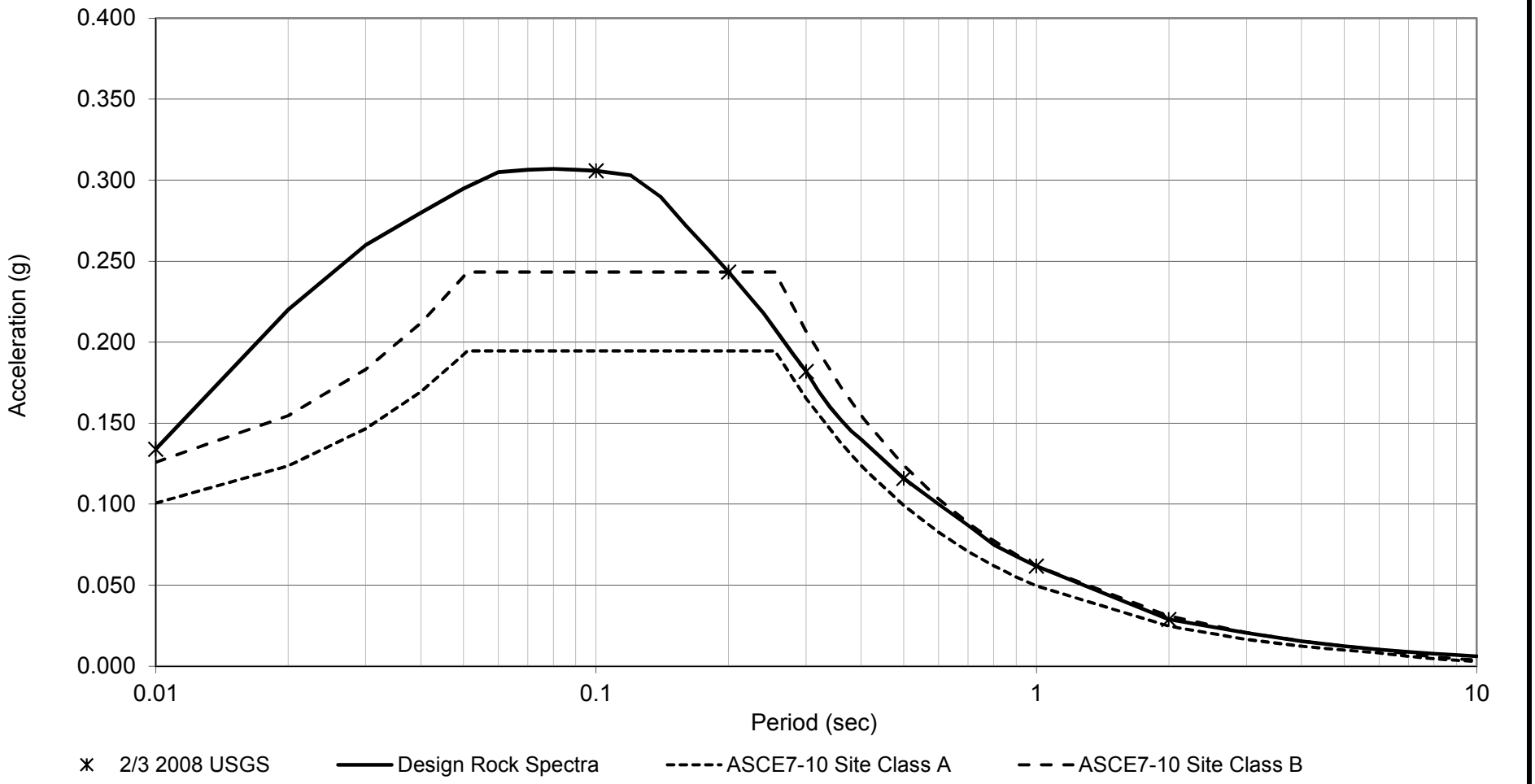
N
W E
S

SITE LOCATION PLAN
BURILINGTON TOWN CENTER
BURLINGTON, VT

GEODESIGN
INCORPORATED P.C.
241 W 30th Street, New York, NY

DR. BY:	ESG	**SCALE:**	NTS	**PROJ NO.:**	1332-001
		DATE:	Feb. 2017	**FIG. NO:**	1

M:\CL\1332-Burlington\Seismic\Report\Figure1_SiteLocationPlan

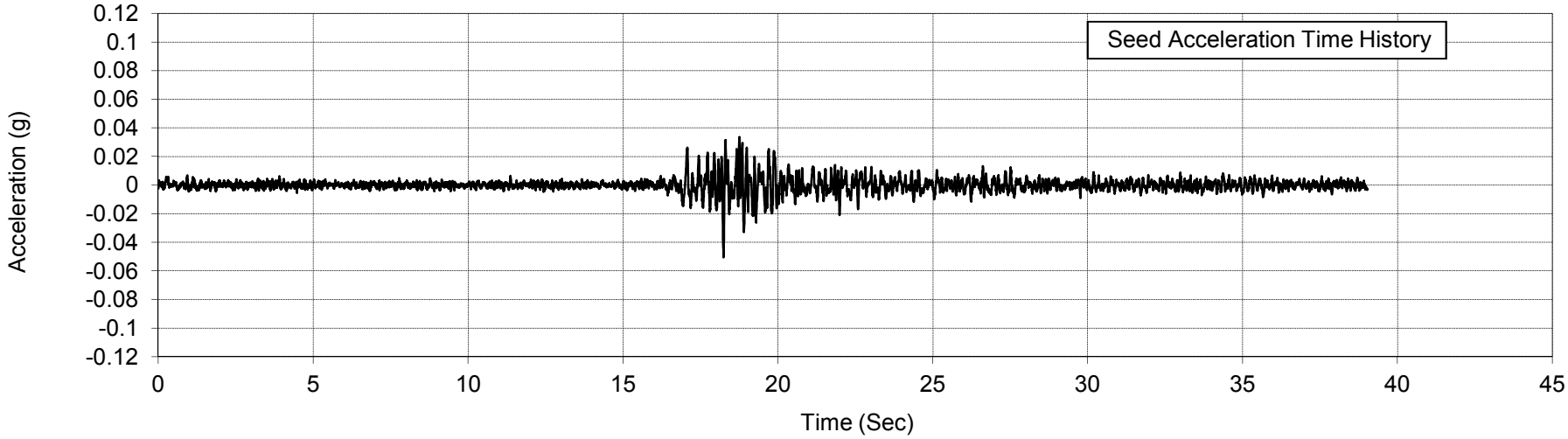


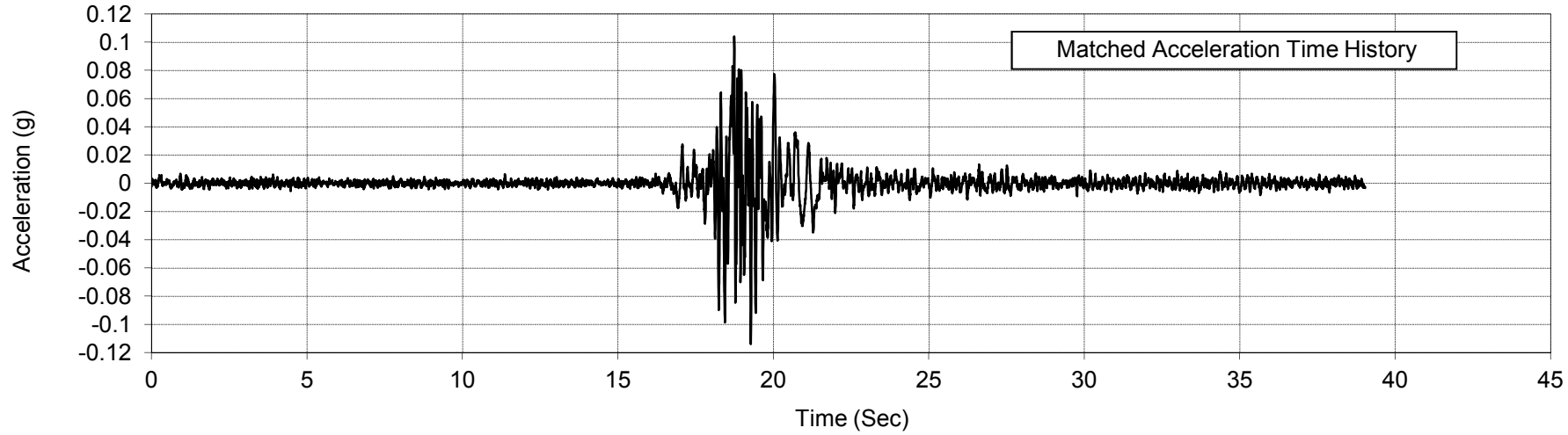
DESIGN ROCK RESPONSE SPECTRUM
BURLINGTON TOWN CENTER
BURLINGTON , VT

GEODESIGN INCORPORATED P.C.
241 West 30th Street, New York, NY

DR. BY: ESG	SCALE: As shown	PROJ NO: 1332-001
CHK'd BY: TGT	DATE: Feb. 2017	FIG NO: 2

M:\CL\1332-Burlington\Seismic\RSPMatch\BedrockSpectra



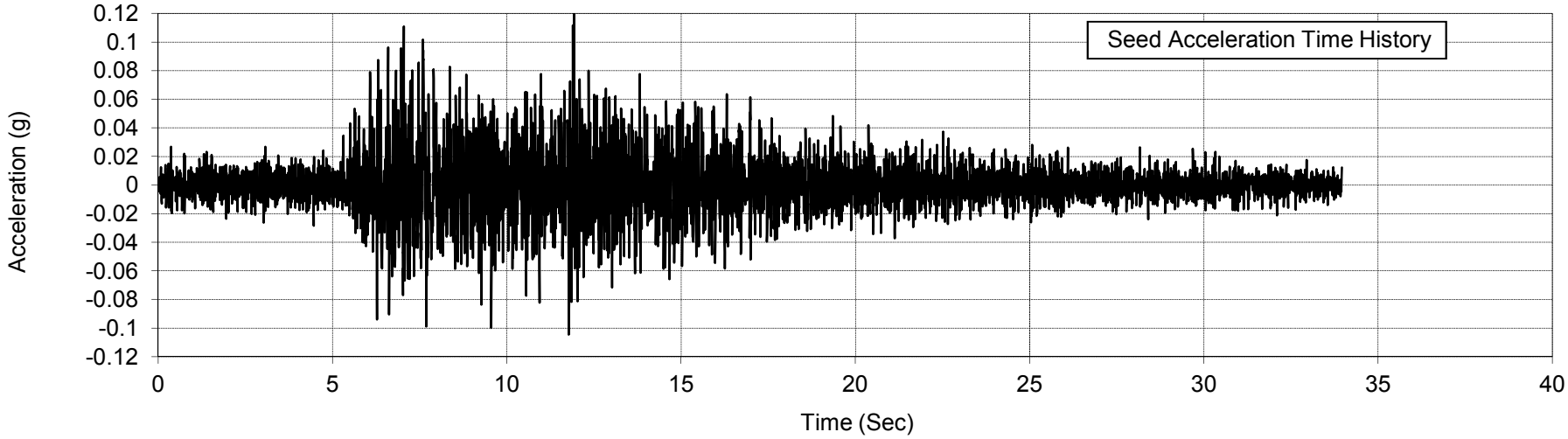


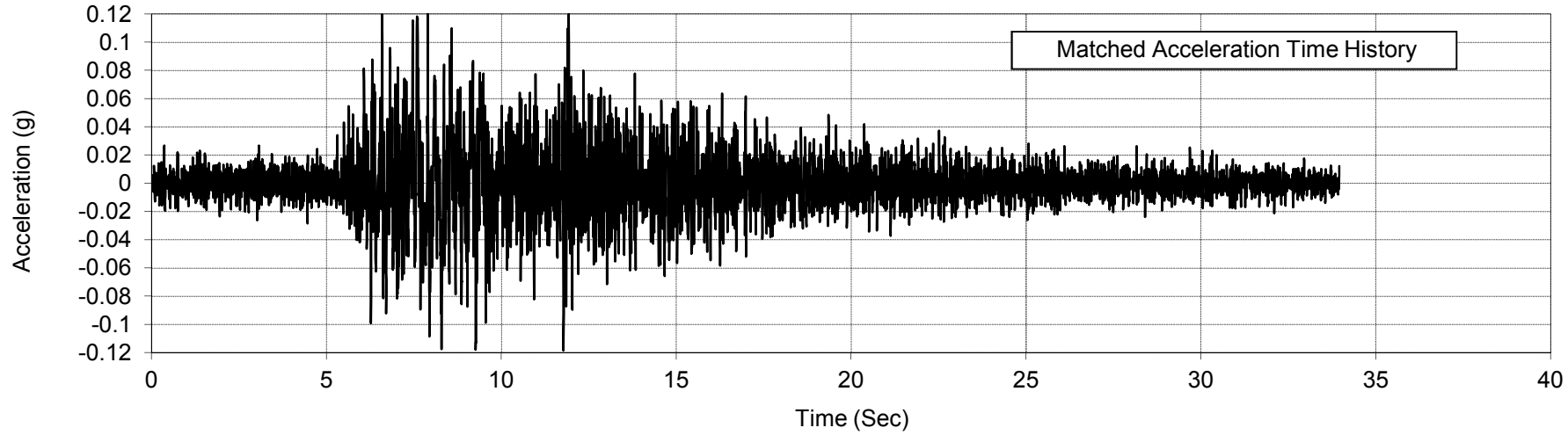
Seed and Matched Time Histories
1988 Saguenay Earthquake - Station SM02051
Burlington Town Center

GEODESIGN INCORPORATED P.C.
241 West 30th Street, New York, NY

DR. BY: ESG	SCALE: As shown	PROJ NO.: 1332-001
CHK'd BY: TGT	DATE: Feb. 2017	FIG NO: 3

M:\CL\1332-Burlington\Seismic\RSPMatch\AccelerationComparison



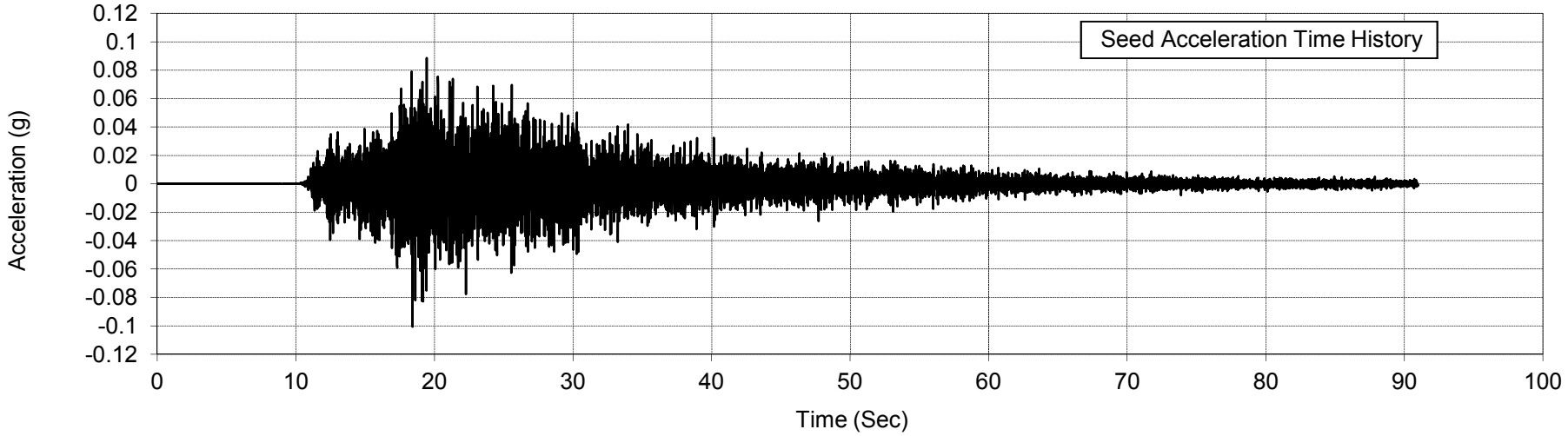


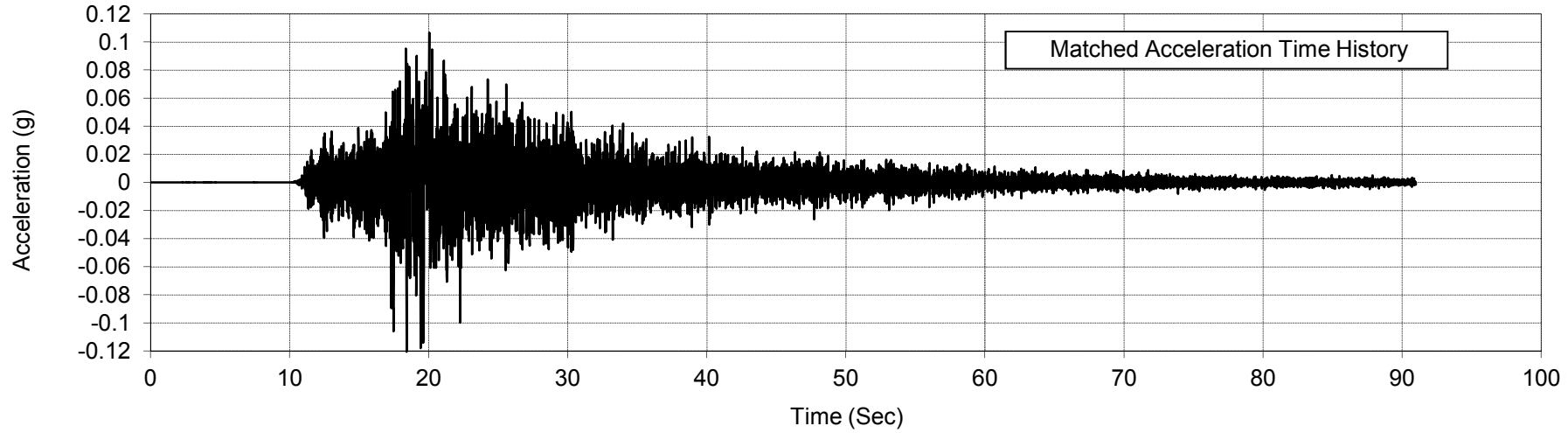
Seed and Matched Time Histories
1988 Saguenay Earthquake - Station SM16124
Burlington Town Center

GEODESIGN INCORPORATED P.C.
241 West 30th Street, New York, NY

DR. BY: ESG	SCALE: As shown	PROJ NO.: 1332-001
CHK'd BY: TGT	DATE: Feb. 2017	FIG NO: 4

M:\CL\1332-Burlington\Seismic\RSPMatch\AccelerationComparison



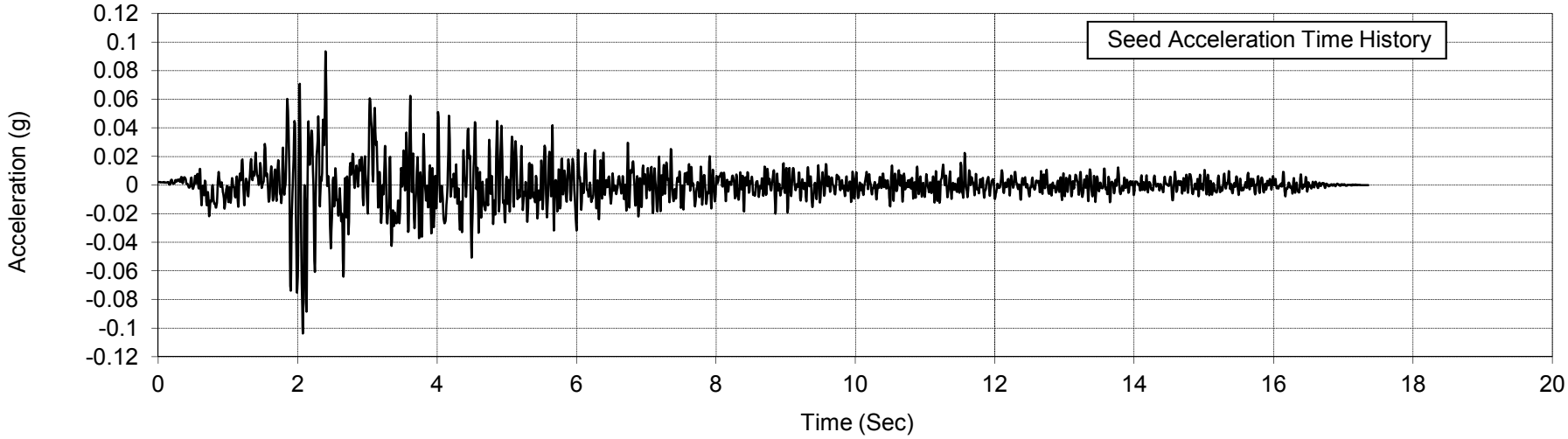


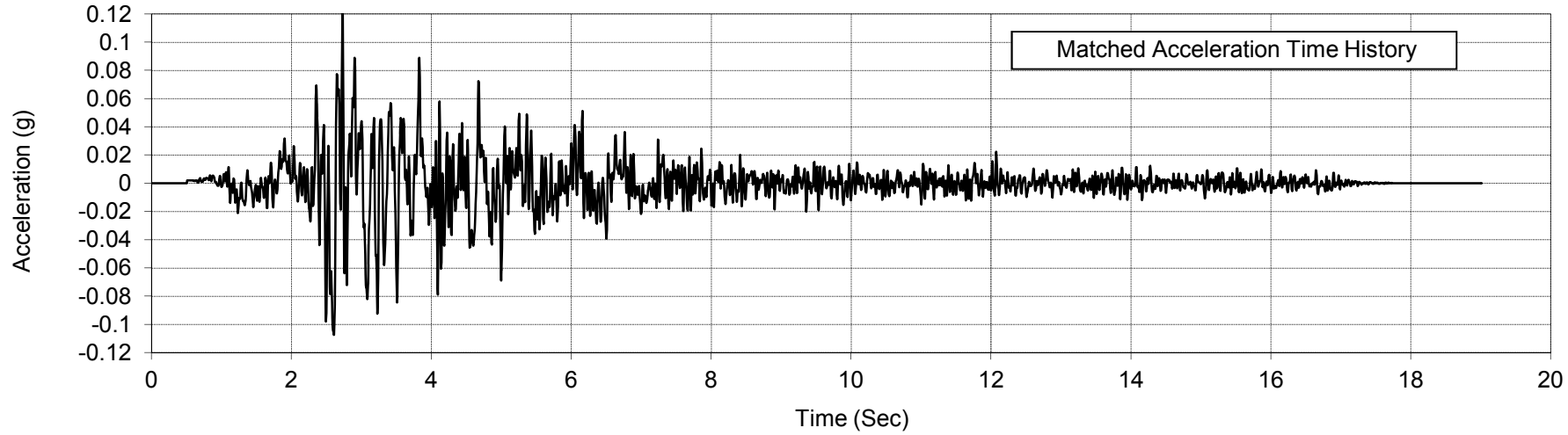
Seed and Matched Time Histories
2011 Mineral Earthquake - RSN5585, Northeast Burlington Town Center

GEODESIGN INCORPORATED P.C.
241 West 30th Street, New York, NY

DR. BY: ESG	SCALE: As shown	PROJ NO.: 1332-001
CHK'd BY: TGT	DATE: Feb. 2017	FIG NO: 5

M:\CL\1332-Burlington\Seismic\RSPMatch\AccelerationComparison



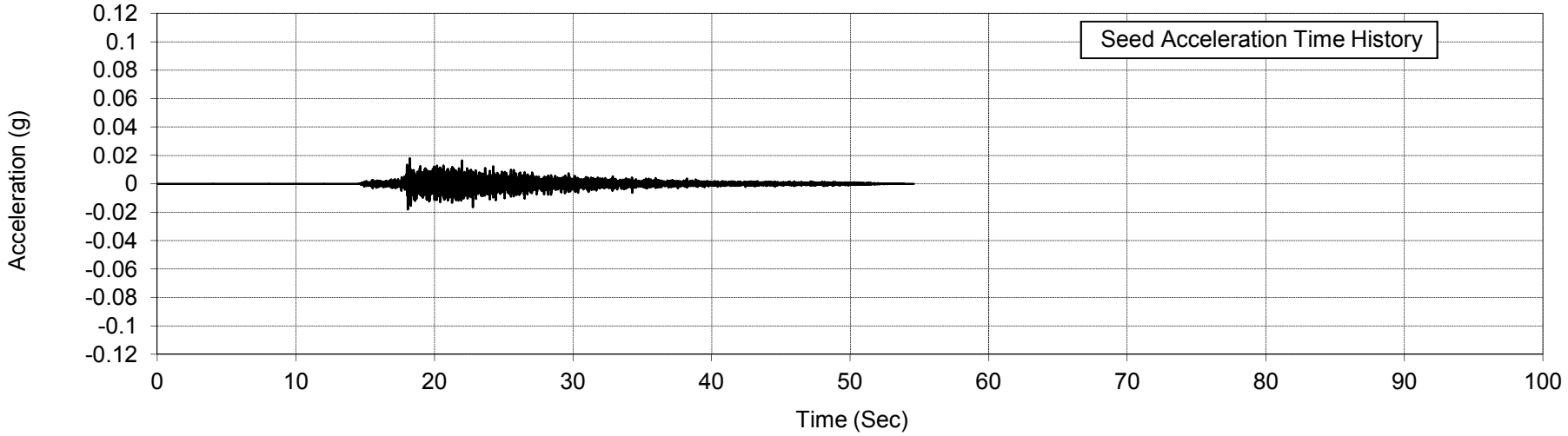


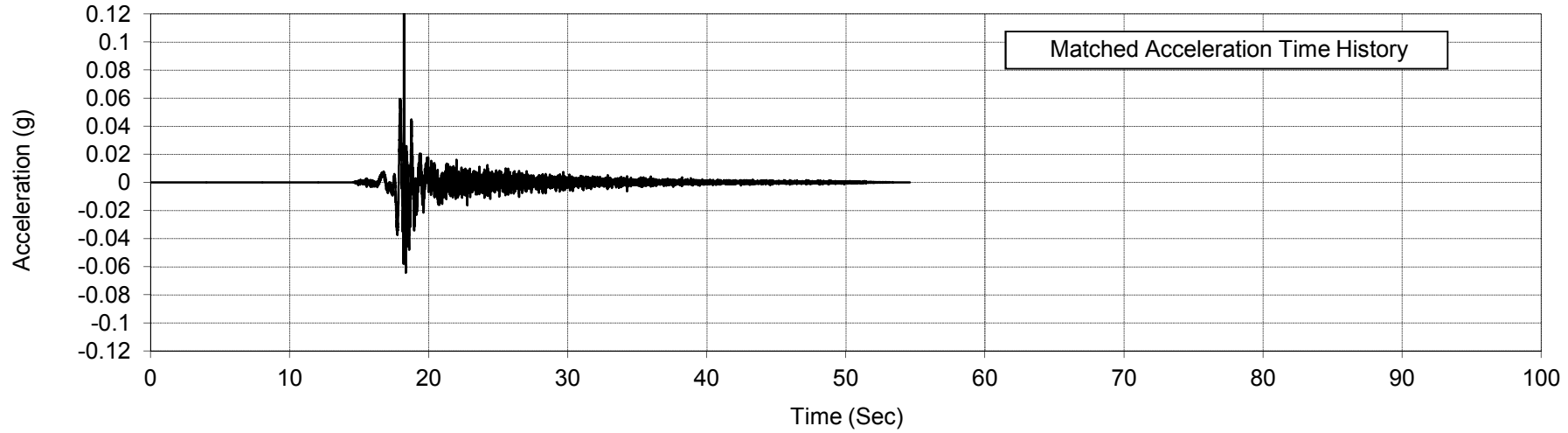
Seed and Matched Time Histories
2011 Mineral Earthquake - RSN8571, North 1
Burlington Town Center

