GEOTECHNICAL INVESTIGATION

PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT AND HOTEL 777 N. FRONT STREET, BURBANK, CALIFORNIA

GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

4TERRA-LA I LLC
EL SEGUNDO, CALIFORNIA

PROJECT NO. A9377-06-01

FEBURARY 12, 2016

Project No. A9377-06-01
February 12, 2016

Mrs. Kimberly Paperin
4TERRA-LA I LLC
222 North Sepulveda Boulevard, Suite 2000
El Segundo, California 90245

Subject: PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT AND HOTEL
777 NORTH FRONT STREET
BURBANK, CALIFORNIA

Dear Mrs. Paperin:

In accordance with your authorization of our proposal dated December 18, 2015, we have performed a geotechnical investigation for the proposed multi-family residential development and hotel located at 777 North Front Street in the City of Burbank, California. The accompanying report presents the findings of our study and our conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction. Based on the results of our investigation, it is our opinion that the site can be developed as proposed, provided the recommendations of this report are followed and implemented during design and construction.

If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Very truly yours,

GEOCON WEST, INC.

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed multi-family residential development and hotel located at 777 North Front Street in the City of Burbank, California (see Vicinity Map, Figure 1). The purpose of the investigation was to evaluate subsurface soil and geologic conditions underlying the site and, based on conditions encountered, to provide conclusions and recommendations pertaining to the geotechnical aspects of design and construction.

The scope of this investigation included a site reconnaissance, field exploration, laboratory testing, engineering analysis, and the preparation of this report. The site was explored from January 19, 2016 to January 21, 2016 by excavating eight 8-inch diameter boring utilizing a truck-mounted hollow-stem auger drilling machine. The borings were excavated to depths between 7 and 61½ feet below the existing ground surface. The approximate locations of the exploratory borings are depicted on the Site Exploration Plan (see Figure 2). A detailed discussion of the field investigation, including boring logs, is presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to determine pertinent physical and chemical soil properties. Appendix B presents a summary of the laboratory test results.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions. References reviewed to prepare this report are provided in the *List of References* section.

If project details vary significantly from those described above, Geocon should be contacted to determine the necessity for review and possible revision of this report.

2. SITE AND PROJECT DESCRIPTION

The subject site is located at 777 North Front Street in the City of Burbank, California. The site is an irregularly-shaped parcel and is currently occupied by extensive concrete slabs and an abandoned section of old Front Street. The site is bounded by Front Street to the west, by Burbank Boulevard to the north, by Interstate-5 to the east, and by a vacant lot and Magnolia Boulevard to the south. The site is relatively level; however, three concrete slabs currently occupy the site, each stepping up to the north approximately 3 feet above the adjacent concrete slab (see Site Exploration Plan, Figure 2). Surface water drainage at the site appears to be by sheet flow along the existing ground contours to the city streets. Vegetation onsite consists of grass and trees on the east periphery. The existing site conditions are depicted on the Site Exploration Plan (Figure 2).

Based on the information provided by the Client, it is our understanding that the proposed project will consist of a multi-family residential development and a hotel. The multi-family residential development will include two six- to seven-story buildings over one to two levels of subterranean parking. The multi-family residential development will have a north and south building. It has not yet been determined if the proposed parking structure will be continuous below the two buildings. It is assumed that the proposed subterranean parking levels for the multi-family residential development, not including foundation depths, will extend to depths ranging from 10 to 20 feet below the existing ground surface. The hotel, planned in the northern portion of the property, will be constructed at or near present grade. The proposed site development is depicted on the Proposed Development Plan (see Figure 3).

Based on the preliminary nature of the design at this time, wall and column loads were not available. It is anticipated that column loads for the proposed structures will be up to 700 kips, and wall loads will be up to 8 kips per linear foot.

Once the design phase and foundation loading configuration proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Any changes in the design, location or elevation of any structure, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

3. GEOLOGIC SETTING

The site is located in the eastern portion of the San Fernando Valley situated along the southwestern edge of the Verdugo Mountains (Hitchcock & Wills, 2000). The San Fernando Valley is an alluvial-filled basin, approximately 23 miles wide and 12 miles long. The alluvium within the San Fernando Valley is mainly derived from the Santa Monica Mountains to the south, the Santa Susana Mountains to the north, the Simi Hills to the west, the San Gabriel Mountains to the northeast, and the Verdugo Mountains to the east. Regionally, the site is located in the southern portion Transverse Ranges geomorphic province which is characterized by east-west trending geologic structures such as the nearby Santa Monica Mountains and the east-west trending active San Fernando fault zone. Topography at the site is gently sloping to the south-southeast with elevations at the site ranging from approximately 588 to 578 feet above mean sea level (U.S. Geological Survey datum).

4. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation and published geologic maps of the area, the site is underlain by artificial fill and the site is underlain by Holocene to late Pleistocene age alluvial fan deposits consisting of unconsolidated to slightly consolidated sand, silt and gravel (California Geological Survey, 2010; Hitchcock and Wills, 2000). Detailed stratigraphic profiles are provided on the boring logs in Appendix A.

4.1 Artificial Fill

Artificial fill was encountered in our field explorations to a maximum depth of 14 feet below existing ground surface. The artificial fill consists primarily of brown, reddish brown and grayish brown fine- to medium-grained silty sand with some fine gravel and lesser amounts of silt. The artificial fill is characterized as slightly moist and very loose to medium dense or soft. The fill is likely the result of past grading and construction activities at the site. Deeper fill may exist between excavations and in other portions of the site that were not directly explored.

4.2 Alluvium

Holocene to late Pleistocene age alluvial fan deposits were encountered beneath the fill materials. The alluvium generally consists of light brown to yellowish brown, interbedded well-graded to poorly graded sand, silty sand, sand with silt, sandy silt, and silt with varying amounts of gravel. The alluvium is fine- to coarse-grained and characterized as slightly moist and loose to very dense or very soft to stiff.

5. GROUNDWATER

Based on a review of the Seismic Hazard Zone Report for the Burbank 7.5 Minute Quadrangle (California Division of Mines and Geology [CDMG], 1998), the historically highest groundwater level in the general area is between 20 and 30 feet beneath the ground surface. Groundwater information presented in this document is generated from data collected in the early 1900's to the late 1990s. Based on current groundwater basin management practices, it is unlikely that groundwater levels will ever exceed the historic high levels.

The Los Angeles County Department of Public Works (LACDPW) has maintained various groundwater monitoring wells in the vicinity of the subject site over the past 50 years. The closest active LACDPW monitoring well to the site is Well No. 3872H (State No. 1N14W14F05) located approximately 0.5 mile southwest of the subject site (LACDPW, 2016a). Review of the available monitoring data for this well for the monitoring period between 1964 and 2015 indicate that the depth to groundwater has fluctuated between high and low measurements of 54.6 feet below the existing ground surface in April, 1984 and 215.4 feet below the existing ground surface in March 1965, respectively (LACDPW, 2016a). The most recent groundwater level measurement for Well No. 3872H was measured on August 19, 2015 at a depth of 80.70 feet below the existing ground surface (LACDPW, 2016a).

There are thirteen inactive wells with a ¾-mile radius of the site. Of these 13 wells, seven of them have been inactive for over 60 years and the groundwater level data from these wells is not considered relevant to groundwater conditions at this site. The historic groundwater level measurements of the six inactive wells with more recent measurements (within the last 60 years) are considered representative of the groundwater conditions at the site and are summarized in the following table.

SUMMARY OF GROUNDWATER LEVELS INACTIVE MONITORING WELLS				
Well ID	**Distance (miles) and Direction From Site**	**Monitoring Period**	**Lowest Water Level Measurement (feet)**	**Highest Water Level Measurement (feet)**
3882F	0.28 S	Jan 1956 to Apr 1961	81.0 03/05/1956	92.4 04/08/1957
3882P	0.14 SW	Jan 1956 to Nov 1985	60.2 05/02/1983	155.7 08/07/1967
3882T	0.37 SSE	Jan 1956 to Nov 1985	61.6 11/15/1981	156.5 08/07/1967
3871H	0.68 W	Oct 1995 to Apr 1997	101.4 10/12/1995	110.5 04/14/1997
3871J	0.68 W	Oct 1995 to Apr 1997	98.8 10/12/1995	103.9 04/14/1997
3871G	0.68 W	Oct 1995 to Apr 1997	102.1 10/12/1995	109.7 04/14/1997

The groundwater level data collected from these inactive wells indicates the highest groundwater level measured since 1956 is at a depth of 60.2 feet beneath the existing ground surface as measured in Well No. 3882P, located within approximately 0.14-mile (760 feet) of the site.

Groundwater was not encountered in our field explorations drilled to a maximum depth of 61½ feet below the existing ground surface. Based on the historic groundwater levels in the site vicinity over the last 50 years, the lack of groundwater in our borings, and the depth of the proposed development, groundwater is neither expected to be encountered during construction, nor have a detrimental effect on the project. However, it is not uncommon for groundwater levels to vary seasonally or for groundwater seepage conditions to develop where none previously existed, especially in impermeable fine-grained soils which are heavily irrigated or after seasonal rainfall. In addition, recent requirements for stormwater infiltration could result in shallower seepage conditions in the immediate site vicinity. Proper surface drainage of irrigation and precipitation will be critical for future performance of the project. Recommendations for drainage are provided in the S*urface Drainage* section of this report (see Section 7.26).

6. GEOLOGIC HAZARDS

6.1 Surface Fault Rupture

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (CGS, formerly known as CDMG) for the Alquist-Priolo Earthquake Fault Zone Program (Bryant and Hart, 2007). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years), but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive.

This site is not within the Alquist-Priolo Earthquake Fault Zone and a fault rupture hazard investigation is not required for the proposed development. No active or potentially active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low. However, the site is located in the seismically active Southern California region, and could be subjected to moderate to strong ground shaking in the event of an earthquake on one of the many active Southern California faults. The faults in the vicinity of the site are shown in Figure 4, Regional Fault Map.

The closest surface trace of an active fault to the site is the Verdugo Fault located approximately 1.0 mile to the northeast (CGS, 2014). Other nearby active faults are the Hollywood Fault, Sierra Madre Fault, and the Raymond Fault located approximately 5.0 miles south, 5.6 miles northeast, 6.3 miles southwest of the site, respectively (Ziony and Jones, 1989). The active San Andreas Fault Zone is located approximately 29 miles northeast of the site.

Several buried thrust faults, commonly referred to as blind thrusts, underlie the Los Angeles Basin at depth. These faults are not exposed at the ground surface and are typically identified at depths greater than 3.0 kilometers. The October 1, 1987 M_w 5.9 Whittier Narrows earthquake and the January 17, 1994 M_w 6.7 Northridge earthquake were a result of movement on the Puente Hills Blind Thrust and the Northridge Thrust, respectively. These thrust faults are not exposed at the surface and do not present a potential surface fault rupture hazard at the site; however, these active features are capable of generating future earthquakes and could generate significant ground motion at the site.

6.2 Seismicity

As with all of Southern California, the site has experienced historic earthquakes from various regional faults. The seismicity of the region surrounding the site was formulated based on research of an electronic database of earthquake data. The epicenters of recorded earthquakes with magnitudes equal to or greater than 5.0 in the site vicinity are depicted on Figure 5, Regional Seismicity Map. A partial list of moderate to major magnitude earthquakes that have occurred in the Southern California area within the last 100 years is included in the following table

LIST OF HISTORIC EARTHQUAKES

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
San Jacinto-Hemet area	April 21, 1918	6.8	81	ESE
Near Redlands	July 23, 1923	6.3	62	E
Long Beach	March 10, 1933	6.4	44	SE
Tehachapi	July 21, 1952	7.5	69	NW
San Fernando	February 9, 1971	6.6	16	NNW
Whittier Narrows	October 1, 1987	5.9	16	ESE
Sierra Madre	June 28, 1991	5.8	19	ENE
Landers	June 28, 1992	7.3	107	E
Big Bear	June 28, 1992	6.4	85	E
Northridge	January 17, 1994	6.7	13	W
Hector Mine	October 16, 1999	7.1	120	ENE

The site could be subjected to strong ground shaking in the event of an earthquake. However, this hazard is common in Southern California and the effects of ground shaking can be mitigated if the proposed structures are designed and constructed in conformance with current building codes and engineering practices.

6.3 Seismic Design Criteria

The following table summarizes summarizes site-specific design criteria obtained from the 2013 California Building Code (CBC; Based on the 2012 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The data was calculated using the computer program *U.S. Seismic Design Maps*, provided by the USGS. The short spectral response uses a period of 0.2 second. The values presented below are for the risk-targeted maximum considered earthquake (MCE_R).

2013 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2013 CBC Reference
Site Class	D	Table 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class D (short), S_S	2.226g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class D (1 sec), S_1	0.850g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.0	Table 1613.3.3(1)
Site Coefficient, F_V	1.5	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	2.226g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	1.274g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	1.484g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.850g	Section 1613.3.4 (Eqn 16-40)

The table below presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10.

ASCE 7-10 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.845g	Figure 22-7
Site Coefficient, F_{PGA}	1.0	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.845g	Section 11.8.3 (Eqn 11.8-1)

The Maximum Considered Earthquake Ground Motion (MCE) is the level of ground motion that has a 2 percent chance of exceedance in 50 years, with a statistical return period of 2,475 years. According to the 2013 California Building Code and ASCE 7-10, the MCE is to be utilized for the evaluation of liquefaction, lateral spreading, seismic settlements, and it is our understanding that the intent of the Building code is to maintain "Life Safety" during a MCE event. The Design Earthquake Ground Motion (DE) is the level of ground motion that has a 10 percent chance of exceedance in 50 years, with a statistical return period of 475 years.

Deaggregation of the MCE peak ground acceleration was performed using the USGS 2008 Probabilistic Seismic Hazard Analysis (PSHA) Interactive Deaggregation online tool. The result of the deaggregation analysis indicates that the predominant earthquake contributing to the MCE peak ground acceleration is characterized as a 6.71 magnitude event occurring at a hypocentral distance of 9.1 kilometers from the site.

Deaggregation was also performed for the Design Earthquake (DE) peak ground acceleration, and the result of the analysis indicates that the predominant earthquake contributing to the DE peak ground acceleration is characterized as a 6.70 magnitude occurring at a hypocentral distance of 12.2 kilometers from the site.

Conformance to the criteria in the above tables for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

6.4 Liquefaction Potential

Liquefaction is a phenomenon in which loose, saturated, relatively cohesionless soil deposits lose shear strength during strong ground motions. Primary factors controlling liquefaction include intensity and duration of ground motion, gradation characteristics of the subsurface soils, in-situ stress conditions, and the depth to groundwater. Liquefaction is typified by a loss of shear strength in the liquefied layers due to rapid increases in pore water pressure generated by earthquake accelerations.

The current standard of practice, as outlined in the "Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California" and "Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California" requires liquefaction analysis to a depth of 50 feet below the lowest portion of the proposed structure. Liquefaction typically occurs in areas where the soils below the water table are composed of poorly consolidated, fine to medium-grained, primarily sandy soil. In addition to the requisite soil conditions, the ground acceleration and duration of the earthquake must also be of a sufficient level to induce liquefaction.

A review of the State of California Seismic Hazard Zones Map for the Burbank Quadrangle (CDMG, 1999) identifies the site as being within an area that has a potential for liquefaction. In addition, review of the County of Los Angeles Safety Element (Leighton, 1990) and the Safety Element of the City of Burbank General Plan (1997) indicate that the site is located within an area designated as "liquefiable".

Liquefaction analysis of the soils underlying the site was performed using an updated version of the spreadsheet template LIQ2_30.WQ1 developed by Thomas F. Blake (1996). This program utilizes the 1996 NCEER method of analysis. This semi-empirical method is based on a correlation between values of Standard Penetration Test (SPT) resistance and field performance data.

The liquefaction analysis was performed for the Design Earthquake level by using a groundwater table of 50 feet below the ground surface, a magnitude 6.66 earthquake, and a peak horizontal acceleration of 0.56g ($⅔PGA_M$). A groundwater depth of 50 feet was chosen based on our review of groundwater well data in close proximity of the site with regular readings over the past 50 years. The enclosed liquefaction analyses, included herein for borings B1, B5, and B8, indicate that the alluvial soils below the groundwater level could be prone to less than 0.1 inches of liquefaction induced settlement during Design Earthquake ground motion (see enclosed calculation sheets, Figures 6 through 11).

It is our understanding that the intent of the Building Code is to maintain "Life Safety" during Maximum Considered Earthquake level events. Therefore, additional analysis was performed to evaluate the potential for liquefaction during a MCE event. The structural engineer should evaluate the proposed structure for the anticipated MCE liquefaction induced settlements and verify that anticipated deformations would not cause the foundation system to lose the ability to support the gravity loads and/or cause collapse of the structure.

The liquefaction analysis was also performed for the Maximum Considered Earthquake level by using a groundwater table of 50 feet below the ground surface, a magnitude 6.66 earthquake, and a peak horizontal acceleration of 0.84g (PGA_M). The enclosed liquefaction analyses, included herein for borings B1, B5, and B8, indicate that the alluvial soils below the groundwater level could be prone to less than 1.1 inches of liquefaction induced settlement during Maximum Considered Earthquake ground motion (see enclosed calculation sheets, Figures 12 through 17).

6.5 Seismically-Induced Settlement

Dynamic compaction of dry and loose sands may occur during a major earthquake. Typically, settlements occur in thick beds of such soils. The seismically-induced settlement calculations were performed in accordance with the American Society of Civil Engineers, Technical Engineering and Design Guides as adapted from the US Army Corps of Engineers, No. 9.

The calculations provided herein for borings B1, B5, and B8 indicate that the soil above the groundwater level of 50 feet could be prone to less than 0.59 inches of settlement as a result of the Design Earthquake peak ground acceleration ($⅔PGA_M$). Calculation of the anticipated seismically-induced settlements during Design Earthquake ground motion is provided as Figures 18 through 20.

The calculations provided herein for borings B1, B5, and B8 indicate that the soil above the groundwater level of 50 feet could be prone to less than 0.91 inches of settlement as a result of the Maximum Considered Earthquake peak ground acceleration (PGA_M), respectively. Calculation of the anticipated seismically-induced settlements during Design Earthquake ground motion is provided as Figures 20 through 21.

6.6 Slope Stability

The topography at the site is relatively flat to gently sloping to the southwest. According to the County of Los Angeles Safety Element (Leighton, 1990) and the Safety Element of the City of Burbank General Plan (1997), the site is not located within an area identified as having a potential for slope instability. Also, the site is not within an area designated as having a potential for seismic slope instability (CDMG, 1999). There are no known landslides near the site, nor is the site in the path of any known or potential landslides. Therefore, the potential for slope instability to affect the site is considered low.

6.7 Earthquake-Induced Flooding

Earthquake-induced flooding is inundation caused by failure of dams or other water-retaining structures due to earthquakes. Based on a review of the Los Angeles County Safety Element (Leighton, 1990), the site is located within a potential inundation area for an earthquake-induced dam failure from Hansen Dam and Lopez Dam. However, these dams, as well as others in California, is continually monitored by various governmental agencies (such as the State of California Division of Safety of Dams and the U.S. Army Corps of Engineers) to guard against the threat of dam failure. Current design and construction practices and ongoing programs of review, modification, or total reconstruction of existing dams are intended to ensure that all dams are capable of withstanding the maximum considered earthquake (MCE) for the site. Therefore, the potential for inundation at the site as a result of an earthquake-induced dam failure is considered low.

6.8 Tsunamis, Seiches, and Flooding

The site is not located within a coastal area. Therefore, tsunamis, seismic sea waves, are not considered a significant hazard at the site.

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Flooding from a seismically-induced seiche is considered unlikely.

The site is within an area of minimal flooding (Zone X) as defined by the Federal Emergency Management Agency (LACDPW, 2016b).

6.9 Oil Fields & Methane Potential

The site is not located within the limits of an oilfield and oil wells are not located in the immediate site vicinity (California Division of Oil, Gas, and Geothermal Resources [DOGGR], 2016). However, due to the voluntary nature of record reporting by the oil well drilling companies, wells may be improperly located or not documented and undocumented wells could be encountered during construction. Any wells encountered will need to be properly abandoned in accordance with the current requirements of the DOGGR.

The site is not located within the boundaries of an oil field. Therefore, the potential for methane and other volatile gases to occur at the site is considered very low. However, should it be determined that a methane study is required for the proposed development it is recommended that a qualified methane consultant be retained to perform the study and provide mitigation measures as necessary.

6.10 Subsidence

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. Soils that are particularly subject to subsidence include those with high silt or clay content. The site is not located within an area of known ground subsidence. No large-scale extraction of groundwater, gas, oil, or geothermal energy is occurring or planned at the site or in the general site vicinity. There appears to be little or no potential for ground subsidence due to withdrawal of fluids or gases at the site.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 It is our opinion that neither soil nor geologic conditions were encountered during the investigation that would preclude construction of the proposed project provided the recommendations presented herein are followed and implemented during design and construction.

7.1.2 Up to 14 feet of existing artificial fill was encountered during site exploration. The existing fill is believed to be the result of past grading and construction activities at the site. Deeper fill may exist in other areas of the site that were not directly explored. The existing fill and site soils are suitable for re-use as engineered fill, if needed, provided the recommendations in the *Grading* section of this report are followed (see Section 7.4).

7.1.3 The enclosed liquefaction and seismically-induced settlement analyses for Design Earthquake peak ground acceleration ($^{2}/_{3}PGA_{M}$) indicate that the site soils could be prone to less than 0.69 inches of total settlement. The recommendations presented herein are intended to mitigate the potential for differential settlements.

7.1.4 Groundwater was not encountered during site exploration and the current groundwater table is sufficiently deep that it not expected to be encountered during construction. However, local seepage could be encountered during excavation of the subterranean level, especially if conducted during the rainy season.

7.1.5 Based on the preliminary nature of the project at this time, precise information on the existing site topography and proposed excavation depths is not available. Excavations for the subterranean portion of the proposed multi-family residential structures are anticipated to penetrate through a majority of the existing artificial fill, if not all. Once information on the existing site topography and proposed excavation depths becomes available, this information should be provided to Geocon for review and update of the recommendations presented herein. For the purposes of this report, is has been assumed that excavations for the proposed multi-family residential structure will penetrate through the existing artificial fill and expose undisturbed alluvial soils throughout the excavation bottom.

7.1.6 Based on these considerations, it is recommended that the proposed multi-family residential structures be supported on a conventional spread foundation system deriving support in the undisturbed alluvial soils found at and below a depth of 14 feet below the existing ground surface. Recommendations for the design of a conventional foundation system are provided in Section 7.7 of this report.

7.1.7 It is our understanding that a second subterranean parking level may be constructed under a select portion of the structure. Although differential settlements are not anticipated to be excessive, it is recommended that the stepped transition between the lowest subterranean levels be more heavily reinforced. The reinforcement and structural connection should be designed by the project structural engineer.

7.1.8 In order to support the proposed hotel structure on conventional spread foundations, it is required that all existing artificial fill within the building footprint area be excavated and properly compacted for foundation and slab support. The excavation should extend laterally a minimum distance of five feet beyond the building footprint areas, including building appurtenances, or a distance equal to the depth of fill below the foundation, whichever is greater. The limits of existing fill and/or soft soil removal will be verified by the Geocon representative during site grading activities. Recommendations for earthwork are provided in the *Grading* section of this report (see Section 7.4).

7.1.9 Alternatively, the proposed hotel structure may be supported on deepened foundations consisting of cast-in-place friction piles which penetrate through the existing artificial fill and derive support in the undisturbed alluvial soils found below a depth of 14 feet. Recommendations for the design of a deepened foundation system are provided in Section 7.9 of this report.

7.1.10 The concrete slab for a pile-supported structure penetrating through uncertified artificial fill should be designed as a structural slab that derives all support from the pile, eliminating permanent reliance on the questionable soil underlying the slab. As a minimum, it is recommended that the upper 12 inches of slab subgrade be compacted to provide a suitable temporary surface upon which concrete can be poured and placed. Any disturbed soils should be properly compacted prior to slab construction.

7.1.11 Excavations on the order of 22 feet in vertical height are anticipated for construction of the subterranean level and foundation system of the multi-family residential structures, and could also be needed if grading is performed for the proposed hotel structure. Due to the depth of the excavation and the proximity to the property lines, city streets and adjacent offsite structures, the proposed excavations will likely require sloping and shoring measures in order to provide a stable excavation. Where shoring is required, it is recommended that a soldier pile shoring system be utilized. In addition, where the proposed excavation will be deeper than and adjacent to an offsite structure, the proposed shoring should be designed to resist the surcharge imposed by the adjacent offsite structure. Recommendations for shoring are provided in Section 7.21 of this report.

7.1.12 Refusal was encountered during the excavation of boring B3 at a depth of 7 feet. Based on the depth of artificial fill encountered across the site, it is likely that refusal was encountered due to buried debris and oversize materials. It is suggested that this be further investigated by the contractor prior to construction to avoid a construction delay due to an unknown condition.

7.1.13 All excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).

7.1.14 Due to the nature of the proposed design and intent for subterranean levels, waterproofing of subterranean walls and slabs is suggested. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

7.1.15 It is suggested that flexible utility connections be considered for all rigid utilities tied into pile supported structures in order to minimize or prevent damage to utilities from minor differential movements subsequent to an earthquake event.

7.1.16 Foundations for small outlying structures, such as block walls up to 6 feet high, planter walls or trash enclosures, which will not be tied-in to the proposed structures, may be supported on conventional foundations deriving support in newly placed engineered fill. If excavation and compaction cannot be performed, such as adjacent to property lines or due to the depth of artificial fill, alternative foundation recommendations will be required. Improvements constructed over existing uncertified fill may experience increased settlement and/or cracking and may therefore have a shorter design life and increased maintenance costs. Due to the preliminary nature of the project at this time, if required, alternative recommendations will be provided under separate cover as the design progresses.

7.1.17 Where new paving is to be placed, it is recommended that all existing fill and soft alluvial soils be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all existing fill and soft alluvial soils in the area of new paving is not required; however, paving constructed over existing uncertified fill or unsuitable alluvial soil may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of subgrade soil should be scarified and properly compacted for paving support. Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 7.14).

7.1.18 Once the design and foundation loading configuration for the proposed structure proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Based on the final foundation loading configurations, the potential for settlement should be re-evaluated by this office.

7.1.19 Any changes in the design, location or elevation, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

7.2 Soil and Excavation Characteristics

7.2.1 The in-situ soils can be excavated with moderate effort using conventional excavation equipment. Caving should be anticipated in unshored excavations, especially where granular soils are encountered. The contractor should be aware that formwork will likely be required to prevent caving of shallow spread foundation excavations, and casing in drilled excavations.

7.2.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly sloped, shored and maintained in accordance with applicable OSHA rules and regulations to maintain safety and maintain the stability of adjacent existing improvements.

7.2.3 All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load. Penetrations below this 1:1 projection will require special excavation measures such as sloping or shoring. Excavation recommendations are provided in the *Temporary Excavations* section of this report (see Section 7.20).

7.2.4 The soils encountered during site exploration are considered to have a "very low" expansive potential (EI = 3) and are classified as "non-expansive" in accordance with the 2013 California Building Code (CBC) Section 1803.5.3. The recommendations presented herein assume that building foundations and slabs will derive support in non-expansive materials.