GEODESIGN INCORPORATED P.C.
241 West 30th Street, New York, NY

DR. BY: ESG	SCALE: As shown	PROJ NO.: 1332-001
CHK'd BY: TGT	DATE: Feb. 2017	FIG NO: 6

M:\CL\1332-Burlington\Seismic\RSPMatch\AccelerationComparison



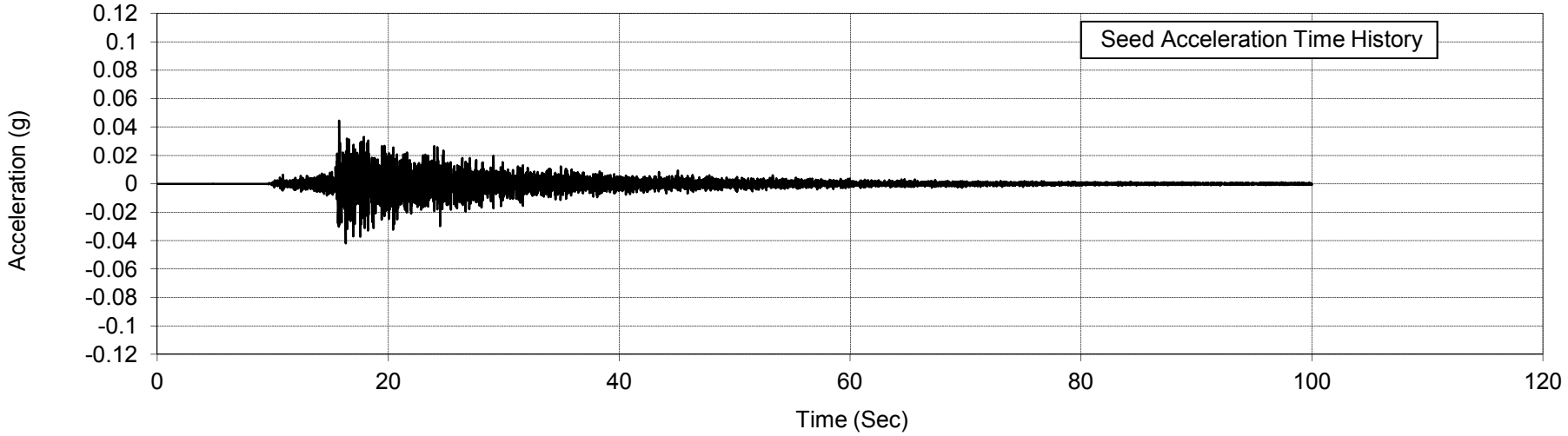


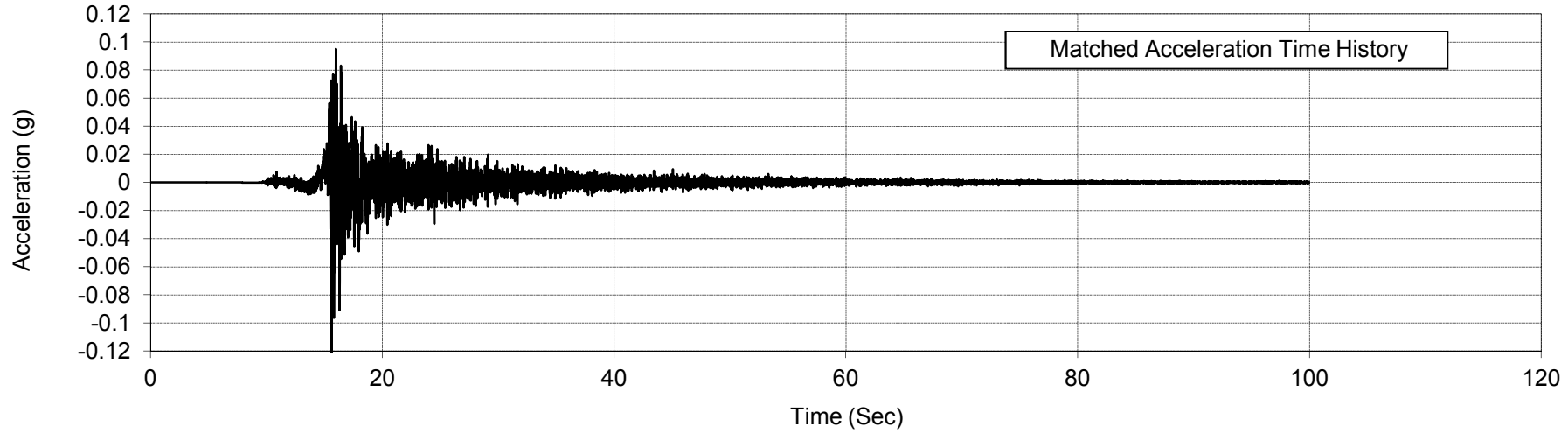
Seed and Matched Time Histories
2010 Val Des Bois Earthquake - RSN3982, North Burlington Town Center

GEODESIGN INCORPORATED P.C.
241 West 30th Street, New York, NY

DR. BY: ESG	SCALE: As shown	PROJ NO.: 1332-001
CHK'd BY: TGT	DATE: Feb. 2017	FIG NO: 7

M:\CL\1332-Burlington\Seismic\RSPMatch\AccelerationComparison



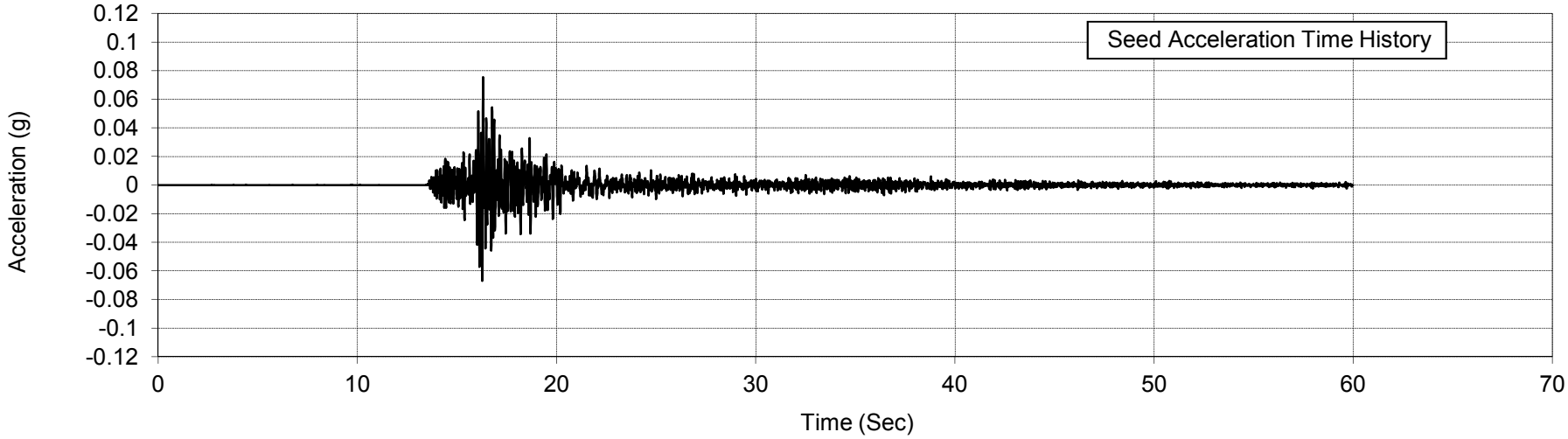


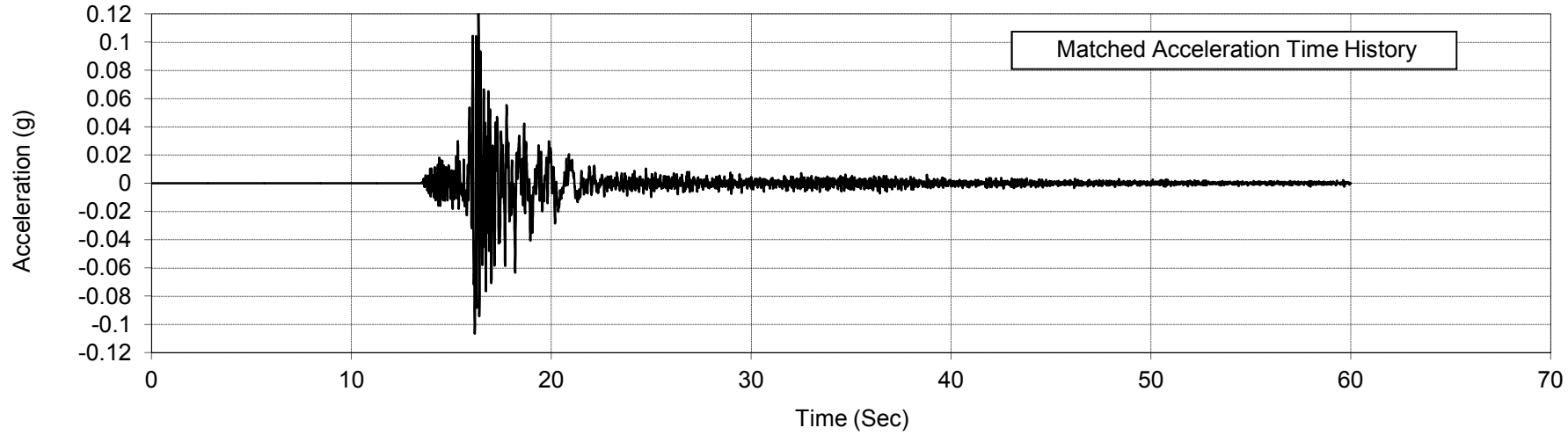
Seed and Matched Time Histories
2010 Val Quebec - Station ORIOHHE
Burlington Town Center

GEODESIGN INCORPORATED P.C.
241 West 30th Street, New York, NY

DR. BY: ESG	SCALE: As shown	PROJ NO.: 1332-001
CHK'd BY: TGT	DATE: Feb. 2017	FIG NO: 8

M:\CL\1332-Burlington\Seismic\RSPMatch\AccelerationComparison



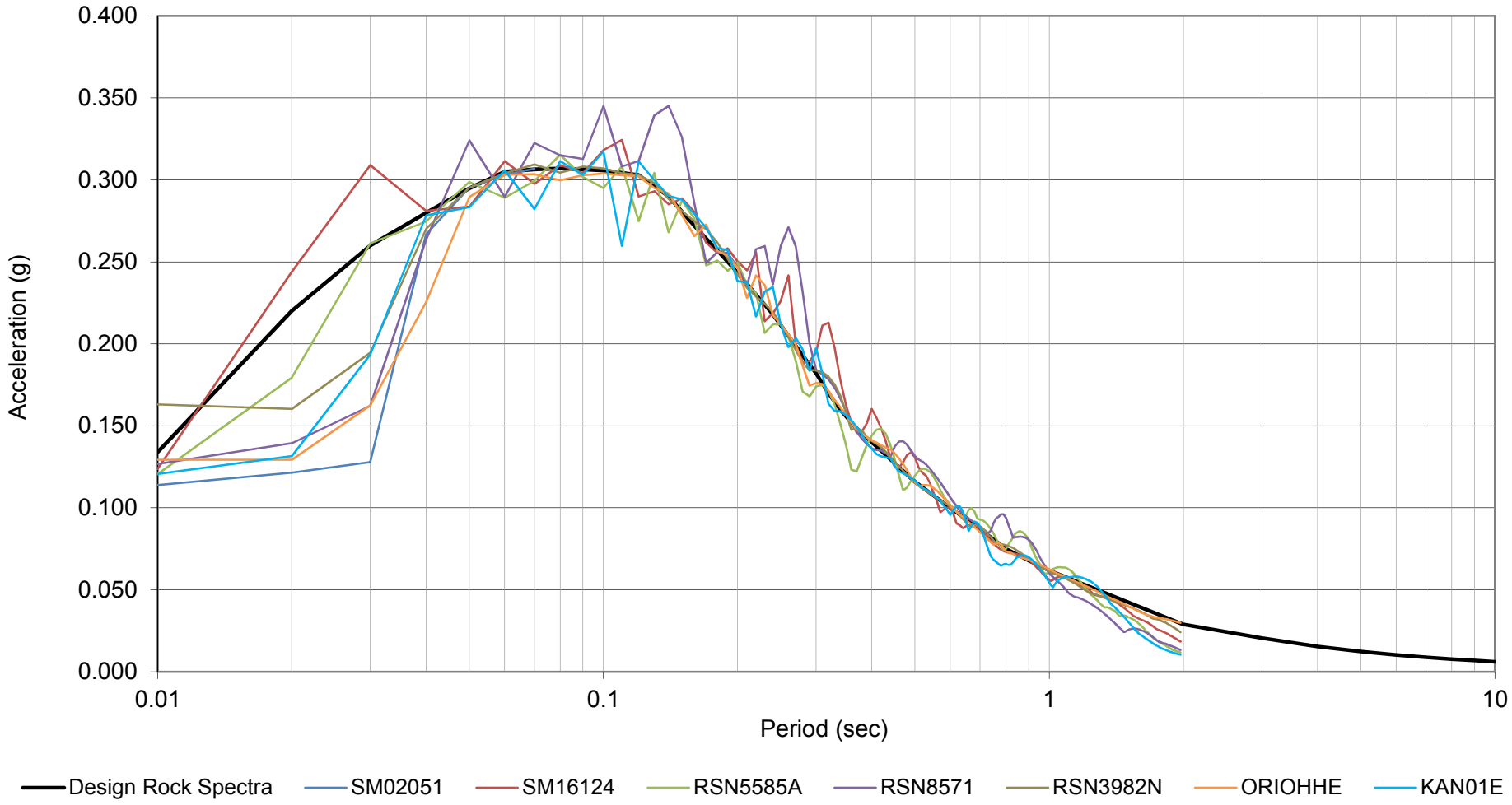


Seed and Matched Time Histories
2014 Conway Springs - KAN01, Northeast Burlington Town Center

GEODESIGN INCORPORATED P.C.
241 West 30th Street, New York, NY

DR. BY: ESG	SCALE: As shown	PROJ NO.: 1332-001
CHK'd BY: TGT	DATE: Feb. 2017	FIG NO: 9

M:\CL\1332-Burlington\Seismic\RSPMatch\AccelerationComparison

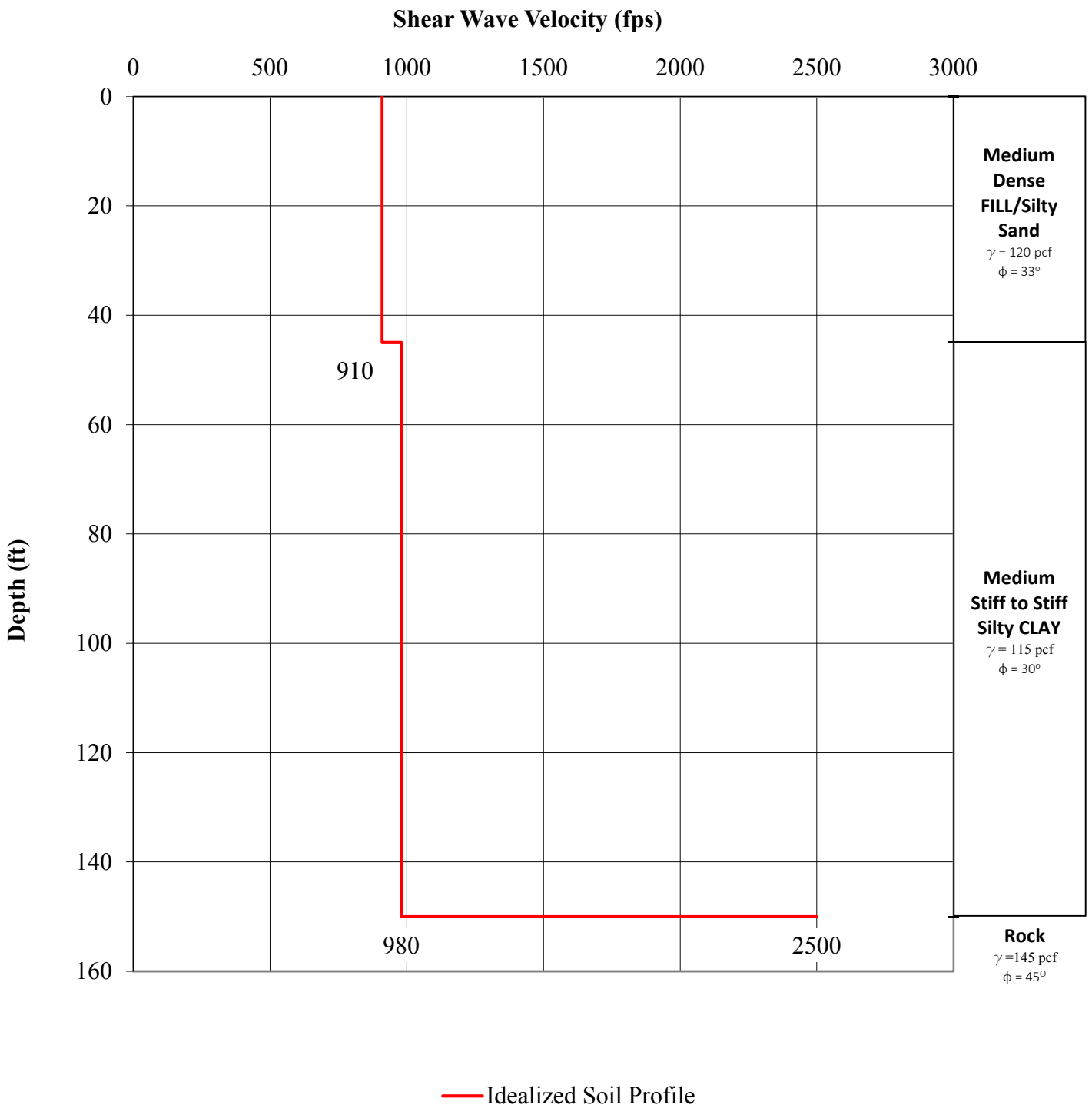


SPECTRUM MATCHING RESULTS
BURLINGTON TOWN CENTER
BURLINGTON , VT

GEODESIGN INCORPORATED P.C.
241 West 30th Street, New York, NY

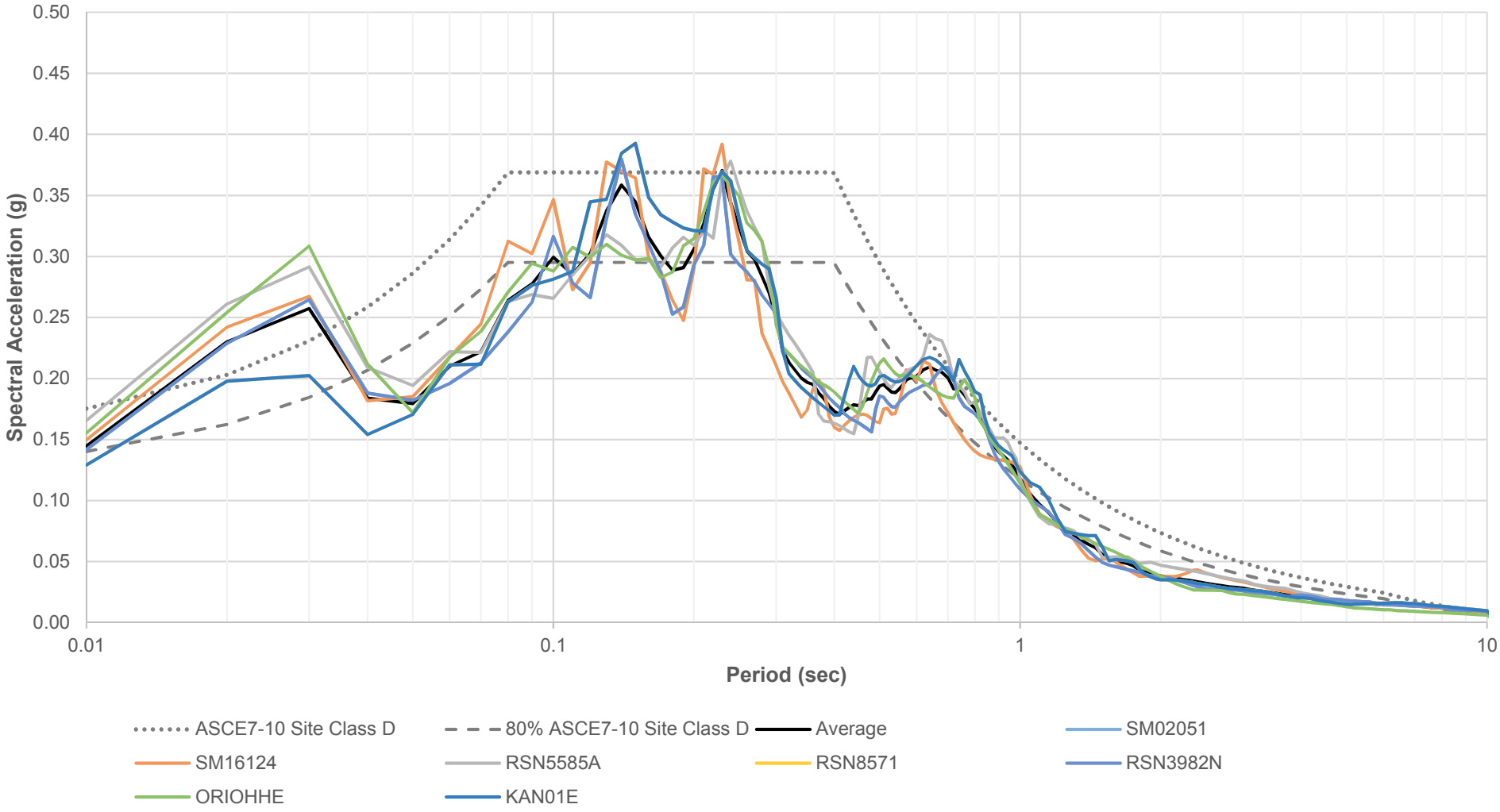
DR. BY: ESG	SCALE: As shown	PROJ NO: 1332-001
CHK'd BY: TGT	DATE: Feb. 2017	FIG NO: 10

M:\CL\1332-Burlington\Seismic\RSPMatch\BedrockSpectra



SHEAR WAVE VELOCITY PROFILE BURLINGTON TOWN CENTER BURLINGTON, VT					
GEODESIGN INCORPORATED P.C. 241 W 30th Street, New York, NY					
DR. BY:	ESG	**SCALE:**	AS SHOWN	**PROJ NO.:**	1332-001
CHK'D. BY:	TGT	**DATE:**	Feb. 2017	**FIG. NO:**	11

M:\CL\1332-Burlington\Seismic\SHAKE\VsProfile&SHAKE_Results



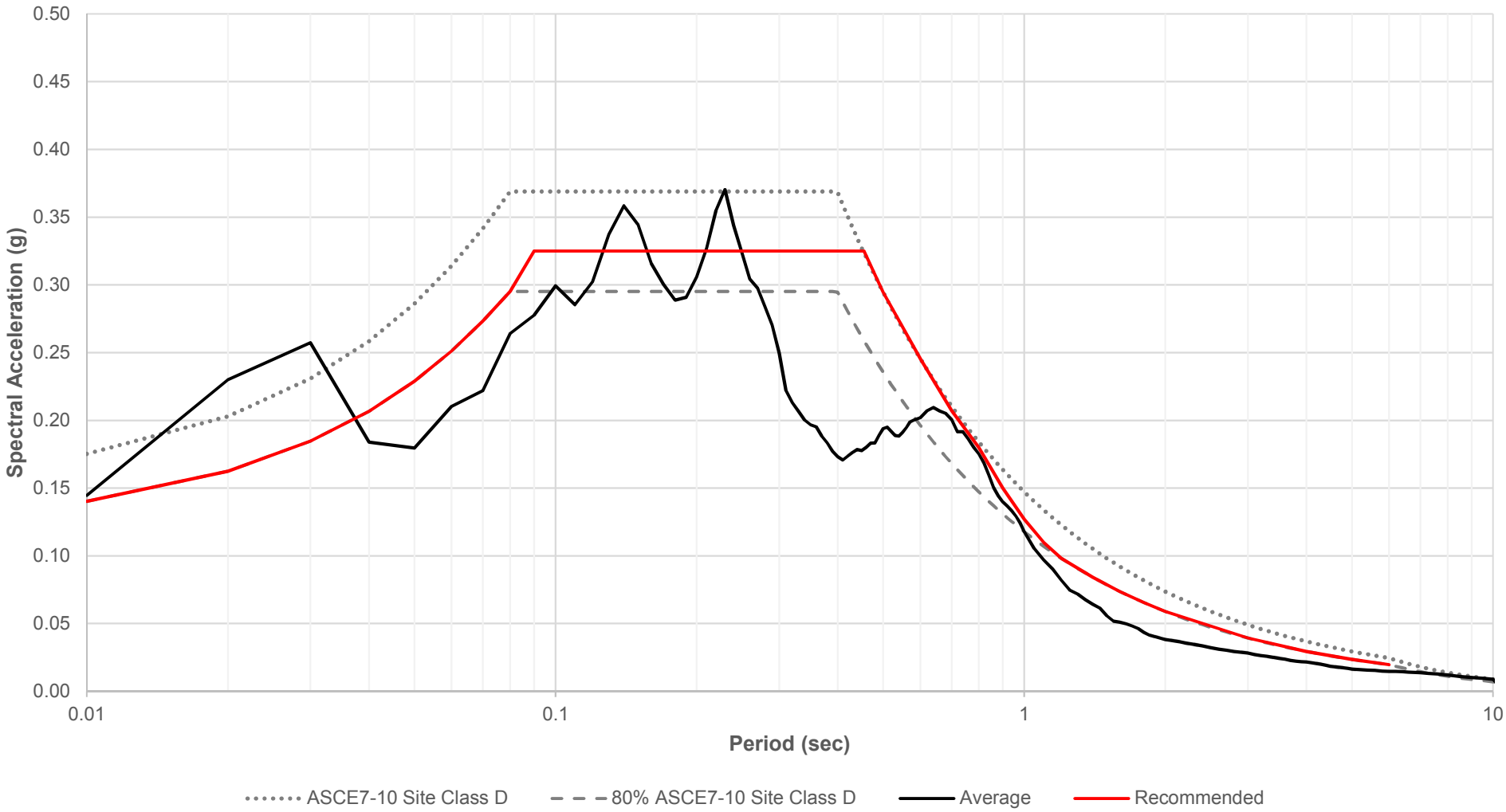
5% Damping

RESPONSE SPECTRA - FOUNDATION LEVEL
BURLINGTON TOWN CENTER
BURLINGTON, VT

GEODESIGN INCORPORATED P.C.
241 W 30th Street, New York, NY

DR. BY:	ESG	**SCALE:**	AS SHOWN	**PROJ NO.:**	1332-001
CHK'D. BY:	TGT	**DATE:**	Feb. 2017	**FIG. NO:**	12

M:\CL\1332-Burlington\Seismic\SHAKE\VsProfile&SHAKE_Results



5% Damping

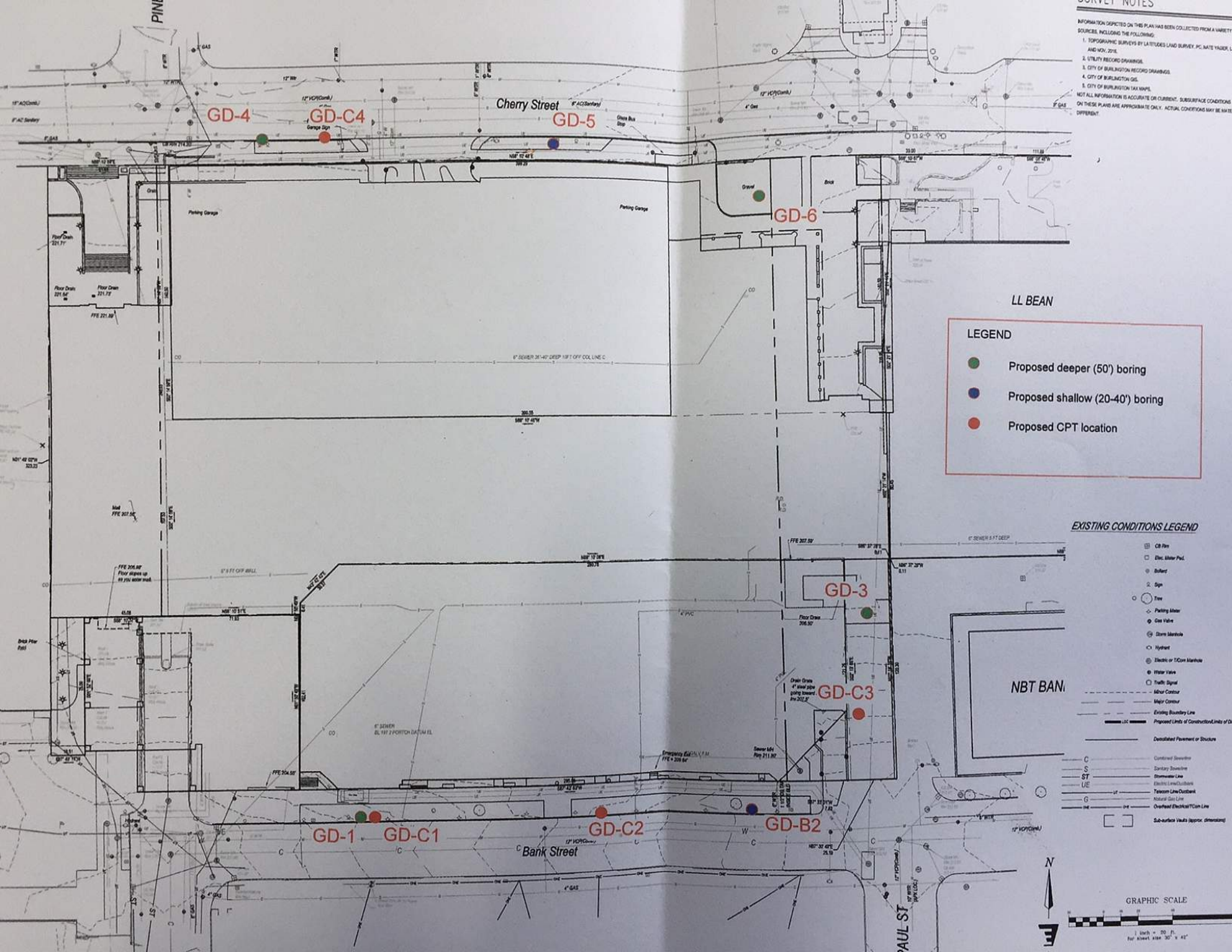
RECOMMENDED DESIGN RESPONSE SPECTRA
BURLINGTON TOWN CENTER
BURLINGTON, VT

GEODESIGN INCORPORATED P.C.
241 W 30th Street, New York, NY

DR. BY:	ESG	**SCALE:**	AS SHOWN	**PROJ NO.:**	1332-001
CHK'D. BY:	TGT	**DATE:**	Feb. 2017	**FIG. NO:**	13

M:\CL\1332-Burlington\Seismic\SHAKE\VsProfile&SHAKE_Results

APPENDIX A
CPT LOGS


GD-4
GD-C4
Cherry Street
GD-5
GD-6
LL BEAN
LEGEND
Proposed deeper (50') boring
Proposed shallow (20-40') boring
Proposed CPT location
EXISTING CONDITIONS LEGEND
GD-3
GD-C3
NBT BAN
GD-1
GD-C1
GD-C2
GD-B2
Bank Street
N
GRAPHIC SCALE

Job No:	17-53020
Client:	GeoDesign
Project:	Burlington Town Center, Burlington, VT
Sounding ID:	SCPT17-GD-C1
Date:	20-Feb-2017

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

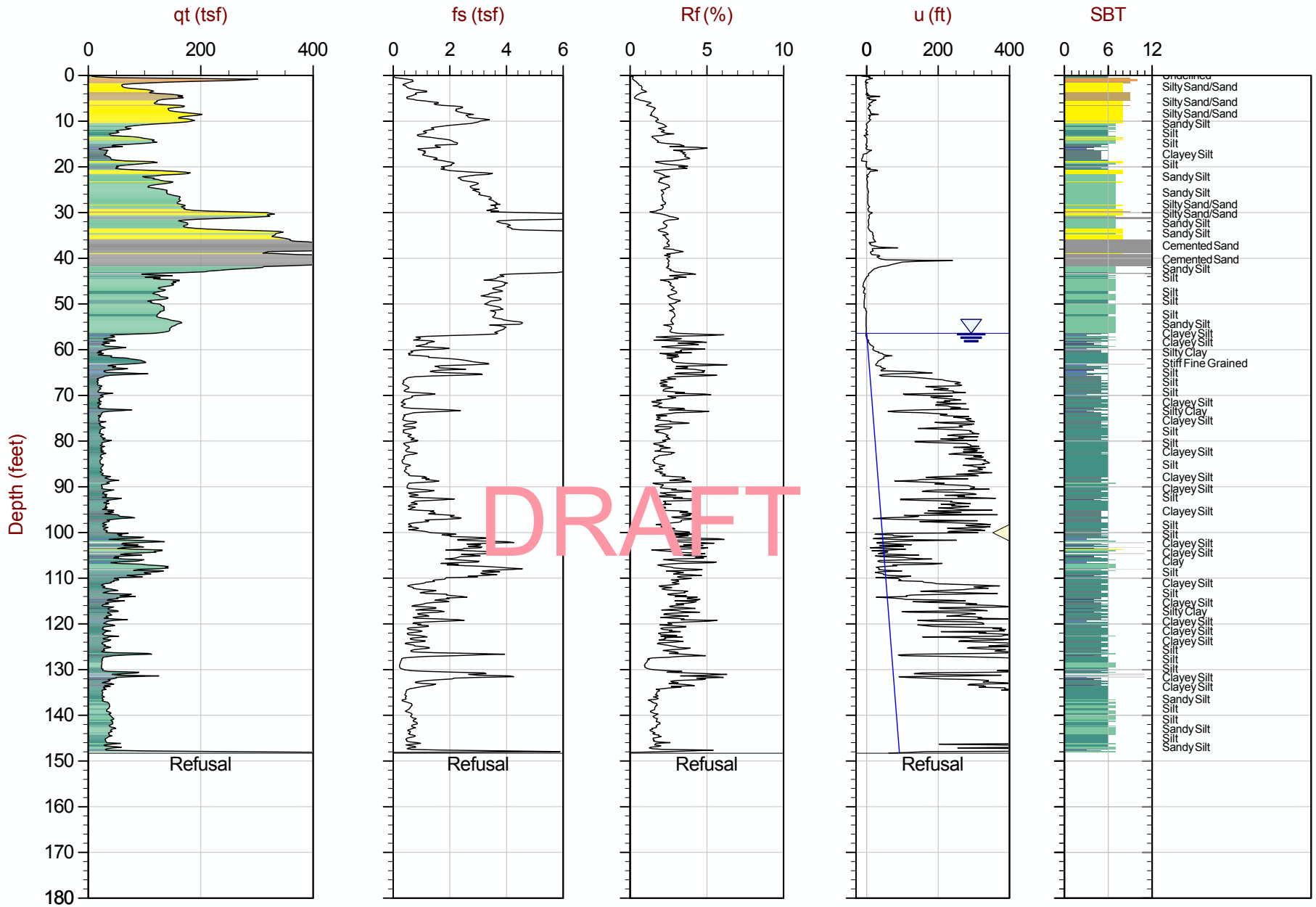
Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
100.07	99.41	99.43			
110.07	109.42	109.43	10.00	9.96	1005
120.08	119.42	119.44	10.01	9.31	1075
130.09	129.43	129.44	10.01	9.80	1021
140.09	139.44	139.45	10.01	9.23	1084
148.29	147.64	147.65	8.20	6.15	1333

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 15:13
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C1
Cone: 468:T1500F15U500



DRAFT

Max Depth: 45.200 m / 148.29 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C1.DRF

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926528m E: 641935m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Job No:	17-53020
Client:	GeoDesign
Project:	Burlington Town Center, Burlington, VT
Sounding ID:	SCPT17-GD-C2
Date:	20-Feb-2017

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

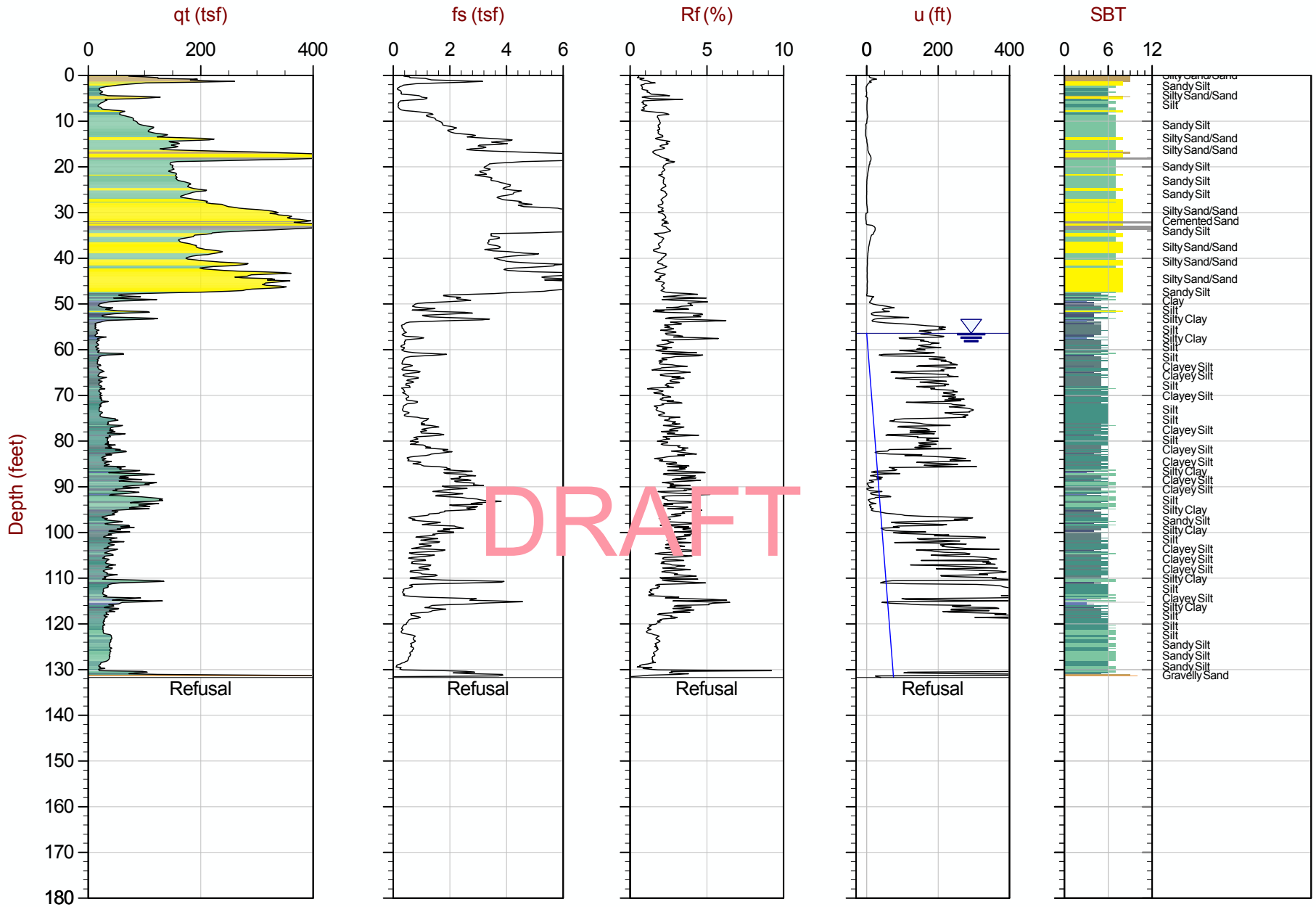
Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
30.02	29.36	29.43			
60.04	59.38	59.42	29.99	33.77	888
90.06	89.40	89.42	30.01	31.40	956

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 12:30
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C2
Cone: 468:T1500F15U500



DRAFT

Max Depth: 40.150 m / 131.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C2.DRF

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926523m E: 641980m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Job No: 17-53020
Client: GeoDesign
Project: Burlington Town Center, Burlington, VT
Sounding ID: SCPT17-GD-C3
Date: 20-Feb-2017

Seismic Source: Beam
Source Offset (ft): 1.97
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

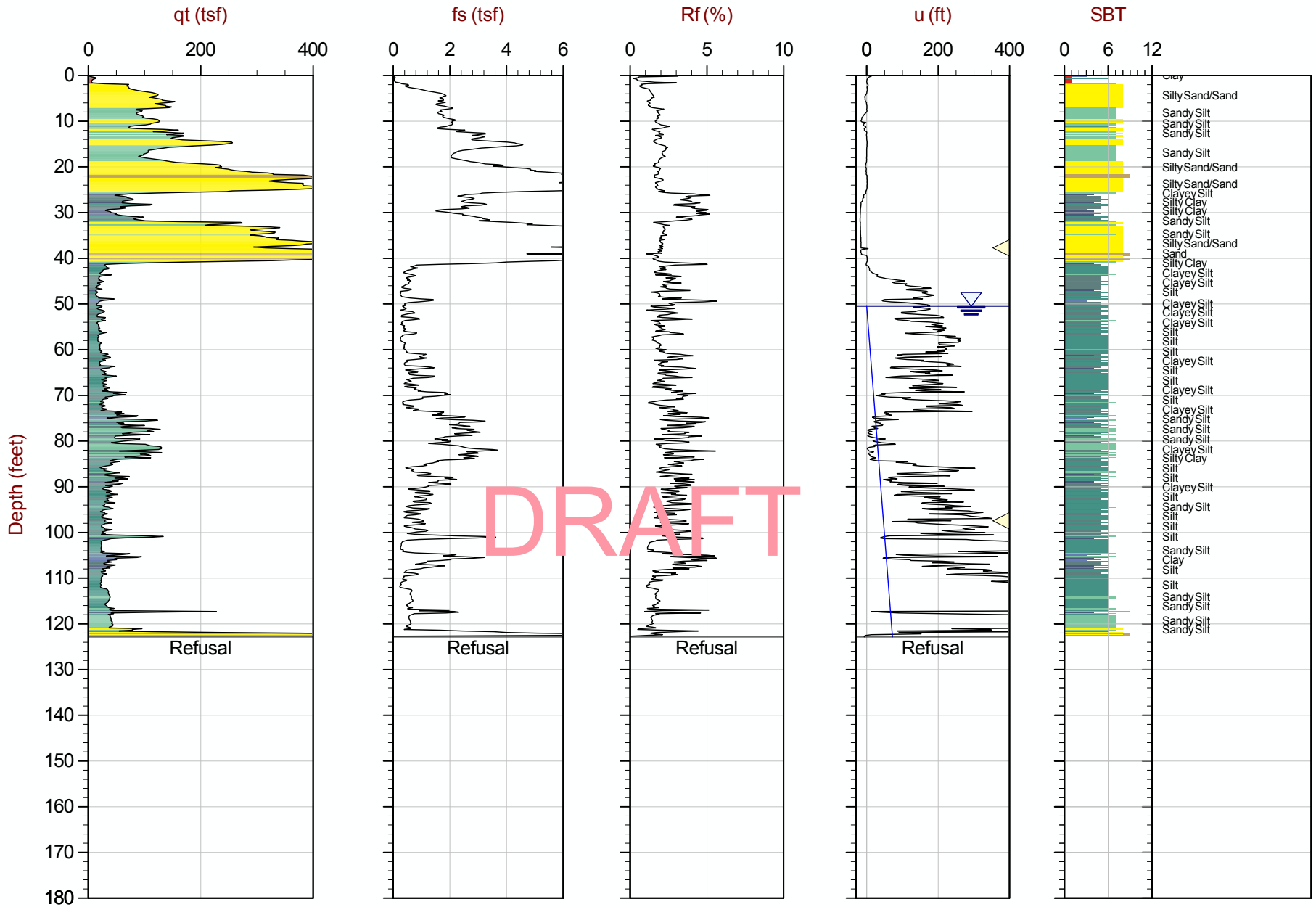
Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
20.01	19.36	19.46			
40.19	39.53	39.58	20.13	22.09	911
60.04	59.38	59.42	19.83	22.61	877
80.05	79.40	79.42	20.00	22.03	908
100.07	99.41	99.43	20.01	20.03	999
110.56	109.91	109.93	10.50	10.75	977
120.08	119.42	119.44	9.51	9.34	1018
122.87	122.21	122.23	2.79	1.48	1881

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 08:27
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C3
Cone: 468:T1500F15U500



Max Depth: 37.450 m / 122.87 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C3.DRF

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926556m E: 642035m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Job No: 17-53020
Client: GeoDesign
Project: Burlington Town Center, Burlington, VT
Sounding ID: SCPT17-GD-C4
Date: 20-Feb-2017

Seismic Source: Beam
Source Offset (ft): 1.97
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

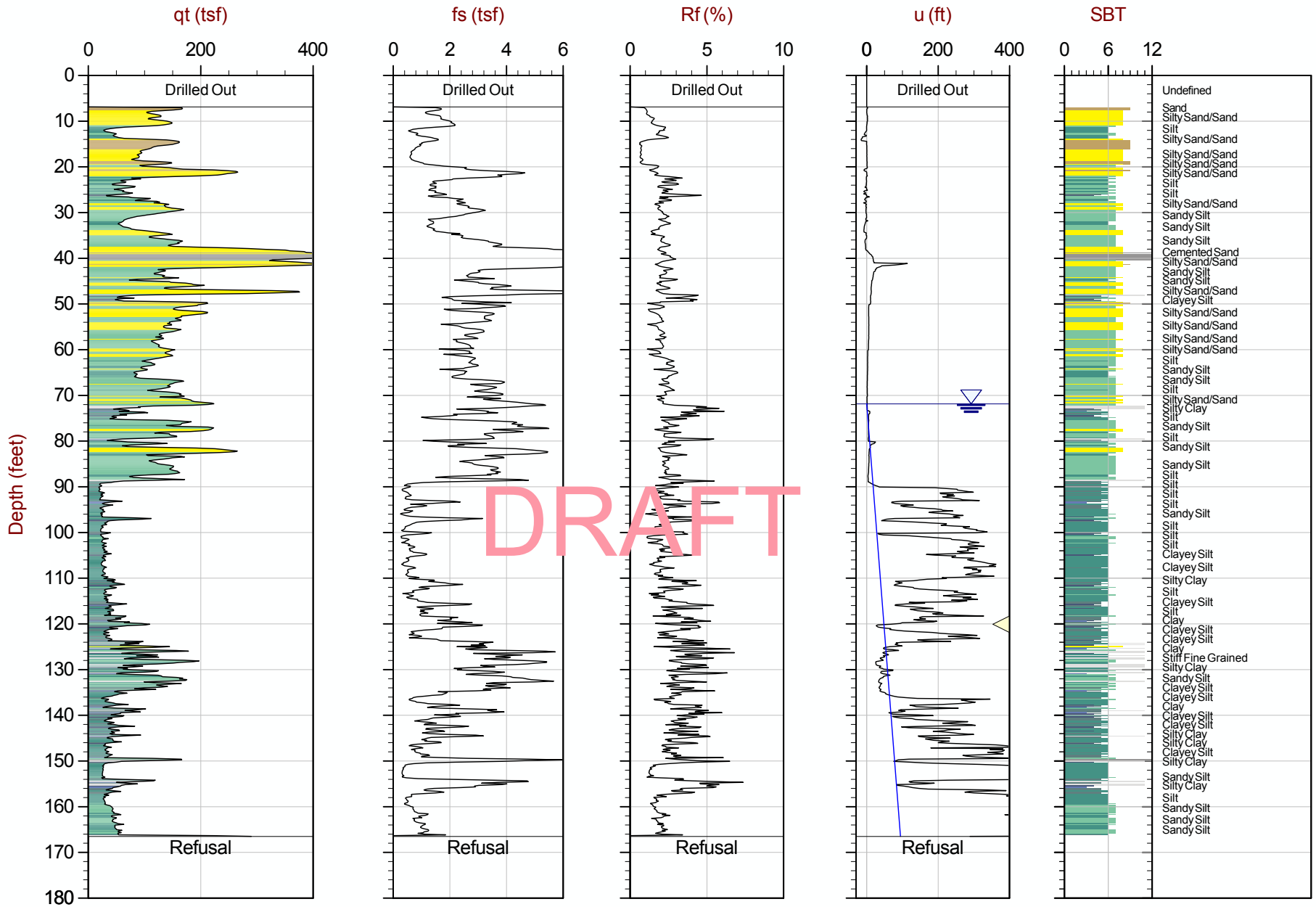
Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
41.01	40.35	40.40			
50.03	49.38	49.42	9.01	9.59	940
60.04	59.38	59.42	10.00	11.13	898
70.21	69.55	69.58	10.17	9.18	1107
80.05	79.40	79.42	9.84	8.67	1135
90.06	89.40	89.42	10.00	10.39	963
100.07	99.41	99.43	10.00	10.88	919
105.15	104.49	104.51	5.08	4.31	1179
110.07	109.42	109.43	4.92	5.69	865
115.16	114.50	114.52	5.08	4.66	1091
120.08	119.42	119.44	4.92	6.20	794
125.16	124.51	124.52	5.08	6.27	811
130.25	129.59	129.61	5.08	5.20	977
135.01	134.35	134.36	4.76	3.90	1219
140.09	139.44	139.45	5.08	4.67	1089
150.10	149.44	149.46	10.01	11.29	886
155.02	154.36	154.38	4.92	8.34	590
160.10	159.45	159.46	5.08	4.37	1162
165.03	164.37	164.38	4.92	5.26	935

CONETEC

GeoDesign

Job No: 17-53020
Date: 2017-02-20 18:51
Site: Burlington Town Center, Burlington, VT

Sounding: SCPT17-GD-C4
Cone: 468:T1500F15U500



DRAFT

Max Depth: 50.750 m / 166.50 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53020_SPGD-C4.DRF

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4926644m E: 641915m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ATTACHMENT 5 – LABORATORY TESTING

GRAIN SIZE ANALYSIS AND ATTERBERG LIMITS TESTING SUMMARY

Table 1. Results Summary For Washed Sieve (ASTM D6913, Method A) & Sieve-Hydrometer (ASTM D7928) tests performed.