7.3 Minimum Resistivity, pH, and Water-Soluble Sulfate

7.3.1 Potential of Hydrogen (pH) and resistivity testing as well as chloride content testing were performed on representative samples of soil to generally evaluate the corrosion potential to surface utilities. The tests were performed in accordance with California Test Method Nos. 643 and 422 and indicate that the soils are considered "moderately corrosive" with respect to corrosion of buried ferrous metals on site. The results are presented in Appendix B (Figure B13) and should be considered for design of underground structures.

7.3.2 Laboratory tests were performed on representative samples of the site materials to measure the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate tests are presented in Appendix B (Figure B13) and indicate that the on-site materials possess "negligible" sulfate exposure to concrete structures as defined by 2013 CBC Section 1904 and ACI 318-11 Sections 4.2 and 4.3.

7.3.3 Geocon West, Inc. does not practice in the field of corrosion engineering and mitigation. If corrosion sensitive improvements are planned, it is recommended that a corrosion engineer be retained to evaluate corrosion test results and incorporate the necessary precautions to avoid premature corrosion of buried metal pipes and concrete structures in direct contact with the soils.

7.4 Grading

7.4.1 Earthwork should be observed, and compacted fill tested by representatives of Geocon West, Inc. The existing fill and alluvial soils encountered during exploration are suitable for re-use as an engineered fill, provided any encountered oversize material (greater than 6 inches) and any encountered deleterious debris is removed.

7.4.2 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer and soil engineer in attendance. Special soil handling requirements can be discussed at that time.

7.4.3 Grading should commence with the removal of all existing vegetation and existing improvements from the area to be graded. Deleterious debris such as wood and root structure should be exported from the site and should not be mixed with the fill soils. Asphalt and concrete should not be mixed with the fill soils unless approved in writing by the Geotechnical Engineer. All existing underground improvement planned for removal should be completely excavated and the resulting depressions properly backfilled in accordance with the procedures described herein. Once a clean excavation bottom has been established it must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.4.4 The proposed multi-family residential structures may be supported on a conventional spread foundation system deriving support in the undisturbed alluvial soils found at and below a depth of 14 feet below the existing ground surface. Once information on the existing site topography and proposed excavation depths becomes available, this information should be provided to Geocon to confirm that excavations will penetrate into undisturbed alluvial soils. If needed, additional recommendations will be provided at that time.

7.4.5 If grading will be performed for support of the proposed hotel structure, as a minimum it is recommended that the upper 14 feet of existing earth materials within the proposed building footprint area be excavated and properly compacted for foundation and slab support. Deeper excavations should be conducted as necessary to remove deeper artificial fill or soft alluvial soil at the direction of the Geotechnical Engineer (a representative of Geocon). The excavation should extend laterally a minimum distance of 5 feet beyond the building footprint area, including building appurtenances, or a distance equal to the depth of fill below the foundation, whichever is greater. The limits of existing fill and/or soft alluvial soil removals will be verified by the Geocon representative during site grading activities.

7.4.6 All excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon). Prior to placing any fill, the excavation bottom must be proof-rolled with heavy equipment in the presence of the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.4.7 In order to minimize static settlements, fill should be placed in horizontal loose layers approximately 6 to 8 inches thick, moisture conditioned to near optimum moisture content, and compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.4.8. Where new paving is to be placed, it is recommended that all existing fill and soft alluvium be excavated and properly compacted for paving support. As a minimum, the upper 12 inches of soil should be scarified, moisture conditioned to optimum moisture content, and compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 7.14).

7.4.9 All imported fill shall be observed, tested and approved by Geocon West, Inc. prior to bringing soil to the site. Rocks larger than 6 inches in diameter shall not be used in the fill. Imported soils should have an expansion index less than 20 and soils corrosivity properties that are equally or less detrimental to that of the existing onsite soils (see Figure B13).

7.4.10 It is suggested that flexible utility connections be considered for all rigid utilities tied into pile supported structures in order to minimize or prevent damage to utilities from minor differential movements subsequent to an earthquake event. Utility trenches should be properly backfilled in accordance with the requirements of the Green Book (latest edition). The pipe should be bedded with clean sands (Sand Equivalent greater than 30) to a depth of at least one foot over the pipe, and the bedding material must be inspected and approved in writing by the Geotechnical Engineer (a representative of Geocon). The use of gravel is

not acceptable unless used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. The use of minimum 2-sack slurry is also acceptable. Prior to placing any bedding materials or pipes, the excavation bottom must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).

7.4.11 All trench and foundation excavation bottoms must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing bedding sands, fill, steel, gravel, or concrete.

7.5 Shrinkage

7.5.1 Shrinkage results when a volume of material removed at one density is compacted to a higher density. A shrinkage factor of up to 15 percent should be anticipated when excavating and compacting the upper 14 feet of existing earth materials on the site to an average relative compaction of 95 percent.

7.4.2 If import soils will be utilized in the building pad, the soils must be placed uniformly and at equal thickness at the direction of the Geotechnical Engineer (a representative of Geocon West, Inc.). Soils can be borrowed from non-building pad areas and later replaced with imported soils.

7.6 Foundation Design

7.6.1 The proposed multi-family residential structures may be supported on a conventional spread foundation system deriving support in the undisturbed alluvial soils found at and below a depth of 14 feet below the existing ground surface. Foundations should be deepened as necessary to penetrate through unsuitable soils and extend into competent alluvial soils. Once information on the existing site topography and proposed excavation depths becomes available, this information should be provided to Geocon to confirm that excavations will penetrate into undisturbed alluvial soils. If needed, additional recommendations will be provided at that time. Recommendations for the design of a conventional foundation system are provided in Section 7.7 of this report.

7.6.2 If grading will be performed below the proposed hotel structure, subsequent to the grading the hotel structure may be supported on a conventional foundation system deriving support in newly placed engineered fill. Recommendations for the design of a conventional foundation system are provided in Section 7.7 of this report.

7.6.3 Alternatively, the proposed hotel structure may be supported on deepened foundations consisting of cast-in-place friction piles which penetrate through the existing artificial fill and derive support in the undisturbed alluvial soils found below a depth of 14 feet. The concrete slab for a pile-supported structure should be designed as a structural slab that derives all support from the pile, eliminating permanent reliance on the soil underlying the slab. Recommendations for the design of a deepened foundation system are provided in Section 7.9 of this report.

7.6.4 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

7.6.5 Waterproofing of subterranean walls and slabs is recommended for this project. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method which would provide protection to subterranean walls, floor slabs and foundations.

7.6.6 This office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

7.7 Conventional Foundation Design

7.7.1 Continuous footings may be designed for an allowable bearing capacity of 2,500 pounds per square foot (psf), and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing material.

7.7.2 Isolated spread foundations may be designed for an allowable bearing capacity of 3,000 psf, and should be a minimum of 24 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing material.

7.7.3 The allowable soil bearing pressure above may be increased by 300 psf and 500psf for each additional foot of foundation width and depth, respectively, up to a maximum bearing pressure of 5,000 psf.

7.7.4 Once the design and foundation loading configurations for the proposed structures proceeds to a more finalized plan, the estimated settlements presented in this report should be reviewed and revised, if necessary. If the final foundation loading configurations are greater than the assumed loading conditions, the potential for settlement should be reevaluated by this office.

7.7.5 The allowable bearing pressures may be increased by one-third for transient loads due to wind or seismic forces.

7.7.6 Continuous footings should be reinforced with a minimum of four No. 4 steel reinforcing bars, two placed near the top of the footing and two near the bottom. The reinforcement for isolated spread footings should be designed by the project structural engineer.

7.7.7 If depth increases are utilized for the exterior wall footings, this office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

7.7.8 The above foundation dimensions and minimum reinforcement recommendations are based on soil conditions and building code requirements only, and are not intended to be used in lieu of those required for structural purposes.

7.7.9 No special subgrade presaturation is required prior to placement of concrete. However, the slab and foundation subgrade should be sprinkled as necessary; to maintain a moist condition as would be expected in any concrete placement.

7.8 Conventional Foundation Settlement

7.8.1 The enclosed liquefaction and seismically-induced settlement analyses for Design Earthquake peak ground acceleration ($⅔PGA_M$) indicate that the site soils could be prone to less than 0.69 inches of total settlement. These settlements are in addition to the static settlements indicated below and must be considered in the structural design.

7.8.2 The maximum expected static settlement for the proposed multi-family residential structures supported on a conventional foundation system deriving support in competent alluvial soils found at or below a depth of 14 feet and designed with a maximum bearing pressure of 5,000 psf is estimated to be less than ¾ inch and occur below the heaviest loaded structural element. Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is not expected to exceed half of the total settlement over a distance of 20 feet. Based on seismic considerations, the proposed multi-family residential structures supported on a spread foundation system should be designed for a combined static and seismically induced differential settlement of ¾ inch over a distance of 20 feet.

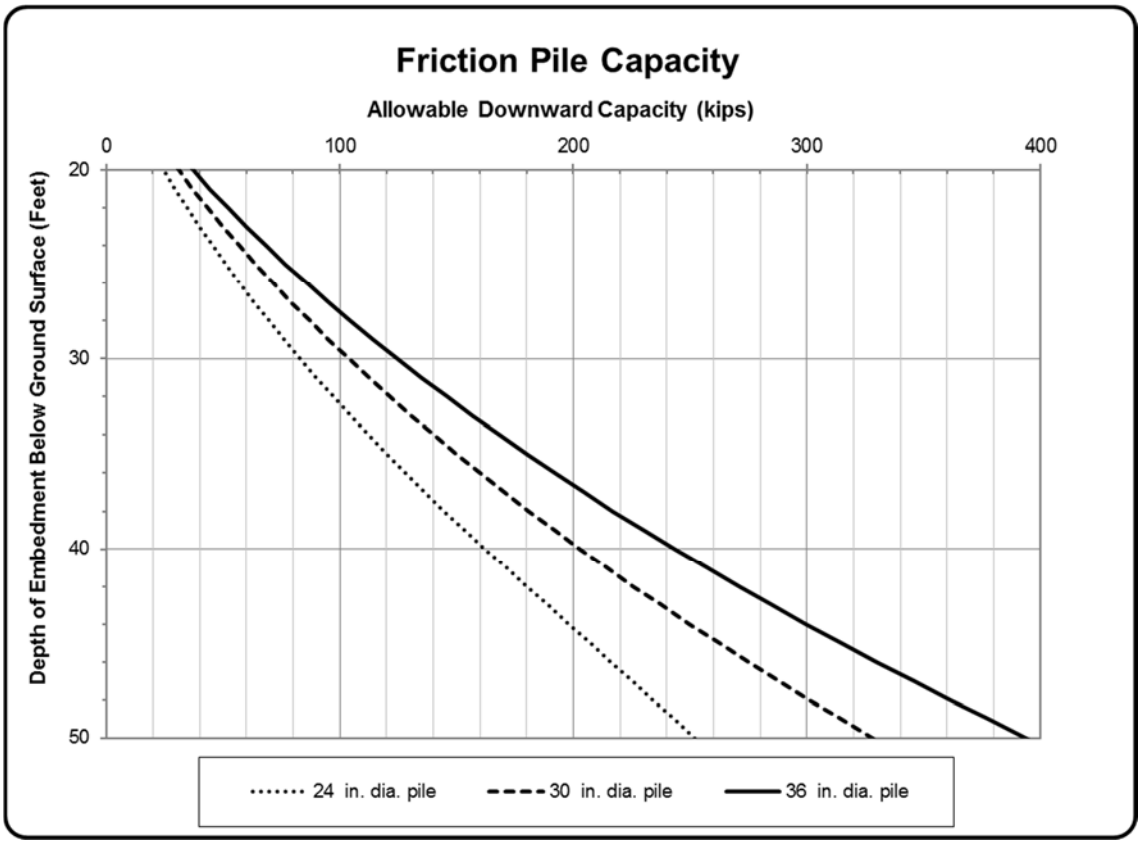
7.8.3 It is our understanding that a second subterranean parking level may be constructed under a select portion of the structure. Although differential settlements are not anticipated to be excessive, it is recommended that the stepped transition between the lowest subterranean levels be more heavily reinforced. The reinforcement and structural connection should be designed by the project structural engineer.

7.8.4 The maximum expected static settlement for the proposed hotel structure supported on a conventional foundation system deriving support in newly placed engineered fill and designed with a maximum bearing pressure of 5,000 psf is estimated to be less than 1 inch and occur below the heaviest loaded structural element. Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is not expected to exceed half of the total settlement over a distance of 20 feet. Based on seismic considerations, the proposed hotel structure supported on a spread foundation system should be designed for a combined static and seismically induced differential settlement of ⅞ inches over a distance of 20 feet.

7.8.5 Once the design and foundation loading configurations for the proposed structures proceeds to a more finalized plan, the estimated settlements presented in this report should be reviewed and revised, if necessary. If the final foundation loading configurations are greater than the assumed loading conditions, the potential for settlement should be reevaluated by this office.

7.9 Deepened Foundation Design

7.9.1 For preliminary design purposes 24-, 30-, and 36-inch diameter drilled cast-in-place friction piles have been evaluated. Piles should be embedded a minimum of 20 feet into the competent alluvium found at and below a depth of 14 feet and derive axial and lateral support exclusively in the undisturbed alluvial soils. The allowable axial capacities for pile embedment into the competent alluvial soils are provided in the chart on the following page. The axial capacities are based on skin friction; end-bearing capacity is not being considered.



7.9.2 All drilled pile excavations should be continuously observed by personnel of this firm to verify adequate penetration into the recommended bearing materials. The capacity presented is based on the strength of the soils. The compressive and tensile strength of the pile sections should be checked to verify the structural capacity of the piles.

7.9.3 Single pile uplift capacity can be taken as 60 percent of the allowable downward capacity.

7.9.4 The allowable downward capacity and allowable uplift capacity may be increased by one-third when considering transient wind or seismic loads.

8.9.2 The maximum expected static settlement for the structure supported on friction piles is estimated to be less than ½ inch. Differential settlement between adjacent pile foundations is not expected to exceed ¼ inch. The majority of the foundation settlement is expected to occur on initial application of loading and during construction. These static settlements are estimates and will require confirmation once foundation loads become available. In addition seismically induced settlements should be considered.

7.9.5 If pile spacing is at least three times the maximum dimension of the pile, no reduction in axial capacity or lateral load capacity is considered necessary for group effects. If pile spacing is closer than three pile diameters, an evaluation for group effects including appropriate reductions should be performed by Geocon based on pile dimension and spacing.

7.9.6 For increased resistance to differential foundation movement and lateral drift, the pile tops should be interconnected in two horizontal directions with grade beams or tied with a structural slab. The project structural engineer should provide slab and grade beam design, reinforcement and spacing dependent on anticipated loading. However, for grade beams we recommend a minimum embedment depth below lowest adjacent pad grade of 24 inches and a minimum width of 12 inches. In addition, minimum reinforcement should consist of four No. 4 steel reinforcing bars; two placed near the top of the grade beam and two near the bottom.

7.10 Deepened Foundation Installation

7.10.1 Casing may be required if caving occurs in the granular soil layers during deep drilled excavation. The contractor should have casing available and should be prepared to use it. If casing is used, extreme care should be employed so that the pile is not pulled apart as the casing is withdrawn. At no time should the distance between the surface of the concrete and the bottom of the casing be less than 5 feet. Continuous observation of the drilling and pouring of the piles by the Geotechnical Engineer (a representative of Geocon West, Inc.), is required.

7.10.2 Friction piles do not require the complete removal of all loose earth materials from the bottom of the excavation since the end-bearing capacity is not being considered for design. However, a cleanout of the excavation bottom will be required.

7.10.3 Groundwater was not encountered during site exploration, and the groundwater table is sufficient deep that it will not be encountered during pile installation. However, local seepage may be encountered during excavations for the proposed soldier piles, especially if conducted during the rainy season. If more than 6 inches of water is present in the bottom of the excavation, a tremie is required to place the concrete into the bottom of the hole. A tremie should consist of a rigid, water-tight tube having a diameter of not less than 6 inches with a hopper at the top. The tube should be equipped with a device that will close the discharge end and prevent water from entering the tube while it is being charged with concrete. The tremie should be supported so as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end should be closed at the start of the work to prevent water entering the tube and should be entirely sealed at all times, except when the concrete is being placed. The tremie tube should be kept full of concrete. The flow should be continuous until the work is completed and the resulting concrete seal should be monolithic and homogeneous. The tip of the tremie tube should always be kept about 5 feet below the surface of the concrete and definite steps and safeguards should be taken to insure that the tip of the tremie tube is never raised above the surface of the concrete.

7.10.4 A special concrete mix should be used for concrete to be placed below water. The design shall provide for concrete with a strength of 1,000 psi over the initial job specification. An admixture that reduces the problem of segregation of paste/aggregates and dilution of paste shall be included. The slump shall be commensurate to any research report for the admixture, provided that it shall also be the minimum for a reasonable consistency for placing when water is present. Extreme care should be employed so that the pile is not pulled apart as the casing is withdrawn. At no time should the distance between the surface of the concrete and the bottom of the casing be less than 5 feet. Continuous observation of the drilling and pouring of the piles by a representative of this firm is required.

7.10.5 Closely spaced piles should be drilled and filled alternately, with the concrete permitted to set at least eight hours before drilling an adjacent hole. Pile excavations should be filled with concrete as soon after drilling and inspection as possible; the holes should not be left open overnight.

7.11 Miscellaneous Foundations

7.11.1 Foundations for small outlying structures, such as block walls up to 6 feet high, planter walls or trash enclosures, which will not be tied-in to the proposed structures, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill. If excavation and compaction cannot be performed, such as adjacent to property lines or due to the depth of existing artificial fill, alternative foundation recommendations will be required. Improvements constructed over existing uncertified fill may experience increased settlement and/or cracking and may therefore have a shorter design life and increased maintenance costs. Due to the preliminary nature of the project at this time, alternative recommendations will be provided under separate cover as the project proceeds.

7.11.2 Miscellaneous foundations deriving support in newly placed engineered fill may be designed for a bearing value of 1,500 psf, and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade and 12 inches into the recommended bearing material. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

7.11.3 Foundation excavations should be observed by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated.

7.12 Lateral Design

7.12.1 Resistance to lateral loading may be provided by friction acting at the base of foundations and by passive earth pressure. An allowable coefficient of friction of 0.35 may be used with the dead load forces in the undisturbed alluvium or properly compacted engineered fill.

7.12.2 Passive earth pressure for the sides of foundations poured against engineered fill and undisturbed alluvium may be computed as an equivalent fluid having a density of 250 pounds per cubic foot with a maximum earth pressure of 2,500 psf. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third. A one-third increase in the passive value may be used for wind or seismic loads. The allowable capacity may be doubled for isolated piles spaced more than three times the diameter.

7.12.3 Once the project design proceeds to a more finalized state and the foundation system has been selected, analysis of lateral pile capacity can be performed. If piles are spaced at least at least 8 diameters on-center when loaded in-line and at least 3 diameters on-center when loaded in parallel, no reduction in lateral capacity is considered necessary for group effects. If pile spacing is closer, an evaluation for group effects including appropriate reductions should be incorporated into the pile design based on pile dimension, spacing, and the direction of loading.

7.13 Concrete Slabs-on-Grade

7.13.1 Concrete slabs-on-grade subject to vehicle loading should be designed in accordance with the recommendations in the *Pavement Recommendations* section of this report (Section 7.14).

7.13.2 Subsequent to the recommended grading, concrete slabs-on-grade for structures not subject to vehicle loading, should be a minimum of 4 inches thick and minimum slab reinforcement should consist of No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Steel reinforcing should be positioned vertically near the slab midpoint.

7.13.3 It is recommended that the concrete slab-on-grade for a pile supported structure be designed as a structural slab deriving support from the deepened foundation system. The thickness and reinforcing of the structural slab should be designed by the project structural engineer. It is recommended that the upper 12 inches of slab subgrade be compacted to provide a suitable surface upon which concrete can be placed. Any soils unintentionally disturbed should be properly compacted prior to slab construction.

7.13.4 Slabs-on-grade that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder placed directly beneath the slab. The vapor retarder and acceptable permeance should be specified by the project architect or developer based on the type of floor covering that will be installed. The vapor retarder design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06) and should be installed in general conformance with ASTM E 1643 (latest edition) and the manufacturer's recommendations. A minimum thickness of 15 mils extruded polyolefin plastic is recommended; vapor retarders which contain recycled content or woven materials are not recommended. The vapor retarder should have a permeance of less than 0.01 perms demonstrated by testing before and after mandatory conditioning. The vapor retarder should be installed in direct contact with the concrete slab with proper perimeter seal. If the California Green Building Code requirements apply to this project, the vapor retarder should be underlain by 4 inches of clean aggregate. It is important that the vapor retarder be puncture resistant since it will be in direct contact with angular gravel. As an alternative to the clean aggregate suggested in the Green Building Code, it is our opinion that the concrete slab-on-grade may be underlain by a vapor retarder over 4 inches of clean sand (sand equivalent greater than 30), since the sand will serve a capillary break and will minimize the potential for punctures and damage to the vapor barrier.

7.13.5 Due to the nature of the proposed design and intent for a subterranean level, waterproofing of subterranean walls and slabs is suggested. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

7.13.6 For seismic design purposes, a coefficient of friction of 0.35 may be utilized between concrete slabs and subgrade soils without a moisture barrier, and 0.15 for slabs underlain by a moisture barrier.

7.13.7 Exterior slabs for walkways or flatwork, not subject to traffic loads, should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Prior to construction of slabs, the upper 12 inches of subgrade should be moistened to optimum moisture content and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Crack control joints should be spaced at

intervals not greater than 10 feet and should be constructed using saw-cuts or other methods as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. The project structural engineer should design construction joints as necessary.

7.13.8 The recommendations of this report are intended to reduce the potential for cracking of slabs due to settlement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.14 Preliminary Pavement Recommendations

7.14.1 Where new paving is to be placed, it is recommended that all existing fill and soft or unsuitable alluvial materials be excavated and properly recompacted for paving support. The client should be aware that excavation and compaction of all existing artificial fill and soft alluvium in the area of new paving is not required; however, paving constructed over existing unsuitable material may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper twelve inches of paving subgrade should be scarified, moisture conditioned to optimum moisture content, and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.14.2 The following pavement sections are based on an assumed R-Value of 35. Once site grading activities are complete an R-Value should be obtained by laboratory testing to confirm the properties of the soils serving as paving subgrade, prior to placing pavement.

7.14.3 The Traffic Indices listed below are estimates. Geocon does not practice in the field of traffic engineering. The actual Traffic Index for each area should be determined by the project civil engineer. If pavement sections for Traffic Indices other than those listed below are required, Geocon should be contacted to provide additional recommendations. Pavement thicknesses were determined following procedures outlined in the *California Highway Design Manual* (Caltrans). It is anticipated that the majority of traffic will consist of automobile and large truck traffic.

PRELIMINARY PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Automobile Parking And Driveways	4.0	3.0	4.0
Trash Truck & Fire Lanes	7.0	3.5	9.0

7.14.4 Asphalt concrete should conform to Section 203-6 of the "*Standard Specifications for Public Works Construction"* (Green Book). Class 2 aggregate base materials should conform to Section 26-1.02A of the "*Standard Specifications of the State of California, Department of Transportation"* (Caltrans). The use of Crushed Miscellaneous Base in lieu of Class 2 aggregate base is acceptable. Crushed Miscellaneous Base should conform to Section 200-2.4 of the "*Standard Specifications for Public Works Construction"* (Green Book).

7.14.5 Unless specifically designed and evaluated by the project structural engineer, where concrete paving will be utilized for support of vehicles, it is recommended that the concrete be a minimum of 5 inches of concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Concrete paving supporting vehicular traffic should be underlain by a minimum of 4 inches of aggregate base and a properly compacted subgrade. The subgrade and base material should be compacted to 95 percent relative compactions determined by ASTM Test Method D 1557 (latest edition).

7.14.6 The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Ponding of water on or adjacent to the pavement will likely result in saturation of the subgrade materials and subsequent cracking, subsidence and pavement distress. If planters are planned adjacent to paving, it is recommended that the perimeter curb be extended at least 12 inches below the bottom of the aggregate base to minimize the introduction of water beneath the paving.

7.15 Retaining Wall Design

7.15.1 The recommendations presented below are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 22 feet. In the event that walls higher than 22 feet are planned, Geocon should be contacted for additional recommendations.

7.15.2 Retaining wall foundations may be designed in accordance with the recommendations provided in the *Foundation Design* sections of this report (see Sections 7.6 through 7.8).

7.15.3 Retaining walls with a level backfill surface that are not restrained at the top should be designed utilizing a triangular distribution of pressure (active pressure). Restrained walls are those that are not allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, walls may be designed utilizing a triangular distribution of pressure (at-rest pressure). The table below presents recommended pressures to be used in retaining wall design, assuming that proper drainage will be maintained.

RETAINING WALL WITH LEVEL BACKFILL SURFACE

HEIGHT OF RETAINING WALL (Feet)	ACTIVE PRESSURE EQUIVALENT FLUID PRESSURE (Pounds Per Cubic Foot)	AT-REST PRESSURE EQUIVALENT FLUID PRESSURE (Pounds Per Cubic Foot)
Up to 12	38	60
12 to 22	47	68

7.15.4 The wall pressures provided above assume that the retaining wall will be properly drained preventing the buildup of hydrostatic pressure. If retaining wall drainage is not implemented, the equivalent fluid pressure to be used in design of undrained walls is 90 pcf. The value includes hydrostatic pressures plus buoyant lateral earth pressures.

7.15.5 The wall pressures provided above assume that the proposed retaining walls will support relatively undisturbed alluvial soils or engineered fill derived from onsite soils. If import soil will be used to backfill proposed retaining walls, revised earth pressures may be required to account for the geotechnical properties of the import soil used as engineered fill. This should be evaluated once the use of import soil is established. All imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site.

7.15.6 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent structures and should be designed for each condition as the project progresses.

7.15.7 It is recommended that line-load surcharges from adjacent wall footings, use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For \quad {}^{x}/_{H} \le 0.4$$

$$\sigma_H(z) = \frac{0.20\left(\frac{z}{H}\right)}{\left[0.16+\left(\frac{z}{H}\right)^2\right]^2}\frac{Q_L}{H}$$

and

$$For \quad {}^{x}/_{H} > 0.4$$

$$\sigma_H(x,z) = \frac{1.26\left(\frac{x}{H}\right)^2\left(\frac{z}{H}\right)}{\left[\left(\frac{x}{H}\right)^2+\left(\frac{z}{H}\right)^2\right]^2}\frac{Q_L}{H}$$

where x is the distance from the face of the excavation to the vertical line-load, H is the distance from the bottom of the footing to the bottom of excavation, z is the depth at which the horizontal pressure is desired, QL is the vertical line-load and σH is the horizontal pressure at depth z.