EXPLORATION ID	SAMPLE NO.	DEPTH (ft)	MOISTURE CONTENT (%)	UNCOR-SPT N-VALUE	REC / PEN (in)	PERCENT SILT/CLAY
GD-B1	S3	9	11.6	22	14/24	40
GD-B1	S8	34	11.5	78	17/24	38
GD-B1	S12	54	19.2	25	11/24	55
GD-B1	ST-1	66.5	25	n/a	24/18	76/23
GD-B1	ST-5	84.5	25	n/a	21/21	83/16
GD-B1	S20	119	24.7	3	24/24	80.7 / 19.0
GD-B1	ST-6	135	38	n/a	18.5/18.5	28/67
GD-B2	S8	19	14.1	27	24/24	53
GD-B3	S2	2	17.8	12	15/24	80
GD-B4	S11	29	16.1	17	20/24	38
GD-B4	S15	49	14.2	11	15/24	42
GD-B5	S5	19	26.7	7	12/24	79.5 / 12.9
GD-B6	S5	8	4.2	14	24/24	6
GD-B6	S10	24	16.7	26	14/24	12
GD-B6	S16	52	27.2	n/a	n/a	82.8 / 14.8
GD-B6	S20	79	25.7	5	24/24	82.6 / 16.6

Table 2. Summary of Atterberg Limits (ASTM D4318).

EXPLORATION ID	SAMPLE NO.	DEPTH (ft)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
GD-B1	S14	64	27.8	26	20	6
GD-B1	ST-1	66.5	26	28	22	6
GD-B1	ST-5	84.5	25	28	21	7
GD-B1	S20	119	24.7	25	18	7
GD-B1	ST-6	135	38	63	26	37
GD-B6	S16	52	27.2	23	19	4
GD-B6	S20	79	28.2	23	18	5
GD-B6	S24	109	26.6	24	19	5
GD-B6	S25	119	24.7	27	19	8

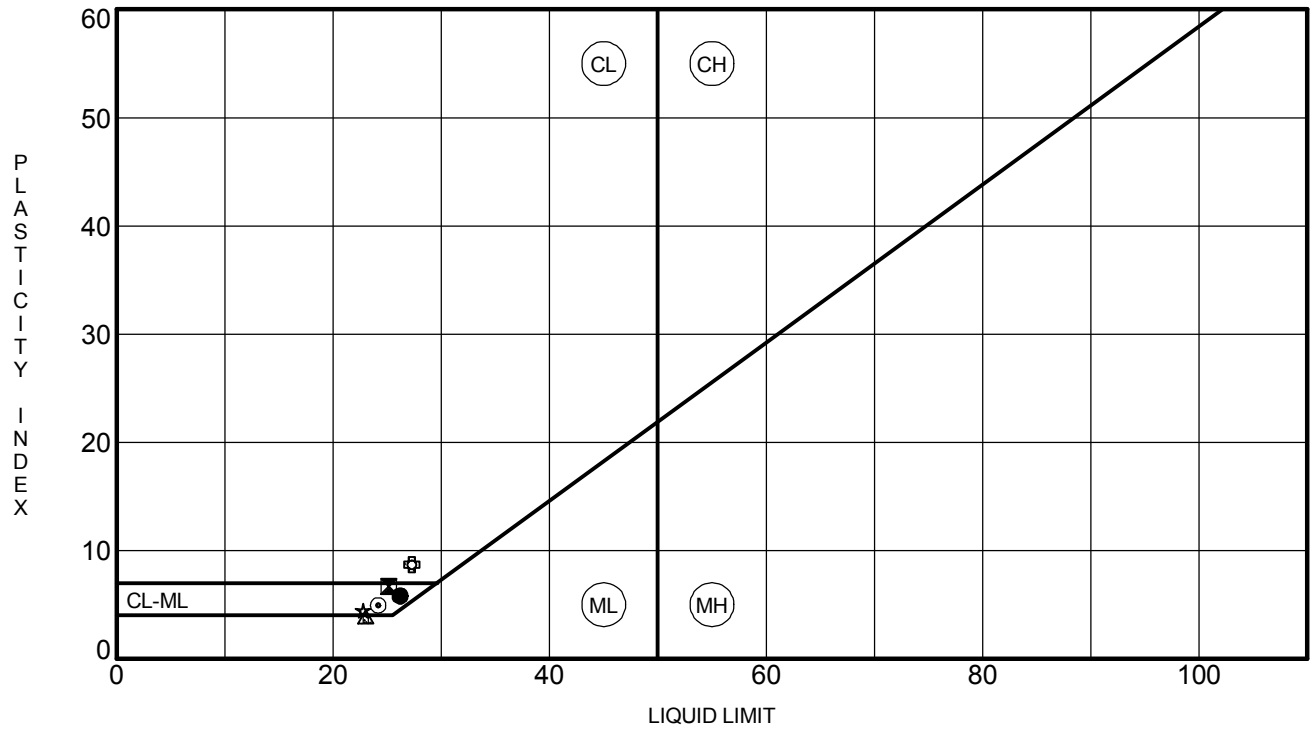
ATTACHMENT 5A – GEODESIGN LABORATORY RESULTS

WATER CONTENT DETERMINATIONS

Project Name	Burlington Town Center	Test By	JFW
Site Location	Burlington , VT	Date Tested	4/10 to 4/11
Project No.	1332-01	Review By	DTH
Client	Devonwood Investors, LLC		

ASTM D 2216

Boring No.	Sample No.	Depth (feet)	Wt. of Container (g)	Wet Wt. (g) [inc. container]	Dry Wt. (g) [inc. container]	Wet Wt. Soil (g)	Dry Wt. Soil (g)	Water Content (%)	Comments
GD-B1	S13	59'	0.46	31.26	24.43	30.80	23.97	28.5	
	S14	64'	0.45	32.00	25.13	31.55	24.68	27.8	
	S15	69'	0.44	36.94	28.89	36.50	28.45	28.3	
	S16	79'	0.45	31.87	25.01	31.42	24.56	27.9	
	S17	89'	0.46	25.83	20.43	25.37	19.97	27.0	
	S18	99'	0.46	45.01	35.92	44.55	35.46	25.6	
	S19	109'	0.44	27.15	21.84	26.71	21.40	24.8	
	ST2	121.5'	0.71	27.22	21.41	26.51	20.70	28.1	
	S21	129'	0.45	48.66	37.96	48.21	37.51	28.5	
GD-B6	S14	44'	0.46	33.15	26.04	32.69	25.58	27.8	
	S15	49'	0.46	22.47	17.70	22.01	17.24	27.7	
	S17	54'	0.45	18.22	14.65	17.77	14.20	25.1	
	S18	59'	0.46	18.55	14.28	18.09	13.82	30.9	
	S19	69'	0.46	29.52	23.35	29.06	22.89	27.0	
	ST-3	72'	0.45	58.04	45.68	57.59	45.23	27.3	
	S20	79'	0.46	37.21	29.12	36.75	28.66	28.2	
	S21	89'	0.47	33.60	27.18	33.13	26.71	24.0	
	S23	101'	0.45	31.25	24.97	30.80	24.52	25.6	
	S24	109'	0.45	50.65	40.10	50.20	39.65	26.6	
	S25	119'	0.45	26.52	21.36	26.07	20.91	24.7	



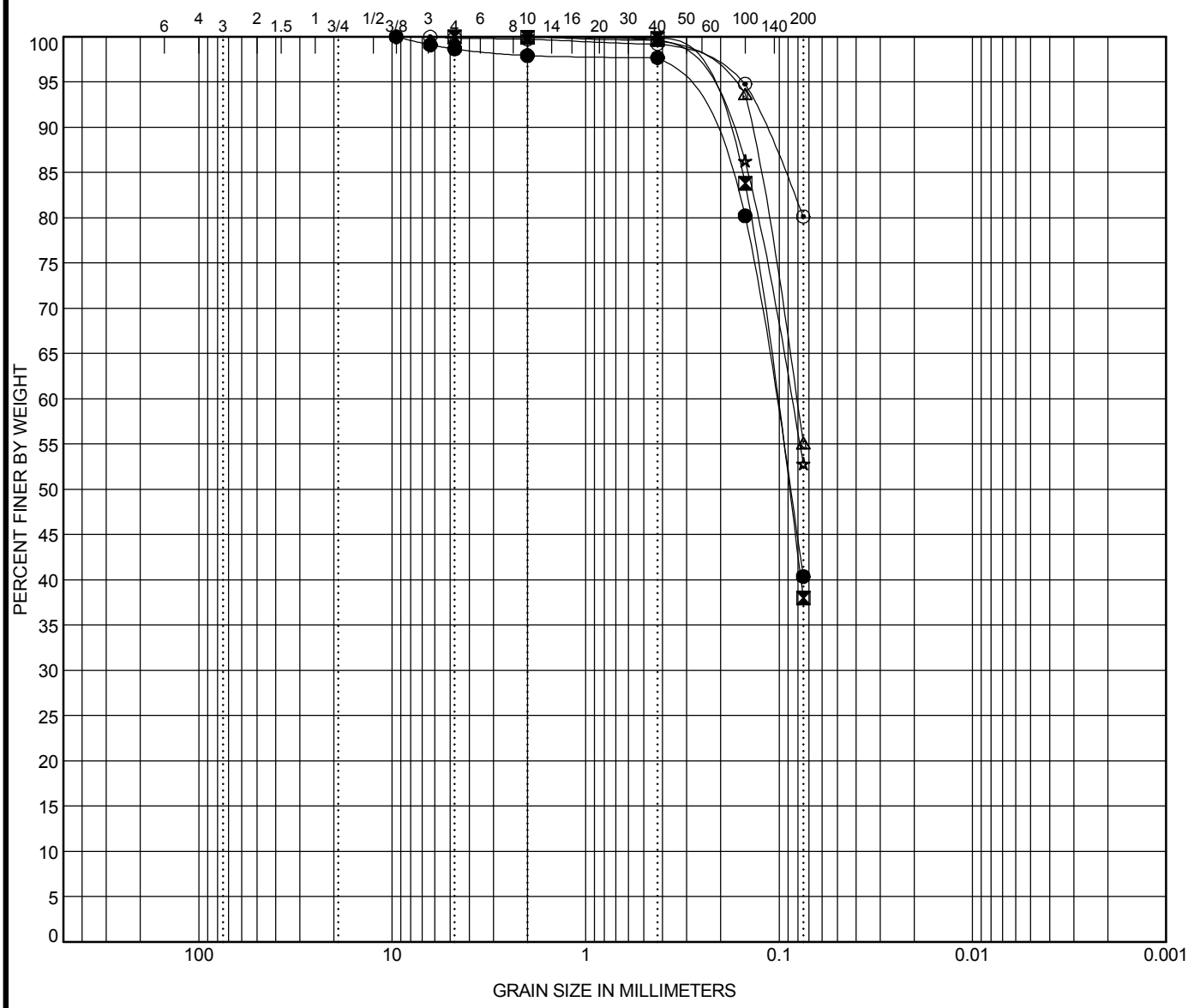
	Borehole No.	Sample	Depth	LL	PL	PI	% > #40	Mc	Sample Description (Burmister)
●	GD-B1	S14	64.0	26	20	6	~100	27.8	SILT & CLAY
⊠	GD-B1	S20	119.0	25	18	7	~100	24.7	SILT & CLAY
⚠	GD-B6	S16	52.0	23	19	4	+/-95	27.2	Clayey SILT
☆	GD-B6	S20	79.0	23	18	5	~100	28.2	SILT & CLAY
⊙	GD-B6	S24	109.0	24	19	5	~100	26.6	SILT & CLAY
⯐	GD-B6	S25	119.0	27	19	8	~100	24.7	SILT & CLAY

Notes:
1. Percent passing the #40 sieve reported is based on visual estimates made by GeoDesign personnel during preparation of the test specimen.
2. Moisture content shown is based on samples stored in drillers jars prior to testing.
3. Several pieces of fine gravel were noted in sample GD-B6, S16; but were not representative of the overall soil matrix.

GEODESIGN INCORPORATED
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ATTERBERG LIMITS' RESULTS

Project: Burlington Town Center
Location: Burlington, VT
Number: 1332-01
Tested By: JFW Reviewed By: JAG
Date:April 5-11, 2017
Testing performed in general accordance with ASTM D 4318



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

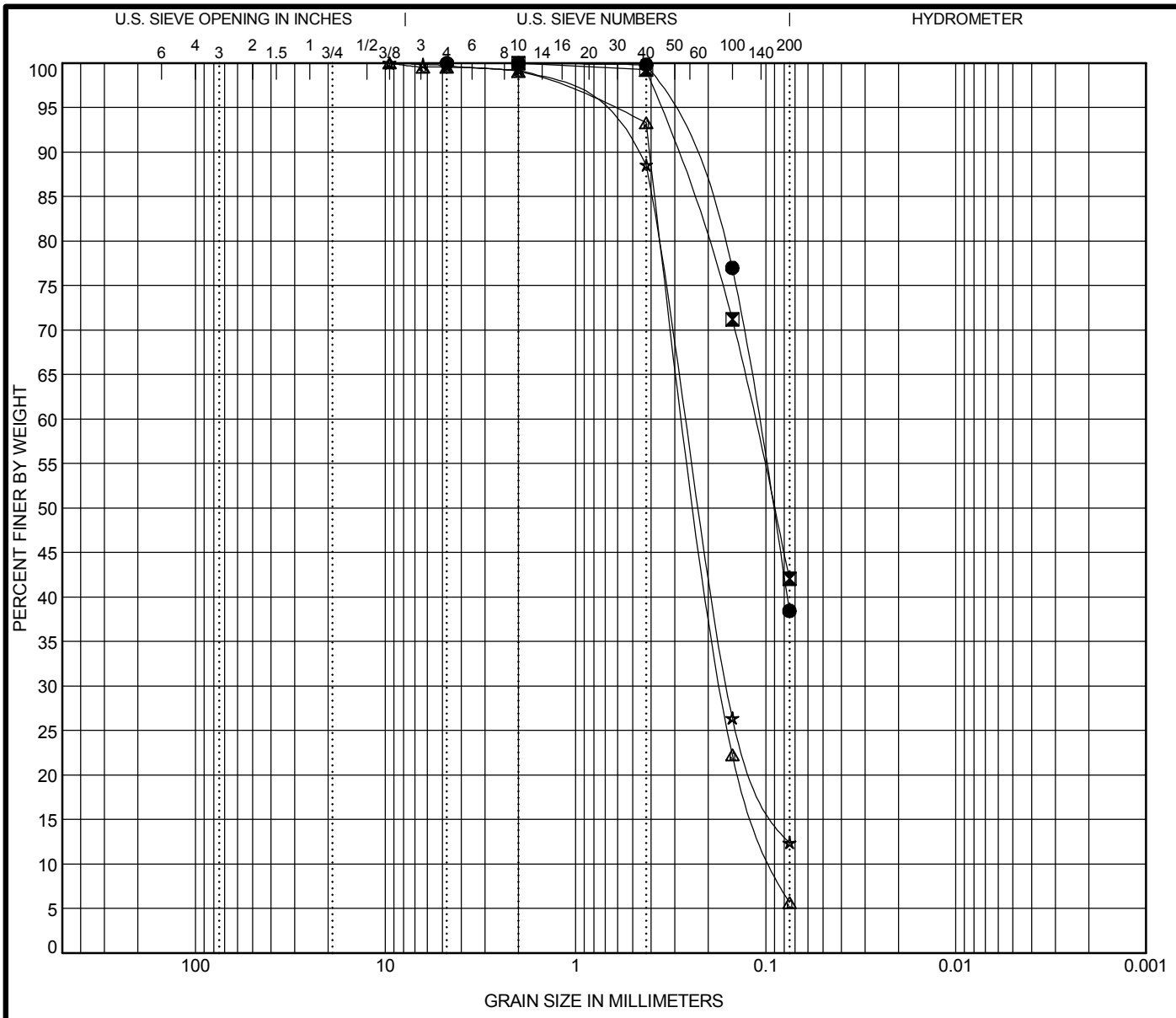
Borehole No.	Sample No.	Depth (ft)	Moisture Content	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	Fines based on % passing No. 4 sieve.
● GD-B1	S3	9.0	11.6	9.525	0.106			1	59	40		41
⊠ GD-B1	S8	34.0	11.5	4.75	0.105			0	62	38		38
◬ GD-B1	S12	54.0	19.2	2	0.082			0	45	55		
★ GD-B2	S8	19.0	14.1	2	0.087			0	47	53		
⊙ GD-B3	S2	2.0	17.8	6.35				0	20	80		80

Notes:
1) Testing was performed in general accordance with ASTM D 6913 Method A.
2) Test specimens were stored in drillers jars and sealed plastic bags prior to testing.

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GRAIN SIZE DISTRIBUTION

Project: Burlington Town Center
Location: Burlington, VT
Number: 1332-01
Tested By: JFW Reviewed By: JAG
Date:April 5-11, 2017



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

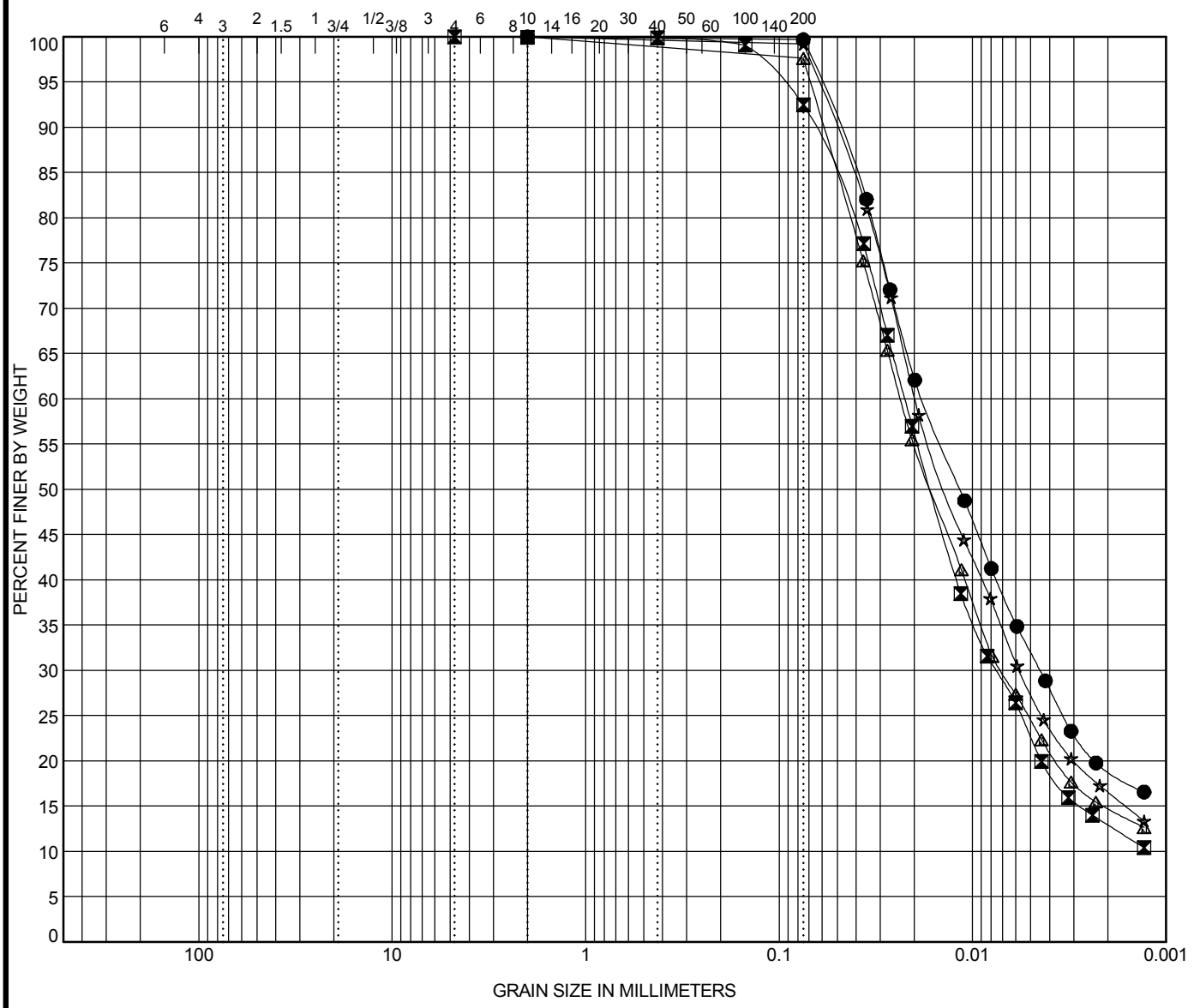
Borehole No.	Sample No.	Depth (ft)	Moisture Content	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	Fines based on % passing No. 4 sieve.
● GD-B4	S11	29.0	16.1	4.75	0.111			0	62	38		38
⊠ GD-B4	S15	49.0	14.2	2	0.115			0	58	42		
⚠ GD-B6	S5	8.0	4.2	9.525	0.261	0.168	0.09	0	94	6		6
★ GD-B6	S10	24.0	16.7	9.525	0.263	0.159		0	88	12		12

Notes:
1) Testing was performed in general accordance with ASTM D 6913 Method A.
2) Test specimens were stored in sealed drillers jars and plastic bags prior to sampling.

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GRAIN SIZE DISTRIBUTION

Project: Burlington Town Center
Location: Burlington, VT
Number: 1332-01
Tested By: JFW Reviewed By: JAG
Date:April 5-11, 2017



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Borehole No.	Sample No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● GD-B1	S20	119.0	2	0.018	0.004		0.0	0.3	80.7	19.0
⊠ GD-B5	S5	19.0	4.75	0.022	0.008		0.0	7.6	79.5	12.9
△ GD-B6	S16	52.0	2	0.024	0.007		0.0	2.4	82.8	14.8
☆ GD-B6	S20	79.0	2	0.02	0.006		0.0	0.8	82.6	16.6

Notes:
1. Test specimens were stored in sealed drillers jars prior to testing.
2. Results for the test specimen S5 from boring GD-B5 shown are a combination of a washed sieve performed in general accordance with ASTM D 6913 (for the portion retained on the #100 sieve) and a hydrometer performed in general accordance with ASTM D7928 (for the portion finer than the #100 sieve). It was noted upon completion of testing that the portion of the test specimen used for sieving (taken from the upper portion of the split spoon sample) had a lower fines content than the portion of the test specimen used for hydrometer testing (taken from the lower portion of the split spoon sample). This difference was approximately 10%.

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GRAIN SIZE DISTRIBUTION

Project: Burlington Town Center
Location: Burlington, VT
Number: 1332-01
Tested By: JFW Reviewed By: JAG
Date:April 5-11, 2017 Method: ASTM D7928

ATTACHMENT 5B – UMASS LABORATORY REPORT

Results of Laboratory Tests Conducted for Burlington Town Center, Burlington, VT

Prepared for

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GeoDesign, Inc
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FINAL
24 April 2017

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1 INTRODUCTION

This report contains results of constant rate of strain (CRS) and classification tests conducted for GeoDesign, Inc (GeoDesign). Three Shelby tube samples were provided by GeoDesign for testing. All tests described herein were conducted during April 2017 under the supervision of Professor Don J. DeGroot. The report includes information on the scope of services, methods of investigation, and presentation of test results.

2 TEST SAMPLES

The test samples were collected by GeoDesign and included three 3-inch Shelby tube samples labeled:

GD-B1 ST-1 66.5-68.5'
GD-B1 ST-5 84.5-86.5'
GD-B1B ST-6 135.0-136.5'

which were delivered to Don DeGroot on 1 April 2017.

3 SCOPE OF SERVICES

The scope of services was discussed in person, by telephone and electronic correspondence between Don DeGroot and Shawn Kelley, P.E. of GeoDesign. The final test program consisted of conducting 3 CRS, 3 hydrometers, 3 Atterberg Limits, Torvane tests, and Pocket Penetrometer tests.

4 METHODS

4.1 Sample Extraction and Inspection

CRS test specimens were extracted from the sample tube using the extrusion procedure shown in Figure 1 or with a hydraulic sample extruder. The selected section of a sample tube was cut using a pipe cutter or horizontal band saw.

4.2 Water Content

Water contents were determined in general accordance with American Society for Testing and Materials (ASTM) Standard D2216 *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.*

4.3 Total and Dry Unit Weight

The total and dry unit weights of the soil were determined by using the trimmed CRS specimens. The volume of the CRS specimen was measured after trimming and the wet mass of the specimen was weighed for calculation of the total unit weight. The dry unit weight was determined using the oven dry weight of the test specimen.

4.4 Atterberg Limits

Atterberg Limits were determined in general accordance with ASTM Standard D4318 *Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils*. Soil was prepared using the wet method. The as received soil was mixed with distilled water to a 15 blow count consistency using a Casagrande Cup and allowed to temper in a humid room for approximately 24 hours prior to testing. Liquid and Plastic Limit data points were determined by allowing the soil to dry at room temperature from the initial wet state to lower water contents.