7.15.8 It is recommended that vertical point-loads, from construction equipment outriggers or adjacent building columns use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For \quad {}^{x}/_{H} \le 0.4$$

$$\sigma(z) = \frac{0.28\times\left(\frac{z}{H}\right)^2}{\left[0.16+\left(\frac{z}{H}\right)^2\right]^3}\times\frac{Q_p}{H^2}$$

and

$$For \quad {}^{x}/_{H} > 0.4$$

$$\sigma(z) = \frac{1.77\times\left(\frac{x}{H}\right)^2\times\left(\frac{z}{H}\right)^2}{\left[\left(\frac{x}{H}\right)^2+\left(\frac{z}{H}\right)^2\right]^3}\times\frac{Q_p}{H^2}$$

then

$$\sigma_H'(z) = \sigma_H(z)\cos^2(1.1\theta)$$

where x is the distance from the face of the excavation to the vertical point-load, H is distance from the outrigger/bottom of column footing to the bottom of excavation, z is the depth at which the horizontal pressure is desired, Q_p is the vertical point-load, σ is the vertical pressure at depth z, Θ is the angle between a line perpendicular to the bulkhead and a line from the point-load to half the pile spacing at the bulkhead, and σ_H is the horizontal pressure at depth z.

7.15.9 In addition to the recommended earth pressure, the upper 10 feet of the subterranean wall adjacent to the street and parking lot should be designed to resist a uniform lateral pressure of 100 psf, acting as a result of an assumed 300 psf surcharge behind the walls due to normal street traffic. If the traffic is kept back at least 10 feet from the subterranean walls, the traffic surcharge may be neglected.

7.15.10 Seismic lateral forces should be incorporated into the design as necessary, and recommendations for seismic lateral forces are presented below.

7.16 Dynamic (Seismic) Lateral Forces

7.16.1 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, proposed retaining walls in excess of 6 feet in height should be designed with seismic lateral pressure (Section 1803.5.12 of the 2013 CBC).

7.16.2 A seismic load of 12 pcf should be used for design of walls that support more than 6 feet of backfill in accordance with Section 1803.5.12 of the 2013 CBC. The seismic load is applied as an equivalent fluid pressure along the height of the wall and the calculated loads result in a maximum load exerted at the base of the wall and zero at the top of the wall. This seismic load should be applied in addition to the active earth pressure. The earth pressure is based on half of two thirds of PGA_M calculated from ASCE 7-10 Section 11.8.3.

7.17 Retaining Wall Drainage

7.17.1 Retaining walls should be provided with a drainage system extended at least two-thirds the height of the wall. At the base of the drain system, a subdrain covered with a minimum of 12 inches of gravel should be installed, and a compacted fill blanket or other seal placed at the surface (see Figure 24). The clean bottom and subdrain pipe, behind a retaining wall, should be observed by the Geotechnical Engineer (a representative of Geocon), prior to placement of gravel or compacting backfill.

7.17.2 As an alternative, a plastic drainage composite such as Miradrain or equivalent may be installed in continuous, 4-foot wide columns along the entire back face of the wall, at 8 feet on center. The top of these drainage composite columns should terminate approximately 18 inches below the ground surface, where either hardscape or a minimum of 18 inches of relatively cohesive material should be placed as a cap (see Figure 25). These vertical columns of drainage material would then be connected at the bottom of the wall to a collection panel or a one-cubic-foot rock pocket drained by a 4-inch subdrain pipe.

7.17.3 Subdrainage pipes at the base of the retaining wall drainage system should outlet to an acceptable location via controlled drainage structures.

7.17.4 Moisture affecting below grade walls is one of the most common post-construction complaints. Poorly applied or omitted waterproofing can lead to efflorescence or standing water. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

7.18 Elevator Pit Design

7.18.1 The elevator pit slab and retaining wall should be designed by the project structural engineer. Elevator pits may be designed in accordance with the recommendations in the *Conventional Foundation Design* and *Retaining Wall Design* section of this report (see Sections 7.7 and 7.15).

7.18.2 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic, or adjacent foundations and should be designed for each condition as the project progresses.

7.18.3 If retaining wall drainage is to be provided, the drainage system should be designed in accordance with the *Retaining Wall Drainage* section of this report (see Section 7.17).

7.18.4 It is suggested that the exterior walls and slab be waterproofed to prevent excessive moisture inside of the elevator pit. Waterproofing design and installation is not the responsibility of the geotechnical engineer.

7.19 Elevator Piston

7.19.1 If a plunger-type elevator piston is installed for this project, a deep drilled excavation will be required. It is important to verify that the drilled excavation is not situated immediately adjacent to a foundation or shoring pile, or the drilled excavation could compromise the existing foundation or pile support, especially if the drilling is performed subsequent to the foundation or pile construction.

7.19.2 Due to the preliminary nature of the project at this time, it is unknown if a plunger-type elevator piston will be included for this project. If in the future it is determined that a plunger-type elevator piston will be constructed, the location of the proposed elevator should be reviewed by the Geotechnical Engineer to evaluate the setback from foundations and shoring piles. Additional recommendations will be provided as necessary.

7.19.3 Casing may be required if caving is experienced in the drilled excavation. The contractor should be prepared to use casing and should have it readily available at the commencement of drilling activities. Continuous observation of the drilling and installation of the elevator piston by the Geotechnical Engineer (a representative of Geocon West, Inc.) is required.

7.19.4 The annular space between the piston casing and drilled excavation wall should be filled with a minimum of 1½-sack slurry pumped from the bottom up. As an alternative, pea gravel may be utilized. The use of soil to backfill the annular space is not acceptable.

7.20 Temporary Excavations

7.20.1 Excavations up to 22 feet in height are anticipated for excavation and construction of the proposed subterranean levels and foundation system and grading activities. The excavations are expected to expose artificial fill and alluvial soils, which are suitable for vertical excavations up to 5 feet where loose soils or caving sands are not present or where not surcharged by adjacent traffic or structures.

7.20.2 Vertical excavations greater than 5 feet will require sloping and/or shoring measures in order to provide a stable excavation. Where sufficient space is available, temporary unsurcharged embankments could be sloped back at a uniform 1:1 slope gradient or flatter, up to a maximum of 7 feet in height. A uniform slope does not have a vertical portion. Where space is limited, shoring measures will be required. *Shoring* data is provided in Section 7.21 of this report.

7.20.3 Where sloped embankments are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary construction embankments are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary

to prevent runoff water from entering the excavation and eroding the slope faces. Geocon personnel should inspect the soils exposed in the cut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur. All excavations should be stabilized within 30 days of initial excavation.

7.21 Shoring – Soldier Pile Design and Installation

7.21.1 The following information on the design and installation of shoring is preliminary. Review of the final shoring plans and specifications should be made by this office prior to bidding or negotiating with a shoring contractor.

7.21.2 One method of shoring would consist of steel soldier piles, placed in drilled holes and backfilled with concrete. The steel soldier piles may also be installed utilizing high frequency vibration. Where maximum excavation heights are less than 12 feet the soldier piles are typically designed as cantilevers. Where excavations exceed 12 feet or are surcharged, soldier piles may require lateral bracing utilizing drilled tie-back anchors or raker braces to maintain an economical steel beam size and prevent excessive deflection. The size of the steel beam, the need for lateral bracing, and the acceptable shoring deflection should be determined by the project shoring engineer.

7.21.3 The design embedment of the shoring pile toes must be maintained during excavation activities. The toes of the perimeter shoring piles should be deepened to take into account any required excavations necessary for foundation excavations and/or adjacent drainage systems.

7.21.4 Piles utilized for shoring can also be incorporated into a permanent retaining wall system (shotcrete wall) and should be designed in accordance with the earth pressure provided in the *Retaining Wall Design* section of this report (see Section 7.15).

7.21.5 Drilled cast-in-place soldier piles should be placed no closer than three diameters on center. The minimum diameter of the piles is 18 inches. Structural concrete should be used for the soldier piles below the excavation; lean-mix concrete may be employed above that level. As an alternative, lean-mix concrete may be used throughout the pile where the reinforcing consists of a wideflange section. The slurry must be of sufficient strength to impart the lateral bearing pressure developed by the wideflange section to the soil. For design purposes, an allowable passive value for the soils below the bottom plane of excavation may be assumed to be 250 psf per foot. Where piles are installed by vibration techniques, the passive pressure may be assumed to mobilize across a width equal to the two times the dimension of the beam flange. The allowable passive value may be doubled for isolated piles spaced a minimum of three times the pile diameter. To develop the full lateral value, provisions should be implemented to assure firm contact between the soldier piles and the undisturbed alluvium.

7.21.6 Groundwater was not encountered during site exploration, and the groundwater table is sufficient deep that it will not be encountered during pile installation. However, local seepage may be encountered during excavations for the proposed soldier piles, especially if conducted during the rainy season. If more than 6 inches of water is present in the bottom of the excavation, a tremie is required to place the concrete into the bottom of the hole. A tremie should consist of a rigid, water-tight tube having a diameter of not less than 6 inches with a hopper at the top. The tube should be equipped with a device that will close the discharge end and prevent water from entering the tube while it is being charged with concrete. The tremie should be supported so as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end should be closed at the start of the work to prevent water entering the tube and should be entirely sealed at all times, except when the concrete is being placed. The tremie tube should be kept full of concrete. The flow should be continuous until the work is completed and the resulting concrete seal should be monolithic and homogeneous. The tip of the tremie tube should always be kept about 5 feet below the surface of the concrete and definite steps and safeguards should be taken to insure that the tip of the tremie tube is never raised above the surface of the concrete.

7.21.7 A special concrete mix should be used for concrete to be placed below water. The design should provide for concrete with an unconfined compressive strength psi of 1,000 pounds per square inch (psi) over the initial job specification. An admixture that reduces the problem of segregation of paste/aggregates and dilution of paste should be included. The slump should be commensurate to any research report for the admixture, provided that it should also be the minimum for a reasonable consistency for placing when water is present.

7.21.8 Casing will likely be required if caving is experienced, and the contractor should have casing available prior to commencement of pile excavation. When casing is used, extreme care should be employed so that the pile is not pulled apart as the casing is withdrawn. At no time should the distance between the surface of the concrete and the bottom of the casing be less than 5 feet. As an alternative, piles may be vibrated into place; however, there is always a risk that excessive vibrations in sandy soils could induce settlements and distress to adjacent offsite improvements. Continuous observation of the drilling and pouring of the piles by the Geotechnical Engineer (a representative of Geocon West, Inc.), is required.

7.21.9 If a vibratory method of solider pile installation is utilized, predrilling may be performed prior to installation of the steel beams. If predrilling is performed, it is recommended that the bore diameter be at least 2 inches smaller than the largest dimension of the pile to prevent excessive loss in the frictional component of the pile capacity. Predrilling should not be conducted below the proposed excavation bottom.

7.21.10 If a vibratory method is utilized, the owner should be aware of the potential risks associated with vibratory efforts, which typically involve inducing settlement within the vicinity of the pile which could result in a potential for damage to existing improvements in the area.

7.21.11 The level of vibration that results from the installation of the piles should not exceed a threshold where occupants of nearby structures are disturbed, despite higher vibration tolerances that a building may endure without deformation or damage. The main parameter used for vibration assessment is peak particle velocity in units of inch per second (in/sec). The acceptable range of peak particle velocity should be evaluated based on the age and condition of adjacent structures, as well as the tolerance of human response to vibration.

7.21.12 Based on Table 19 of the *Transportation and Construction Induced Vibration Guidance Manual* (Caltrans 2004), a continuous source of vibrations (ex. vibratory pile driving) which generates a maximum peak particle velocity of 0.5 in/sec is considered tolerable for modern industrial/commercial buildings and new residential structures. The Client should be aware that a lower value may be necessary if older or fragile structures are in the immediate vicinity of the site.

7.21.13 Vibrations should be monitored and record with seismographs during pile installation to detect the magnitude of vibration and oscillation experienced by adjacent structures. If the vibrations exceed the acceptable range during installation, the shoring contractor should modify the installation procedure to reduce the values to within the acceptable range. Vibration monitoring is not the responsibility of the Geotechnical Engineer.

7.21.14 Geocon does not practice in the field of vibration monitoring. If construction techniques will be implemented, it is recommended that qualified consultant be retained to provide site specific recommendations for vibration thresholds and monitoring.

7.21.15 The frictional resistance between the soldier piles and retained soil may be used to resist the vertical component of the anchor load. The coefficient of friction may be taken as 0.35 based on uniform contact between the steel beam and lean-mix concrete and retained earth. The portion of soldier piles below the plane of excavation may also be employed to resist the downward loads. The downward capacity may be determined using a frictional resistance of 350 psf per foot.

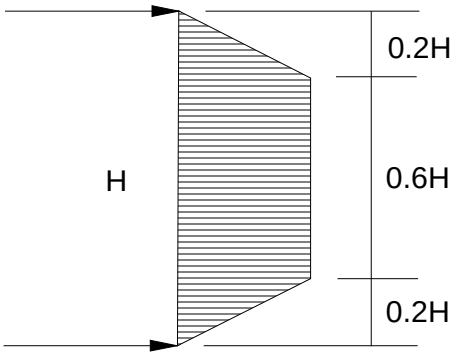
7.21.16 Due to the nature of the site soils, it is expected that continuous lagging between soldier piles will be required. However, it is recommended that the exposed soils be observed by the Geotechnical Engineer (a representative of Geocon West, Inc.), to verify the presence of any competent, cohesive soils and the areas where lagging may be omitted.

7.21.17 The time between lagging excavation and lagging placement should be as short as possible soldier piles should be designed for the full-anticipated pressures. Due to arching in the soils, the pressure on the lagging will be less. It is recommended that the lagging be designed for the full design pressure but be limited to a maximum of 400 psf.

7.21.18 For the design of shoring, it is recommended that an equivalent fluid pressure based on the following table, be utilized for design. A diagram depicting the trapezoidal pressure distribution of lateral earth pressure is provided below the table.

HEIGHT OF SHORING (FEET)	**EQUIVALENT FLUID PRESSURE (Pounds Per Cubic Foot) (ACTIVE PRESSURE)**	**EQUIVALENT FLUID PRESSURE Trapezoidal (Where H is the height of the shoring in feet)**
Up to 12	30	19H
12 to 22	38	24H

Trapezoidal Distribution of Pressure



7.21.19 It is very important to note that active pressures can only be achieved when movement in the soil (earth wall) occurs. If movement in the soil is not acceptable, such as adjacent to an existing structure, or the pile is restrained from movement by bracing or a tie back anchor, at-rest pressures of 50 pcf and 600 pcf for shoring up to 12 feet and 22 feet, respectively, should be considered for design purposes.

7.21.20 Where a combination of sloped embankment and shoring is utilized, the pressure will be greater and must be determined for each combination. Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic, or adjacent structures and must be determined for each combination.

7.21.21 It is recommended that line-load surcharges from adjacent wall footings, use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For \quad x/H \le 0.4$$

$$\sigma_H(z) = \frac{0.20\left(\frac{z}{H}\right)}{\left[0.16+\left(\frac{z}{H}\right)^2\right]^2}\frac{Q_L}{H}$$

and

$$For \quad x/H > 0.4$$

$$\sigma_H(x,z) = \frac{1.26\left(\frac{x}{H}\right)^2\left(\frac{z}{H}\right)}{\left[\left(\frac{x}{H}\right)^2+\left(\frac{z}{H}\right)^2\right]^2}\frac{Q_L}{H}$$

where x is the distance from the face of the excavation to the vertical line-load, H is the distance from the bottom of the footing to the bottom of excavation, z is the depth at which the horizontal pressure is desired, QL is the vertical line-load and σH is the horizontal pressure at depth z.

7.21.22 It is recommended that vertical point-loads, from construction equipment outriggers or adjacent building columns use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For \quad x/H \le 0.4$$

$$\sigma(z) = \frac{0.28 \times \left(\frac{z}{H}\right)^2}{\left[0.16 + \left(\frac{z}{H}\right)^2\right]^3} \times \frac{Q_p}{H^2}$$

and

$$For \quad x/H > 0.4$$

$$\sigma(z) = \frac{1.77 \times \left(\frac{x}{H}\right)^2 \times \left(\frac{z}{H}\right)^2}{\left[\left(\frac{x}{H}\right)^2 + \left(\frac{z}{H}\right)^2\right]^3} \times \frac{Q_p}{H^2}$$

then

$$\sigma_H^{'}(z) = \sigma_H(z)\cos^2(1.1\theta)$$

where x is the distance from the face of the excavation to the vertical point-load, H is distance from the outrigger/bottom of column footing to the bottom of excavation, z is the depth at which the horizontal pressure is desired, Q_p is the vertical point-load, σ is the vertical pressure at depth z, Θ is the angle between a line perpendicular to the bulkhead and a line from the point-load to half the pile spacing at the bulkhead, and σ_H is the horizontal pressure at depth z.

7.21.23 In addition to the recommended earth pressure, the upper ten feet of the shoring adjacent to the street or driveway areas should be designed to resist a uniform lateral pressure of 100 psf, acting as a result of an assumed 300 psf surcharge behind the shoring due to normal street traffic. If the traffic is kept back at least 10 feet from the shoring, the traffic surcharge may be neglected.

7.21.24 It is difficult to accurately predict the amount of deflection of a shored embankment. It should be realized that some deflection will occur. It is recommended that the deflection be minimized to prevent damage to existing structures and adjacent improvements. Where public right-of-ways are present or adjacent offsite structures do not surcharge the shoring excavation, the shoring deflection should be limited to less than 1 inch at the top of the shored embankment. Where offsite structures are within the shoring surcharge area it is recommended that the beam deflection be limited to less than ½ inch at the elevation of the adjacent offsite foundation, and no deflection at all if deflections will damage existing structures. The allowable deflection is dependent on many factors, such as the presence of structures and utilities near the top of the embankment, and will be assessed and designed by the project shoring engineer.

7.21.25 Because of the depth of the excavation, some means of monitoring the performance of the shoring system is suggested. The monitoring should consist of periodic surveying of the lateral and vertical locations of the tops of all soldier piles and the lateral movement along the entire lengths of selected soldier piles.

7.21.26 Due to the depth of the depth of the excavation and proximity to adjacent structures, it is suggested that prior to excavation the existing improvements be inspected to document the present condition. For documentation purposes, photographs should be taken of preconstruction distress conditions and level surveys of adjacent grade and pavement should be considered. During excavation activities, the adjacent structures and pavement should be periodically inspected for signs of distress. In the even that distress or settlement is noted, an investigation should be performed and corrective measures taken sot that continued or worsened distress or settlement is mitigated. Documentation and monitoring of the offsite structures and improvements is not the responsibility of the geotechnical engineer.

7.22 Tie-Back Anchors

7.22.1 Tie-back anchors may be used with the solider pile wall system to resist lateral loads. Post-grouted friction anchors are recommended. For design purposes, it may be assumed that the active wedge adjacent to the shoring is defined by a plane drawn 35 degrees with the vertical through the bottom plane of the excavation. Friction anchors should extend a minimum of 20 feet beyond the potentially active wedge and to greater lengths if necessary to develop the desired capacities. The locations and depths of all offsite utilities should be thoroughly checked and incorporated into the drilling angle design for the tie-back anchors.

7.22.2 The capacities of the anchors should be determined by testing of the initial anchors as outlined in a following section. Only the frictional resistance developed beyond the active wedge would be effective in resisting lateral loads. Anchors should be placed at least 6 feet on center to be considered isolated. For preliminary design purposes, it is estimated that drilled friction anchors constructed without utilizing post-grouting techniques will develop average skin frictions as follows:

- 5 feet below the top of the excavation – 650 pounds per square foot
- 12 feet below the top of the excavation – 900 pounds per square foot

7.22.3 Depending on the techniques utilized, and the experience of the contractor performing the installation, a maximum allowable friction capacity of 2.5 kips per linear foot for post-grouted anchors (for a minimum 20 foot length beyond the active wedge) may be assumed for design purposes. Only the frictional resistance developed beyond the active wedge should be utilized in resisting lateral loads.

7.23 Anchor Installation

7.23.1 Tied-back anchors are typically installed between 20 and 40 degrees below the horizontal; however, occasionally alternative angles are necessary to avoid existing improvements and utilities. The locations and depths of all offsite utilities should be thoroughly checked prior to design and installation of the tie-back anchors. Caving of the anchor shafts, particularly within sand and gravel deposits or seepage zones, should be anticipated during installation and provisions should be implemented in order to minimize such caving. It is suggested that hollow-stem auger drilling equipment be used to install the anchors. The anchor shafts should be filled with concrete by pumping from the tip out, and the concrete should extend from the tip of the anchor to the active wedge. In order to minimize the chances of caving, it is recommended that the portion of the anchor shaft within the active wedge be backfilled with sand before testing the anchor. This portion of the shaft should be filled tightly and flush with the face of the excavation. The sand backfill should be placed by pumping; the sand may contain a small amount of cement to facilitate pumping.

7.24 Anchor Testing

7.24.1 All of the anchors should be tested to at least 150 percent of design load. The total deflection during this test should not exceed 12 inches. The rate of creep under the 150 percent test load should not exceed 0.1 inch over a 15-minute period in order for the anchor to be approved for the design loading.

7.24.2 At least ten percent of the anchors should be selected for "quick" 200 percent tests and three additional anchors should be selected for 24-hour 200 percent tests. The purpose of the 200 percent tests is to verify the friction value assumed in design. The anchors should be tested to develop twice the assumed friction value. These tests should be performed prior to installation of additional tiebacks. Where satisfactory tests are not achieved on the initial anchors, the anchor diameter and/or length should be increased until satisfactory test results are obtained.

7.24.3 The total deflection during the 24-hour 200 percent test should not exceed 12 inches. During the 24-hour tests, the anchor deflection should not exceed 0.75 inches measured after the 200 percent test load is applied.

7.24.4 For the "quick" 200 percent tests, the 200 percent test load should be maintained for 30 minutes. The total deflection of the anchor during the 200 percent quick tests should not exceed 12 inches; the deflection after the 200 percent load has been applied should not exceed 0.25 inch during the 30-minute period.

7.24.5 After a satisfactory test, each anchor should be locked-off at the design load. This should be verified by rechecking the load in the anchor. The load should be within 10 percent of the design load. A representative of this firm should observe the installation and testing of the anchors.

7.25 Internal Bracing

7.25.1 Rakers may be utilized to brace the soldier piles in lieu of tieback anchors. The raker bracing could be supported laterally by temporary concrete footings (deadmen) or by the permanent, interior footings. For design of such temporary footings or deadmen, poured with the bearing surface normal to rakers inclined at 45 degrees, a bearing value of 2,000 psf may be used, provided the shallowest point of the footing is at least one foot below the lowest adjacent grade. The structural engineer should review the shoring plans to determine if raker footings conflict with the structural foundation system. The client should be aware that the utilization of rakers could significantly impact the construction schedule due to their intrusion into the construction site and potential interference with equipment.

7.26 Surface Drainage

7.26.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the original designed engineering properties. Proper drainage should be maintained at all times.

7.26.2 The site soils are highly sensitive to moisture and are subject to settlement when wetted. All site drainage should be collected and controlled in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2013 CBC 1804.3 or other applicable standards. In addition, drainage should not be allowed to flow uncontrolled over any descending slope. Discharge from downspouts, roof drains and scuppers are not recommended onto unprotected soils within five feet of the building perimeter. Planters which are located adjacent to foundations should be sealed to prevent moisture intrusion into the soils providing foundation support. Landscape irrigation is not recommended within 5 feet of the building perimeter footings except when enclosed in protected planters.

7.26.3 Positive site drainage should be provided away from structures, pavement, and the tops of slopes to swales or other controlled drainage structures. The building pad and pavement areas should be fine graded such that water is not allowed to pond.

7.26.4 Landscaping planters immediately adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Either a subdrain, which collects excess irrigation water and transmits it to drainage structures, or an impervious above-grade planter boxes should be used. In addition, where landscaping is planned adjacent to the pavement, it is recommended that consideration be given to providing a cutoff wall along the edge of the pavement that extends at least 12 inches below the base material.

7.27 Plan Review

7.27.1 Grading, foundation, and shoring plans should be reviewed by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to finalization to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon West, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon West, Inc.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid at the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

LIST OF REFERENCES

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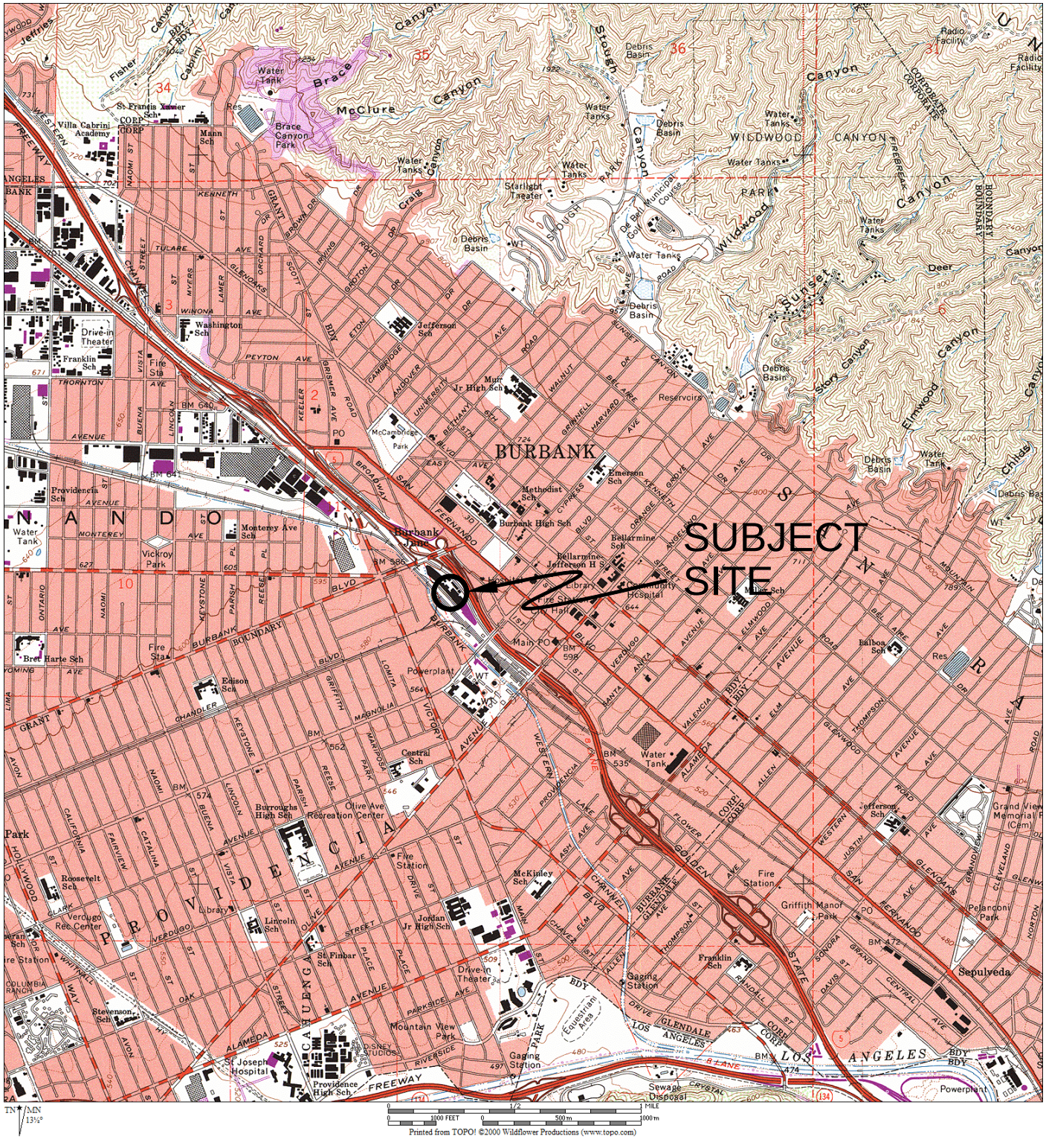

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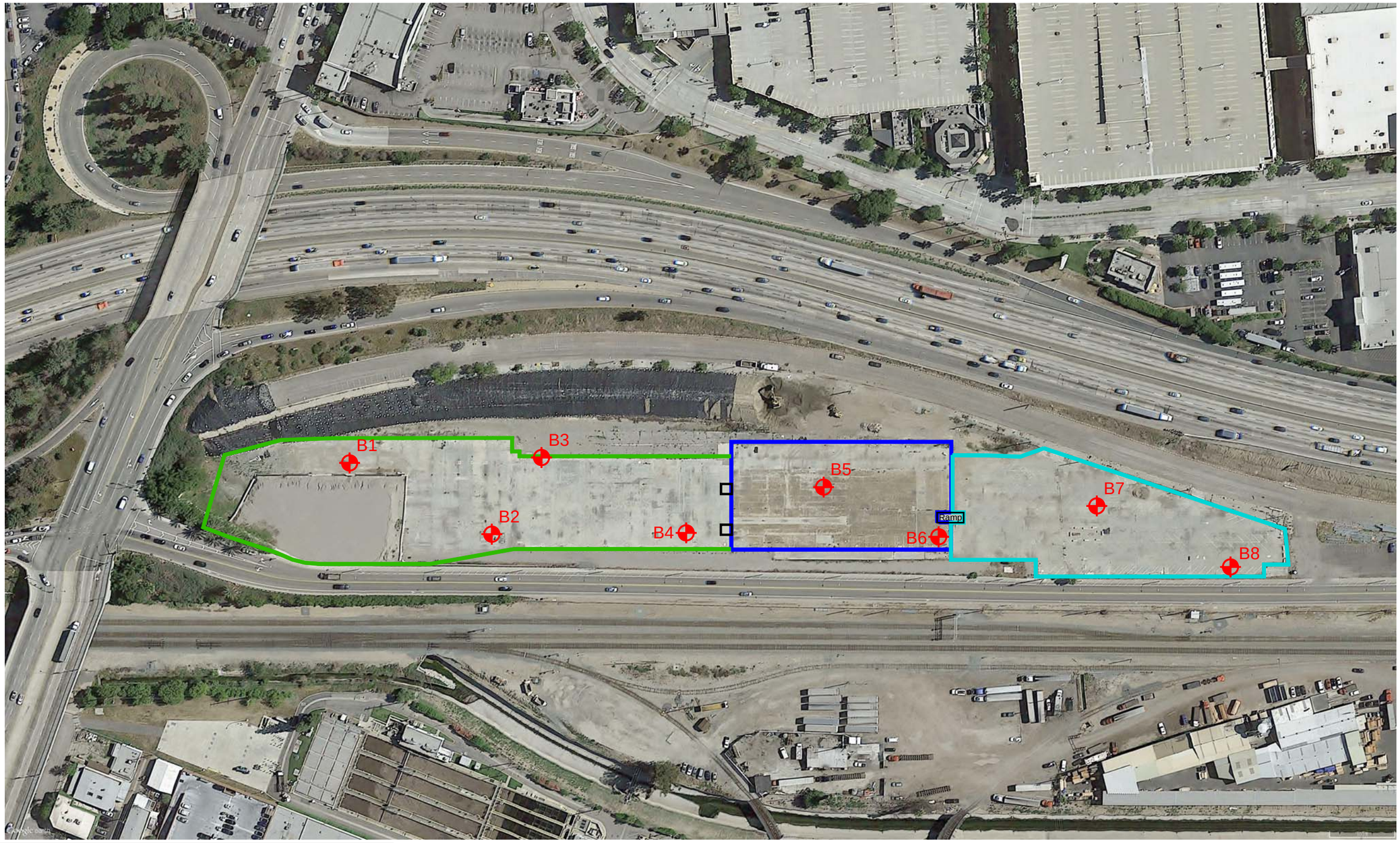
VICINITY MAP

4TERRA-LA I LLC
777 NORTH FRONT STREET
BURBANK, CALIFORNIA

DRAFTED BY: MDS	CHECKED BY: SFK	FEB. 2016	PROJECT NO. A9377-06-01	FIG. 1



LEGEND

B1 — Approximate Location of Boring

Approximate Extents of Elevated Concrete Slabs

0 150' 300'

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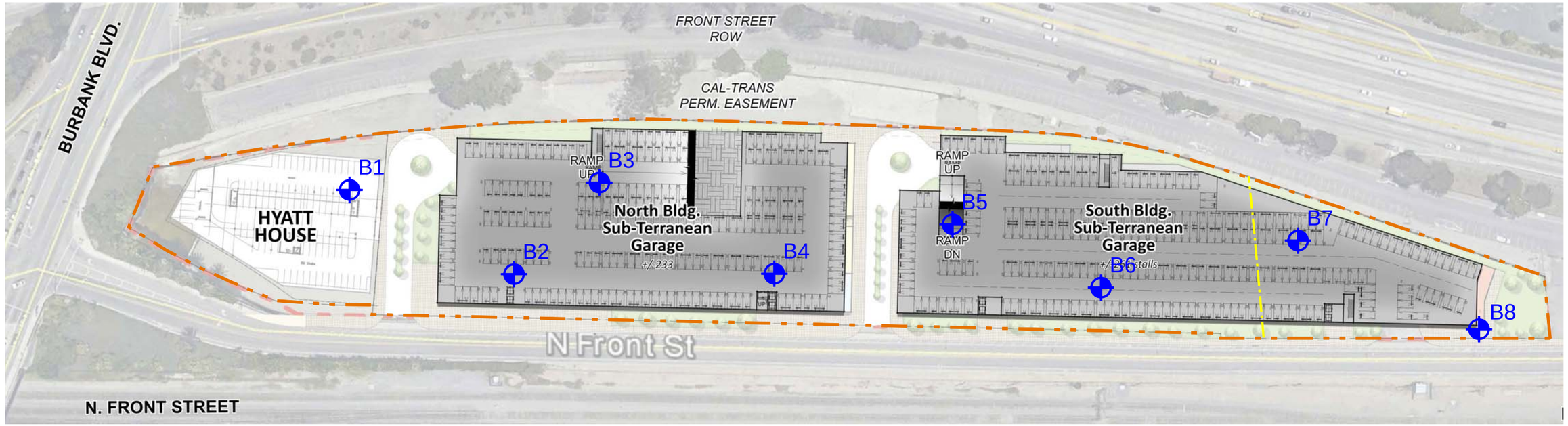
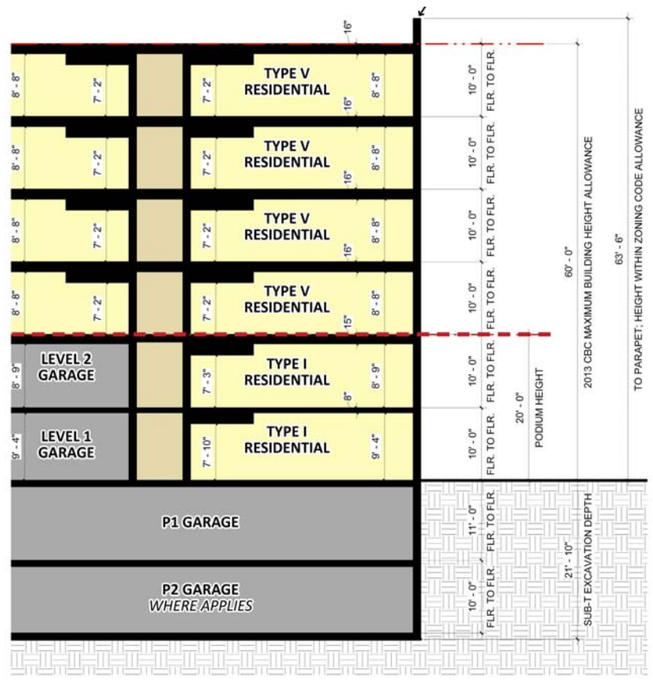
DRAFTED BY: MDS | CHECKED BY: SKF

SITE EXPLORATION PLAN

4TERRA-LA I LLC
777 NORTH FRONT STREET
BURBANK, CALIFORNIA

FEB. 2016 | PROJECT NO. A9377-06-01 | FIG.2





TYPICAL BLDG. SECTION
W/ STANDARD FLOOR ELEVATIONS

1" = 30' (H&V)

Note: Extents of P2 undetermined at this time and may only include a a portion of the building footprint.

0 120' 240'

LEGEND

B8 — Approximate Location of Boring

Approximate Property Line

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DRAFTED BY: JMT | CHECKED BY: NDB

PROPOSED DEVELOPMENT PLAN

4TERRA-LA I LLC
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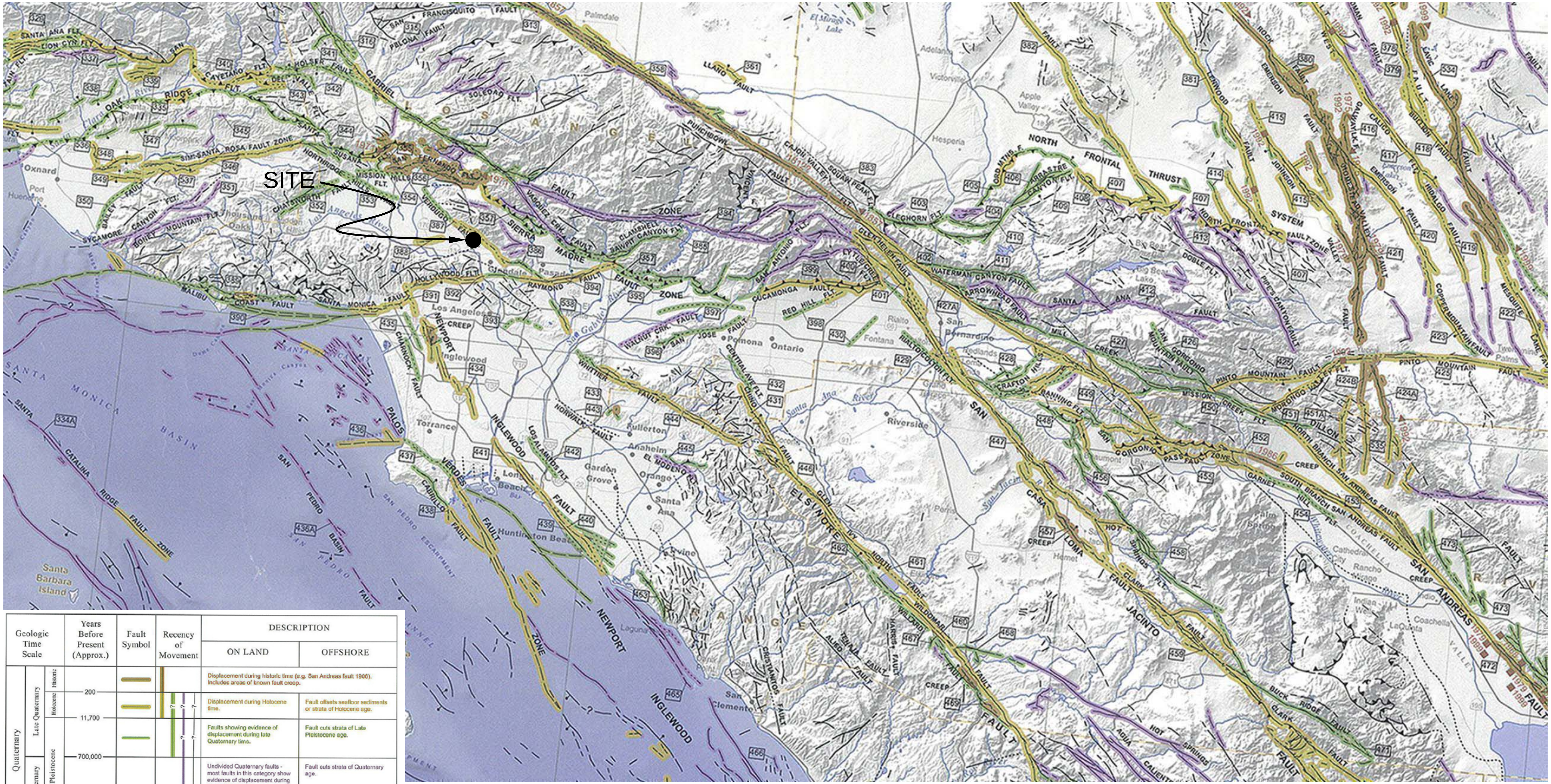
BURBANK, CALIFORNIA

FEB. 2016 | PROJECT NO. A9377-06-01 | FIG. 3

Reference: Jennings, C.W. and Bryant, W. A., 2010, Fault Activity Map of California, California Geological Survey Geologic Data Map No. 6.



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION: ON LAND	DESCRIPTION: OFFSHORE
Quaternary	Late Quaternary	Historic	200			Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
Quaternary	Late Quaternary	Holocene	11,700		? ? ?	Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
Quaternary	Late Quaternary	Pleistocene	700,000		? ?	Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
Quaternary	Early Quaternary	Pleistocene	1,600,000*		?	Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			4.5 billion (Age of Earth)			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.6 Ma criterion.

N

0 12 24 Miles

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REGIONAL FAULT MAP

4TERRA-LA I LLC
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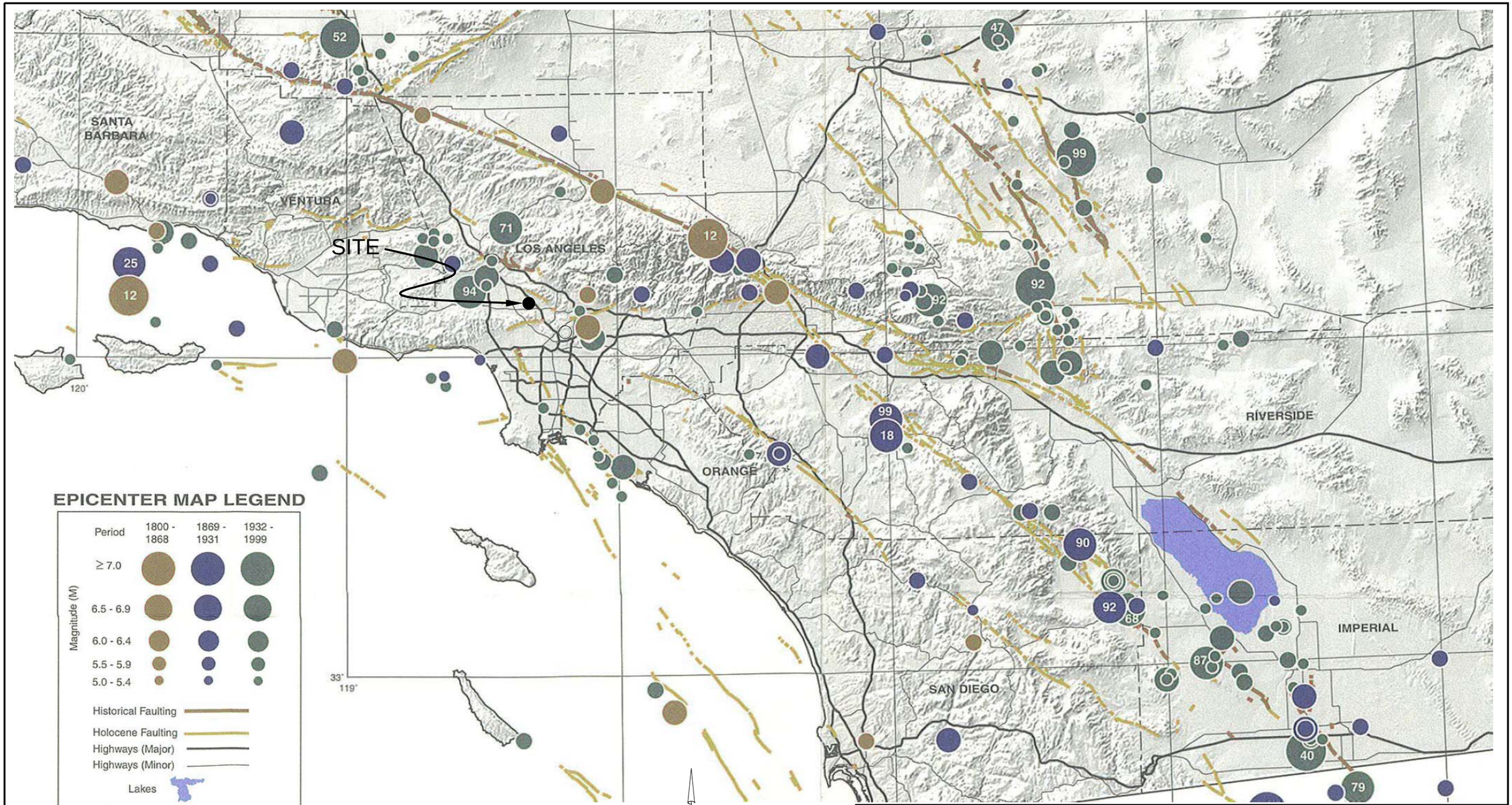
BURBANK, CALIFORNIA

FEB. 2016 | PROJECT NO. A9377-06-01 | FIG. 4



EPICENTER MAP LEGEND

Period	1800 - 1868	1869 - 1931	1932 - 1999
≥ 7.0			
6.5 - 6.9			
6.0 - 6.4			
5.5 - 5.9			
5.0 - 5.4			

Magnitude (M)

- Historical Faulting
- Holocene Faulting
- Highways (Major)
- Highways (Minor)
- Lakes
- 65 — Last two digits of M ≥ 6.5 earthquake year

N

0 20 40 Miles

Reference: Toppozada, T., Branum, D., Petersen, M., Hallstrom, C., Cramer, C., and Reichle, M., 2000, Epicenters and Areas Damaged by M≥5 California Earthquakes, 1800 - 1999, California Geological Survey, Map Sheet 49.

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REGIONAL SEISMICITY MAP

4TERRA-LA I LLC
777 NORTH FRONT STREET
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FEB. 2016 | PROJECT NO. A9377-06-01 | FIG.5

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 1

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
DESIGN EARTHQUAKE

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.70
Peak Horiz. Acceleration PGA_M (g):	0.840
2/3 PGA_M (g):	0.560
Calculated Mag.Wtg.Factor:	0.753
Historic High Groundwater:	50.0
Groundwater Depth During Exploration:	60.0

By Thomas F. Blake (1994-1996)
ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.15
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	130.1	0	3	1.0	1		42	2.000	7.8	130.1	0.087	0.998	0.274	--
2.0	130.1	0	3	2.0	1		41	2.000	7.8	130.1	0.087	0.993	0.272	--
3.0	130.1	0	3	3.0	1		39	2.000	7.8	130.1	0.087	0.989	0.271	--
4.0	130.1	0	3	4.0	1		38	2.000	7.8	130.1	0.087	0.984	0.270	--
5.0	130.1	0	3	5.0	1		37	1.889	7.3	130.1	0.084	0.979	0.269	--
6.0	130.1	0	3	6.0	1		37	1.708	6.6	130.1	0.078	0.975	0.267	--
7.0	130.1	0	3	7.0	1		36	1.572	6.1	130.1	0.074	0.970	0.266	--
8.0	130.1	0	3	8.0	1		35	1.463	5.7	130.1	0.071	0.966	0.265	--
9.0	130.1	0	3	9.0	1		34	1.374	5.3	130.1	0.068	0.961	0.264	--
10.0	130.1	0	3	10.0	1	41	33	1.300	12.0	130.1	0.132	0.957	0.262	--
11.0	130.1	0	3	10.0	1	41	33	1.236	11.8	130.1	0.129	0.952	0.261	--
12.0	130.1	0	3	10.0	1	41	33	1.181	11.6	130.1	0.127	0.947	0.260	--
13.0	130.1	0	3	10.0	1	41	33	1.133	11.4	130.1	0.125	0.943	0.259	--
14.0	130.1	0	3	10.0	1	41	33	1.090	11.2	130.1	0.123	0.938	0.257	--
15.0	139.6	0	9	12.5	1	25	55	1.051	16.8	139.6	0.183	0.934	0.256	--
16.0	139.6	0	9	12.5	1	25	55	1.014	16.4	139.6	0.178	0.929	0.255	--
17.0	139.1	0	7	17.5	1	72	44	0.981	17.1	139.1	0.184	0.925	0.253	--
18.0	139.1	0	7	17.5	1	72	44	0.951	16.8	139.1	0.181	0.920	0.252	--
19.0	139.1	0	7	17.5	1	72	44	0.924	16.5	139.1	0.178	0.915	0.251	--
20.0	139.1	0	14	17.5	1	25	63	0.898	23.2	139.1	0.255	0.911	0.250	--
21.0	139.1	0	14	17.5	1	25	63	0.875	22.7	139.1	0.249	0.906	0.248	--
22.0	119.3	0	29	22.5	1	6	84	0.855	40.0	119.3	Infin.	0.902	0.247	--
23.0	119.3	0	29	22.5	1	6	84	0.838	39.2	119.3	Infin.	0.897	0.246	--
24.0	119.3	0	29	22.5	1	6	84	0.822	38.4	119.3	Infin.	0.893	0.245	--
25.0	119.3	0	29	22.5	1	6	84	0.806	37.7	119.3	Infin.	0.888	0.243	--
26.0	119.3	0	29	22.5	1	6	84	0.792	37.0	119.3	Infin.	0.883	0.242	--
27.0	119.3	0	29	22.5	1	6	84	0.778	36.4	119.3	Infin.	0.879	0.241	--
28.0	136.8	0	20	27.5	1	25	66	0.764	30.3	136.8	Infin.	0.874	0.240	--
29.0	136.8	0	20	27.5	1	25	66	0.750	29.9	136.8	0.428	0.870	0.238	--
30.0	136.8	0	20	27.5	1	25	66	0.736	29.4	136.8	0.378	0.865	0.237	--
31.0	136.8	0	20	27.5	1	25	66	0.723	29.0	136.8	0.355	0.861	0.236	--
32.0	136.8	0	28	32.5	1	25	73	0.711	38.9	136.8	Infin.	0.856	0.235	--
33.0	136.8	0	28	32.5	1	25	73	0.700	38.3	136.8	Infin.	0.851	0.233	--
34.0	136.8	0	28	32.5	1	25	73	0.689	37.8	136.8	Infin.	0.847	0.232	--
35.0	136.8	0	28	32.5	1	25	73	0.678	37.3	136.8	Infin.	0.842	0.231	--
36.0	131.6	0	30	37.5	1	10	72	0.669	35.7	131.6	Infin.	0.838	0.230	--
37.0	131.6	0	30	37.5	1	10	72	0.659	35.2	131.6	Infin.	0.833	0.228	--
38.0	131.6	0	30	37.5	1	10	72	0.650	34.8	131.6	Infin.	0.829	0.227	--
39.0	131.6	0	30	37.5	1	10	72	0.642	34.3	131.6	Infin.	0.824	0.226	--
40.0	122.8	0	30	37.5	1	10	72	0.634	33.9	122.8	Infin.	0.819	0.225	--
41.0	122.8	0	30	37.5	1	10	72	0.627	33.5	122.8	Infin.	0.815	0.223	--
42.0	122.8	0	30	37.5	1	10	72	0.620	33.2	122.8	Infin.	0.810	0.222	--
43.0	131.8	0	28	42.5	1	10	67	0.612	30.7	131.8	Infin.	0.806	0.221	--
44.0	131.8	0	28	42.5	1	10	67	0.605	30.3	131.8	Infin.	0.801	0.220	--
45.0	131.8	0	28	42.5	1	10	67	0.598	30.0	131.8	Infin.	0.797	0.218	--
46.0	131.8	0	28	42.5	1	10	67	0.592	29.7	131.8	0.363	0.792	0.217	--
47.0	131.8	0	28	42.5	1	10	67	0.585	29.4	131.8	0.340	0.787	0.216	--
48.0	131.8	0	11	47.5	1	54	40	0.579	18.0	131.8	0.158	0.783	0.215	--
49.0	128.6	0	11	47.5	1	54	40	0.573	17.9	128.6	0.157	0.778	0.213	--
50.0	128.6	1	20	52.5	1	54	53	0.567	26.6	66.2	0.250	0.774	0.213	1.17
51.0	137.2	1	20	52.5	1	53	53	0.562	26.4	74.8	0.247	0.769	0.214	1.16
52.0	137.2	1	20	52.5	1	53	53	0.556	26.2	74.8	0.244	0.765	0.215	1.14
53.0	137.2	1	20	52.5	1	53	53	0.550	26.0	74.8	0.241	0.760	0.215	1.12
54.0	137.2	1	20	52.5	1	53	53	0.545	25.8	74.8	0.238	0.755	0.216	1.10
55.0	137.2	1	20	52.5	1	53	53	0.540	25.6	74.8	0.236	0.751	0.216	1.09
56.0	128.6	1	22	52.5	1	54	55	0.535	27.3	66.2	0.263	0.746	0.217	1.21
57.0	128.6	1	22	52.5	1	54	55	0.530	27.1	66.2	0.260	0.742	0.217	1.20
58.0	141.3	1	58	57.5	1	10	88	0.525	53.7	78.9	Infin.	0.737	0.217	Non-Liq.
59.0	141.3	1	58	57.5	1	10	88	0.521	53.2	78.9	Infin.	0.733	0.218	Non-Liq.
60.0	141.3	1	58	57.5	1	10	88	0.517	52.8	78.9	Infin.	0.728	0.218	Non-Liq.
61.0	141.3	1	58	57.5	1	10	88	0.514	52.6	78.9	Infin.	0.723	0.218	Non-Liq.
62.0	141.3	1	58	57.5	1	10	88	0.512	52.3	78.9	Infin.	0.719	0.218	Non-Liq.