4.5 Grain Size Distribution

The grain size distribution test was conducted in general accordance with ASTM D422 *Standard Test Method for Particle-Size Analysis of Soils* using a hydrometer. The specimen was prepared for testing by allowing it to soak overnight in 125 mL of a 40 g/L sodium hexametaphosphate solution. After soaking, the specimen was dispersed using *Method A* after which the soil was transferred to a 1000 mL cylinder and mixed with distilled water. Once the test started, hydrometer readings of the soil slurry were taken for a period of approximately 24 hrs. At the conclusion of the hydrometer test, the material retained on the #200 sieve was oven dried and passed through a set of sieves.

4.6 Torvane Test

Torvane (TV) tests were conducted with a Humboldt Torvane apparatus using the standard vane (0 to 1 kg/cm^2). Tests were conducted on a flat surface of the soil that was prepared using a flat ended spatula and razor blade while still in the Shelby tube. The torvane was initially pressed into the soil to the depth of the blades and then rotated while maintaining a nominal normal pressure. The rate of rotation was selected so that failure occurred in approximately five to ten seconds.

4.7 Pocket Penetrometer Test

Pocket Penetrometer (PP) tests were conducted using the standard plunger. Tests were conducted on a flat surface of the soil that was prepared using a flat ended spatula and razor blade while still in the Shelby tube. The pocket penetrometer was pushed into the soil to the indicator depth with a push-in time of about one second. The undrained shear strength is estimated as the pocket penetrometer stress divided by 2.

4.8 Constant Rate of Strain Consolidation (CRS)

The constant rate of strain (CRS) consolidation tests were performed in general accordance with ASTM D4186 *Standard Test Method for One-Dimensional Consolidation Properties of Soils Using Controlled-Strain Loading* and Sandbeakken et al. (1986). The tests were conducted using a GeoTac personal computer based test control and data acquisition system, which includes a load frame, flow pump, CRS consolidometer cell and Sigma-1^{TM} CRS control and data acquisition software.

The general CRS test sequence consisted of the following stages:

1. Preparation of the specimen for testing first consisted of removing a test sample from the sample tube as described in Section 4.1. The test specimen was hand trimmed using a soil lathe together with a sharp trimming ring and sharp trimming tools. The top and bottom surfaces of the specimen were trimmed flat with a wire saw and a long sharp edged knife with the final trimmed right cylinder dimensions equaling a diameter of 2.5 in and a height of 0.75 in.
2. The specimen was placed in the CRS cell with moist top and bottom filter stones. After application of the seating load, one to four incremental loads were applied. Thereafter the cell chamber was filled with deaired water and the specimen was back pressure saturated and left to sit overnight.
3. Constant rate of strain loading was conducted using a nominal strain rate of 1.5 to 2.0 %/hr (4.2 to 5.6×10^{-6} s^{-1}). An unload-reload loop was conducted and included a constant stress period prior to starting the unload phase and again prior to starting the reload phase.
4. Upon completion of the unload-reload loop, loading continued until either a maximum stress of approximately 200,000 psf or strain of approximately 25 to 35% was reached.
5. In some cases at the end of loading the specimen was subject to a constant stress period prior to an unloading phase.

All measurements during testing were made using load, displacement and pressure transducers. The measured data were processed using the methods of Wissa et al. (1971) and also described in ASTM D4186 and Sandbækken et al. (1986). All vertical strains were computed taking into account the apparatus compliance that was determined using a steel disk. The preconsolidation stress was estimated using the Casagrande and strain energy methods (Becker et al. 1987).

5 RESULTS

Tables 1 list the tests performed and Figures 2 to 4 present sample logs.

Table 2 presents a summary of the Atterberg Limits and Figure 5 plots the data in a plasticity chart. Table 3 presents the sand, silt and clay fractions and Figure 6 plots the grain size distribution data as determined from the hydrometer and sieve tests.

Table 4 presents results from the Torvane and Pocket Penetrometer tests.

Table 5 presents a summary of the CRS test specimen properties and results. Figures 7 to 18 present plots of the CRS test results including the compression curve (ε_v versus σ'_v), coefficient of consolidation (c_v) versus vertical effective stress, normalized base excess pore pressure (Δu_b), void ratio (e) versus hydraulic conductivity (k_v) and constrained modulus (M) versus vertical effective stress.

Appendix A presents some sample photographs.

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7 NOTATION AND UNITS

Not all symbols and notation necessarily used in the report

Notation

c_v = vertical coefficient of consolidation (ft^2/day)
e = void ratio (-)
e_0 = initial void ratio (-)
E_u = Secant Young's Modulus (ksf)
G = shear modulus (psf or ksf)
G_s = specific gravity of solids (-)
k_h = horizontal hydraulic conductivity (ft/day or m/s)
k_v = vertical hydraulic conductivity (ft/day or m/s)
K = stress ratio
K_c = consolidation stress ratio = σ'_h/σ'_v
K_0 = coefficient of lateral earth pressure at rest
LL = liquid limit (%)
LI = liquidity index = (w – PL)/PI
M = constrained (oedometer) modulus = $\Delta\sigma'_v/\Delta\varepsilon_v$ (ksf)
PI = plasticity index (%)
PL = plastic limit (%)
q = shear stress = $(\sigma_v - \sigma_h)/2$ (psf)
q_f = shear stress at failure (= q_{max} = maximum value q) (psf)
s_u = undrained shear strength (psf)
t = time (day, hr, min, s)
u = shear induced pore pressure (psf)
w = water content (%)
w_n = natural water content (%)

Δ = change
ΔL = horizontal displacement (in)
ΔH = vertical displacement (change in specimen height) (in)
Δu = equivalent DSS shear induced pore pressure (psf)
ε_v = vertical strain (%)
ε_{vc} = vertical consolidation strain (%)
ε_{vf} = final vertical consolidation strain (%)
ε_{vol} = volumetric strain (%)
ε_{vmax} = maximum vertical strain during consolidation phase of DSS test (%)
γ = shear strain for DSS test (%)
γ_t = total unit weight (pcf)
γ_d = dry unit weight (pcf)
% = percentage
σ'_p = preconsolidation stress (psf)

σ'_v = vertical effective stress (psf)
σ'_{vc} = vertical effective stress at end of consolidation (psf)
σ'_{hc} = horizontal effective stress at end of consolidation (psf)
σ'_{h0} = in situ horizontal effective stress (psf)
σ'_{v0} = in situ vertical effective stress (psf)
σ'_{vmax} = maximum vertical stress during consolidation phase of DSS test (psf)
τ_h = horizontal shear stress (psf)

Units
cm = centimeter
ft = feet
in = inches
m = meter
min = minute
mm = millimeter
pcf = pounds per cubic foot
psf = pounds per square foot
ksf = kips per square foot
tsf = tons per square foot
s = seconds

Table 1 Summary of tests performed

Test	GD-B1 ST-1 66.5-68.5'	GD-B1 ST-5 84.5-86.5'	GD-B1B ST-6 135.0-136.5'
Water Content	multiple	multiple	multiple
Total and Dry Unit Weight	1	1	1
Atterberg Limits	1	1	1
Grain Size Distribution	1	1	1
Torvane	1 set	2 sets	2 sets
Pocket Penetrometer	1 set	2 sets	2 sets
CRS consolidation	1 (CRS270)	1 (CRS269)	1 (CRS271)

Notes:

1. '#' = number of tests completed
2. '-' = test not requested
3. (CRSxxx) = test number

Table 2 Summary of Atterberg Limits

Boring/Sample/Test	Depth†	w	LL	PL	PI	LI	USCS
-	ft	%	%	%	%	-	-
1	2	3	4	5	6	7	8
GD-B1 ST-1	66.5-68.5	26†	28	22	6	0.67	CL-ML
GD-B1 ST-5	84.5-86.5	25†	28	21	7	0.57	CL-ML
GD-B1B ST-6	135.0-136.5	38†	63	26	37	0.32	CH

Notes

1. Notation given in Section 7.
2. Data plotted in Plasticity chart in Figure 5.
3. †Sample for Atterberg Limits collected adjacent to CRS test specimen, with locations indicated on the sample logs (Figures 2 to 4), and water content values listed are for full CRS test specimen.
4. USCS = Unified Soil Classification System

Table 3 Summary of grain size distribution results

Boring/Sample	Depth†	Sand	Silt	Clay
-	ft	%	%	%
1	2	3	4	5
GD-B1 ST-1	66.5-68.5	1	76	23
GD-B1 ST-5	84.5-86.5	1	83	16
GD-B1B ST-6	135.0-136.5	5	28	67

Notes:

1. Data plotted in Figure 6.
2. †Sample for hydrometer collected adjacent to CRS test specimen, with locations indicated on the sample logs (Figures 2 to 4).
3. Hydrometer data processed using assumed specific gravity = 2.70 except = 2.80 for GD-B1B ST-6.
4. Fractions: % sand defined as % ≥ 0.075 mm
   % clay defined as % < 0.002 mm
   % silt = 100 – (% sand + % clay)

Table 4 Summary of Torvane test results

Tube	Depth	Location†	Torvane	Pocket Penetrometer*	Water Content
-	ft	in	tsf	tsf	%
1	2	3	4	5	6
GD-B1 ST-1	66.5-68.5	9	0.35, 0.45, 0.47	1.1, 1.3, 1.8	32
GD-B1 ST-5	84.5-86.5	5	0.51, 0.54, 0.65	1.8, 1.8, 2.1, 2.3	24
		7	0.48, 0.58	2.3, 2.4, 2.5	27
GD-B1B ST-6	135.0-136.5	5	0.92, 1.33, 1.38	2.8, 3.2, 3.2	38
		8	0.95, 1.51	3.7, 3.8, 4.0	39

Notes

1. Notation given in Section 7.
2. †Location = distance from bottom of tube; see sample log figures (Figures 2 to 4).
3. *The undrained shear strength is estimated as the measured pocket penetrometer stress listed in column 5 divided by 2

Table 5 Summary of Constant Rate of Strain (CRS) specimen properties and test results

Test #	Boring Sample	Depth	w	e_0	γ_t	γ_d	σ'_{v0}	Sample Quality† (at σ'_{v0})		σ'_p		OCR		Figure Numbers
								$\Delta e/e_0$	ε_v	Casa.	S.E.	Casa.	S.E.	
-	-	ft	%	-	pcf	pcf	psf	-	%	psf	psf	-	-	-
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CRS270	GD-B1 ST-1	66.5-68.5	26	0.698	125	99	7507	0.084	3.5	20300*	27570*	2.70*	3.67*	7 to 10
CRS269	GD-B1 ST-5	84.5-86.5	25	0.696	124	99	8274	0.062	2.5	24540*	28615*	2.97*	3.46*	11 to 14
CRS271	GD-B1B ST-6	135.0-136.5	38	1.050	113	82	10795	0.017	0.8	23225	22870	2.15	2.12	15 to 18

Notes:

*no distinct break evident in compression curve – values uncertain

1. Notation given in Section 7
2. See sample logs for specific test specimen locations.
3. Void ratio based on assumed specific gravity = 2.70
4. σ'_{v0} values from GeoDesign, Inc
5. For estimates of σ'_p: Casa. = Casagrande construction; S.E. = strain energy method of Becker et al. (1987).
6. Sample quality evaluation methods (†NOTE: for low to medium plasticity clays with OCR 1 to 4):

Lunne et al. (2006) quality ratings 1 = very good to excellent, 2 = fair to good, 3 = poor, 4 = very poor					Terzaghi et al. (1996) Specimen Quality Designation (SQD) A (best) to E (worst)					
OCR	$\Delta e/e_0$ at σ'_{v0}									
1 to 2	< 0.04	0.04 – 0.07	0.07 – 0.14	> 0.14	ε_v at σ'_{v0}	< 1	1 - 2	2 - 4	4 - 8	> 8
2 to 4	< 0.03	0.03 – 0.05	0.05 – 0.10	> 0.10	SQD	A	B	C	D	E
Quality	1	2	3	4						

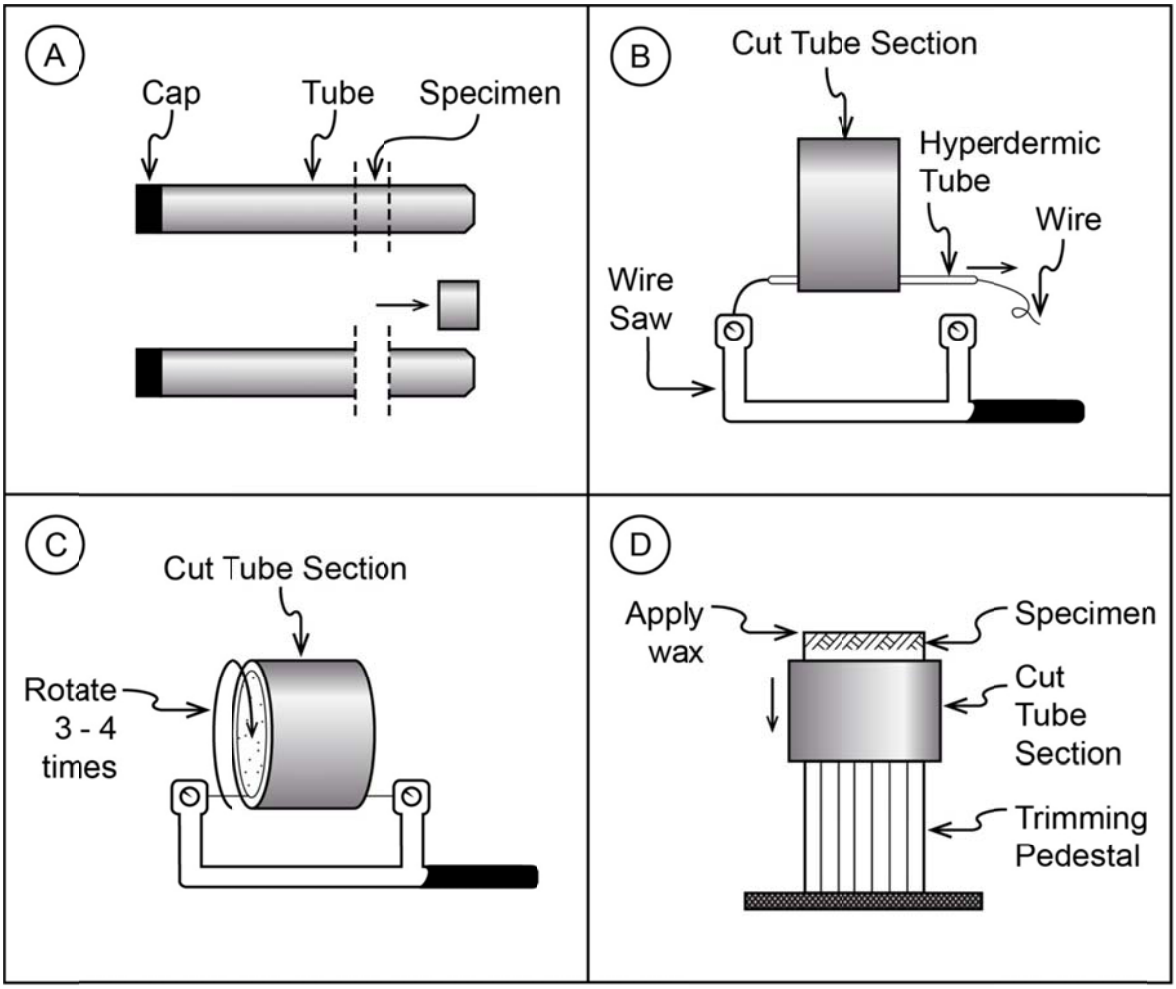


Figure 1 Procedure for sample extrusion for CRS and DSS test specimens taken from Shelby tubes (after Ladd and DeGroot 2003)

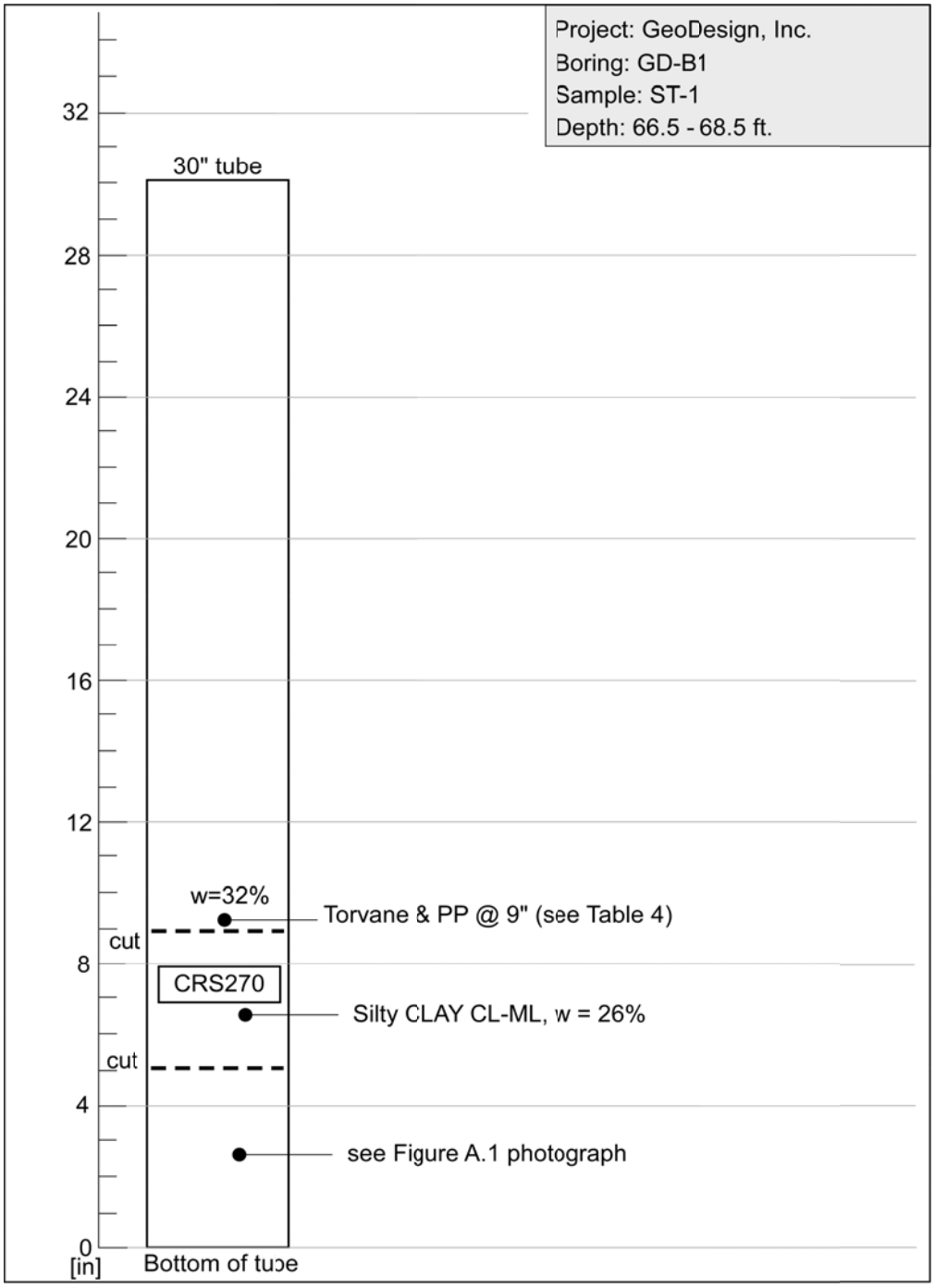


Figure 2 Sample log and test locations for Sample GD-B1 ST-1 66.5 to 68.5 ft.

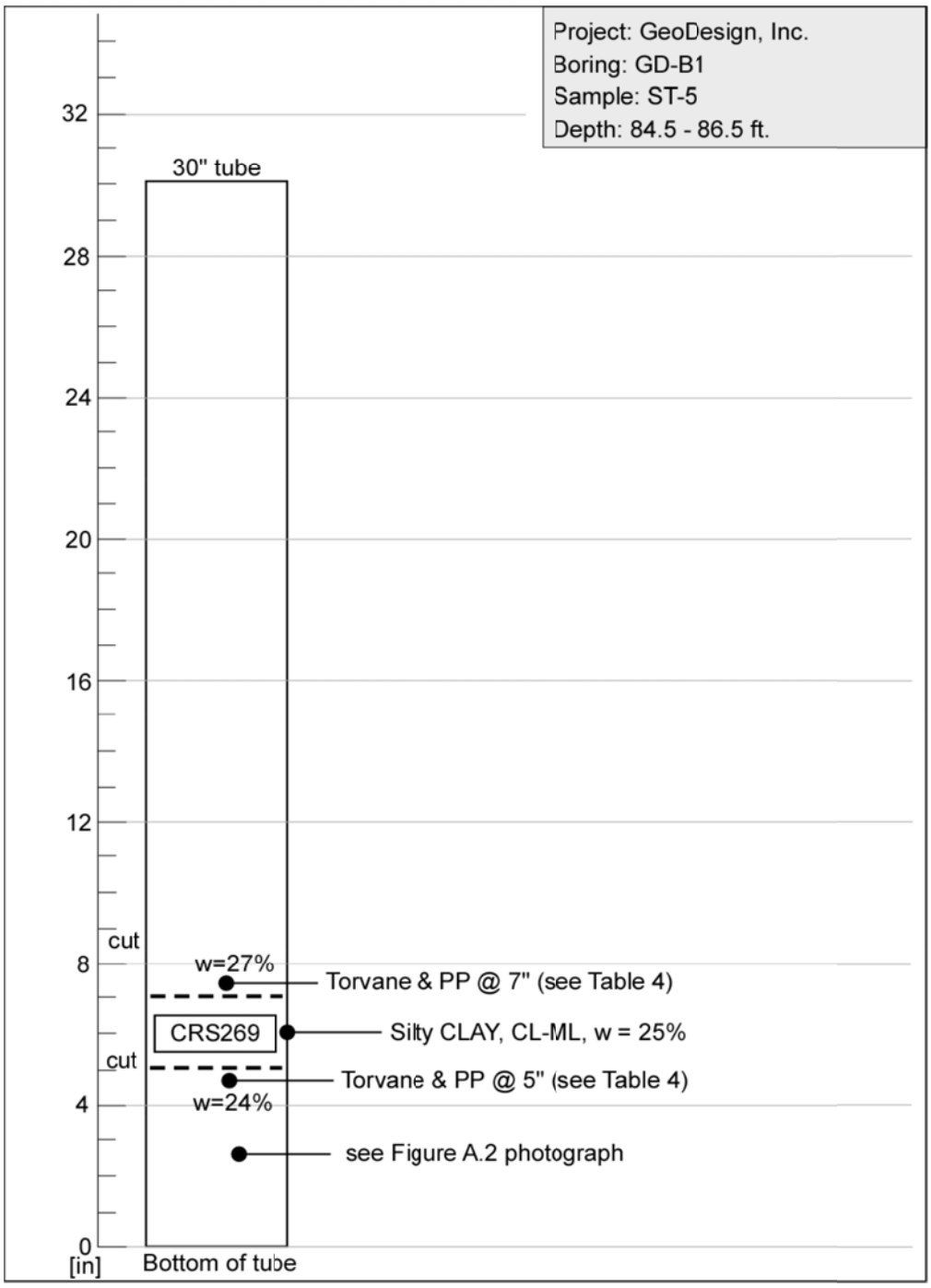


Figure 3 Sample log and test locations for Sample GD-B1 ST-5 84.5 to 86.5 ft.

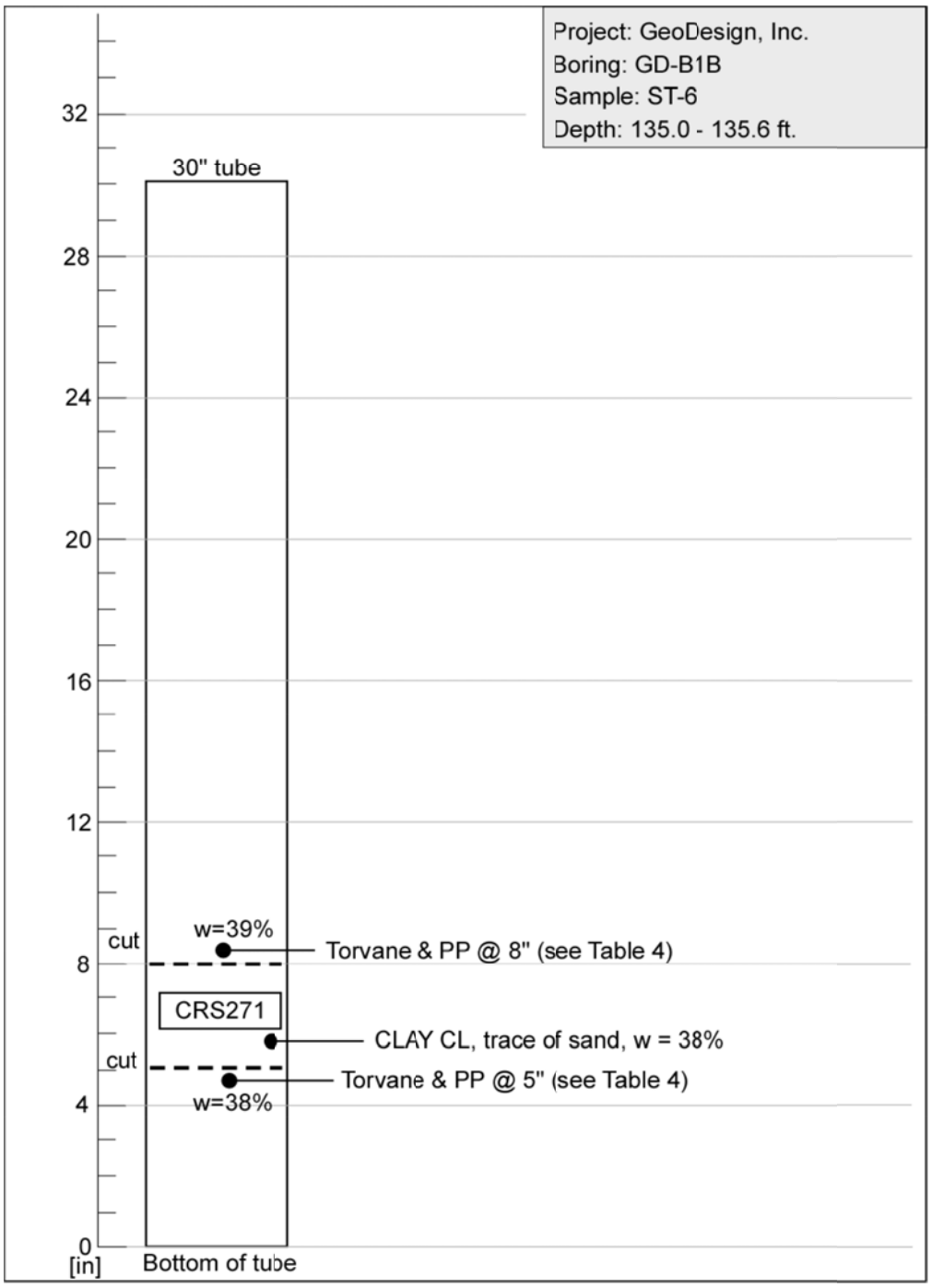


Figure 4 Sample log and test locations for Sample GD-B1B ST-6 135.0 to 136.5 ft.