Figure 6

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 1

LIQUEFACTION SETTLEMENT ANALYSIS
DESIGN EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.70
PGAM (g):	0.840
2/3 PGAM (g):	0.56
Calculated Mag.Wtg.Factor:	0.753
Historic High Groundwater:	50.0
Groundwater @ Exploration:	60.0

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e_{15}] (%)	EQ. SETTLE. Pe (in.)
1	3	130.06929	0.033	0.033	42	8	0.364	--	0.00	0.00
2	3	130.06929	0.098	0.098	41	8	0.364	--	0.00	0.00
3	3	130.06929	0.163	0.163	39	8	0.364	--	0.00	0.00
4	3	130.06929	0.228	0.228	38	8	0.364	--	0.00	0.00
5	3	130.06929	0.293	0.293	37	7	0.364	--	0.00	0.00
6	3	130.06929	0.358	0.358	37	7	0.364	--	0.00	0.00
7	3	130.06929	0.423	0.423	36	6	0.364	--	0.00	0.00
8	3	130.06929	0.488	0.488	35	6	0.364	--	0.00	0.00
9	3	130.06929	0.553	0.553	34	5	0.364	--	0.00	0.00
10	3	130.06929	0.618	0.618	33	12	0.364	--	0.00	0.00
11	3	130.06929	0.683	0.683	33	12	0.364	--	0.00	0.00
12	3	130.06929	0.748	0.748	33	12	0.364	--	0.00	0.00
13	3	130.06929	0.813	0.813	33	11	0.364	--	0.00	0.00
14	3	130.06929	0.878	0.878	33	11	0.364	--	0.00	0.00
15	9	139.573	0.945	0.945	55	17	0.364	--	0.00	0.00
16	9	139.573	1.015	1.015	55	16	0.364	--	0.00	0.00
17	7	139.0551	1.085	1.085	44	17	0.364	--	0.00	0.00
18	7	139.0551	1.154	1.154	44	17	0.364	--	0.00	0.00
19	7	139.0551	1.224	1.224	44	17	0.364	--	0.00	0.00
20	14	139.0551	1.293	1.293	63	23	0.364	--	0.00	0.00
21	14	139.0551	1.363	1.363	63	23	0.364	--	0.00	0.00
22	29	119.3424	1.428	1.428	84	40	0.364	--	0.00	0.00
23	29	119.3424	1.487	1.487	84	39	0.364	--	0.00	0.00
24	29	119.3424	1.547	1.547	84	38	0.364	--	0.00	0.00
25	29	119.3424	1.607	1.607	84	38	0.364	--	0.00	0.00
26	29	119.3424	1.666	1.666	84	37	0.364	--	0.00	0.00
27	29	119.3424	1.726	1.726	84	36	0.364	--	0.00	0.00
28	20	136.8475	1.790	1.790	66	30	0.364	--	0.00	0.00
29	20	136.8475	1.858	1.858	66	30	0.364	--	0.00	0.00
30	20	136.8475	1.927	1.927	66	29	0.364	--	0.00	0.00
31	20	136.8475	1.995	1.995	66	29	0.364	--	0.00	0.00
32	28	136.8475	2.064	2.064	73	39	0.364	--	0.00	0.00
33	28	136.8475	2.132	2.132	73	38	0.364	--	0.00	0.00
34	28	136.8475	2.200	2.200	73	38	0.364	--	0.00	0.00
35	28	136.8475	2.269	2.269	73	37	0.364	--	0.00	0.00
36	30	131.6446	2.336	2.336	72	36	0.364	--	0.00	0.00
37	30	131.6446	2.402	2.402	72	35	0.364	--	0.00	0.00
38	30	131.6446	2.468	2.468	72	35	0.364	--	0.00	0.00
39	30	131.6446	2.533	2.533	72	34	0.364	--	0.00	0.00
40	30	122.7672	2.597	2.597	72	34	0.364	--	0.00	0.00
41	30	122.7672	2.658	2.658	72	34	0.364	--	0.00	0.00
42	30	122.7672	2.720	2.720	72	33	0.364	--	0.00	0.00
43	28	131.796	2.784	2.784	67	31	0.364	--	0.00	0.00
44	28	131.796	2.849	2.849	67	30	0.364	--	0.00	0.00
45	28	131.796	2.915	2.915	67	30	0.364	--	0.00	0.00
46	28	131.796	2.981	2.981	67	30	0.364	--	0.00	0.00
47	28	131.796	3.047	3.047	67	29	0.364	--	0.00	0.00
48	11	131.796	3.113	3.113	40	18	0.364	--	0.00	0.00
49	11	128.6	3.178	3.178	40	18	0.364	--	0.00	0.00
50	20	128.6	3.242	3.227	53	27	0.366	1.17	0.00	0.00
51	20	137.2406	3.309	3.262	53	26	0.369	1.16	0.00	0.00
52	20	137.2406	3.377	3.299	53	26	0.373	1.14	0.00	0.00
53	20	137.2406	3.446	3.337	53	26	0.376	1.12	0.00	0.00
54	20	137.2406	3.515	3.374	53	26	0.379	1.10	0.00	0.00
55	20	137.2406	3.583	3.412	53	26	0.382	1.09	0.80	0.10
56	22	128.6	3.650	3.447	55	27	0.386	1.21	0.00	0.00
57	22	128.6	3.714	3.480	55	27	0.389	1.20	0.00	0.00
58	58	141.3152	3.782	3.516	88	54	0.392	Non-Liq.	0.00	0.00
59	58	141.3152	3.852	3.556	88	53	0.395	Non-Liq.	0.00	0.00
60	58	141.3152	3.923	3.595	88	53	0.397	Non-Liq.	0.00	0.00
61	58	141.3152	3.994	3.635	88	53	0.400	Non-Liq.	0.00	0.00
62	58	141.3152	4.064	3.674	88	52	0.403	Non-Liq.	0.00	0.00

TOTAL SETTLEMENT = 0.1 INCHES

Figure 7

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 5

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
DESIGN EARTHQUAKE

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.70
Peak Horiz. Acceleration PGA_M (g):	0.840
2/3 PGA_M (g):	0.560
Calculated Mag.Wtg.Factor:	0.753
Historic High Groundwater:	50.0
Groundwater Depth During Exploration:	100.0

By Thomas F. Blake (1994-1996)
ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.15
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	126.3	0	8	1.0	1		68	2.000	20.7	126.3	0.226	0.998	0.274	--
2.0	126.3	0	8	2.0	1		66	2.000	20.7	126.3	0.226	0.993	0.272	--
3.0	126.3	0	8	3.0	1		65	2.000	20.7	126.3	0.226	0.989	0.271	--
4.0	126.3	0	8	4.0	1		63	2.000	20.7	126.3	0.226	0.984	0.270	--
5.0	126.3	0	8	5.0	1		61	1.917	19.8	126.3	0.216	0.979	0.269	--
6.0	126.3	0	8	6.0	1		60	1.734	17.9	126.3	0.195	0.975	0.267	--
7.0	126.3	0	8	7.0	1	50	59	1.595	23.5	126.3	0.262	0.970	0.266	--
8.0	126.3	0	8	8.0	1	50	57	1.485	22.4	126.3	0.247	0.966	0.265	--
9.0	126.3	0	8	9.0	1	50	56	1.394	21.4	126.3	0.235	0.961	0.264	--
10.0	126.3	0	8	10.0	1	50	55	1.319	20.7	126.3	0.225	0.957	0.262	--
11.0	126.3	0	7	12.5	1	50	49	1.255	18.4	126.3	0.200	0.952	0.261	--
12.0	126.3	0	7	12.5	1	50	49	1.199	17.9	126.3	0.194	0.947	0.260	--
13.0	126.3	0	7	12.5	1	50	49	1.150	17.4	126.3	0.189	0.943	0.259	--
14.0	126.3	0	7	12.5	1	50	49	1.107	17.0	126.3	0.185	0.938	0.257	--
15.0	131.0	0	7	17.5	1	10	45	1.067	12.2	131.0	0.132	0.934	0.256	--
16.0	131.0	0	7	17.5	1	10	45	1.031	11.8	131.0	0.128	0.929	0.255	--
17.0	131.0	0	7	17.5	1	31	45	0.998	16.3	131.0	0.176	0.925	0.253	--
18.0	131.0	0	7	17.5	1	31	45	0.968	16.0	131.0	0.173	0.920	0.252	--
19.0	131.0	0	7	17.5	1	31	45	0.941	15.7	131.0	0.170	0.915	0.251	--
20.0	134.4	0	23	22.5	1	31	75	0.916	39.7	134.4	Infin.	0.911	0.250	--
21.0	134.4	0	23	22.5	1	31	75	0.892	38.8	134.4	Infin.	0.906	0.248	--
22.0	134.4	0	23	22.5	1	31	75	0.870	38.0	134.4	Infin.	0.902	0.247	--
23.0	134.4	0	23	22.5	1	31	75	0.849	37.3	134.4	Infin.	0.897	0.246	--
24.0	134.4	0	23	22.5	1	31	75	0.830	36.6	134.4	Infin.	0.893	0.245	--
25.0	130.2	0	23	22.5	1	31	75	0.813	35.9	130.2	Infin.	0.888	0.243	--
26.0	130.2	0	23	22.5	1	31	75	0.797	35.3	130.2	Infin.	0.883	0.242	--
27.0	125.2	0	26	27.5	1	6	75	0.782	34.5	125.2	Infin.	0.879	0.241	--
28.0	125.2	0	26	27.5	1	6	75	0.768	33.8	125.2	Infin.	0.874	0.240	--
29.0	125.2	0	26	27.5	1	6	75	0.754	33.3	125.2	Infin.	0.870	0.238	--
30.0	125.2	0	26	27.5	1	6	75	0.742	32.7	125.2	Infin.	0.865	0.237	--
31.0	125.2	0	26	27.5	1	6	75	0.730	32.2	125.2	Infin.	0.861	0.236	--
32.0	121.0	0	33	32.5	1	20	80	0.719	44.4	121.0	Infin.	0.856	0.235	--
33.0	121.0	0	33	32.5	1	20	80	0.708	43.8	121.0	Infin.	0.851	0.233	--
34.0	121.0	0	33	32.5	1	20	80	0.698	43.2	121.0	Infin.	0.847	0.232	--
35.0	121.0	0	33	32.5	1	20	80	0.688	42.6	121.0	Infin.	0.842	0.231	--
36.0	121.0	0	33	32.5	1	20	80	0.679	42.1	121.0	Infin.	0.838	0.230	--
37.0	121.0	0	19	37.5	1	45	58	0.670	29.0	121.0	0.333	0.833	0.228	--
38.0	121.0	0	19	37.5	1	45	58	0.662	28.7	121.0	0.323	0.829	0.227	--
39.0	121.0	0	19	37.5	1	45	58	0.653	28.4	121.0	0.314	0.824	0.226	--
40.0	140.7	0	13	42.5	1	45	46	0.645	21.5	140.7	0.197	0.819	0.225	--
41.0	140.7	0	13	42.5	1	45	46	0.636	21.3	140.7	0.195	0.815	0.223	--
42.0	140.7	0	13	42.5	1	45	46	0.628	21.1	140.7	0.193	0.810	0.222	--
43.0	140.7	0	13	42.5	1	45	46	0.619	20.9	140.7	0.192	0.806	0.221	--
44.0	140.7	0	13	42.5	1	45	46	0.612	20.7	140.7	0.190	0.801	0.220	--
45.0	140.7	0	13	42.5	1	45	46	0.604	20.5	140.7	0.188	0.797	0.218	--
46.0	140.7	0	13	42.5	1	45	46	0.597	20.4	140.7	0.186	0.792	0.217	--
47.0	135.1	0	100	47.5	1	12	122	0.590	103.3	135.1	Infin.	0.787	0.216	--
48.0	135.1	0	100	47.5	1	12	122	0.583	102.2	135.1	Infin.	0.783	0.215	--
49.0	135.1	0	100	47.5	1	12	122	0.577	101.1	135.1	Infin.	0.778	0.213	--
50.0	135.1	1	100	47.5	1	12	122	0.571	100.0	72.7	Infin.	0.774	0.213	Non-Liq.
51.0	135.1	1	100	47.5	1	12	122	0.565	99.0	72.7	Infin.	0.769	0.214	Non-Liq.
52.0	126.6	1	37	52.5	1	12	72	0.559	37.2	64.2	Infin.	0.765	0.215	Non-Liq.
53.0	126.6	1	37	52.5	1	12	72	0.554	36.9	64.2	Infin.	0.760	0.215	Non-Liq.
54.0	126.6	1	37	52.5	1	12	72	0.549	36.6	64.2	Infin.	0.755	0.216	Non-Liq.
55.0	126.6	1	37	52.5	1	12	72	0.544	36.3	64.2	Infin.	0.751	0.216	Non-Liq.
56.0	126.6	1	37	52.5	1	12	72	0.539	36.0	64.2	Infin.	0.746	0.217	Non-Liq.
57.0	134.4	1	45	57.5	1	15	78	0.534	43.9	72.0	Infin.	0.742	0.217	Non-Liq.
58.0	134.4	1	45	57.5	1	15	78	0.530	43.5	72.0	Infin.	0.737	0.218	Non-Liq.
59.0	134.4	1	45	57.5	1	15	78	0.525	43.1	72.0	Infin.	0.733	0.218	Non-Liq.
60.0	134.4	1	45	57.5	1	15	78	0.520	42.8	72.0	Infin.	0.728	0.218	Non-Liq.
61.0	134.4	1	45	57.5	1	15	78	0.516	42.4	72.0	Infin.	0.723	0.218	Non-Liq.
62.0	134.4	1	45	57.5	1	15	78	0.511	42.1	72.0	Infin.	0.719	0.218	Non-Liq.

Figure 8

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 5

LIQUEFACTION SETTLEMENT ANALYSIS
DESIGN EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.70
PGAM (g):	0.840
2/3 PGAM (g):	0.56
Calculated Mag.Wtg.Factor:	0.753
Historic High Groundwater:	50.0
Groundwater @ Exploration:	100.0

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e_{15}] (%)	EQ. SETTLE. Pe (in.)
1	8	126.3232	0.032	0.032	68	21	0.364	--	0.00	0.00
2	8	126.3232	0.095	0.095	66	21	0.364	--	0.00	0.00
3	8	126.3232	0.158	0.158	65	21	0.364	--	0.00	0.00
4	8	126.3232	0.221	0.221	63	21	0.364	--	0.00	0.00
5	8	126.3232	0.284	0.284	61	20	0.364	--	0.00	0.00
6	8	126.3232	0.347	0.347	60	18	0.364	--	0.00	0.00
7	8	126.3232	0.411	0.411	59	24	0.364	--	0.00	0.00
8	8	126.3232	0.474	0.474	57	22	0.364	--	0.00	0.00
9	8	126.3232	0.537	0.537	56	21	0.364	--	0.00	0.00
10	8	126.3232	0.600	0.600	55	21	0.364	--	0.00	0.00
11	7	126.3232	0.663	0.663	49	18	0.364	--	0.00	0.00
12	7	126.3232	0.726	0.726	49	18	0.364	--	0.00	0.00
13	7	126.3232	0.790	0.790	49	17	0.364	--	0.00	0.00
14	7	126.3232	0.853	0.853	49	17	0.364	--	0.00	0.00
15	7	130.9914	0.917	0.917	45	12	0.364	--	0.00	0.00
16	7	130.9914	0.983	0.983	45	12	0.364	--	0.00	0.00
17	7	130.9914	1.048	1.048	45	16	0.364	--	0.00	0.00
18	7	130.9914	1.113	1.113	45	16	0.364	--	0.00	0.00
19	7	130.9914	1.179	1.179	45	16	0.364	--	0.00	0.00
20	23	134.407	1.245	1.245	75	40	0.364	--	0.00	0.00
21	23	134.407	1.313	1.313	75	39	0.364	--	0.00	0.00
22	23	134.407	1.380	1.380	75	38	0.364	--	0.00	0.00
23	23	134.407	1.447	1.447	75	37	0.364	--	0.00	0.00
24	23	134.407	1.514	1.514	75	37	0.364	--	0.00	0.00
25	23	130.248	1.580	1.580	75	36	0.364	--	0.00	0.00
26	23	130.248	1.645	1.645	75	35	0.364	--	0.00	0.00
27	26	125.2152	1.709	1.709	75	34	0.364	--	0.00	0.00
28	26	125.2152	1.772	1.772	75	34	0.364	--	0.00	0.00
29	26	125.2152	1.835	1.835	75	33	0.364	--	0.00	0.00
30	26	125.2152	1.897	1.897	75	33	0.364	--	0.00	0.00
31	26	125.2152	1.960	1.960	75	32	0.364	--	0.00	0.00
32	33	120.9694	2.021	2.021	80	44	0.364	--	0.00	0.00
33	33	120.9694	2.082	2.082	80	44	0.364	--	0.00	0.00
34	33	120.9694	2.142	2.142	80	43	0.364	--	0.00	0.00
35	33	120.9694	2.203	2.203	80	43	0.364	--	0.00	0.00
36	33	120.9694	2.263	2.263	80	42	0.364	--	0.00	0.00
37	19	120.9694	2.324	2.324	58	29	0.364	--	0.00	0.00
38	19	120.9694	2.384	2.384	58	29	0.364	--	0.00	0.00
39	19	120.9694	2.445	2.445	58	28	0.364	--	0.00	0.00
40	13	140.716	2.510	2.510	46	21	0.364	--	0.00	0.00
41	13	140.716	2.580	2.580	46	21	0.364	--	0.00	0.00
42	13	140.716	2.651	2.651	46	21	0.364	--	0.00	0.00
43	13	140.716	2.721	2.721	46	21	0.364	--	0.00	0.00
44	13	140.716	2.792	2.792	46	21	0.364	--	0.00	0.00
45	13	140.716	2.862	2.862	46	21	0.364	--	0.00	0.00
46	13	140.716	2.932	2.932	46	20	0.364	--	0.00	0.00
47	100	135.0675	3.001	3.001	122	103	0.364	--	0.00	0.00
48	100	135.0675	3.069	3.069	122	102	0.364	--	0.00	0.00
49	100	135.0675	3.136	3.136	122	101	0.364	--	0.00	0.00
50	100	135.0675	3.204	3.188	122	100	0.366	Non-Liq.	0.00	0.00
51	100	135.0675	3.271	3.225	122	99	0.369	Non-Liq.	0.00	0.00
52	37	126.5609	3.337	3.259	72	37	0.373	Non-Liq.	0.00	0.00
53	37	126.5609	3.400	3.291	72	37	0.376	Non-Liq.	0.00	0.00
54	37	126.5609	3.463	3.323	72	37	0.380	Non-Liq.	0.00	0.00
55	37	126.5609	3.527	3.355	72	36	0.383	Non-Liq.	0.00	0.00
56	37	126.5609	3.590	3.387	72	36	0.386	Non-Liq.	0.00	0.00
57	45	134.4469	3.655	3.421	78	44	0.389	Non-Liq.	0.00	0.00
58	45	134.4469	3.722	3.457	78	44	0.392	Non-Liq.	0.00	0.00
59	45	134.4469	3.790	3.493	78	43	0.395	Non-Liq.	0.00	0.00
60	45	134.4469	3.857	3.529	78	43	0.398	Non-Liq.	0.00	0.00
61	45	134.4469	3.924	3.565	78	42	0.401	Non-Liq.	0.00	0.00
62	45	134.4469	3.991	3.601	78	42	0.404	Non-Liq.	0.00	0.00

TOTAL SETTLEMENT = 0.0 INCHES

Figure 9

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 8

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
DESIGN EARTHQUAKE

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.70
Peak Horiz. Acceleration PGA_M (g):	0.840
2/3 PGA_M (g):	0.560
Calculated Mag.Wtg.Factor:	0.753
Historic High Groundwater:	50.0
Groundwater Depth During Exploration:	100.0

By Thomas F. Blake (1994-1996)
ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.15
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	134.0	0	14	1.0	1		90	2.000	36.2	134.0	Infin.	0.998	0.274	--
2.0	134.0	0	14	2.0	1		88	2.000	36.2	134.0	Infin.	0.993	0.272	--
3.0	134.0	0	14	3.0	1		85	2.000	36.2	134.0	Infin.	0.989	0.271	--
4.0	134.0	0	14	4.0	1		83	2.000	36.2	134.0	Infin.	0.984	0.270	--
5.0	134.0	0	14	5.0	1		81	1.861	33.7	134.0	Infin.	0.979	0.269	--
6.0	134.0	0	14	6.0	1		79	1.683	30.5	134.0	Infin.	0.975	0.267	--
7.0	134.0	0	14	7.0	1		77	1.548	28.0	134.0	0.351	0.970	0.266	--
8.0	126.3	0	7	8.0	1	56	53	1.444	20.1	126.3	0.219	0.966	0.265	--
9.0	126.3	0	7	9.0	1	56	52	1.361	19.3	126.3	0.210	0.961	0.264	--
10.0	126.3	0	7	10.0	1	56	51	1.290	18.7	126.3	0.203	0.957	0.262	--
11.0	126.3	0	7	10.0	1	56	51	1.230	18.1	126.3	0.197	0.952	0.261	--
12.0	126.3	0	7	10.0	1	56	51	1.177	17.7	126.3	0.192	0.947	0.260	--
13.0	126.3	0	5	12.5	1	48	41	1.131	14.3	126.3	0.156	0.943	0.259	--
14.0	126.3	0	5	12.5	1	48	41	1.089	14.0	126.3	0.153	0.938	0.257	--
15.0	126.3	0	11	15.0	1	48	58	1.052	23.1	126.3	0.257	0.934	0.256	--
16.0	126.3	0	11	15.0	1	48	58	1.019	22.6	126.3	0.250	0.929	0.255	--
17.0	126.3	0	5	17.5	1	49	38	0.988	14.3	126.3	0.154	0.925	0.253	--
18.0	126.3	0	5	17.5	1	49	38	0.960	14.1	126.3	0.152	0.920	0.252	--
19.0	126.3	0	15	20.0	1	53	63	0.935	28.6	126.3	0.362	0.915	0.251	--
20.0	126.3	0	15	20.0	1	53	63	0.911	28.1	126.3	0.344	0.911	0.250	--
21.0	126.3	0	15	20.0	1	53	63	0.889	27.6	126.3	0.330	0.906	0.248	--
22.0	126.3	0	15	20.0	1	53	63	0.868	27.1	126.3	0.319	0.902	0.247	--
23.0	126.3	0	15	20.0	1	53	63	0.849	26.7	126.3	0.309	0.897	0.246	--
24.0	126.3	0	5	22.5	1	53	35	0.831	13.7	126.3	0.142	0.893	0.245	--
25.0	126.3	0	5	22.5	1	53	35	0.814	13.5	126.3	0.141	0.888	0.243	--
26.0	126.3	0	6	27.5	1	42	36	0.798	15.1	126.3	0.152	0.883	0.242	--
27.0	126.3	0	6	27.5	1	42	36	0.783	14.9	126.3	0.150	0.879	0.241	--
28.0	126.3	0	6	27.5	1	42	36	0.769	14.8	126.3	0.149	0.874	0.240	--
29.0	126.3	0	6	27.5	1	42	36	0.756	14.7	126.3	0.148	0.870	0.238	--
30.0	126.3	0	6	27.5	1	42	36	0.743	14.5	126.3	0.146	0.865	0.237	--
31.0	126.3	0	6	27.5	1	42	36	0.731	14.4	126.3	0.145	0.861	0.236	--
32.0	126.3	0	38	32.5	1	10	86	0.720	48.3	126.3	Infin.	0.856	0.235	--
33.0	126.3	0	38	32.5	1	10	86	0.709	47.5	126.3	Infin.	0.851	0.233	--
34.0	126.3	0	38	32.5	1	10	86	0.698	46.9	126.3	Infin.	0.847	0.232	--
35.0	126.3	0	38	32.5	1	10	86	0.688	46.2	126.3	Infin.	0.842	0.231	--
36.0	126.3	0	38	32.5	1	10	86	0.678	45.6	126.3	Infin.	0.838	0.230	--
37.0	126.3	0	15	37.5	1	42	52	0.669	24.3	126.3	0.238	0.833	0.228	--
38.0	126.3	0	15	37.5	1	42	52	0.660	24.1	126.3	0.234	0.829	0.227	--
39.0	126.3	0	15	37.5	1	20	52	0.652	20.4	126.3	0.192	0.824	0.226	--
40.0	126.3	0	15	37.5	1	20	52	0.643	20.2	126.3	0.190	0.819	0.225	--
41.0	126.3	0	15	37.5	1	20	52	0.636	20.0	126.3	0.188	0.815	0.223	--
42.0	126.3	0	21	42.5	1	20	58	0.628	26.3	126.3	0.259	0.810	0.222	--
43.0	126.3	0	21	42.5	1	20	58	0.621	26.0	126.3	0.255	0.806	0.221	--
44.0	126.3	0	21	42.5	1	20	58	0.613	25.7	126.3	0.251	0.801	0.220	--
45.0	126.3	0	21	42.5	1	20	58	0.607	25.5	126.3	0.247	0.797	0.218	--
46.0	126.3	0	41	47.5	1	20	78	0.600	46.0	126.3	Infin.	0.792	0.217	--
47.0	126.3	0	41	47.5	1	20	78	0.593	45.5	126.3	Infin.	0.787	0.216	--
48.0	126.3	0	41	47.5	1	20	78	0.587	45.1	126.3	Infin.	0.783	0.215	--
49.0	126.3	0	41	47.5	1	20	78	0.581	44.6	126.3	Infin.	0.778	0.213	--
50.0	126.3	1	41	47.5	1	20	78	0.575	44.2	63.9	Infin.	0.774	0.213	Non-Liq.
51.0	126.3	1	41	47.5	1	20	78	0.570	43.8	63.9	Infin.	0.769	0.214	Non-Liq.
52.0	126.3	1	30	52.5	1	32	65	0.564	35.5	63.9	Infin.	0.765	0.215	Non-Liq.
53.0	126.3	1	30	52.5	1	32	65	0.559	35.2	63.9	Infin.	0.760	0.215	Non-Liq.
54.0	126.3	1	30	52.5	1	32	65	0.554	34.9	63.9	Infin.	0.755	0.216	Non-Liq.
55.0	126.3	1	30	52.5	1	32	65	0.549	34.7	63.9	Infin.	0.751	0.217	Non-Liq.
56.0	126.3	1	30	52.5	1	32	65	0.544	34.4	63.9	Infin.	0.746	0.217	Non-Liq.
57.0	126.3	1	30	52.5	1	32	65	0.539	34.2	63.9	Infin.	0.742	0.218	Non-Liq.
58.0	126.3	1	24	57.5	1	30	57	0.534	27.9	63.9	0.275	0.737	0.218	1.26
59.0	126.3	1	24	57.5	1	30	57	0.530	27.7	63.9	0.271	0.733	0.218	1.24
60.0	126.3	1	24	57.5	1	30	57	0.525	27.6	63.9	0.267	0.728	0.219	1.22
61.0	126.3	1	24	57.5	1	30	57	0.521	27.4	63.9	0.263	0.723	0.219	1.20
62.0	126.3	1	24	57.5	1	30	57	0.517	27.2	63.9	0.260	0.719	0.219	1.19

Figure 10

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 8

LIQUEFACTION SETTLEMENT ANALYSIS
DESIGN EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.70
PGAM (g):	0.840
2/3 PGAM (g):	0.56
Calculated Mag.Wtg.Factor:	0.753
Historic High Groundwater:	50.0
Groundwater @ Exploration:	100.0