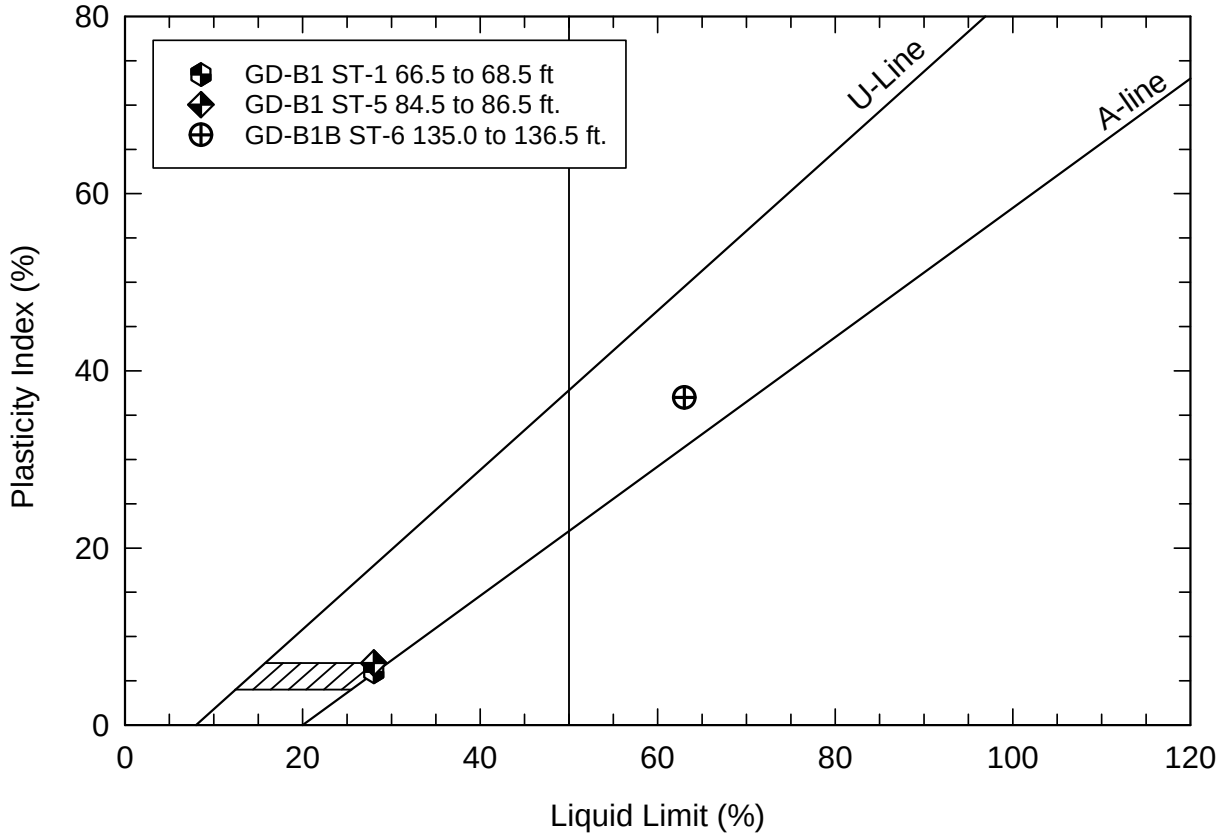


Figure 5 Plasticity chart with Atterberg Limits results (data in Table 3).

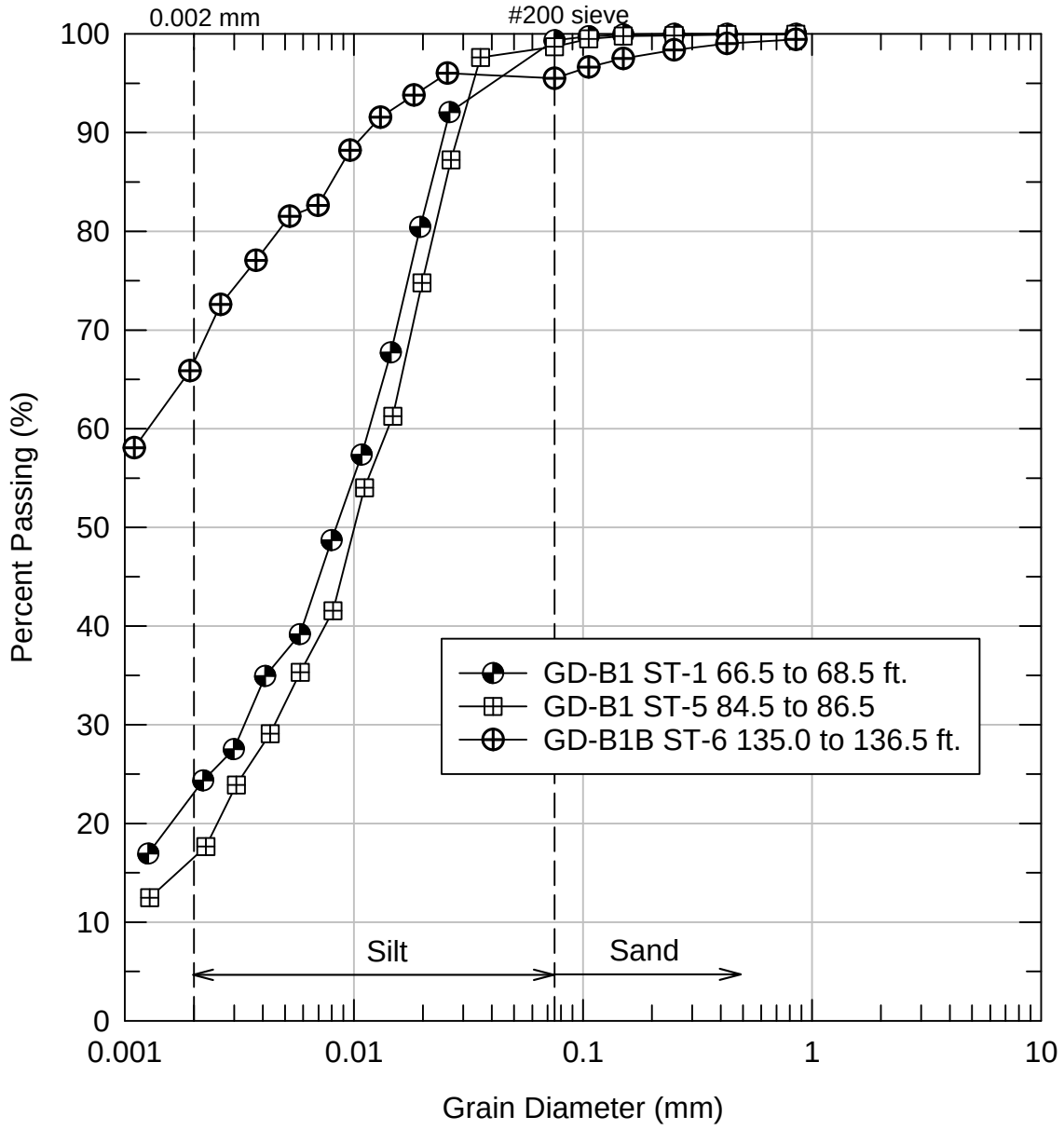


Figure 6 Grain size distribution results (summary data in Table 3).

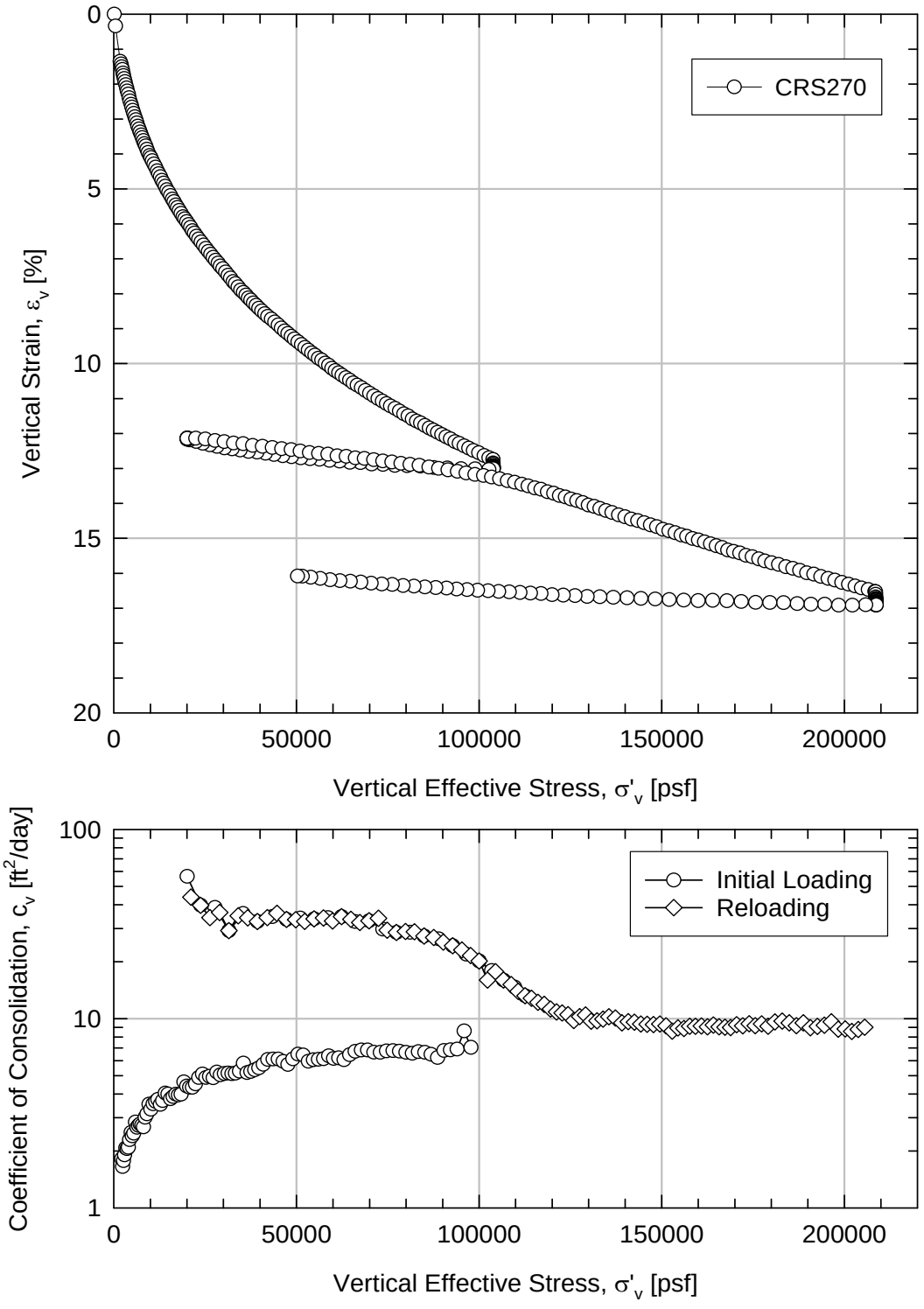


Figure 7 Vertical strain and coefficient of consolidation versus vertical effective stress for test CRS270 on sample GD-B1 ST-1 66.5 to 68.5 ft.

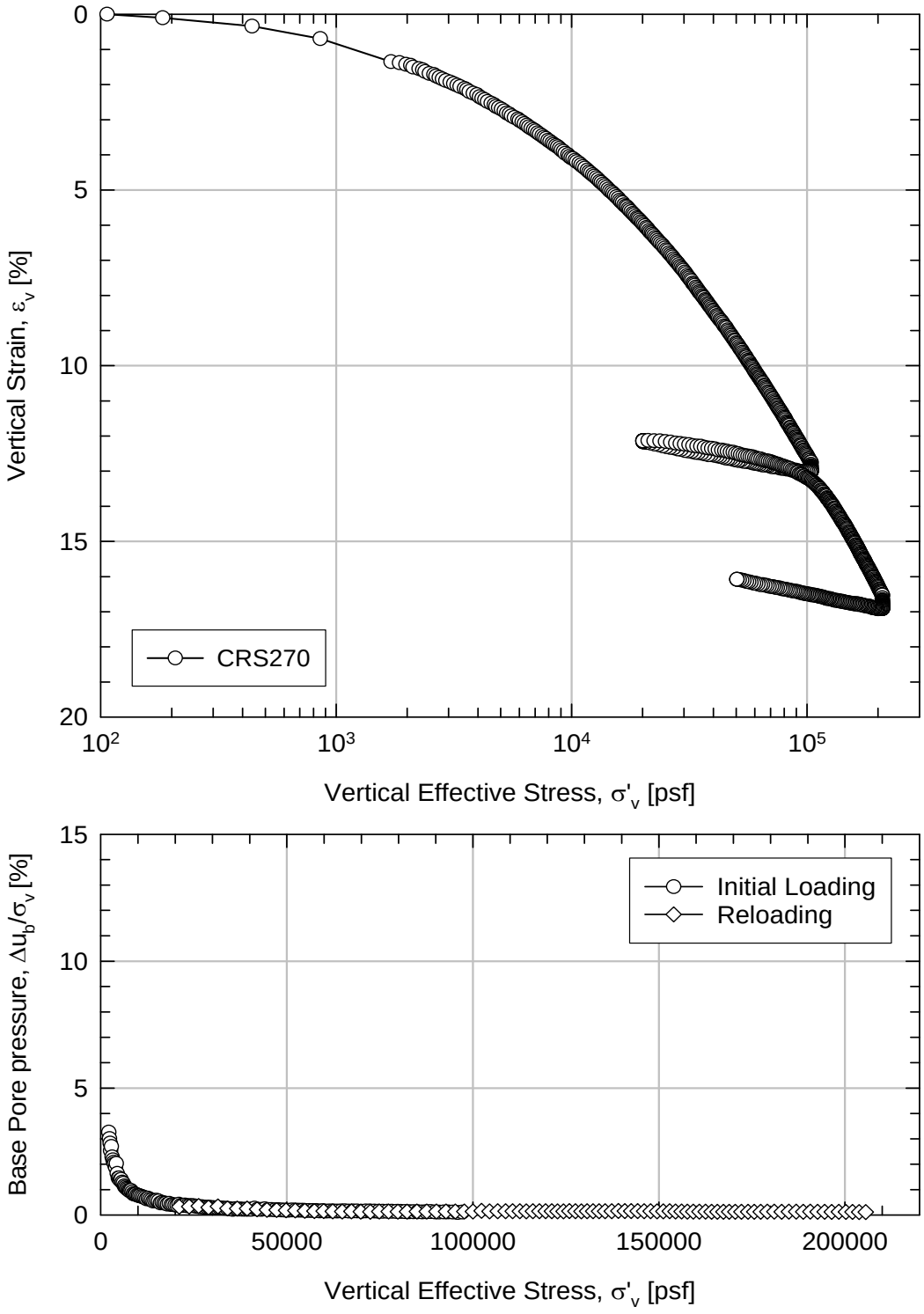


Figure 8 Vertical strain and normalized base pore pressure versus vertical effective stress for test CRS270 on sample GD-B1 ST-1 66.5 to 68.5 ft.

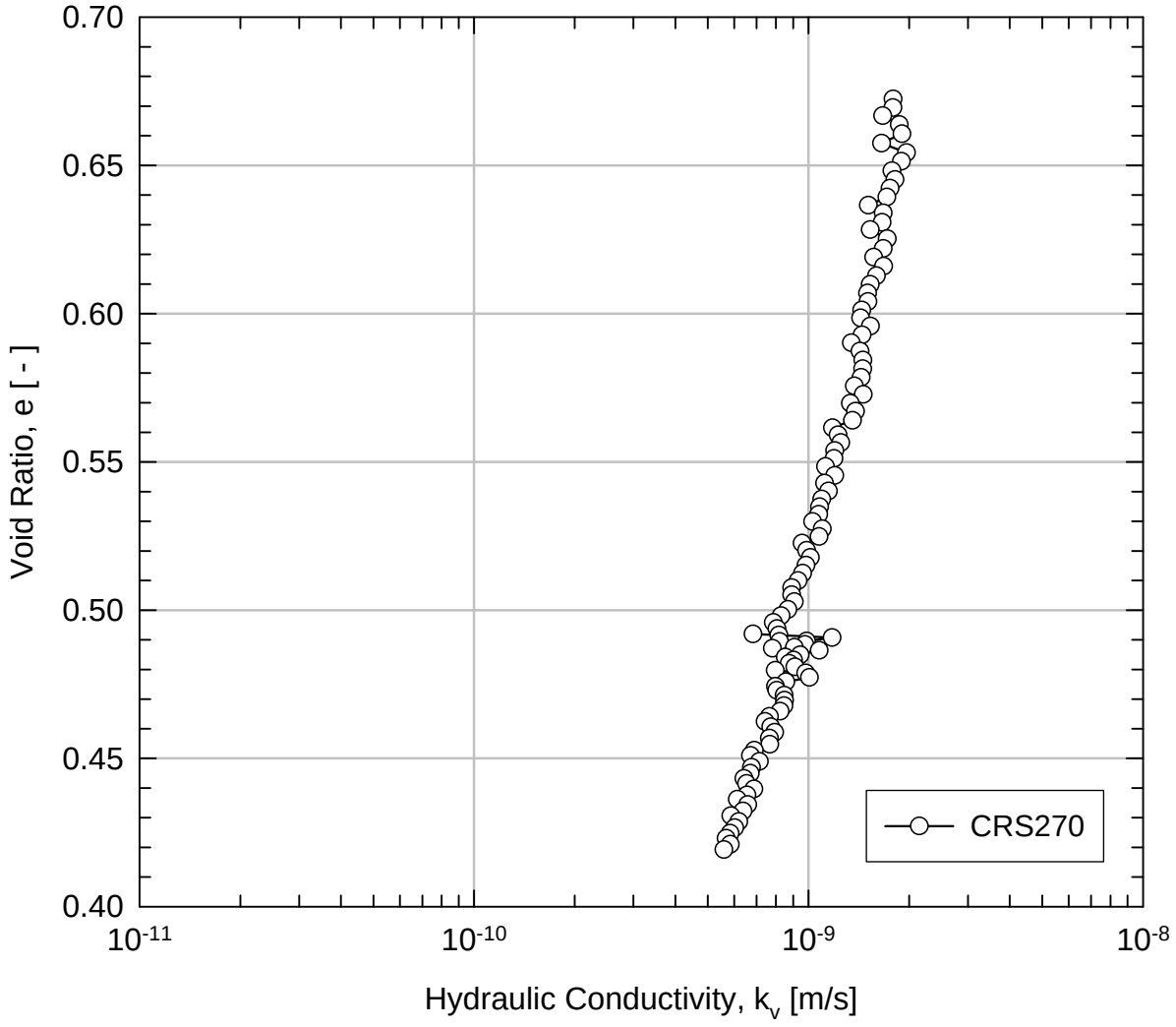


Figure 9 Void Ratio versus permeability for test CRS270 on sample GD-B1 ST-1 66.5 to 68.5 ft.

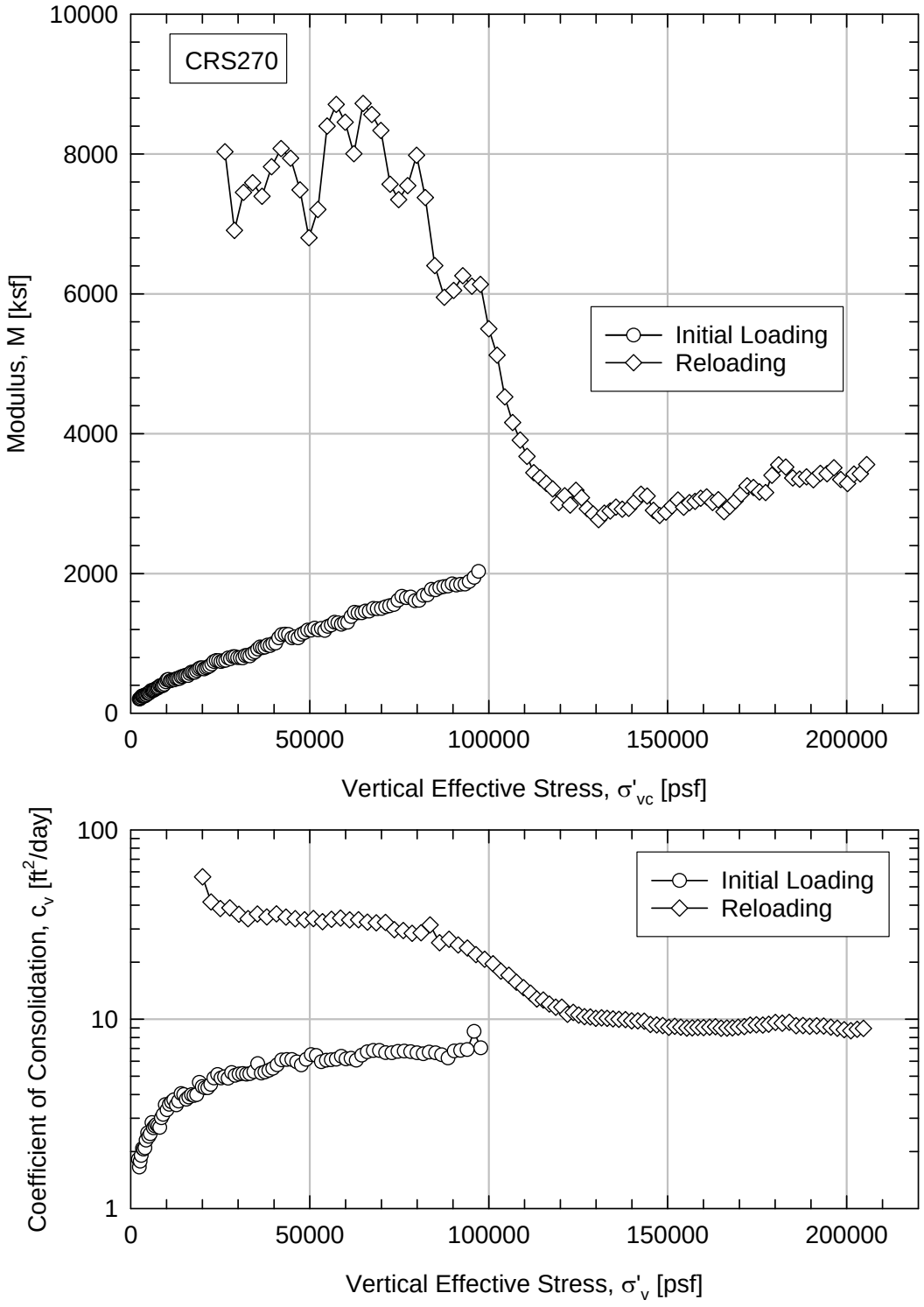


Figure 10 Modulus and coefficient of consolidation versus vertical effective stress for test CRS270 on sample GD-B1 ST-1 66.5 to 68.5 ft.

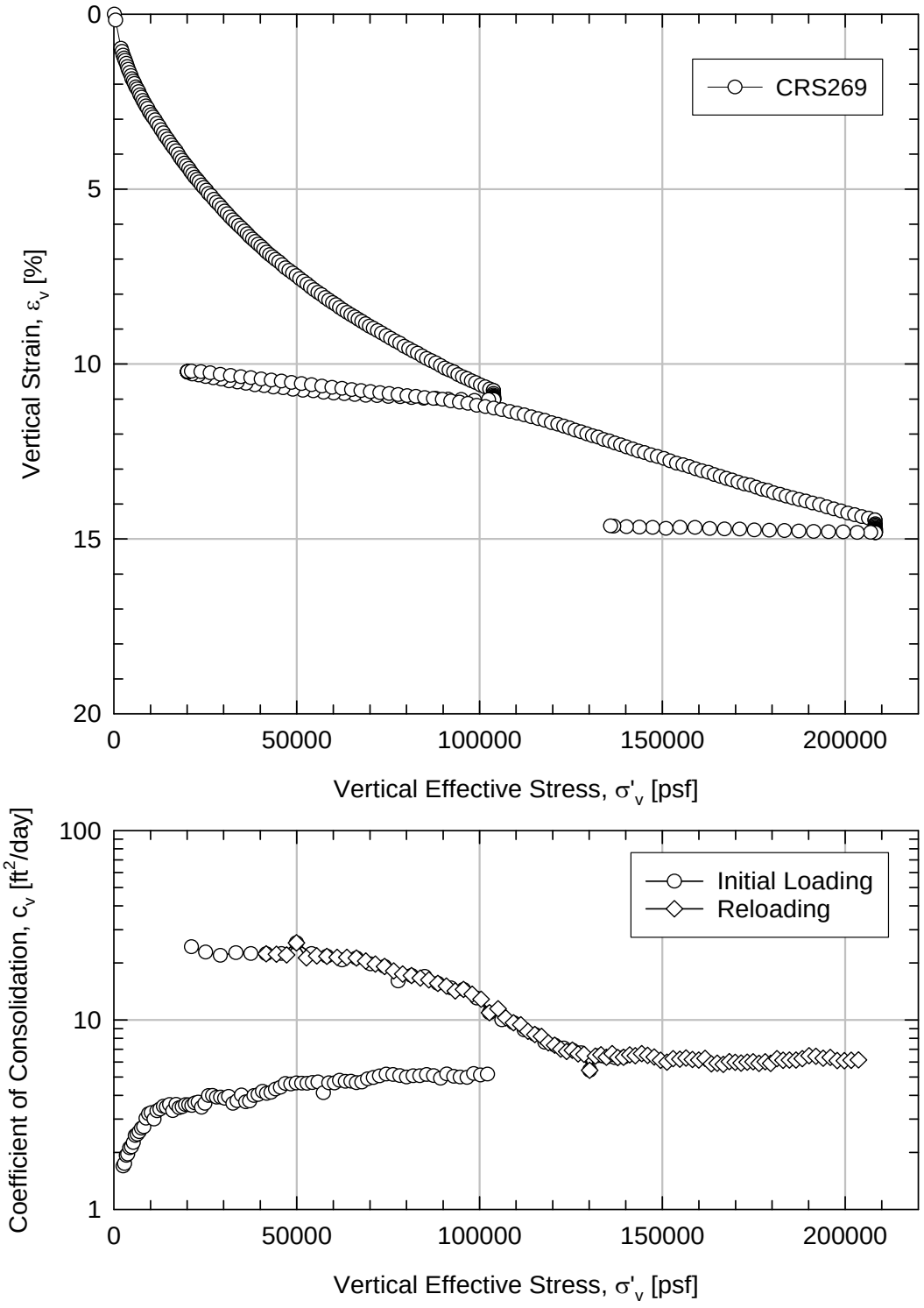


Figure 11 Vertical strain and coefficient of consolidation versus vertical effective stress for test CRS269 on sample GD-B1 ST-5 84.5 to 86.5 ft.

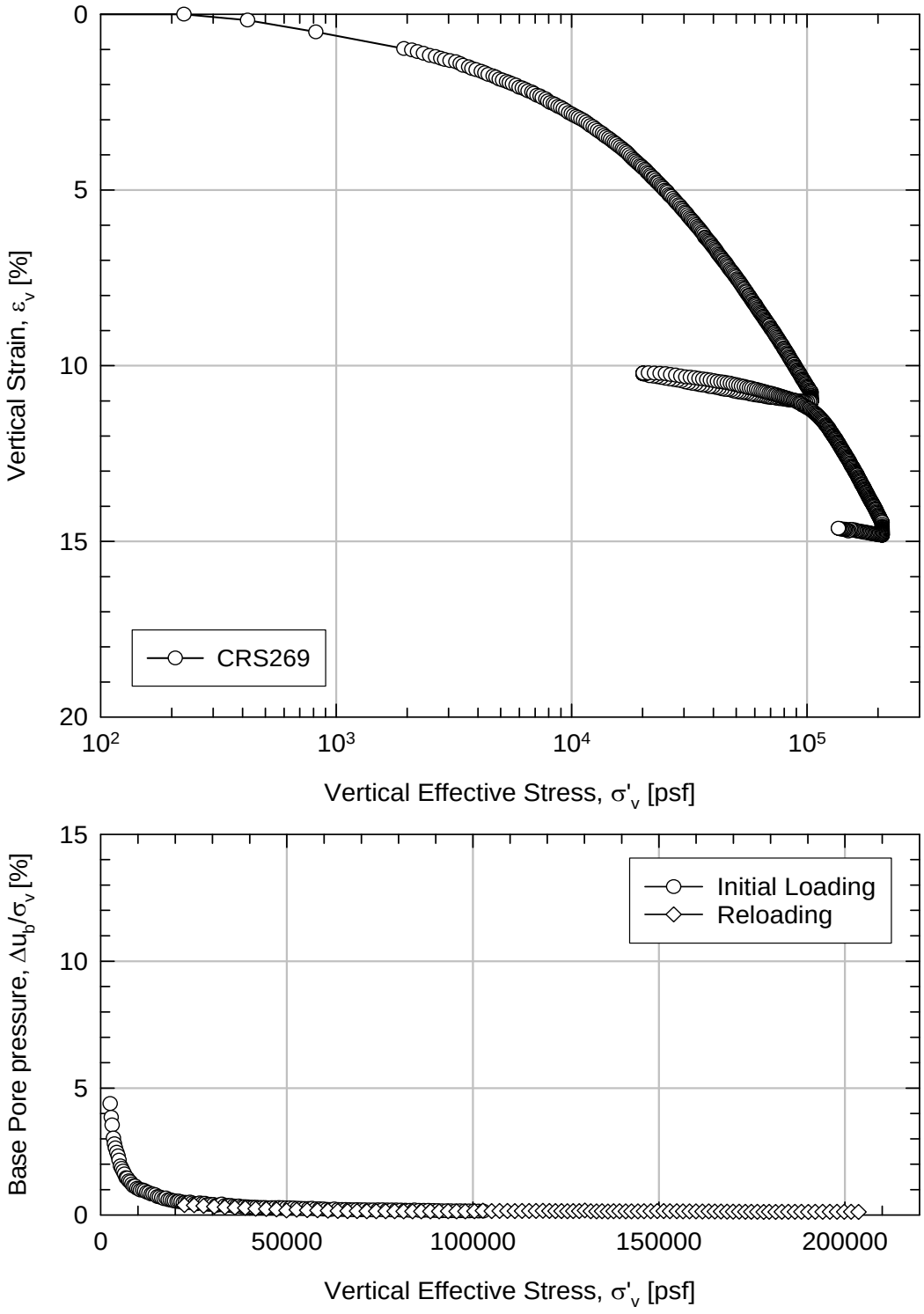


Figure 12 Vertical strain and normalized base pore pressure versus vertical effective stress for test CRS269 on sample GD-B1 ST-5 84.5 to 86.5 ft.

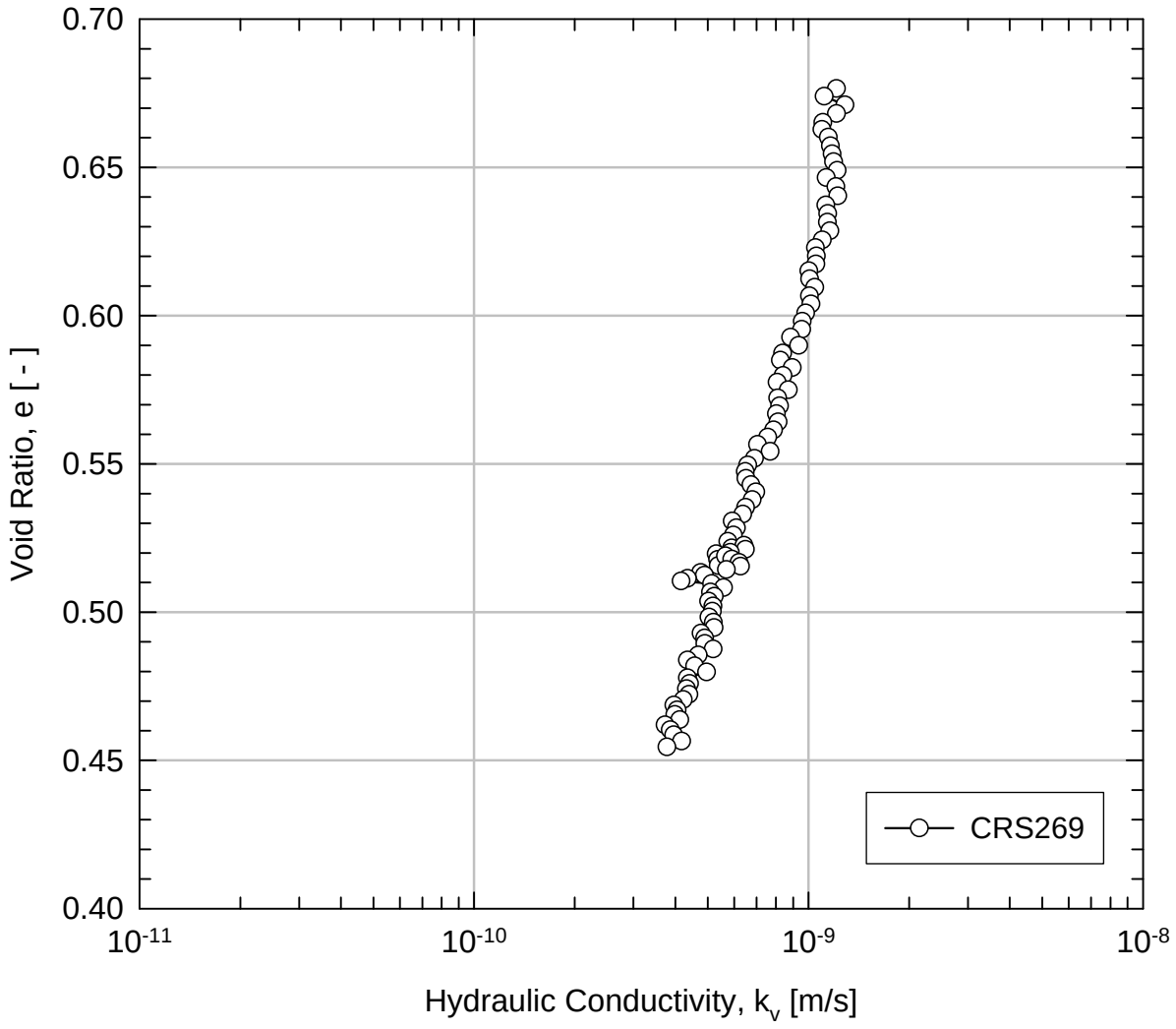


Figure 13 Void Ratio versus permeability for test CRS269 on sample GD-B1 ST-5 84.5 to 86.5 ft.

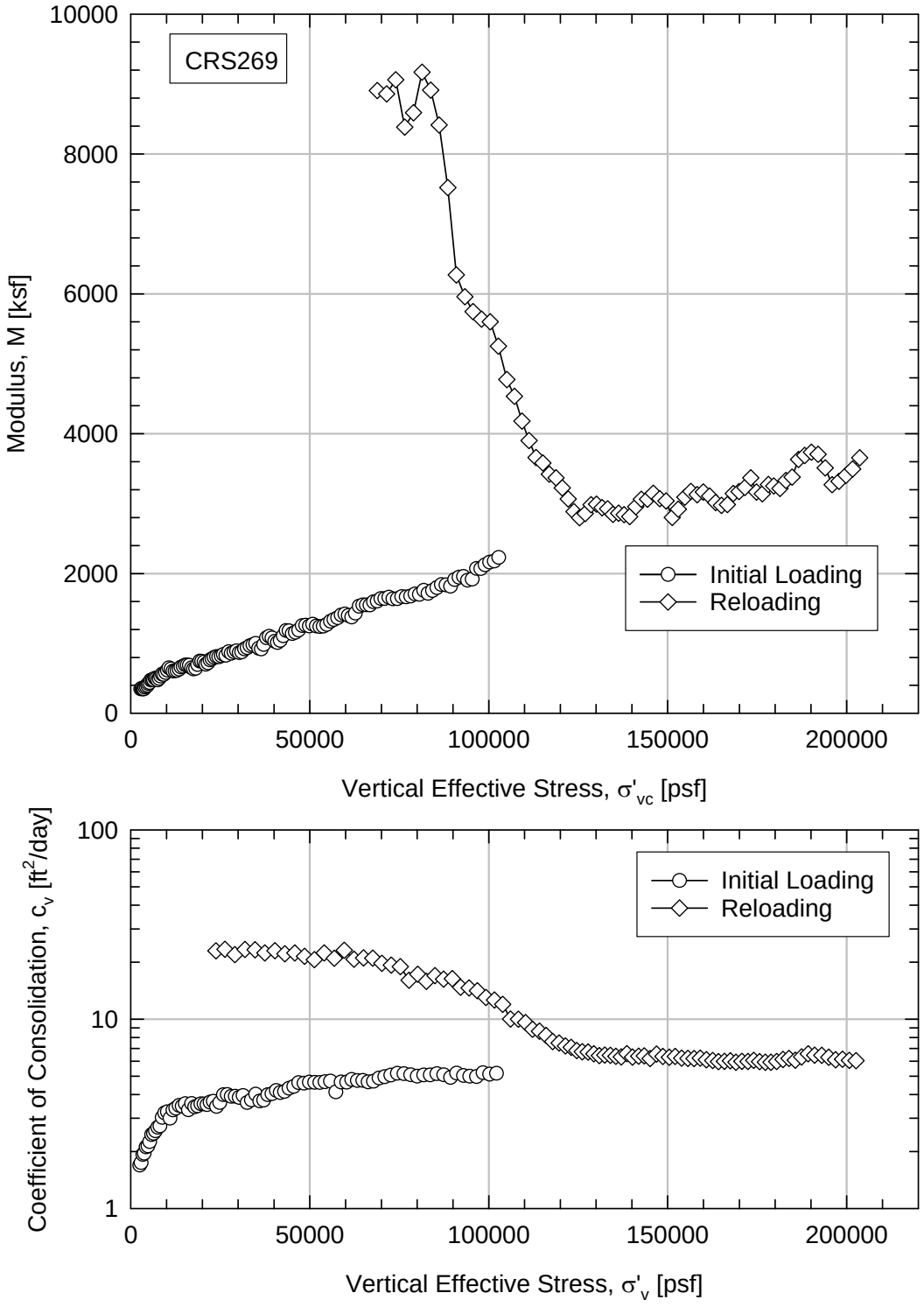


Figure 14 Modulus and coefficient of consolidation versus vertical effective stress for test CRS269 on sample GD-B1 ST-5 84.5 to 86.5 ft.

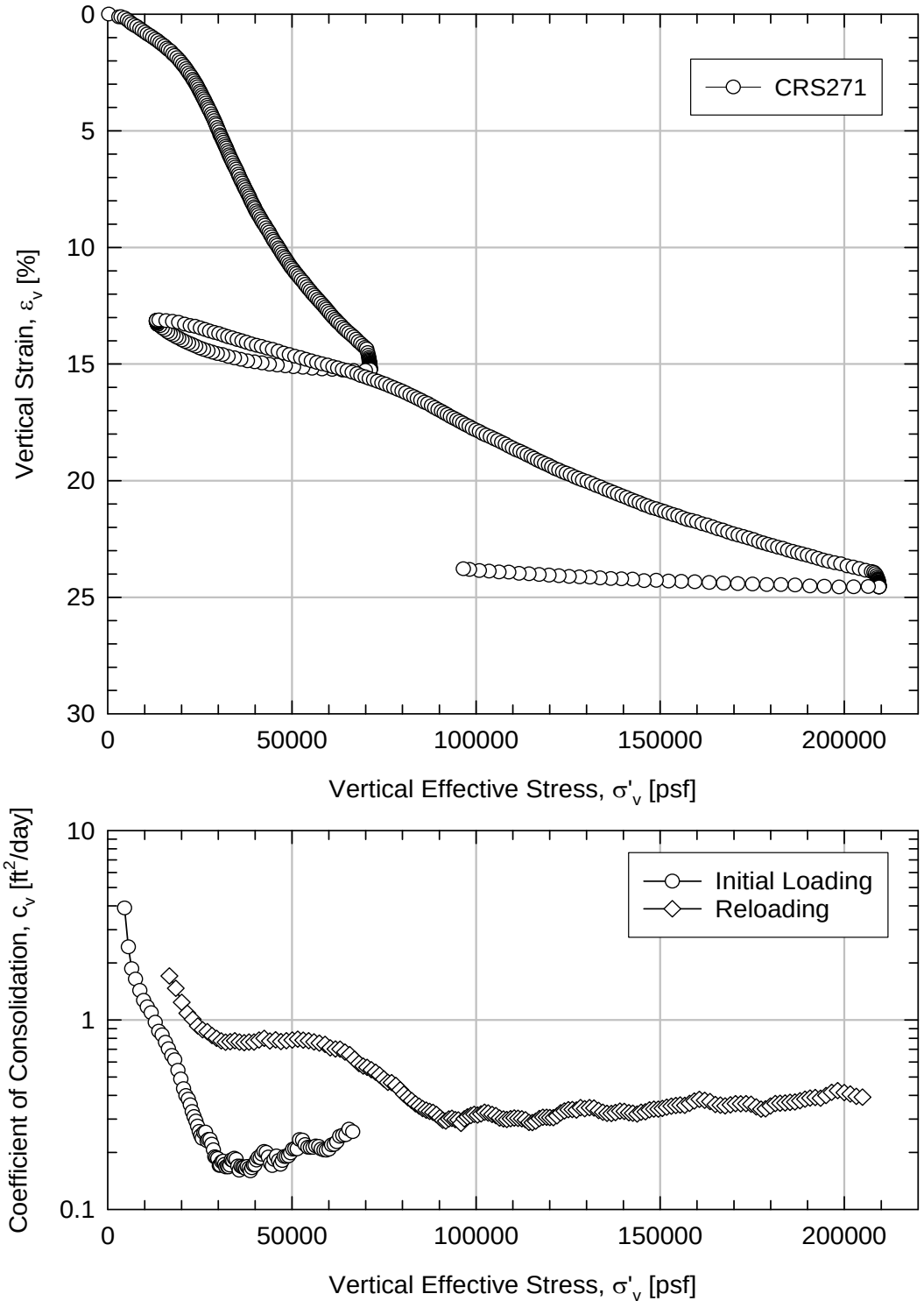


Figure 15 Vertical strain and coefficient of consolidation versus vertical effective stress for test CRS271 on sample GD-B1B ST-6 135.0 to 136.5 ft.

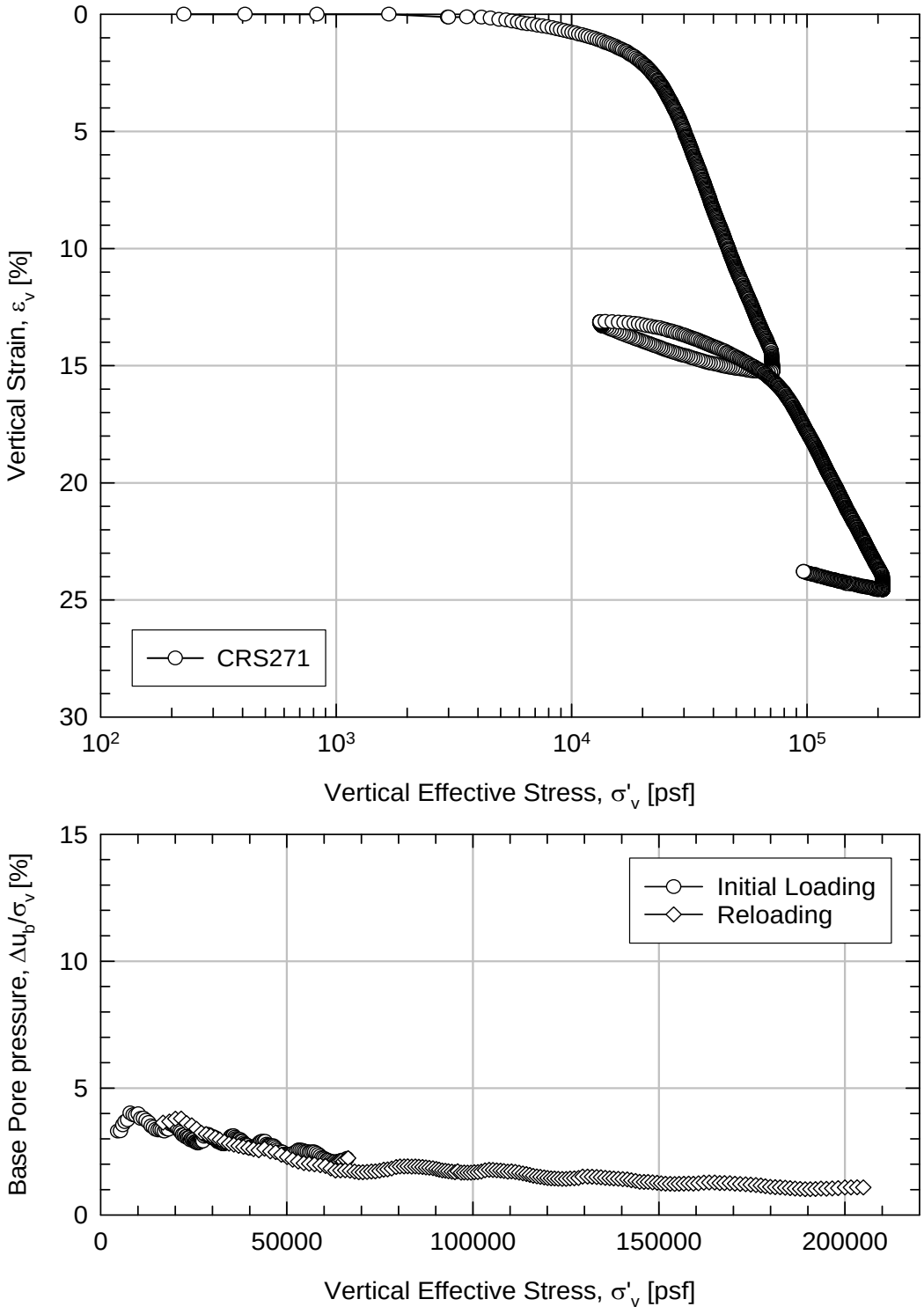


Figure 16 Vertical strain and normalized base pore pressure versus vertical effective stress for test CRS271 on sample GD-B1B ST-6 135.0 to 136.5 ft.

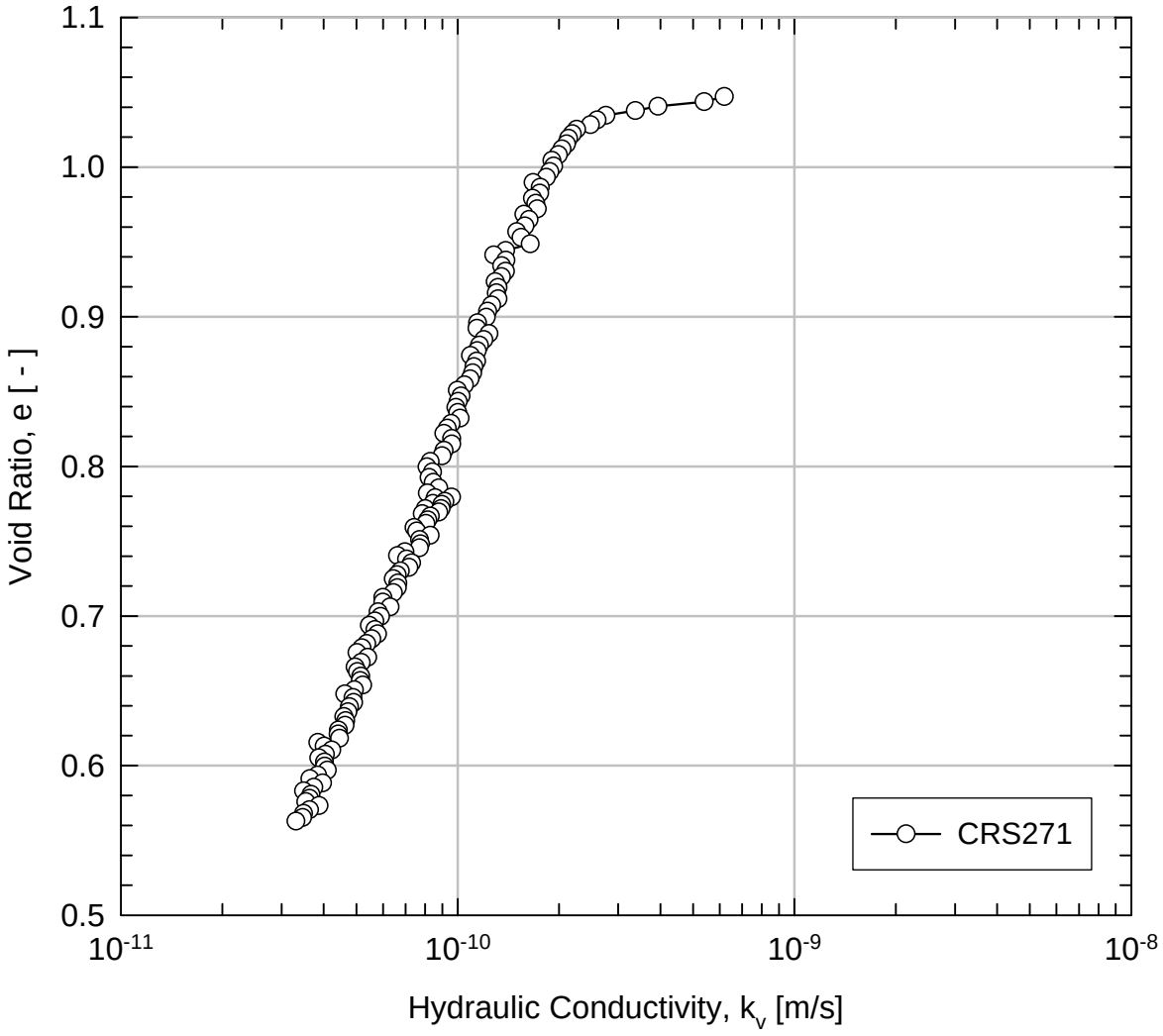


Figure 17 Void Ratio versus permeability for test CRS271 on sample GD-B1B ST-6 135.0 to 136.5 ft.