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e_{15}] (%)	EQ. SETTLE. Pe (in.)
1	14	134.0288	0.034	0.034	90	36	0.364	--	0.00	0.00
2	14	134.0288	0.101	0.101	88	36	0.364	--	0.00	0.00
3	14	134.0288	0.168	0.168	85	36	0.364	--	0.00	0.00
4	14	134.0288	0.235	0.235	83	36	0.364	--	0.00	0.00
5	14	134.0288	0.302	0.302	81	34	0.364	--	0.00	0.00
6	14	134.0288	0.369	0.369	79	30	0.364	--	0.00	0.00
7	14	134.0288	0.436	0.436	77	28	0.364	--	0.00	0.00
8	7	126.318	0.501	0.501	53	20	0.364	--	0.00	0.00
9	7	126.318	0.564	0.564	52	19	0.364	--	0.00	0.00
10	7	126.318	0.627	0.627	51	19	0.364	--	0.00	0.00
11	7	126.318	0.690	0.690	51	18	0.364	--	0.00	0.00
12	7	126.318	0.753	0.753	51	18	0.364	--	0.00	0.00
13	5	126.318	0.816	0.816	41	14	0.364	--	0.00	0.00
14	5	126.318	0.880	0.880	41	14	0.364	--	0.00	0.00
15	11	126.318	0.943	0.943	58	23	0.364	--	0.00	0.00
16	11	126.318	1.006	1.006	58	23	0.364	--	0.00	0.00
17	5	126.318	1.069	1.069	38	14	0.364	--	0.00	0.00
18	5	126.318	1.132	1.132	38	14	0.364	--	0.00	0.00
19	15	126.318	1.195	1.195	63	29	0.364	--	0.00	0.00
20	15	126.318	1.259	1.259	63	28	0.364	--	0.00	0.00
21	15	126.318	1.322	1.322	63	28	0.364	--	0.00	0.00
22	15	126.318	1.385	1.385	63	27	0.364	--	0.00	0.00
23	15	126.318	1.448	1.448	63	27	0.364	--	0.00	0.00
24	5	126.318	1.511	1.511	35	14	0.364	--	0.00	0.00
25	5	126.318	1.574	1.574	35	14	0.364	--	0.00	0.00
26	6	126.318	1.638	1.638	36	15	0.364	--	0.00	0.00
27	6	126.318	1.701	1.701	36	15	0.364	--	0.00	0.00
28	6	126.318	1.764	1.764	36	15	0.364	--	0.00	0.00
29	6	126.318	1.827	1.827	36	15	0.364	--	0.00	0.00
30	6	126.318	1.890	1.890	36	15	0.364	--	0.00	0.00
31	6	126.318	1.953	1.953	36	14	0.364	--	0.00	0.00
32	38	126.318	2.016	2.016	86	48	0.364	--	0.00	0.00
33	38	126.318	2.080	2.080	86	48	0.364	--	0.00	0.00
34	38	126.318	2.143	2.143	86	47	0.364	--	0.00	0.00
35	38	126.318	2.206	2.206	86	46	0.364	--	0.00	0.00
36	38	126.318	2.269	2.269	86	46	0.364	--	0.00	0.00
37	15	126.318	2.332	2.332	52	24	0.364	--	0.00	0.00
38	15	126.318	2.395	2.395	52	24	0.364	--	0.00	0.00
39	15	126.318	2.459	2.459	52	20	0.364	--	0.00	0.00
40	15	126.318	2.522	2.522	52	20	0.364	--	0.00	0.00
41	15	126.318	2.585	2.585	52	20	0.364	--	0.00	0.00
42	21	126.318	2.648	2.648	58	26	0.364	--	0.00	0.00
43	21	126.318	2.711	2.711	58	26	0.364	--	0.00	0.00
44	21	126.318	2.774	2.774	58	26	0.364	--	0.00	0.00
45	21	126.318	2.838	2.838	58	25	0.364	--	0.00	0.00
46	41	126.318	2.901	2.901	78	46	0.364	--	0.00	0.00
47	41	126.318	2.964	2.964	78	45	0.364	--	0.00	0.00
48	41	126.318	3.027	3.027	78	45	0.364	--	0.00	0.00
49	41	126.318	3.090	3.090	78	45	0.364	--	0.00	0.00
50	41	126.318	3.153	3.138	78	44	0.366	Non-Liq.	0.00	0.00
51	41	126.318	3.217	3.170	78	44	0.370	Non-Liq.	0.00	0.00
52	30	126.318	3.280	3.202	65	35	0.373	Non-Liq.	0.00	0.00
53	30	126.318	3.343	3.234	65	35	0.376	Non-Liq.	0.00	0.00
54	30	126.318	3.406	3.266	65	35	0.380	Non-Liq.	0.00	0.00
55	30	126.318	3.469	3.298	65	35	0.383	Non-Liq.	0.00	0.00
56	30	126.318	3.532	3.330	65	34	0.386	Non-Liq.	0.00	0.00
57	30	126.318	3.595	3.361	65	34	0.390	Non-Liq.	0.00	0.00
58	24	126.318	3.659	3.393	57	28	0.393	1.26	0.00	0.00
59	24	126.318	3.722	3.425	57	28	0.396	1.24	0.00	0.00
60	24	126.318	3.785	3.457	57	28	0.399	1.22	0.00	0.00
61	24	126.318	3.848	3.489	57	27	0.402	1.20	0.00	0.00
62	24	126.318	3.911	3.521	57	27	0.405	1.19	0.00	0.00

TOTAL SETTLEMENT = 0.0 INCHES

Figure 11

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 1

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
MAXIMUM CONSIDERED EARTHQUAKE

NCEER (1996) METHOD

EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.71
Peak Horiz. Acceleration PGA_M (g):	0.840
Calculated Mag.Wtg.Factor:	0.756
Historic High Groundwater:	50.0
Groundwater Depth During Exploration:	60.0

By Thomas F. Blake (1994-1996)

ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.15
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	130.1	0	3	1.0	1		42	2.000	7.8	130.1	0.087	0.998	0.412	--
2.0	130.1	0	3	2.0	1		41	2.000	7.8	130.1	0.087	0.993	0.410	--
3.0	130.1	0	3	3.0	1		39	2.000	7.8	130.1	0.087	0.989	0.408	--
4.0	130.1	0	3	4.0	1		38	2.000	7.8	130.1	0.087	0.984	0.406	--
5.0	130.1	0	3	5.0	1		37	1.889	7.3	130.1	0.084	0.979	0.404	--
6.0	130.1	0	3	6.0	1		37	1.708	6.6	130.1	0.078	0.975	0.402	--
7.0	130.1	0	3	7.0	1		36	1.572	6.1	130.1	0.074	0.970	0.400	--
8.0	130.1	0	3	8.0	1		35	1.463	5.7	130.1	0.071	0.966	0.398	--
9.0	130.1	0	3	9.0	1		34	1.374	5.3	130.1	0.068	0.961	0.397	--
10.0	130.1	0	3	10.0	1	41	33	1.300	12.0	130.1	0.132	0.957	0.395	--
11.0	130.1	0	3	10.0	1	41	33	1.236	11.8	130.1	0.129	0.952	0.393	--
12.0	130.1	0	3	10.0	1	41	33	1.181	11.6	130.1	0.127	0.947	0.391	--
13.0	130.1	0	3	10.0	1	41	33	1.133	11.4	130.1	0.125	0.943	0.389	--
14.0	130.1	0	3	10.0	1	41	33	1.090	11.2	130.1	0.123	0.938	0.387	--
15.0	139.6	0	9	12.5	1	25	55	1.051	16.8	139.6	0.183	0.934	0.385	--
16.0	139.6	0	9	12.5	1	25	55	1.014	16.4	139.6	0.178	0.929	0.383	--
17.0	139.1	0	7	17.5	1	72	44	0.981	17.1	139.1	0.184	0.925	0.381	--
18.0	139.1	0	7	17.5	1	72	44	0.951	16.8	139.1	0.181	0.920	0.380	--
19.0	139.1	0	7	17.5	1	72	44	0.924	16.5	139.1	0.178	0.915	0.378	--
20.0	139.1	0	14	17.5	1	25	63	0.898	23.2	139.1	0.255	0.911	0.376	--
21.0	139.1	0	14	17.5	1	25	63	0.875	22.7	139.1	0.249	0.906	0.374	--
22.0	119.3	0	29	22.5	1	6	84	0.855	40.0	119.3	Infin.	0.902	0.372	--
23.0	119.3	0	29	22.5	1	6	84	0.838	39.2	119.3	Infin.	0.897	0.370	--
24.0	119.3	0	29	22.5	1	6	84	0.822	38.4	119.3	Infin.	0.893	0.368	--
25.0	119.3	0	29	22.5	1	6	84	0.806	37.7	119.3	Infin.	0.888	0.366	--
26.0	119.3	0	29	22.5	1	6	84	0.792	37.0	119.3	Infin.	0.883	0.365	--
27.0	119.3	0	29	22.5	1	6	84	0.778	36.4	119.3	Infin.	0.879	0.363	--
28.0	136.8	0	20	27.5	1	25	66	0.764	30.3	136.8	Infin.	0.874	0.361	--
29.0	136.8	0	20	27.5	1	25	66	0.750	29.9	136.8	0.428	0.870	0.359	--
30.0	136.8	0	20	27.5	1	25	66	0.736	29.4	136.8	0.378	0.865	0.357	--
31.0	136.8	0	20	27.5	1	25	66	0.723	29.0	136.8	0.355	0.861	0.355	--
32.0	136.8	0	28	32.5	1	25	73	0.711	38.9	136.8	Infin.	0.856	0.353	--
33.0	136.8	0	28	32.5	1	25	73	0.700	38.3	136.8	Infin.	0.851	0.351	--
34.0	136.8	0	28	32.5	1	25	73	0.689	37.8	136.8	Infin.	0.847	0.349	--
35.0	136.8	0	28	32.5	1	25	73	0.678	37.3	136.8	Infin.	0.842	0.348	--
36.0	131.6	0	30	37.5	1	10	72	0.669	35.7	131.6	Infin.	0.838	0.346	--
37.0	131.6	0	30	37.5	1	10	72	0.659	35.2	131.6	Infin.	0.833	0.344	--
38.0	131.6	0	30	37.5	1	10	72	0.650	34.8	131.6	Infin.	0.829	0.342	--
39.0	131.6	0	30	37.5	1	10	72	0.642	34.3	131.6	Infin.	0.824	0.340	--
40.0	122.8	0	30	37.5	1	10	72	0.634	33.9	122.8	Infin.	0.819	0.338	--
41.0	122.8	0	30	37.5	1	10	72	0.627	33.5	122.8	Infin.	0.815	0.336	--
42.0	122.8	0	30	37.5	1	10	72	0.620	33.2	122.8	Infin.	0.810	0.334	--
43.0	131.8	0	28	42.5	1	10	67	0.612	30.7	131.8	Infin.	0.806	0.332	--
44.0	131.8	0	28	42.5	1	10	67	0.605	30.3	131.8	Infin.	0.801	0.331	--
45.0	131.8	0	28	42.5	1	10	67	0.598	30.0	131.8	Infin.	0.797	0.329	--
46.0	131.8	0	28	42.5	1	10	67	0.592	29.7	131.8	0.363	0.792	0.327	--
47.0	131.8	0	28	42.5	1	10	67	0.585	29.4	131.8	0.340	0.787	0.325	--
48.0	131.8	0	11	47.5	1	54	40	0.579	18.0	131.8	0.158	0.783	0.323	--
49.0	128.6	0	11	47.5	1	54	40	0.573	17.9	128.6	0.157	0.778	0.321	--
50.0	128.6	1	20	52.5	1	54	53	0.567	26.6	66.2	0.250	0.774	0.321	0.78
51.0	137.2	1	20	52.5	1	53	53	0.562	26.4	74.8	0.247	0.769	0.322	0.77
52.0	137.2	1	20	52.5	1	53	53	0.556	26.2	74.8	0.244	0.765	0.323	0.76
53.0	137.2	1	20	52.5	1	53	53	0.550	26.0	74.8	0.241	0.760	0.324	0.74
54.0	137.2	1	20	52.5	1	53	53	0.545	25.8	74.8	0.238	0.755	0.325	0.73
55.0	137.2	1	20	52.5	1	53	53	0.540	25.6	74.8	0.236	0.751	0.325	0.72
56.0	128.6	1	22	52.5	1	54	55	0.535	27.3	66.2	0.263	0.746	0.326	0.81
57.0	128.6	1	22	52.5	1	54	55	0.530	27.1	66.2	0.260	0.742	0.327	0.80
58.0	141.3	1	58	57.5	1	10	88	0.525	53.7	78.9	Infin.	0.737	0.327	Non-Liq.
59.0	141.3	1	58	57.5	1	10	88	0.521	53.2	78.9	Infin.	0.733	0.327	Non-Liq.
60.0	141.3	1	58	57.5	1	10	88	0.517	52.8	78.9	Infin.	0.728	0.328	Non-Liq.
61.0	141.3	1	58	57.5	1	10	88	0.514	52.6	78.9	Infin.	0.723	0.328	Non-Liq.
62.0	141.3	1	58	57.5	1	10	88	0.512	52.3	78.9	Infin.	0.719	0.328	Non-Liq.

Figure 12

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 1

LIQUEFACTION SETTLEMENT ANALYSIS
MAXIMUM CONSIDERED EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.71
PGA_M (g):	0.840
Calculated Mag.Wtg.Factor:	0.756
Historic High Groundwater:	50.0
Groundwater @ Exploration:	60.0

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e15] (%)	EQ. SETTLE. Pe (in.)
1	3	130.0693	0.033	0.033	42	8	0.546	--	0.00	0.00
2	3	130.0693	0.098	0.098	41	8	0.546	--	0.00	0.00
3	3	130.0693	0.163	0.163	39	8	0.546	--	0.00	0.00
4	3	130.0693	0.228	0.228	38	8	0.546	--	0.00	0.00
5	3	130.0693	0.293	0.293	37	7	0.546	--	0.00	0.00
6	3	130.0693	0.358	0.358	37	7	0.546	--	0.00	0.00
7	3	130.0693	0.423	0.423	36	6	0.546	--	0.00	0.00
8	3	130.0693	0.488	0.488	35	6	0.546	--	0.00	0.00
9	3	130.0693	0.553	0.553	34	5	0.546	--	0.00	0.00
10	3	130.0693	0.618	0.618	33	12	0.546	--	0.00	0.00
11	3	130.0693	0.683	0.683	33	12	0.546	--	0.00	0.00
12	3	130.0693	0.748	0.748	33	12	0.546	--	0.00	0.00
13	3	130.0693	0.813	0.813	33	11	0.546	--	0.00	0.00
14	3	130.0693	0.878	0.878	33	11	0.546	--	0.00	0.00
15	9	139.573	0.945	0.945	55	17	0.546	--	0.00	0.00
16	9	139.573	1.015	1.015	55	16	0.546	--	0.00	0.00
17	7	139.0551	1.085	1.085	44	17	0.546	--	0.00	0.00
18	7	139.0551	1.154	1.154	44	17	0.546	--	0.00	0.00
19	7	139.0551	1.224	1.224	44	17	0.546	--	0.00	0.00
20	14	139.0551	1.293	1.293	63	23	0.546	--	0.00	0.00
21	14	139.0551	1.363	1.363	63	23	0.546	--	0.00	0.00
22	29	119.3424	1.428	1.428	84	40	0.546	--	0.00	0.00
23	29	119.3424	1.487	1.487	84	39	0.546	--	0.00	0.00
24	29	119.3424	1.547	1.547	84	38	0.546	--	0.00	0.00
25	29	119.3424	1.607	1.607	84	38	0.546	--	0.00	0.00
26	29	119.3424	1.666	1.666	84	37	0.546	--	0.00	0.00
27	29	119.3424	1.726	1.726	84	36	0.546	--	0.00	0.00
28	20	136.8475	1.790	1.790	66	30	0.546	--	0.00	0.00
29	20	136.8475	1.858	1.858	66	30	0.546	--	0.00	0.00
30	20	136.8475	1.927	1.927	66	29	0.546	--	0.00	0.00
31	20	136.8475	1.995	1.995	66	29	0.546	--	0.00	0.00
32	28	136.8475	2.064	2.064	73	39	0.546	--	0.00	0.00
33	28	136.8475	2.132	2.132	73	38	0.546	--	0.00	0.00
34	28	136.8475	2.200	2.200	73	38	0.546	--	0.00	0.00
35	28	136.8475	2.269	2.269	73	37	0.546	--	0.00	0.00
36	30	131.6446	2.336	2.336	72	36	0.546	--	0.00	0.00
37	30	131.6446	2.402	2.402	72	35	0.546	--	0.00	0.00
38	30	131.6446	2.468	2.468	72	35	0.546	--	0.00	0.00
39	30	131.6446	2.533	2.533	72	34	0.546	--	0.00	0.00
40	30	122.7672	2.597	2.597	72	34	0.546	--	0.00	0.00
41	30	122.7672	2.658	2.658	72	34	0.546	--	0.00	0.00
42	30	122.7672	2.720	2.720	72	33	0.546	--	0.00	0.00
43	28	131.796	2.784	2.784	67	31	0.546	--	0.00	0.00
44	28	131.796	2.849	2.849	67	30	0.546	--	0.00	0.00
45	28	131.796	2.915	2.915	67	30	0.546	--	0.00	0.00
46	28	131.796	2.981	2.981	67	30	0.546	--	0.00	0.00
47	28	131.796	3.047	3.047	67	29	0.546	--	0.00	0.00
48	11	131.796	3.113	3.113	40	18	0.546	--	0.00	0.00
49	11	128.6	3.178	3.178	40	18	0.546	--	0.00	0.00
50	20	128.6	3.242	3.227	53	27	0.549	0.78	1.10	0.13
51	20	137.2406	3.309	3.262	53	26	0.554	0.77	1.10	0.13
52	20	137.2406	3.377	3.299	53	26	0.559	0.76	1.10	0.13
53	20	137.2406	3.446	3.337	53	26	0.564	0.74	1.10	0.13
54	20	137.2406	3.515	3.374	53	26	0.569	0.73	1.10	0.13
55	20	137.2406	3.583	3.412	53	26	0.573	0.72	1.10	0.13
56	22	128.6	3.650	3.447	55	27	0.578	0.81	1.10	0.13
57	22	128.6	3.714	3.480	55	27	0.583	0.80	1.10	0.13
58	58	141.3152	3.782	3.516	88	54	0.587	Non-Liq.	0.00	0.00
59	58	141.3152	3.852	3.556	88	53	0.592	Non-Liq.	0.00	0.00
60	58	141.3152	3.923	3.595	88	53	0.596	Non-Liq.	0.00	0.00
61	58	141.3152	3.994	3.635	88	53	0.600	Non-Liq.	0.00	0.00
62	58	141.3152	4.064	3.674	88	52	0.604	Non-Liq.	0.00	0.00

TOTAL SETTLEMENT = 1.1 INCHES

Figure 13

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 5

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
MAXIMUM CONSIDERED EARTHQUAKE

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.71
Peak Horiz. Acceleration PGA_M (g):	0.840
Calculated Mag.Wtg.Factor:	0.756
Historic High Groundwater:	50.0
Groundwater Depth During Exploration:	100.0

By Thomas F. Blake (1994-1996)
ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.15
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	126.3	0	8	1.0	1		68	2.000	20.7	126.3	0.226	0.998	0.412	--
2.0	126.3	0	8	2.0	1		66	2.000	20.7	126.3	0.226	0.993	0.410	--
3.0	126.3	0	8	3.0	1		65	2.000	20.7	126.3	0.226	0.989	0.408	--
4.0	126.3	0	8	4.0	1		63	2.000	20.7	126.3	0.226	0.984	0.406	--
5.0	126.3	0	8	5.0	1		61	1.917	19.8	126.3	0.216	0.979	0.404	--
6.0	126.3	0	8	6.0	1		60	1.734	17.9	126.3	0.195	0.975	0.402	--
7.0	126.3	0	8	7.0	1	50	59	1.595	23.5	126.3	0.262	0.970	0.400	--
8.0	126.3	0	8	8.0	1	50	57	1.485	22.4	126.3	0.247	0.966	0.398	--
9.0	126.3	0	8	9.0	1	50	56	1.394	21.4	126.3	0.235	0.961	0.397	--
10.0	126.3	0	8	10.0	1	50	55	1.319	20.7	126.3	0.225	0.957	0.395	--
11.0	126.3	0	7	12.5	1	50	49	1.255	18.4	126.3	0.200	0.952	0.393	--
12.0	126.3	0	7	12.5	1	50	49	1.199	17.9	126.3	0.194	0.947	0.391	--
13.0	126.3	0	7	12.5	1	50	49	1.150	17.4	126.3	0.189	0.943	0.389	--
14.0	126.3	0	7	12.5	1	50	49	1.107	17.0	126.3	0.185	0.938	0.387	--
15.0	131.0	0	7	17.5	1	10	45	1.067	12.2	131.0	0.132	0.934	0.385	--
16.0	131.0	0	7	17.5	1	10	45	1.031	11.8	131.0	0.128	0.929	0.383	--
17.0	131.0	0	7	17.5	1	31	45	0.998	16.3	131.0	0.176	0.925	0.381	--
18.0	131.0	0	7	17.5	1	31	45	0.968	16.0	131.0	0.173	0.920	0.380	--
19.0	131.0	0	7	17.5	1	31	45	0.941	15.7	131.0	0.170	0.915	0.378	--
20.0	134.4	0	23	22.5	1	31	75	0.916	39.7	134.4	Infin.	0.911	0.376	--
21.0	134.4	0	23	22.5	1	31	75	0.892	38.8	134.4	Infin.	0.906	0.374	--
22.0	134.4	0	23	22.5	1	31	75	0.870	38.0	134.4	Infin.	0.902	0.372	--
23.0	134.4	0	23	22.5	1	31	75	0.849	37.3	134.4	Infin.	0.897	0.370	--
24.0	134.4	0	23	22.5	1	31	75	0.830	36.6	134.4	Infin.	0.893	0.368	--
25.0	130.2	0	23	22.5	1	31	75	0.813	35.9	130.2	Infin.	0.888	0.366	--
26.0	130.2	0	23	22.5	1	31	75	0.797	35.3	130.2	Infin.	0.883	0.365	--
27.0	125.2	0	26	27.5	1	6	75	0.782	34.5	125.2	Infin.	0.879	0.363	--
28.0	125.2	0	26	27.5	1	6	75	0.768	33.8	125.2	Infin.	0.874	0.361	--
29.0	125.2	0	26	27.5	1	6	75	0.754	33.3	125.2	Infin.	0.870	0.359	--
30.0	125.2	0	26	27.5	1	6	75	0.742	32.7	125.2	Infin.	0.865	0.357	--
31.0	125.2	0	26	27.5	1	6	75	0.730	32.2	125.2	Infin.	0.861	0.355	--
32.0	121.0	0	33	32.5	1	20	80	0.719	44.4	121.0	Infin.	0.856	0.353	--
33.0	121.0	0	33	32.5	1	20	80	0.708	43.8	121.0	Infin.	0.851	0.351	--
34.0	121.0	0	33	32.5	1	20	80	0.698	43.2	121.0	Infin.	0.847	0.349	--
35.0	121.0	0	33	32.5	1	20	80	0.688	42.6	121.0	Infin.	0.842	0.348	--
36.0	121.0	0	33	32.5	1	20	80	0.679	42.1	121.0	Infin.	0.838	0.346	--
37.0	121.0	0	19	37.5	1	45	58	0.670	29.0	121.0	0.333	0.833	0.344	--
38.0	121.0	0	19	37.5	1	45	58	0.662	28.7	121.0	0.323	0.829	0.342	--
39.0	121.0	0	19	37.5	1	45	58	0.653	28.4	121.0	0.314	0.824	0.340	--
40.0	140.7	0	13	42.5	1	45	46	0.645	21.5	140.7	0.197	0.819	0.338	--
41.0	140.7	0	13	42.5	1	45	46	0.636	21.3	140.7	0.195	0.815	0.336	--
42.0	140.7	0	13	42.5	1	45	46	0.628	21.1	140.7	0.193	0.810	0.334	--
43.0	140.7	0	13	42.5	1	45	46	0.619	20.9	140.7	0.192	0.806	0.332	--
44.0	140.7	0	13	42.5	1	45	46	0.612	20.7	140.7	0.190	0.801	0.331	--
45.0	140.7	0	13	42.5	1	45	46	0.604	20.5	140.7	0.188	0.797	0.329	--
46.0	140.7	0	13	42.5	1	45	46	0.597	20.4	140.7	0.186	0.792	0.327	--
47.0	135.1	0	100	47.5	1	12	122	0.590	103.3	135.1	Infin.	0.787	0.325	--
48.0	135.1	0	100	47.5	1	12	122	0.583	102.2	135.1	Infin.	0.783	0.323	--
49.0	135.1	0	100	47.5	1	12	122	0.577	101.1	135.1	Infin.	0.778	0.321	--
50.0	135.1	1	100	47.5	1	12	122	0.571	100.0	72.7	Infin.	0.774	0.321	Non-Liq.
51.0	135.1	1	100	47.5	1	12	122	0.565	99.0	72.7	Infin.	0.769	0.322	Non-Liq.
52.0	126.6	1	37	52.5	1	12	72	0.559	37.2	64.2	Infin.	0.765	0.323	Non-Liq.
53.0	126.6	1	37	52.5	1	12	72	0.554	36.9	64.2	Infin.	0.760	0.324	Non-Liq.
54.0	126.6	1	37	52.5	1	12	72	0.549	36.6	64.2	Infin.	0.755	0.325	Non-Liq.
55.0	126.6	1	37	52.5	1	12	72	0.544	36.3	64.2	Infin.	0.751	0.326	Non-Liq.
56.0	126.6	1	37	52.5	1	12	72	0.539	36.0	64.2	Infin.	0.746	0.326	Non-Liq.
57.0	134.4	1	45	57.5	1	15	78	0.534	43.9	72.0	Infin.	0.742	0.327	Non-Liq.
58.0	134.4	1	45	57.5	1	15	78	0.530	43.5	72.0	Infin.	0.737	0.327	Non-Liq.
59.0	134.4	1	45	57.5	1	15	78	0.525	43.1	72.0	Infin.	0.733	0.328	Non-Liq.
60.0	134.4	1	45	57.5	1	15	78	0.520	42.8	72.0	Infin.	0.728	0.328	Non-Liq.
61.0	134.4	1	45	57.5	1	15	78	0.516	42.4	72.0	Infin.	0.723	0.329	Non-Liq.
62.0	134.4	1	45	57.5	1	15	78	0.511	42.1	72.0	Infin.	0.719	0.329	Non-Liq.

Figure 14

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 5

LIQUEFACTION SETTLEMENT ANALYSIS
MAXIMUM CONSIDERED EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.71
PGA_M (g):	0.840
Calculated Mag.Wtg.Factor:	0.756
Historic High Groundwater:	50.0
Groundwater @ Exploration:	100.0

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e15} (%)	EQ. SETTLE. Pe (in.)
1	8	126.3232	0.032	0.032	68	21	0.546	--	0.00	0.00
2	8	126.3232	0.095	0.095	66	21	0.546	--	0.00	0.00
3	8	126.3232	0.158	0.158	65	21	0.546	--	0.00	0.00
4	8	126.3232	0.221	0.221	63	21	0.546	--	0.00	0.00
5	8	126.3232	0.284	0.284	61	20	0.546	--	0.00	0.00
6	8	126.3232	0.347	0.347	60	18	0.546	--	0.00	0.00
7	8	126.3232	0.411	0.411	59	24	0.546	--	0.00	0.00
8	8	126.3232	0.474	0.474	57	22	0.546	--	0.00	0.00
9	8	126.3232	0.537	0.537	56	21	0.546	--	0.00	0.00
10	8	126.3232	0.600	0.600	55	21	0.546	--	0.00	0.00
11	7	126.3232	0.663	0.663	49	18	0.546	--	0.00	0.00
12	7	126.3232	0.726	0.726	49	18	0.546	--	0.00	0.00
13	7	126.3232	0.790	0.790	49	17	0.546	--	0.00	0.00
14	7	126.3232	0.853	0.853	49	17	0.546	--	0.00	0.00
15	7	130.9914	0.917	0.917	45	12	0.546	--	0.00	0.00
16	7	130.9914	0.983	0.983	45	12	0.546	--	0.00	0.00
17	7	130.9914	1.048	1.048	45	16	0.546	--	0.00	0.00
18	7	130.9914	1.113	1.113	45	16	0.546	--	0.00	0.00
19	7	130.9914	1.179	1.179	45	16	0.546	--	0.00	0.00
20	23	134.407	1.245	1.245	75	40	0.546	--	0.00	0.00
21	23	134.407	1.313	1.313	75	39	0.546	--	0.00	0.00
22	23	134.407	1.380	1.380	75	38	0.546	--	0.00	0.00
23	23	134.407	1.447	1.447	75	37	0.546	--	0.00	0.00
24	23	134.407	1.514	1.514	75	37	0.546	--	0.00	0.00
25	23	130.248	1.580	1.580	75	36	0.546	--	0.00	0.00
26	23	130.248	1.645	1.645	75	35	0.546	--	0.00	0.00
27	26	125.2152	1.709	1.709	75	34	0.546	--	0.00	0.00
28	26	125.2152	1.772	1.772	75	34	0.546	--	0.00	0.00
29	26	125.2152	1.835	1.835	75	33	0.546	--	0.00	0.00
30	26	125.2152	1.897	1.897	75	33	0.546	--	0.00	0.00
31	26	125.2152	1.960	1.960	75	32	0.546	--	0.00	0.00
32	33	120.9694	2.021	2.021	80	44	0.546	--	0.00	0.00
33	33	120.9694	2.082	2.082	80	44	0.546	--	0.00	0.00
34	33	120.9694	2.142	2.142	80	43	0.546	--	0.00	0.00
35	33	120.9694	2.203	2.203	80	43	0.546	--	0.00	0.00
36	33	120.9694	2.263	2.263	80	42	0.546	--	0.00	0.00
37	19	120.9694	2.324	2.324	58	29	0.546	--	0.00	0.00
38	19	120.9694	2.384	2.384	58	29	0.546	--	0.00	0.00
39	19	120.9694	2.445	2.445	58	28	0.546	--	0.00	0.00
40	13	140.716	2.510	2.510	46	21	0.546	--	0.00	0.00
41	13	140.716	2.580	2.580	46	21	0.546	--	0.00	0.00
42	13	140.716	2.651	2.651	46	21	0.546	--	0.00	0.00
43	13	140.716	2.721	2.721	46	21	0.546	--	0.00	0.00
44	13	140.716	2.792	2.792	46	21	0.546	--	0.00	0.00
45	13	140.716	2.862	2.862	46	21	0.546	--	0.00	0.00
46	13	140.716	2.932	2.932	46	20	0.546	--	0.00	0.00
47	100	135.0675	3.001	3.001	122	103	0.546	--	0.00	0.00
48	100	135.0675	3.069	3.069	122	102	0.546	--	0.00	0.00
49	100	135.0675	3.136	3.136	122	101	0.546	--	0.00	0.00
50	100	135.0675	3.204	3.188	122	100	0.549	Non-Liq.	0.00	0.00
51	100	135.0675	3.271	3.225	122	99	0.554	Non-Liq.	0.00	0.00
52	37	126.5609	3.337	3.259	72	37	0.559	Non-Liq.	0.00	0.00
53	37	126.5609	3.400	3.291	72	37	0.564	Non-Liq.	0.00	0.00
54	37	126.5609	3.463	3.323	72	37	0.569	Non-Liq.	0.00	0.00
55	37	126.5609	3.527	3.355	72	36	0.574	Non-Liq.	0.00	0.00
56	37	126.5609	3.590	3.387	72	36	0.579	Non-Liq.	0.00	0.00
57	45	134.4469	3.655	3.421	78	44	0.583	Non-Liq.	0.00	0.00
58	45	134.4469	3.722	3.457	78	44	0.588	Non-Liq.	0.00	0.00
59	45	134.4469	3.790	3.493	78	43	0.592	Non-Liq.	0.00	0.00
60	45	134.4469	3.857	3.529	78	43	0.597	Non-Liq.	0.00	0.00
61	45	134.4469	3.924	3.565	78	42	0.601	Non-Liq.	0.00	0.00
62	45	134.4469	3.991	3.601	78	42	0.605	Non-Liq.	0.00	0.00

TOTAL SETTLEMENT = 0.0 INCHES

Figure 15

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 8

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
MAXIMUM CONSIDERED EARTHQUAKE

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.71
Peak Horiz. Acceleration PGA_M (g):	0.840
Calculated Mag.Wtg.Factor:	0.756
Historic High Groundwater:	50.0
Groundwater Depth During Exploration:	100.0

By Thomas F. Blake (1994-1996)
ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.15
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	134.0	0	14	1.0	1		90	2.000	36.2	134.0	Infin.	0.998	0.412	--
2.0	134.0	0	14	2.0	1		88	2.000	36.2	134.0	Infin.	0.993	0.410	--
3.0	134.0	0	14	3.0	1		85	2.000	36.2	134.0	Infin.	0.989	0.408	--
4.0	134.0	0	14	4.0	1		83	2.000	36.2	134.0	Infin.	0.984	0.406	--
5.0	134.0	0	14	5.0	1		81	1.861	33.7	134.0	Infin.	0.979	0.404	--
6.0	134.0	0	14	6.0	1		79	1.683	30.5	134.0	Infin.	0.975	0.402	--
7.0	134.0	0	14	7.0	1		77	1.548	28.0	134.0	0.351	0.970	0.400	--
8.0	126.3	0	7	8.0	1	56	53	1.444	20.1	126.3	0.219	0.966	0.398	--
9.0	126.3	0	7	9.0	1	56	52	1.361	19.3	126.3	0.210	0.961	0.397	--
10.0	126.3	0	7	10.0	1	56	51	1.290	18.7	126.3	0.203	0.957	0.395	--
11.0	126.3	0	7	10.0	1	56	51	1.230	18.1	126.3	0.197	0.952	0.393	--
12.0	126.3	0	7	10.0	1	56	51	1.177	17.7	126.3	0.192	0.947	0.391	--
13.0	126.3	0	5	12.5	1	48	41	1.131	14.3	126.3	0.156	0.943	0.389	--
14.0	126.3	0	5	12.5	1	48	41	1.089	14.0	126.3	0.153	0.938	0.387	--
15.0	126.3	0	11	15.0	1	48	58	1.052	23.1	126.3	0.257	0.934	0.385	--
16.0	126.3	0	11	15.0	1	48	58	1.019	22.6	126.3	0.250	0.929	0.383	--
17.0	126.3	0	5	17.5	1	49	38	0.988	14.3	126.3	0.154	0.925	0.381	--
18.0	126.3	0	5	17.5	1	49	38	0.960	14.1	126.3	0.152	0.920	0.380	--
19.0	126.3	0	15	20.0	1	53	63	0.935	28.6	126.3	0.362	0.915	0.378	--
20.0	126.3	0	15	20.0	1	53	63	0.911	28.1	126.3	0.344	0.911	0.376	--
21.0	126.3	0	15	20.0	1	53	63	0.889	27.6	126.3	0.330	0.906	0.374	--
22.0	126.3	0	15	20.0	1	53	63	0.868	27.1	126.3	0.319	0.902	0.372	--
23.0	126.3	0	15	20.0	1	53	63	0.849	26.7	126.3	0.309	0.897	0.370	--
24.0	126.3	0	5	22.5	1	53	35	0.831	13.7	126.3	0.142	0.893	0.368	--
25.0	126.3	0	5	22.5	1	53	35	0.814	13.5	126.3	0.141	0.888	0.366	--
26.0	126.3	0	6	27.5	1	42	36	0.798	15.1	126.3	0.152	0.883	0.365	--
27.0	126.3	0	6	27.5	1	42	36	0.783	14.9	126.3	0.150	0.879	0.363	--
28.0	126.3	0	6	27.5	1	42	36	0.769	14.8	126.3	0.149	0.874	0.361	--
29.0	126.3	0	6	27.5	1	42	36	0.756	14.7	126.3	0.148	0.870	0.359	--
30.0	126.3	0	6	27.5	1	42	36	0.743	14.5	126.3	0.146	0.865	0.357	--
31.0	126.3	0	6	27.5	1	42	36	0.731	14.4	126.3	0.145	0.861	0.355	--
32.0	126.3	0	38	32.5	1	10	86	0.720	48.3	126.3	Infin.	0.856	0.353	--
33.0	126.3	0	38	32.5	1	10	86	0.709	47.5	126.3	Infin.	0.851	0.351	--
34.0	126.3	0	38	32.5	1	10	86	0.698	46.9	126.3	Infin.	0.847	0.349	--
35.0	126.3	0	38	32.5	1	10	86	0.688	46.2	126.3	Infin.	0.842	0.348	--
36.0	126.3	0	38	32.5	1	10	86	0.678	45.6	126.3	Infin.	0.838	0.346	--
37.0	126.3	0	15	37.5	1	42	52	0.669	24.3	126.3	0.238	0.833	0.344	--
38.0	126.3	0	15	37.5	1	42	52	0.660	24.1	126.3	0.234	0.829	0.342	--
39.0	126.3	0	15	37.5	1	20	52	0.652	20.4	126.3	0.192	0.824	0.340	--
40.0	126.3	0	15	37.5	1	20	52	0.643	20.2	126.3	0.190	0.819	0.338	--
41.0	126.3	0	15	37.5	1	20	52	0.636	20.0	126.3	0.188	0.815	0.336	--
42.0	126.3	0	21	42.5	1	20	58	0.628	26.3	126.3	0.259	0.810	0.334	--
43.0	126.3	0	21	42.5	1	20	58	0.621	26.0	126.3	0.255	0.806	0.332	--
44.0	126.3	0	21	42.5	1	20	58	0.613	25.7	126.3	0.251	0.801	0.331	--
45.0	126.3	0	21	42.5	1	20	58	0.607	25.5	126.3	0.247	0.797	0.329	--
46.0	126.3	0	41	47.5	1	20	78	0.600	46.0	126.3	Infin.	0.792	0.327	--
47.0	126.3	0	41	47.5	1	20	78	0.593	45.5	126.3	Infin.	0.787	0.325	--
48.0	126.3	0	41	47.5	1	20	78	0.587	45.1	126.3	Infin.	0.783	0.323	--
49.0	126.3	0	41	47.5	1	20	78	0.581	44.6	126.3	Infin.	0.778	0.321	--
50.0	126.3	1	41	47.5	1	20	78	0.575	44.2	63.9	Infin.	0.774	0.321	Non-Liq.
51.0	126.3	1	41	47.5	1	20	78	0.570	43.8	63.9	Infin.	0.769	0.322	Non-Liq.
52.0	126.3	1	30	52.5	1	32	65	0.564	35.5	63.9	Infin.	0.765	0.323	Non-Liq.
53.0	126.3	1	30	52.5	1	32	65	0.559	35.2	63.9	Infin.	0.760	0.324	Non-Liq.
54.0	126.3	1	30	52.5	1	32	65	0.554	34.9	63.9	Infin.	0.755	0.325	Non-Liq.
55.0	126.3	1	30	52.5	1	32	65	0.549	34.7	63.9	Infin.	0.751	0.326	Non-Liq.
56.0	126.3	1	30	52.5	1	32	65	0.544	34.4	63.9	Infin.	0.746	0.327	Non-Liq.
57.0	126.3	1	30	52.5	1	32	65	0.539	34.2	63.9	Infin.	0.742	0.327	Non-Liq.
58.0	126.3	1	24	57.5	1	30	57	0.534	27.9	63.9	0.275	0.737	0.328	0.84
59.0	126.3	1	24	57.5	1	30	57	0.530	27.7	63.9	0.271	0.733	0.328	0.82
60.0	126.3	1	24	57.5	1	30	57	0.525	27.6	63.9	0.267	0.728	0.329	0.81
61.0	126.3	1	24	57.5	1	30	57	0.521	27.4	63.9	0.263	0.723	0.329	0.80
62.0	126.3	1	24	57.5	1	30	57	0.517	27.2	63.9	0.260	0.719	0.329	0.79

Figure 16

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 8

LIQUEFACTION SETTLEMENT ANALYSIS
MAXIMUM CONSIDERED EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.71
PGA_M (g):	0.840
Calculated Mag.Wtg.Factor:	0.756
Historic High Groundwater:	50.0
Groundwater @ Exploration:	100.0

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e15} (%)	EQ. SETTLE. Pe (in.)
1	14	134.0288	0.034	0.034	90	36	0.546	--	0.00	0.00
2	14	134.0288	0.101	0.101	88	36	0.546	--	0.00	0.00
3	14	134.0288	0.168	0.168	85	36	0.546	--	0.00	0.00
4	14	134.0288	0.235	0.235	83	36	0.546	--	0.00	0.00
5	14	134.0288	0.302	0.302	81	34	0.546	--	0.00	0.00
6	14	134.0288	0.369	0.369	79	30	0.546	--	0.00	0.00
7	14	134.0288	0.436	0.436	77	28	0.546	--	0.00	0.00
8	7	126.318	0.501	0.501	53	20	0.546	--	0.00	0.00
9	7	126.318	0.564	0.564	52	19	0.546	--	0.00	0.00
10	7	126.318	0.627	0.627	51	19	0.546	--	0.00	0.00
11	7	126.318	0.690	0.690	51	18	0.546	--	0.00	0.00
12	7	126.318	0.753	0.753	51	18	0.546	--	0.00	0.00
13	5	126.318	0.816	0.816	41	14	0.546	--	0.00	0.00
14	5	126.318	0.880	0.880	41	14	0.546	--	0.00	0.00
15	11	126.318	0.943	0.943	58	23	0.546	--	0.00	0.00
16	11	126.318	1.006	1.006	58	23	0.546	--	0.00	0.00
17	5	126.318	1.069	1.069	38	14	0.546	--	0.00	0.00
18	5	126.318	1.132	1.132	38	14	0.546	--	0.00	0.00
19	15	126.318	1.195	1.195	63	29	0.546	--	0.00	0.00
20	15	126.318	1.259	1.259	63	28	0.546	--	0.00	0.00
21	15	126.318	1.322	1.322	63	28	0.546	--	0.00	0.00
22	15	126.318	1.385	1.385	63	27	0.546	--	0.00	0.00
23	15	126.318	1.448	1.448	63	27	0.546	--	0.00	0.00
24	5	126.318	1.511	1.511	35	14	0.546	--	0.00	0.00
25	5	126.318	1.574	1.574	35	14	0.546	--	0.00	0.00
26	6	126.318	1.638	1.638	36	15	0.546	--	0.00	0.00
27	6	126.318	1.701	1.701	36	15	0.546	--	0.00	0.00
28	6	126.318	1.764	1.764	36	15	0.546	--	0.00	0.00
29	6	126.318	1.827	1.827	36	15	0.546	--	0.00	0.00
30	6	126.318	1.890	1.890	36	15	0.546	--	0.00	0.00
31	6	126.318	1.953	1.953	36	14	0.546	--	0.00	0.00
32	38	126.318	2.016	2.016	86	48	0.546	--	0.00	0.00
33	38	126.318	2.080	2.080	86	48	0.546	--	0.00	0.00
34	38	126.318	2.143	2.143	86	47	0.546	--	0.00	0.00
35	38	126.318	2.206	2.206	86	46	0.546	--	0.00	0.00
36	38	126.318	2.269	2.269	86	46	0.546	--	0.00	0.00
37	15	126.318	2.332	2.332	52	24	0.546	--	0.00	0.00
38	15	126.318	2.395	2.395	52	24	0.546	--	0.00	0.00
39	15	126.318	2.459	2.459	52	20	0.546	--	0.00	0.00
40	15	126.318	2.522	2.522	52	20	0.546	--	0.00	0.00
41	15	126.318	2.585	2.585	52	20	0.546	--	0.00	0.00
42	21	126.318	2.648	2.648	58	26	0.546	--	0.00	0.00
43	21	126.318	2.711	2.711	58	26	0.546	--	0.00	0.00
44	21	126.318	2.774	2.774	58	26	0.546	--	0.00	0.00
45	21	126.318	2.838	2.838	58	25	0.546	--	0.00	0.00
46	41	126.318	2.901	2.901	78	46	0.546	--	0.00	0.00
47	41	126.318	2.964	2.964	78	45	0.546	--	0.00	0.00
48	41	126.318	3.027	3.027	78	45	0.546	--	0.00	0.00
49	41	126.318	3.090	3.090	78	45	0.546	--	0.00	0.00
50	41	126.318	3.153	3.138	78	44	0.549	Non-Liq.	0.00	0.00
51	41	126.318	3.217	3.170	78	44	0.554	Non-Liq.	0.00	0.00
52	30	126.318	3.280	3.202	65	35	0.559	Non-Liq.	0.00	0.00
53	30	126.318	3.343	3.234	65	35	0.564	Non-Liq.	0.00	0.00
54	30	126.318	3.406	3.266	65	35	0.569	Non-Liq.	0.00	0.00
55	30	126.318	3.469	3.298	65	35	0.574	Non-Liq.	0.00	0.00
56	30	126.318	3.532	3.330	65	34	0.579	Non-Liq.	0.00	0.00
57	30	126.318	3.595	3.361	65	34	0.584	Non-Liq.	0.00	0.00
58	24	126.318	3.659	3.393	57	28	0.589	0.84	0.75	0.09
59	24	126.318	3.722	3.425	57	28	0.593	0.82	0.75	0.09
60	24	126.318	3.785	3.457	57	28	0.598	0.81	0.75	0.09
61	24	126.318	3.848	3.489	57	27	0.602	0.80	1.10	0.13
62	24	126.318	3.911	3.521	57	27	0.606	0.79	1.10	0.13

TOTAL SETTLEMENT = 0.5 INCHES

Figure 17

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 1

TECHNICAL ENGINEERING AND DESIGN GUIDES AS ADAPTED FROM THE US ARMY CORPS OF ENGINEERS, NO. 9
EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS IN DRY SANDY SOILS
DESIGN EARTHQUAKE

DE EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.70
Peak Horiz. Acceleration (g):	0.753

Fig 4.1 Fig 4.2 Fig 4.4

Depth of Base of Strata (ft)	Thickness of Layer (ft)	Depth of Mid-point of Layer (ft)	Soil Unit Weight (pcf)	Overburden Pressure at Mid-point (tsf)	Mean Effective Pressure at Mid-point (tsf)	Average Cyclic Shear Stress [Tav]	Field SPT [N]	Correction Factor [Cer]	Relative Density [Dr] (%)	Correction Factor [Cn]	Corrected [N1]60	rd Factor	Maximum Shear Mod. [Gmax] (tsf)	[yeff]*[Geff] [Gmax]	yeff Shear Strain	[yeff]*100%	Volumetric Strain M7.5 [E15] (%)	Number of Strain Cycles [Nc]	Corrected Vol. Strains [Ec]	Estimated Settlement [S] (inches)
1.0	1.0	0.5	130.1	0.03	0.02	0.016	3	1.25	41.9	2.0	7.8	1.0	130.638	1.21E-04	2.30E-04	0.023	7.16E-02	8.6310	5.58E-02	
2.0	1.0	1.5	130.1	0.10	0.07	0.048	3	1.25	40.6	2.0	7.8	1.0	226.272	2.05E-04	3.00E-03	0.300	9.34E-01	8.6310	7.28E-01	
3.0	1.0	2.5	130.1	0.16	0.11	0.080	3	1.25	39.5	2.0	7.8	1.0	292.115	2.59E-04	8.10E-04	0.081	2.52E-01	8.6310	1.97E-01	
4.0	1.0	3.5	130.1	0.23	0.15	0.111	3	1.25	38.4	2.0	7.8	1.0	345.636	3.01E-04	5.00E-03	0.500	1.56E+00	8.6310	1.21E+00	
5.0	1.0	4.5	130.1	0.29	0.20	0.143	3	1.25	37.4	1.9	7.3	1.0	384.507	3.41E-04	5.00E-03	0.500	1.67E+00	8.6310	1.30E+00	
6.0	1.0	5.5	130.1	0.36	0.24	0.175	3	1.25	36.5	1.7	6.6	1.0	411.107	3.83E-04	1.00E-03	0.100	3.76E-01	8.6310	2.93E-01	
7.0	1.0	6.5	130.1	0.42	0.28	0.206	3	1.25	35.7	1.6	6.1	1.0	434.649	4.20E-04	2.70E-03	0.270	1.12E+00	8.6310	8.75E-01	
8.0	1.0	7.5	130.1	0.49	0.33	0.237	3	1.25	34.9	1.5	5.7	1.0	455.884	4.53E-04	2.70E-03	0.270	1.22E+00	8.6310	9.54E-01	
9.0	1.0	8.5	130.1	0.55	0.37	0.269	3	1.25	34.2	1.4	5.3	1.0	475.306	4.83E-04	2.70E-03	0.270	1.32E+00	8.6310	1.03E+00	
10.0	1.0	9.5	130.1	0.62	0.41	0.300	3	1.25	33.5	1.3	12.0	1.0	659.252	3.82E-04	1.00E-03	0.100	1.84E-01	8.6310	1.43E-01	
11.0	1.0	10.5	130.1	0.68	0.46	0.331	3	1.25	33.5	1.2	11.8	1.0	688.326	3.98E-04	1.00E-03	0.100	1.88E-01	8.6310	1.47E-01	
12.0	1.0	11.5	130.1	0.75	0.50	0.361	3	1.25	33.5	1.2	11.6	0.9	715.989	4.11E-04	1.20E-03	0.120	2.31E-01	8.6310	1.80E-01	
13.0	1.0	12.5	130.1	0.81	0.54	0.392	3	1.25	33.5	1.1	11.4	0.9	742.427	4.23E-04	1.20E-03	0.120	2.36E-01	8.6310	1.84E-01	
14.0	1.0	13.5	130.1	0.88	0.59	0.422	3	1.25	33.5	1.1	11.2	0.9	767.788	4.34E-04	1.20E-03	0.120	2.40E-01	8.6310	1.87E-01	
15.0	1.0	14.5	139.6	0.95	0.63	0.453	9	1.25	54.8	1.1	16.8	0.9	910.885	3.87E-04	7.10E-04	0.071	8.76E-02	8.6310	6.83E-02	0.02
16.0	1.0	15.5	139.6	1.02	0.68	0.485	9	1.25	54.8	1.0	16.4	0.9	935.814	3.98E-04	7.10E-04	0.071	9.04E-02	8.6310	7.05E-02	0.02
17.0	1.0	16.5	139.1	1.08	0.73	0.517	7	1.25	44.3	1.0	17.1	0.9	982.448	3.98E-04	7.10E-04	0.071	8.55E-02	8.6310	6.67E-02	0.00
18.0	1.0	17.5	139.1	1.15	0.77	0.548	7	1.25	44.3	1.0	16.8	0.9	1007.295	4.06E-04	1.20E-03	0.120	1.48E-01	8.6310	1.15E-01	0.00
19.0	1.0	18.5	139.1	1.22	0.82	0.579	7	1.25	44.3	0.9	16.5	0.9	1031.335	4.14E-04	1.20E-03	0.120	1.51E-01	8.6310	1.18E-01	0.00
20.0	1.0	19.5	139.1	1.29	0.87	0.610	14	1.25	62.7	0.9	23.2	0.9	1187.277	3.73E-04	7.10E-04	0.071	5.93E-02	8.6310	4.63E-02	0.01
21.0	1.0	20.5	139.1	1.36	0.91	0.640	14	1.25	62.7	0.9	22.7	0.9	1210.323	3.80E-04	7.10E-04	0.071	6.08E-02	8.6310	4.74E-02	0.01
22.0	1.0	21.5	119.3	1.43	0.96	0.668	29	1.25	83.9	0.9	40.0	0.9	1494.917	3.17E-04	7.10E-04	0.071	3.09E-02	8.6310	2.41E-02	0.01
23.0	1.0	22.5	119.3	1.49	1.00	0.693	29	1.25	83.9	0.8	39.2	0.9	1515.542	3.20E-04	7.10E-04	0.071	3.17E-02	8.6310	2.47E-02	0.01
24.0	1.0	23.5	119.3	1.55	1.04	0.717	29	1.25	83.9	0.8	38.4	0.9	1535.625	3.23E-04	5.20E-04	0.052	2.38E-02	8.6310	1.85E-02	0.00
25.0	1.0	24.5	119.3	1.61	1.08	0.742	29	1.25	83.9	0.8	37.7	0.9	1555.200	3.26E-04	5.20E-04	0.052	2.43E-02	8.6310	1.89E-02	0.00
26.0	1.0	25.5	119.3	1.67	1.12	0.766	29	1.25	83.9	0.8	37.0	0.9	1574.299	3.29E-04	5.20E-04	0.052	2.48E-02	8.6310	1.94E-02	0.00
27.0	1.0	26.5	119.3	1.73	1.16	0.789	29	1.25	83.9	0.8	36.4	0.9	1592.950	3.31E-04	5.20E-04	0.052	2.53E-02	8.6310	1.98E-02	0.00
28.0	1.0	27.5	136.8	1.79	1.20	0.814	20	1.25	65.8	0.8	30.3	0.9	1526.881	3.53E-04	5.20E-04	0.052	3.15E-02	8.6310	2.46E-02	0.01
29.0	1.0	28.5	136.8	1.86	1.25	0.841	20	1.25	65.8	0.7	29.9	0.9	1547.555	3.56E-04	5.20E-04	0.052	3.21E-02	8.6310	2.51E-02	0.01
30.0	1.0	29.5	136.8	1.93	1.29	0.867	20	1.25	65.8	0.7	29.4	0.9	1567.770	3.59E-04	5.20E-04	0.052	3.27E-02	8.6310	2.55E-02	0.01
31.0	1.0	30.5	136.8	2.00	1.34	0.893	20	1.25	65.8	0.7	29.0	0.9	1587.551	3.61E-04	5.20E-04	0.052	3.33E-02	8.6310	2.60E-02	0.01
32.0	1.0	31.5	136.8	2.06	1.38	0.919	28	1.25	73.5	0.7	38.9	0.9	1780.984	3.28E-04	5.20E-04	0.052	2.34E-02	8.6310	1.82E-02	0.00
33.0	1.0	32.5	136.8	2.13	1.43	0.944	28	1.25	73.5	0.7	38.3	0.9	1801.608	3.30E-04	5.20E-04	0.052	2.38E-02	8.6310	1.86E-02	0.00
34.0	1.0	33.5	136.8	2.20	1.47	0.968	28	1.25	73.5	0.7	37.8	0.8	1821.824	3.32E-04	5.20E-04	0.052	2.42E-02	8.6310	1.89E-02	0.00
35.0	1.0	34.5	136.8	2.27	1.52	0.992	28	1.25	73.5	0.7	37.3	0.8	1841.653	3.33E-04	5.20E-04	0.052	2.46E-02	8.6310	1.92E-02	0.00
36.0	1.0	35.5	131.6	2.34	1.57	1.015	30	1.25	72.3	0.7	35.7	0.8	1841.233	3.38E-04	5.20E-04	0.052	2.60E-02	8.6310	2.02E-02	0.00
37.0	1.0	36.5	131.6	2.40	1.61	1.037	30	1.25	72.3	0.7	35.2	0.8	1858.632	3.39E-04	5.20E-04	0.052	2.64E-02	8.6310	2.06E-02	0.00
38.0	1.0	37.5	131.6	2.47	1.65	1.059	30	1.25	72.3	0.7	34.8	0.8	1875.723	3.41E-04	5.20E-04	0.052	2.68E-02	8.6310	2.09E-02	0.01
39.0	1.0	38.5	131.6	2.53	1.70	1.080	30	1.25	72.3	0.6	34.3	0.8	1892.518	3.42E-04	5.20E-04	0.052	2.72E-02	8.6310	2.12E-02	0.01
40.0	1.0	39.5	122.8	2.60	1.74	1.099	30	1.25	72.3	0.6	33.9	0.8	1908.478	3.42E-04	5.20E-04	0.052	2.76E-02	8.6310	2.15E-02	0.01
41.0	1.0	40.5	122.8	2.66	1.78	1.118	30	1.25	72.3	0.6	33.5	0.8	1923.641	3.43E-04	5.20E-04	0.052	2.80E-02	8.6310	2.18E-02	0.01
42.0	1.0	41.5	122.8	2.72	1.82	1.135	30	1.25	72.3	0.6	33.2	0.8	1938.576	3.43E-04	5.20E-04	0.052	2.83E-02	8.6310	2.21E-02	0.01
43.0	1.0	42.5	131.8	2.78	1.86	1.154	28	1.25	66.9	0.6	30.7	0.8	1910.929	3.51E-04	5.20E-04	0.052	3.11E-02	8.6310	2.43E-02	0.01
44.0	1.0	43.5	131.8	2.85	1.91	1.172	28	1.25	66.9	0.6	30.3	0.8	1926.162	3.52E-04	5.20E-04	0.052	3.15E-02	8.6310	2.46E-02	0.01
45.0	1.0	44.5	131.8	2.92	1.95	1.191	28	1.25	66.9	0.6	30.0	0.8	1941.166	3.52E-04	5.20E-04	0.052	3.20E-02	8.6310	2.49E-02	0.01
46.0	1.0	45.5	131.8	2.98	2.00	1.209	28	1.25	66.9	0.6	29.7	0.8	1955.951	3.52E-04	5.20E-04	0.052	3.24E-02	8.6310	2.53E-02	0.01
47.0	1.0	46.5	131.8	3.05	2.04	1.226	28	1.25	66.9	0.6	29.4	0.8	1970.525	3.53E-04	1.00E-02	1.000	6.31E-01	8.6310	4.92E-01	0.12
48.0	1.0	47.5	131.8	3.11	2.09	1.243	11	1.25	40.2	0.6	18.0	0.8	1691.479	4.14E-04	1.00E-02	1.000	1.14E+00	8.6310	8.86E-01	0.00
49.0	1.0	48.5	128.6	3.18	2.13	1.259	11	1.25	40.2	0.6	17.9	0.8	1705.483	4.14E-04	1.00E-02	1.000	1.14E+00	8.6310	8.92E-01	0.00
50.0	1.0	49.5	128.6	3.24	2.17	1.274	20	1.25	52.8	0.6	26.6	0.8	1966.123	3.61E-04	1.00E-02	1.000	7.11E-01	8.6310	5.54E-01	0.13
51.0	1.0	50.5	137.2	3.31	2.22	1.290	20	1.25	52.8	0.6	26.4	0.8	1981.236	3.61E-04	1.00E-02	1.000	7.17E-01	8.6310	5.59E-01	0.00
52.0	1.0	51.5	137.2	3.38	2.26	1.306	20	1.25	52.8	0.6	26.2	0.8	1996.657	3.61E-04	1.00E-02	1.000	7.24E-01	8.6310	5.64E-01	0.00
53.0	1.0	52.5	137.2	3.45	2.31	1.322	20	1.25	52.8	0.6	26.0	0.8	2011.897	3.60E-04	1.00E-02	1.000	7.30E-01	8.6310	5.69E-01	0.00
54.0	1.0	53.5	137.2	3.51	2.35	1.337	20	1.25	52.8	0.5	25.8	0.8	2026.963	3.60E-04	1.00E-02	1.000	7.37E-01	8.6310	5.74E-01	0.00
55.0	1.0	54.5	137.2	3.58	2.40	1.352	20	1.25	52.8	0.5	25.6	0.8	2041.860	3.60E-04	1.00E-02	1.000	7.43E-01	8.6310	5.79E-01	0.00
56.0	1.0	55.5	128.6	3.65	2.45	1.365	22	1.25	55.4	0.5	27.3	0.7	2104.665	3.51E-04	1.00E-02	1.000	6.88E-01	8.6310	5.37E-01	0.00
57.0	1.0	56.5	128.6	3.71	2.49	1.378	22	1.25	55.4	0.5	27.1	0.7	2118.539	3.50E-04	1.00E-02	1.000	6.94E-01	8.6310	5.41E-01	0.00
58.0	1.0	57.5	141.3	3.78	2.53	1.391	58	1.25	88.1	0.5	53.7	0.7	2683.781	2.78E-04	1.00E-02	1.000	3.06E-01	8.6310	2.39E-01	0.00
59.0	1.0	58.5	141.3	3.85	2.58	1.404	58	1.25	88.1	0.5	53.2	0.7	2700.564	2.78E-04	1.00E-02	1.000	3.09E-01	8.6310	2.41E-01	0.00
60.0	1.0	59.5	141.3	3.92	2.63	1.418	58	1.25	88.1	0.5	52.8	0.7	2718.913	2.78E-04	1.00E-02	1.000	3.12E-01	8.6310	2.43E-01	0.00
61.0	1.0	60.5	141.3	3.99	2.68	1.431	58	1.25	88.1	0.5	52.6	0.7	2738.796	2.77E-04	1.00E-02	1.000	3.14E-01	8.6310	2.45E-01	0.00
62.0	1.0	61.5	141.3	4.06	2.72	1.443	58	1.25	88.1	0.5	52.3	0.7	2758.437	2.76E-04	1.00E-02	1.000	3.16E-01	8.6310	2.46E-01	0.00