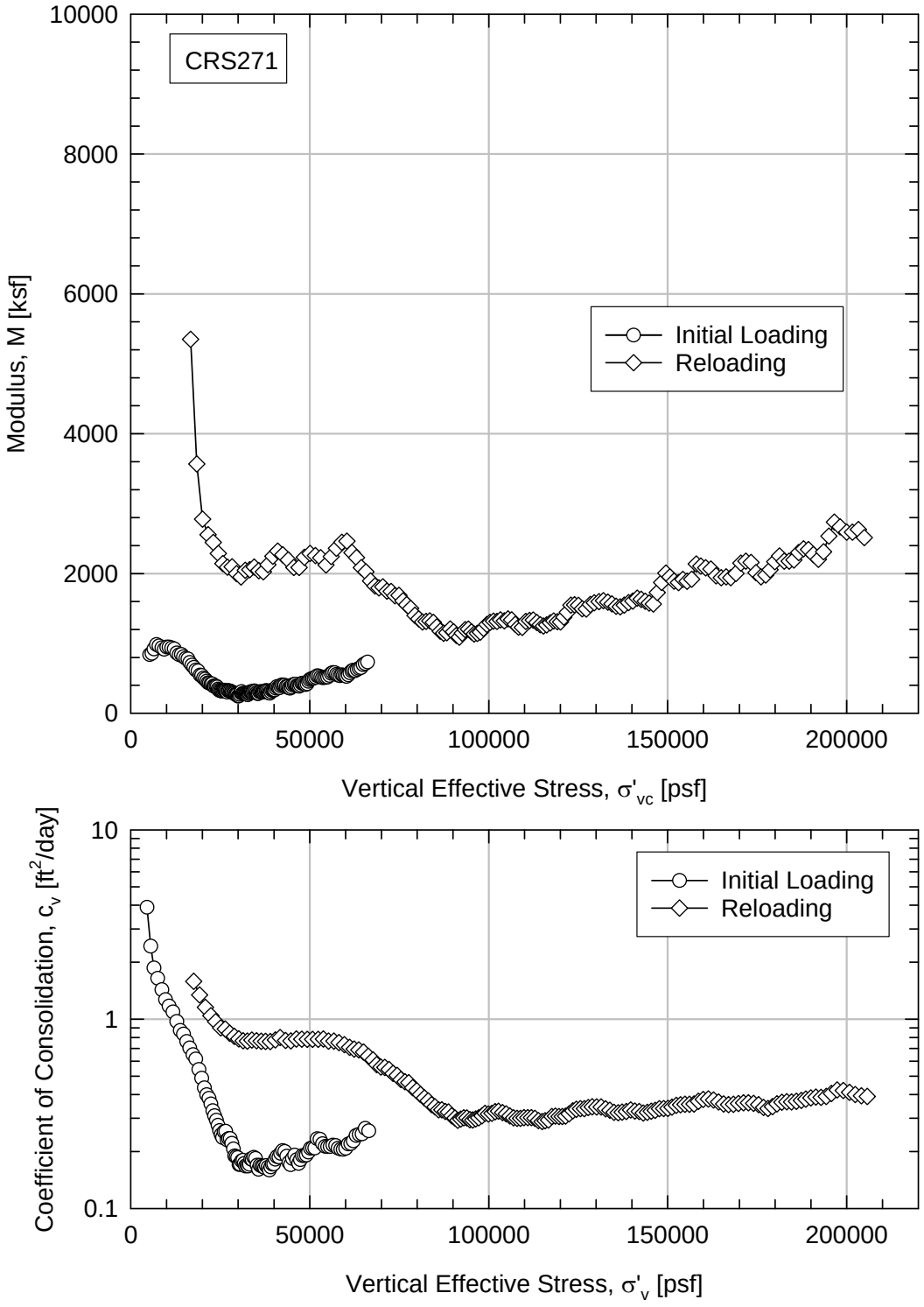


Figure 18 Modulus and coefficient of consolidation versus vertical effective stress for test CRS271 on sample GD-B1B ST-6 135.0 to 136.5 ft.



Figure A.1 Photograph of Sample GD-B1 ST-1 66.5 to 68.5 ft, section of sample from approximately 0.5 to 4.5 inches as measured from bottom of the shelby tube.

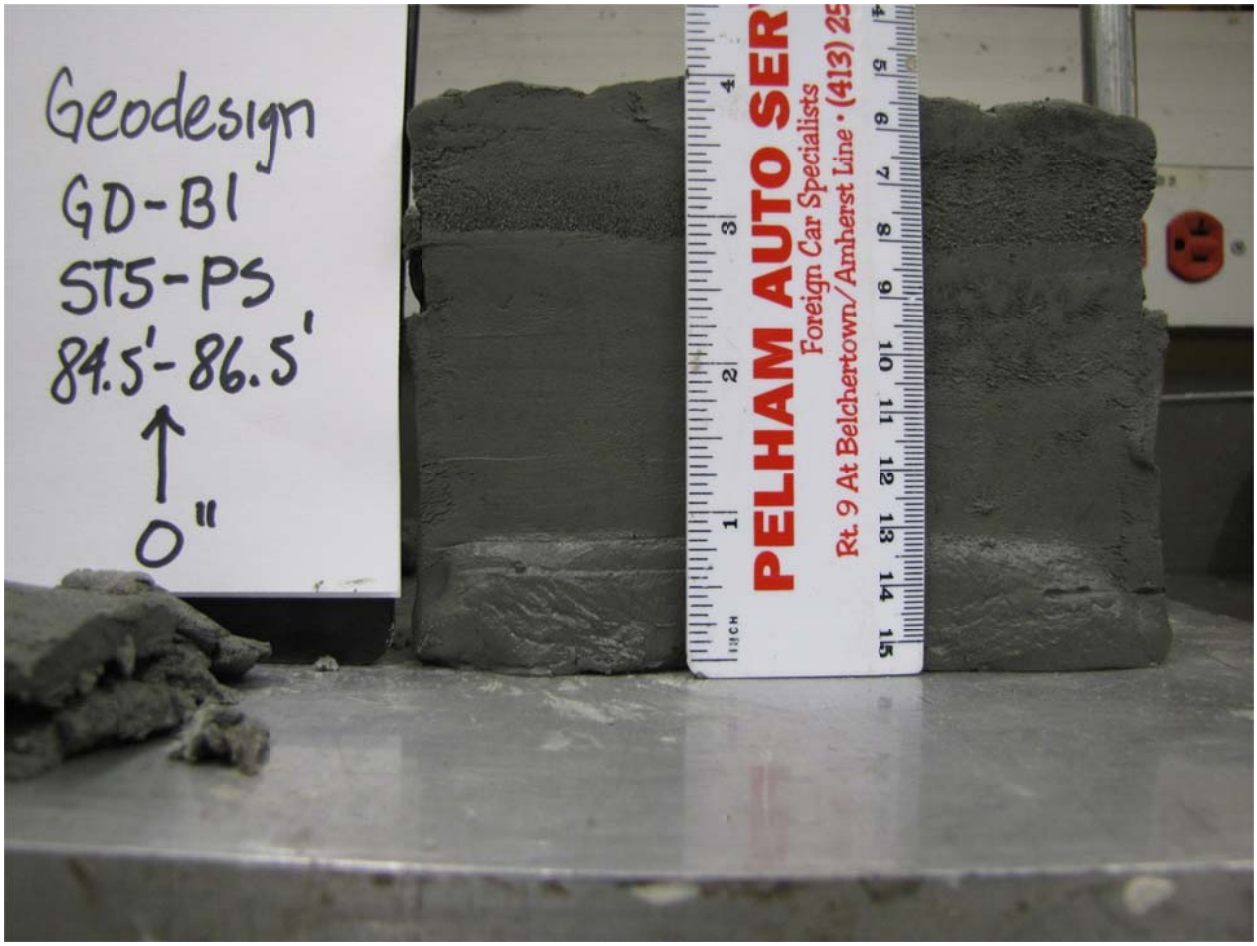


Figure A.2 Photograph of Sample GD-B1 ST-5 84.5 to 86.5 ft, section of sample from approximately 0.5 to 4.5 inches as measured from bottom of the shelby tube.

ATTACHMENT 6 – LIMITATIONS

REPORT LIMITATIONS

Explorations

1. The analysis and recommendations submitted in this report are based in part upon the data obtained from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

2. The generalized soil profiles described in the text are intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil bedrock transitions are probably more erratic. For specific information, refer to the exploration logs.

3. Water level readings have been made in the drill holes and test pits at times and under conditions stated on the logs. These data has been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature and other factors occurring since the time measurements were made.

Review

4. In the event that any changes in the nature, design or location of the proposed structure are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by Geo**Design**, Inc. It is recommended that this firm be provided the opportunity for a general review of final design and specifications in order that geotechnical engineering recommendations may be properly interpreted and implemented in the design and specifications.

Uses of Report

5. This report has been prepared for the exclusive use of **Devonwood Investors, LLC** and their design team for specific application to the proposed **Burlington City Place** in Burlington, VT in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

6. This geotechnical engineering report has been prepared for this project by Geo**Design**, Inc. This report is for design purposes only and is not sufficient to prepare an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

7. Unless otherwise noted, the scope of our services did not included environmental assessment or investigation for the presence of hazardous or toxic materials in the soil, surface water, groundwater or air, on, below, or around this site.

APPENDIX D

STANDARD OPERATING PROCEDURES

SOP **4.0 GENERAL SAMPLING PROCEDURES FOR AQUEOUS AND SOLID MATRICES**

- During field sampling activities, the following applicable procedures will be practiced for sample collection:

- Whenever possible, samples will be collected first from the location expected to be least contaminated. Samples that are expected to be most contaminated will be collected last.

- Accurate and detailed field notes will be maintained in a bound field notebook. Soil samples will be examined and logged in the field.

- Sampling procedures will be performed with the overall intent of collecting representative samples and minimizing sample disturbance.

- Soil samples will be selected for analysis based on the results of qualitative field screening for total volatile organic vapors, visual and olfactory observations, and the depth of the water table.

- Sample containers will be labeled with the site name, project number and date prior to being filled with a sample.

- All sample collection, handling, and shipping information will be recorded in a field notebook.

- Groundwater samples will be logged, using the attached *Groundwater Sampling Log.* Samples of other matrices (sediment, surface water, soil, etc.) will be logged, using the attached *Field Sampling Log*.

- All samples should be collected according the specific requirements of the intended analytical method. Tables 1 and 2 provide lists of sample containers, preservation and holding time requirements for aqueous and soil/sediment samples, respectively.

- All samples will be placed in a chilled, thermally-insulated container containing ice. Blue ice, ice packs, or ice substitutes are not able to reach and maintain the required temperature until receipt at a laboratory.

- All soil samples for volatile organic compound analysis must be collected, preserved, and handled accordingly to SW846 Method 5035. The procedures are outlined in attached memorandum from Spectrum Analytical.

- All samples to be analyzed by Massachusetts Department of Environmental Protection methodologies for Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH) will be collected according the published MADEP procedures outlined in the attached memorandum from Spectrum Analytical, Inc.

SOP 11.00 SAMPLE CUSTODY PROCEDURES

- Sample custody procedures will be followed in order to create an accurate written record. This record can be used to trace the possession and handling of all samples from collection, through all transfers of custody until the samples are delivered to the analytical laboratory. Custody for samples will be maintained by field personnel collecting the samples until they are properly transferred. The following procedures are based on ASTM Designation D 4840-88, standard methods found in DEP (1991), and USPEA (1987) guidance documents.

- A self-adhesive waterproof sample label will be affixed to each sample container before or immediately thereafter sample collection. A waterproof pen will be used to record information on the label. The label should include a unique identifier and may include the following information:

  Project Number
  Sample ID Number
  Sample Location
  Sample Matrix
  Date and Time of Sample Collection
  Designation as Grab or Composite Sample
  Parameters to be Tested
  Preservative
  Initials of Sampler

- All sample containers will be supplied by a state-certified laboratory. Commercially purchased sample containers will be pre-cleaned and quality controlled according to EPA recommended washing procedures and specifications (Level I and/or Level A according to the vendor's specifications).

- Chemical preservatives will be added to the sample containers by the state-certified laboratory providing the containers. Tables 1 and 2 indicate the type of preservation which will be used.

- Chain-of-custody records will be filled out by the sampler using information from the sample labels and field notes made at time of sample collection. The chain-of-custody will include the dates and times of collection and receipt. The chain-of-custody will document any tampering that may have occurred; if there are no such comments then no tampering was observed. An example of the chain of custody (provided by Spectrum Analytical, Inc. of Agawam, Massachusetts) is included.

- One chain-of-custody record will be used for each packaged lot of samples. Where the chain-of-custody consists of more than one page, each page will be sequentially numbered and show the total number of pages. More than one chain-of-custody may be used for one packaged lot.

- Samples will be stored in a thermally insulated container with ice until released to the laboratory, a courier, or transferred to a dedicated and secured sample storage refrigerator. Each cooler will contain sufficient ice to insure that a 4°C temperature is maintained, and will be packed in a manner to prevent damage to the sample containers. The field chain-of-custody records, completed at the time of sample collection, will be placed inside the cooler for transport to the laboratory. These forms will be sealed in a zip-lock type plastic bag to protect them against moisture.

- The chain-of-custody form will be signed by the relinquishing party and the receiving party. The reason for transfer (i.e. courier, shipment of sample) will be indicated each time the sample custody changes.

- The method of shipment to the laboratory will be noted on the chain-of-custody (i.e. hand delivered to laboratory, laboratory courier, commercial shipping). When a commercial shipper is used for sample transport, the chain-of-custody will be signed as relinquished to the shipper, sealed in a zip-lock type bag to protect it from moisture, and placed inside the cooler. The shippers package handling number will be noted on the chain-of-custody, if available. The cooler will then be sealed and a custody seal attached. A copy of the shipping papers will be maintained with the copy of the chain-of-custody.

- Upon receipt by the laboratory, internal laboratory records will document sample custody until its final disposition.

SOP 15.00 SOIL GAS SAMPLE COLLECTION PROCEDURES USING AN EARTHPROBE™

Samples of soil gas will be collected by using a truck-mounted, hydraulically driven probe drive system (Earthprobe) to drive probe rods to the desired sampling depth in the vadose zone. The soil gas samples will be collected by inserting and sealing a length of dedicated polyethylene tubing threaded into an expendable drive point. The soil gas sample is collected by attaching a vacuum pump to an air-tight case containing a Tedlar™ bag which is attached to the dedicated tubing threaded into the probe rods. A portable vacuum/volume system is used to purge a specified volume of soil gas from the sample tubing and to create a vacuum in an air-tight case containing a Tedlar™ soil gas sample bag. The vacuum causes the Tedlar™ bag to inflate with soil gas pulled from the desired sampling depth.

15.1 MATERIALS

The following materials will be available during soil gas sampling:

- health and safety equipment;
- field book;
- disposable gloves;
- Earthprobe™;
- Geoprobe Systems™ vacuum\volume system;
- Geoprobe Systems™ Post-Run Tubing System;
- dedicated 0.25-inch I.D. polyethylene tubing;
- Geoprobe™ AT-100 portable vacuum pump;
- air-tight plastic case;
- Tedlar™ bag and labels;
- chain-of-custody forms;
- cooler and cold source;
- decontamination equipment.

Other materials will be available during soil gas sampling using an on-site portable gas chromatograph.

- air-tight syringe;
- silicon tubing adaptor;
- portable gas chromatograph.

15.2 PROCEDURES

15.2.1 Soil Gas Sampling Protocol using a Tedlar™ Bag in an Air-Tight Sample Case

A decontaminated alloy steel 1-inch O.D. and 0.5-inch I.D. probe rod with an expendable steel drive point and point holder will be driven to a position in the vadose zone at the depth of interest. (Note that the following procedures are adapted from descriptions found in the Geoprobe Systems™ 1995-1996 Tools and Equipment Catalog.)

The expendable point will be disengaged by pulling up on the probe rods. The pull cap is then removed from the top probe rod. An adaptor is secured to a length of dedicated polyethylene tubing. Tape is used on the outside of the adaptor to secure the tubing and prevent the tubing from spinning around the adapter during connection of the sample tubing with the driven point holder. (Note that the air sample will not come in contact with the tape.) The adapter and tubing are

inserted into the probe rods. The adapter is threaded onto the expendable point holder by applying downward pressure and turning counterclockwise to thread the adapter into the point holder. The connection is tested by pulling up lightly on the tubing.

Following the attachment of the polyethylene tubing, the line control valve is closed and the vacuum pump is turned on. Turning on the vacuum pump will allow a vacuum to build in the vacuum tank. When a volume of five liters is reached the pump will be turned off. The vacuum hose will then be attached to the polyethylene tubing by using a coupling. The line control valve will be opened and a minimum of three purge volumes will be evacuated before sampling begins. One purge volume consists of 1 liter of air for every three feet of drive rod used. By dividing the sample depth by three, the number of liters in one purge volume for that sample location will be determine. After attaining the proper purge volume the line valve will be quickly closed and the sample line pressure will be allowed to return to atmospheric pressure. The vacuum pump line and sample tubing will then be connected to two ports located in the air-tight sample case.

The soil gas sample will be collected by using an air-tight plastic sample case containing a Tedlar™ soil gas collection bag. The Tedlar™ bag will be placed in the air-tight case, attached to the inside of the external tubing port which is attached to the sample tubing in the probe rods. The bag will be opened to allow collection of a soil gas sample. The air-tight case will then be sealed. The vacuum pump tubing will then be connected to the external port for the sample case. The line valve will then be opened and the vacuum pump turned back on creating a vacuum in the air-tight case. A vacuum in the air-tight case will cause the Tedlar™bag to draw soil gas from the sample tubing. After the bag inflates (which can be observed through a plexiglass plate located in the sample case), the line control valve will be closed and the tubing from the pump and the sampling tubing will be removed. The air-tight seal of the sample case will thus broken and the case will be opened. The sample valve on the Tedlar™bag will be closed and the bag removed from the external sample port.

Following removal of the dedicated sample tubing from the drive rods, the O-ring at the base of the adapter will be inspected to verify that air-tight sealing was achieved during sampling. The O-ring should be compressed.

The depth of the sample and the volume of gas purged prior to sampling will be recorded.

The Tedlar™ bag sample will be labeled with the following information: site; project number; soil probe location number; date; time of collection; testing parameters; initials of sampling personnel.

The Tedlar™ bag will be cooled to 4°C by placing it immediately in a chilled , thermally insulated container with a cold source;

All equipment used to collect samples for analysis will be either decontaminated before each use or dedicated to a particular sample location.

The polyethylene sample tubing will be disposed of according to applicable disposal protocols.

15.2.2 Soil Gas Sampling Protocol using a Syringe.

General soil gas sampling procedures will be the same as those described in Section 2.10. A syringe will be used for direct injection of the soil gas sample into an on-site portable gas chromatograph.

A silicon tubing adapter will be connected between the sample tubing in the drive rod and the vacuum pump system line valve. Following the purging of the sampling tubing and the closing of the line valve an aliquot of soil gas (100-microliter sample) will be drawn from the silicon adapter by using a gas-tight syringe.

15.2.3 Soil Gas Screening Protocol using an FID.

Soil gas samples are collected in Tedlar™ bags using the general soil gas sampling procedures found in Section 2.1. Soil gas samples are screened for total organic vapors using a flame ionization detector (FID).

A Century Organic Vapor Analyzer (OVA 128) utilizing a flame ionization detector (FID) will be utilized for analyzing the soil gas samples. The FID will be operated according to the manufacturer's recommended standard operating procedures. The FID will be calibrated to a methane response.

Following the removal of the inflated Tedlar™ bag from the collection case (see Section 2.1), the valve of the Tedlar bag will be opened and the probe of the FID will be inserted into the open valve. The FID then draws a continuous sample of soil gas into the probe from the sample bag. The FID specifications indicate a sample flow rate of approximately 1.5 to 2.5 liters per minute at standard temperature and pressure. Soil gas samples are transmitted to the FID detector chamber by an internal pumping system. The soil gas sample is analyzed by the FID using hydrogen flame ionization. A linear scaled meter displays the output signal level (concentrations or total organic vapors) in parts per million (ppm). The results will be recorded in a field notebook. The remaining sample of soil gas in the Tedlar™ bag should not be submitted for quantitative analysis as contaminants may have volatilized during the screening process.

SOP 16.00 JAR HEADSPACE ANALYTICAL SCREENING PROCEDURE

The following are the recommended MADEP (BWSC Policy #WSC-94-400) procedures for conducting analytical screening of gasoline-contaminated soils utilizing a portable Photoionization Detector (PID) or Flame Ionization Detector (FID):

1. Half-fill two clean glass jars with the sample to be analyzed. Quickly cover each open top with one or two sheets of clean aluminum foil and subsequently apply screw caps to tightly seal the jars. Sixteen ounce (16 oz.) (approx. 500 ml) soil or "mason" type jars are preferred; jars less than 8 oz. total capacity (approx. 250 ml), should not be used.

2. Allow headspace development for at least 10 minutes. Vigorously shake jars for 15 seconds both at the beginning and end of the headspace development period. Where ambient temperatures are below 32F (0 C), headspace development should be within a heated vehicle or building.

3. Subsequently to headspace development, remove screw lid/expose foil seal. Quickly puncture foil seal with instrument sampling probe, to a point about one-half of the headspace depth. Exercise care to avoid uptake of water droplets or soil particulates. As an alternative, syringe withdrawal of a headspace sample with subsequent injection to instrument probe or septum-fitted inlet is acceptable contingent upon verification of methodology accuracy using a test gas standard.

4. Following probe insertion through foil seal and/or sample injection to the probe, record highest meter response as the jar headspace concentration. Using foil seal/prove insertion method, maximum response should occur between 2 and 5 seconds. Erratic meter response may occur at high organic vapor concentrations or conditions or elevated headspace moisture, in which case headspace data should be discounted.

5. The headspace screening data from both jar samples should be recorded and compared; generally, replicate values should be consistent to plus or minus 20%.

6. PID and FID field instruments shall be operated and calibrated to yield "total organic vapors" in ppm (v/v) as benzene. PID instruments must be operated, with a 10.0 eV (+/-) lamp source. Operation, maintenance, and calibration shall be performed in accordance with the manufacturer's specification. For jar headspace analysis, instrument calibration shall be checked/adjusted no less than once every 10 analyses, or daily, whichever is greater.

7. Instrumentation with digital (LED/LCD) displays may not be able to discern maximum headspace response unless equipped with a "maximum hold" feature or strip-chart recorder. Deviations, departures and/or additions to the above procedures should be consistent with 310 CMR 40.0017. In such cases, compelling technical justification must be presented and documented by the methodology proponent.

SOP 19.00 FIELD LOG BOOK

The following data validation practices will be followed to insure that raw data are recorded accurately in the field and that an audit trail is developed for the data which require reduction.

Field data generated during instrument calibrations, measurements, and observations will be entered directly into a bound field log book. These field books will be the primary record of field investigation activities and will include a description of any modifications to the work plan, field sampling plan, or health and safety plan.

FIELD BOOK

- A field log book should be a hard-bound notebook with consecutively numbered pages, which is maintained by the primary field person responsible for the on-site activities.

- The front page should have the name of the field personnel, company name and address, and toll free number. The following note should be written - "This book contains information which is valuable and irreplaceable to the owner. If found, please call the above number or return it to the above company at the address noted."

- The "Contents" section should include the page no., job location and job number and date for every field event. This one page will not be sufficient for all the notes generated so the first 3 pages (pages 1 – 3) should be left blank for later use to complete the table of contents.

- All logbooks issued to field personnel shall have the last name of the field personnel and the dates covered by the book on the spine of the book. Field books should be numbered consecutively either on the spine or on the front cover

- In order to maintain information tracking between the field book and particular project file, copies of individual entries made for each particular job should be placed into the corresponding project file. (Note: Please be sure that there is no dirt or sand on any of the pages being copied to prevent damage to the copy machines.)

- A field book established for one project will remain with that project file when the project is completed.

- All personal field books will be maintained by the personnel in the field and when filled will be stored in the person's desk or book shelf so that project managers may access it. The information in the field book belongs to the company and therefore all field books must be returned to the company when the employee leaves.

FIELD BOOK ENTRIES

- Pages of bound field books will be consecutively numbered. All entries into field books will be made in ink. Waterproof ink should be used if available. Entries will include but will not be limited to the following:

- Top of each page – Page #, Date, Job #
- Bottom of each page – initial/signature and date when signing off.

- Time of each entry
- Name, and where appropriate, address, phone number, and affiliation of each person contacted or present during the field activities. Business cards may be stapled into the book.
- Daily synopsis of site activities.
- Field conditions (weather, terrain, hazards, etc).
- References, such as maps or photographs of the site
- Field measurements made, such as remediation system measurements, groundwater measurements, PID readings, soil characterization.
- If using a PID in the field, record the calibration measurements of the instrument in the field book prior to use.
- Identification of number and name of samples collected, with reference to the site plan (sketch if appropriate).
- Date and time of each sample collection. Note any duplicate samples collected. List of samples obtained and sample appearance referenced to field logs if necessary.
- Pertinent information relative to job performance or any subcontractors working at the site.
- All modifications to the field and/or sampling plan and health and safety plan.
- Documentation of all personnel monitoring results and list of personal protective equipment used.
- When a mistake is made in the log, it will be crossed out with a single ink line and will be initialed and dated.