SUBTERRANEAN EXCAVATION OR GRADING

TOTAL SETTLEMENT = **0.44**

Figure 18

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 5

TECHNICAL ENGINEERING AND DESIGN GUIDES AS ADAPTED FROM THE US ARMY CORPS OF ENGINEERS, NO. 9
EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS IN DRY SANDY SOILS
DESIGN EARTHQUAKE

DE EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.70
Peak Horiz. Acceleration (g):	0.753

Fig 4.1 Fig 4.2 Fig 4.4

Depth of Base of Strata (ft)	Thickness of Layer (ft)	Depth of Mid-point of Layer (ft)	Soil Unit Weight (pcf)	Overburden Pressure at Mid-point (tsf)	Mean Effective Pressure at Mid-point (tsf)	Average Cyclic Shear Stress [Tav]	Field SPT [N]	Correction Factor [Cer]	Relative Density [Dr] (%)	Correction Factor [Cn]	Corrected [N1]60	rd Factor	Maximum Shear Mod. [Gmax] (tsf)	[yeff]*[Geff] [Gmax]	yeff Shear Strain	[yeff]*100%	Volumetric Strain M7.5 [E15] (%)	Number of Strain Cycles [Nc]	Corrected Vol. Strains [Ec]	Estimated Settlement [S] (inches)
1.0	1.0	0.5	126.3	0.03	0.02	0.015	8	1.25	68.4	2.0	20.7	1.0	178.531	8.57E-05	1.60E-04	0.016	1.54E-02	8.6310	1.20E-02	
2.0	1.0	1.5	126.3	0.09	0.06	0.046	8	1.25	66.4	2.0	20.7	1.0	309.225	1.46E-04	2.30E-04	0.023	2.21E-02	8.6310	1.72E-02	
3.0	1.0	2.5	126.3	0.16	0.11	0.077	8	1.25	64.6	2.0	20.7	1.0	399.207	1.84E-04	1.70E-04	0.017	1.63E-02	8.6310	1.27E-02	
4.0	1.0	3.5	126.3	0.22	0.15	0.108	8	1.25	62.9	2.0	20.7	1.0	472.348	2.14E-04	8.10E-04	0.081	7.77E-02	8.6310	6.06E-02	
5.0	1.0	4.5	126.3	0.28	0.19	0.139	8	1.25	61.3	1.9	19.8	1.0	528.036	2.41E-04	8.10E-04	0.081	8.18E-02	8.6310	6.38E-02	
6.0	1.0	5.5	126.3	0.35	0.23	0.169	8	1.25	59.9	1.7	17.9	1.0	564.565	2.71E-04	4.50E-04	0.045	5.13E-02	8.6310	4.00E-02	
7.0	1.0	6.5	126.3	0.41	0.28	0.200	8	1.25	58.5	1.6	23.5	1.0	671.552	2.64E-04	4.50E-04	0.045	3.71E-02	8.6310	2.89E-02	
8.0	1.0	7.5	126.3	0.47	0.32	0.231	8	1.25	57.3	1.5	22.4	1.0	709.510	2.83E-04	4.50E-04	0.045	3.94E-02	8.6310	3.07E-02	
9.0	1.0	8.5	126.3	0.54	0.36	0.261	8	1.25	56.1	1.4	21.4	1.0	744.689	3.00E-04	4.50E-04	0.045	4.14E-02	8.6310	3.23E-02	
10.0	1.0	9.5	126.3	0.60	0.40	0.291	8	1.25	55.0	1.3	20.7	1.0	777.598	3.15E-04	1.00E-03	0.100	9.62E-02	8.6310	7.50E-02	
11.0	1.0	10.5	126.3	0.66	0.44	0.321	7	1.25	48.6	1.3	18.4	1.0	786.099	3.38E-04	1.00E-03	0.100	1.11E-01	8.6310	8.64E-02	
12.0	1.0	11.5	126.3	0.73	0.49	0.351	7	1.25	48.6	1.2	17.9	0.9	815.066	3.51E-04	1.00E-03	0.100	1.15E-01	8.6310	8.93E-02	
13.0	1.0	12.5	126.3	0.79	0.53	0.380	7	1.25	48.6	1.1	17.4	0.9	842.673	3.62E-04	7.10E-04	0.071	8.38E-02	8.6310	6.54E-02	
14.0	1.0	13.5	126.3	0.85	0.57	0.410	7	1.25	48.6	1.1	17.0	0.9	869.092	3.73E-04	7.10E-04	0.071	8.62E-02	8.6310	6.72E-02	
15.0	1.0	14.5	131.0	0.92	0.61	0.439	7	1.25	44.7	1.1	12.2	0.9	806.343	4.24E-04	1.20E-03	0.120	2.17E-01	8.6310	1.70E-01	0.04
16.0	1.0	15.5	131.0	0.98	0.66	0.470	7	1.25	44.7	1.0	11.8	0.9	826.024	4.36E-04	1.20E-03	0.120	2.26E-01	8.6310	1.76E-01	0.04
17.0	1.0	16.5	131.0	1.05	0.70	0.499	7	1.25	44.7	1.0	16.3	0.9	950.294	3.98E-04	7.10E-04	0.071	9.06E-02	8.6310	7.06E-02	0.02
18.0	1.0	17.5	131.0	1.11	0.75	0.529	7	1.25	44.7	1.0	16.0	0.9	973.345	4.05E-04	1.20E-03	0.120	1.57E-01	8.6310	1.22E-01	0.03
19.0	1.0	18.5	131.0	1.18	0.79	0.558	7	1.25	44.7	0.9	15.7	0.9	995.656	4.13E-04	1.20E-03	0.120	1.60E-01	8.6310	1.25E-01	0.03
20.0	1.0	19.5	134.4	1.25	0.83	0.587	23	1.25	75.4	0.9	39.7	0.9	1393.114	3.06E-04	7.10E-04	0.071	3.12E-02	8.6310	2.43E-02	0.01
21.0	1.0	20.5	134.4	1.31	0.88	0.616	23	1.25	75.4	0.9	38.8	0.9	1419.640	3.12E-04	7.10E-04	0.071	3.20E-02	8.6310	2.50E-02	0.01
22.0	1.0	21.5	134.4	1.38	0.92	0.645	23	1.25	75.4	0.9	38.0	0.9	1445.350	3.16E-04	7.10E-04	0.071	3.28E-02	8.6310	2.56E-02	0.01
23.0	1.0	22.5	134.4	1.45	0.97	0.674	23	1.25	75.4	0.8	37.3	0.9	1470.307	3.21E-04	7.10E-04	0.071	3.36E-02	8.6310	2.62E-02	0.01
24.0	1.0	23.5	134.4	1.51	1.01	0.702	23	1.25	75.4	0.8	36.6	0.9	1494.568	3.25E-04	5.20E-04	0.052	2.52E-02	8.6310	1.96E-02	0.00
25.0	1.0	24.5	130.2	1.58	1.06	0.730	23	1.25	75.4	0.8	35.9	0.9	1517.823	3.29E-04	5.20E-04	0.052	2.57E-02	8.6310	2.01E-02	0.00
26.0	1.0	25.5	130.2	1.65	1.10	0.756	23	1.25	75.4	0.8	35.3	0.9	1540.143	3.32E-04	5.20E-04	0.052	2.63E-02	8.6310	2.05E-02	0.00
27.0	1.0	26.5	125.2	1.71	1.15	0.782	26	1.25	75.3	0.8	34.5	0.9	1556.641	3.36E-04	5.20E-04	0.052	2.71E-02	8.6310	2.11E-02	0.01
28.0	1.0	27.5	125.2	1.77	1.19	0.806	26	1.25	75.3	0.8	33.8	0.9	1575.457	3.39E-04	5.20E-04	0.052	2.77E-02	8.6310	2.16E-02	0.01
29.0	1.0	28.5	125.2	1.83	1.23	0.830	26	1.25	75.3	0.8	33.3	0.9	1593.837	3.41E-04	5.20E-04	0.052	2.82E-02	8.6310	2.20E-02	0.01
30.0	1.0	29.5	125.2	1.90	1.27	0.854	26	1.25	75.3	0.7	32.7	0.9	1611.804	3.43E-04	5.20E-04	0.052	2.88E-02	8.6310	2.25E-02	0.01
31.0	1.0	30.5	125.2	1.96	1.31	0.877	26	1.25	75.3	0.7	32.2	0.9	1629.381	3.46E-04	5.20E-04	0.052	2.94E-02	8.6310	2.29E-02	0.01
32.0	1.0	31.5	121.0	2.02	1.35	0.900	33	1.25	80.4	0.7	44.4	0.9	1841.493	3.11E-04	5.20E-04	0.052	2.00E-02	8.6310	1.56E-02	0.00
33.0	1.0	32.5	121.0	2.08	1.39	0.921	33	1.25	80.4	0.7	43.8	0.9	1860.397	3.12E-04	5.20E-04	0.052	2.03E-02	8.6310	1.58E-02	0.00
34.0	1.0	33.5	121.0	2.14	1.44	0.943	33	1.25	80.4	0.7	43.2	0.8	1878.955	3.13E-04	5.20E-04	0.052	2.06E-02	8.6310	1.61E-02	0.00
35.0	1.0	34.5	121.0	2.20	1.48	0.963	33	1.25	80.4	0.7	42.6	0.8	1897.183	3.14E-04	5.20E-04	0.052	2.10E-02	8.6310	1.63E-02	0.00
36.0	1.0	35.5	121.0	2.26	1.52	0.984	33	1.25	80.4	0.7	42.1	0.8	1915.096	3.15E-04	5.20E-04	0.052	2.13E-02	8.6310	1.66E-02	0.00
37.0	1.0	36.5	121.0	2.32	1.56	1.003	19	1.25	58.2	0.7	29.0	0.8	1712.951	3.56E-04	5.20E-04	0.052	3.33E-02	8.6310	2.60E-02	0.00
38.0	1.0	37.5	121.0	2.38	1.60	1.023	19	1.25	58.2	0.7	28.7	0.8	1729.484	3.57E-04	5.20E-04	0.052	3.37E-02	8.6310	2.63E-02	0.00
39.0	1.0	38.5	121.0	2.44	1.64	1.042	19	1.25	58.2	0.7	28.4	0.8	1745.773	3.57E-04	5.20E-04	0.052	3.41E-02	8.6310	2.66E-02	0.00
40.0	1.0	39.5	140.7	2.51	1.68	1.063	13	1.25	45.9	0.6	21.5	0.8	1610.952	3.92E-04	5.20E-04	0.052	4.78E-02	8.6310	3.73E-02	0.01
41.0	1.0	40.5	140.7	2.58	1.73	1.085	13	1.25	45.9	0.6	21.3	0.8	1628.321	3.93E-04	5.20E-04	0.052	4.83E-02	8.6310	3.77E-02	0.01
42.0	1.0	41.5	140.7	2.65	1.78	1.107	13	1.25	45.9	0.6	21.1	0.8	1645.426	3.94E-04	5.20E-04	0.052	4.88E-02	8.6310	3.81E-02	0.01
43.0	1.0	42.5	140.7	2.72	1.82	1.128	13	1.25	45.9	0.6	20.9	0.8	1662.276	3.94E-04	5.20E-04	0.052	4.94E-02	8.6310	3.85E-02	0.01
44.0	1.0	43.5	140.7	2.79	1.87	1.149	13	1.25	45.9	0.6	20.7	0.8	1678.883	3.95E-04	5.20E-04	0.052	4.99E-02	8.6310	3.89E-02	0.01
45.0	1.0	44.5	140.7	2.86	1.92	1.169	13	1.25	45.9	0.6	20.5	0.8	1695.255	3.96E-04	5.20E-04	0.052	5.04E-02	8.6310	3.93E-02	0.01
46.0	1.0	45.5	140.7	2.93	1.96	1.189	13	1.25	45.9	0.6	20.4	0.8	1711.404	3.96E-04	5.20E-04	0.052	5.08E-02	8.6310	3.96E-02	0.01
47.0	1.0	46.5	135.1	3.00	2.01	1.208	100	1.25	121.9	0.6	103.3	0.8	2973.931	2.30E-04	1.00E-02	1.000	1.39E-01	8.6310	1.09E-01	0.03
48.0	1.0	47.5	135.1	3.07	2.06	1.225	100	1.25	121.9	0.6	102.2	0.8	2996.239	2.30E-04	1.00E-02	1.000	1.41E-01	8.6310	1.10E-01	0.03
49.0	1.0	48.5	135.1	3.14	2.10	1.242	100	1.25	121.9	0.6	101.1	0.8	3018.226	2.31E-04	1.00E-02	1.000	1.43E-01	8.6310	1.12E-01	0.03
50.0	1.0	49.5	135.1	3.20	2.15	1.259	100	1.25	121.9	0.6	100.0	0.8	3039.901	2.31E-04	1.00E-02	1.000	1.45E-01	8.6310	1.13E-01	0.03
51.0	1.0	50.5	135.1	3.27	2.19	1.276	100	1.25	121.9	0.6	99.0	0.8	3061.277	2.31E-04	1.00E-02	1.000	1.47E-01	8.6310	1.14E-01	0.00
52.0	1.0	51.5	126.6	3.34	2.24	1.291	37	1.25	72.2	0.6	37.2	0.8	2231.925	3.19E-04	1.00E-02	1.000	4.74E-01	8.6310	3.70E-01	0.00
53.0	1.0	52.5	126.6	3.40	2.28	1.304	37	1.25	72.2	0.6	36.9	0.8	2246.238	3.18E-04	1.00E-02	1.000	4.79E-01	8.6310	3.74E-01	0.00
54.0	1.0	53.5	126.6	3.46	2.32	1.318	37	1.25	72.2	0.5	36.6	0.8	2260.379	3.18E-04	1.00E-02	1.000	4.85E-01	8.6310	3.78E-01	0.00
55.0	1.0	54.5	126.6	3.53	2.36	1.331	37	1.25	72.2	0.5	36.3	0.8	2274.353	3.18E-04	1.00E-02	1.000	4.90E-01	8.6310	3.82E-01	0.00
56.0	1.0	55.5	126.6	3.59	2.41	1.343	37	1.25	72.2	0.5	36.0	0.7	2288.166	3.18E-04	1.00E-02	1.000	4.95E-01	8.6310	3.86E-01	0.00
57.0	1.0	56.5	134.4	3.66	2.45	1.356	45	1.25	78.1	0.5	43.9	0.7	2467.449	2.96E-04	1.00E-02	1.000	3.89E-01	8.6310	3.04E-01	0.00
58.0	1.0	57.5	134.4	3.72	2.49	1.369	45	1.25	78.1	0.5	43.5	0.7	2482.899	2.96E-04	1.00E-02	1.000	3.93E-01	8.6310	3.07E-01	0.00
59.0	1.0	58.5	134.4	3.79	2.54	1.382	45	1.25	78.1	0.5	43.1	0.7	2498.170	2.95E-04	1.00E-02	1.000	3.97E-01	8.6310	3.10E-01	0.00
60.0	1.0	59.5	134.4	3.86	2.58	1.394	45	1.25	78.1	0.5	42.8	0.7	2513.267	2.95E-04	1.00E-02	1.000	4.01E-01	8.6310	3.13E-01	0.00
61.0	1.0	60.5	134.4	3.92	2.63	1.406	45	1.25	78.1	0.5	42.4	0.7	2528.195	2.95E-04	1.00E-02	1.000	4.05E-01	8.6310	3.16E-01	0.00
62.0	1.0	61.5	134.4	3.99	2.67	1.417	45	1.25	78.1	0.5	42.1	0.7	2542.960	2.94E-04	1.00E-02	1.000	4.09E-01	8.6310	3.19E-01	0.00

SUBTERRANEAN EXCAVATION & GRADING

TOTAL SETTLEMENT = **0.41**

Figure 19

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 8

TECHNICAL ENGINEERING AND DESIGN GUIDES AS ADAPTED FROM THE US ARMY CORPS OF ENGINEERS, NO. 9
EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS IN DRY SANDY SOILS
DESIGN EARTHQUAKE

DE EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.70
Peak Horiz. Acceleration (g):	0.753

Fig 4.1 Fig 4.2 Fig 4.4

Depth of Base of Strata (ft)	Thickness of Layer (ft)	Depth of Mid-point of Layer (ft)	Soil Unit Weight (pcf)	Overburden Pressure at Mid-point (tsf)	Mean Effective Pressure at Mid-point (tsf)	Average Cyclic Shear Stress [Tav]	Field SPT [N]	Correction Factor [Cer]	Relative Density [Dr] (%)	Correction Factor [Cn]	Corrected [N1]60	rd Factor	Maximum Shear Mod. [Gmax] (tsf)	[yeff]*[Geff] [Gmax]	yeff Shear Strain	[yeff]*100%	Volumetric Strain M7.5 [E15] (%)	Number of Strain Cycles [Nc]	Corrected Vol. Strains [Ec]	Estimated Settlement [S] (inches)	
1.0	1.0	0.5	134.0	0.03	0.02	0.016	14	1.25	90.5	2.0	36.2	1.0	221.607	7.33E-05	1.40E-04	0.014	6.86E-03	8.6310	5.35E-03		
2.0	1.0	1.5	134.0	0.10	0.07	0.049	14	1.25	87.7	2.0	36.2	1.0	383.835	1.24E-04	2.30E-04	0.023	1.13E-02	8.6310	8.79E-03		
3.0	1.0	2.5	134.0	0.17	0.11	0.082	14	1.25	85.1	2.0	36.2	1.0	495.528	1.57E-04	1.70E-04	0.017	8.33E-03	8.6310	6.50E-03		
4.0	1.0	3.5	134.0	0.23	0.16	0.115	14	1.25	82.8	2.0	36.2	1.0	586.317	1.83E-04	1.70E-04	0.017	8.33E-03	8.6310	6.50E-03		
5.0	1.0	4.5	134.0	0.30	0.20	0.147	14	1.25	80.6	1.9	33.7	1.0	649.005	2.08E-04	4.50E-04	0.045	2.41E-02	8.6310	1.88E-02		
6.0	1.0	5.5	134.0	0.37	0.25	0.180	14	1.25	78.6	1.7	30.5	1.0	693.902	2.34E-04	4.50E-04	0.045	2.71E-02	8.6310	2.12E-02		
7.0	1.0	6.5	134.0	0.44	0.29	0.212	14	1.25	76.8	1.5	28.0	1.0	733.638	2.56E-04	4.50E-04	0.045	3.00E-02	8.6310	2.34E-02		
8.0	1.0	7.5	126.3	0.50	0.34	0.244	7	1.25	53.1	1.4	20.1	1.0	703.656	3.01E-04	1.00E-03	0.100	9.95E-02	8.6310	7.76E-02		
9.0	1.0	8.5	126.3	0.56	0.38	0.274	7	1.25	52.0	1.4	19.3	1.0	737.251	3.18E-04	1.00E-03	0.100	1.04E-01	8.6310	8.13E-02		
10.0	1.0	9.5	126.3	0.63	0.42	0.304	7	1.25	51.0	1.3	18.7	1.0	768.806	3.33E-04	1.00E-03	0.100	1.08E-01	8.6310	8.46E-02		
11.0	1.0	10.5	126.3	0.69	0.46	0.334	7	1.25	51.0	1.2	18.1	1.0	798.642	3.46E-04	1.00E-03	0.100	1.12E-01	8.6310	8.77E-02		
12.0	1.0	11.5	126.3	0.75	0.50	0.364	7	1.25	51.0	1.2	17.7	0.9	827.004	3.59E-04	7.10E-04	0.071	8.24E-02	8.6310	6.43E-02		
13.0	1.0	12.5	126.3	0.82	0.55	0.393	5	1.25	40.8	1.1	14.3	0.9	802.745	3.93E-04	7.10E-04	0.071	1.06E-01	8.6310	8.27E-02		
14.0	1.0	13.5	126.3	0.88	0.59	0.423	5	1.25	40.8	1.1	14.0	0.9	827.993	4.04E-04	1.20E-03	0.120	1.83E-01	8.6310	1.43E-01		
15.0	1.0	14.5	126.3	0.94	0.63	0.452	11	1.25	58.5	1.1	23.1	0.9	1011.856	3.48E-04	7.10E-04	0.071	5.97E-02	8.6310	4.66E-02	0.01	
16.0	1.0	15.5	126.3	1.01	0.67	0.481	11	1.25	58.5	1.0	22.6	0.9	1037.394	3.56E-04	7.10E-04	0.071	6.13E-02	8.6310	4.78E-02	0.01	
17.0	1.0	16.5	126.3	1.07	0.72	0.509	5	1.25	37.6	1.0	14.3	0.9	918.084	4.20E-04	1.20E-03	0.120	1.80E-01	8.6310	1.40E-01	0.03	
18.0	1.0	17.5	126.3	1.13	0.76	0.538	5	1.25	37.6	1.0	14.1	0.9	940.245	4.27E-04	1.20E-03	0.120	1.83E-01	8.6310	1.43E-01	0.03	
19.0	1.0	18.5	126.3	1.20	0.80	0.566	15	1.25	63.3	0.9	28.6	0.9	1223.965	3.40E-04	7.10E-04	0.071	4.61E-02	8.6310	3.60E-02	0.01	
20.0	1.0	19.5	126.3	1.26	0.84	0.593	15	1.25	63.3	0.9	28.1	0.9	1247.791	3.46E-04	7.10E-04	0.071	4.72E-02	8.6310	3.68E-02	0.01	
21.0	1.0	20.5	126.3	1.32	0.89	0.621	15	1.25	63.3	0.9	27.6	0.9	1270.929	3.50E-04	7.10E-04	0.071	4.83E-02	8.6310	3.76E-02	0.01	
22.0	1.0	21.5	126.3	1.38	0.93	0.648	15	1.25	63.3	0.9	27.1	0.9	1293.432	3.55E-04	7.10E-04	0.071	4.93E-02	8.6310	3.84E-02	0.01	
23.0	1.0	22.5	126.3	1.45	0.97	0.674	15	1.25	63.3	0.8	26.7	0.9	1315.347	3.59E-04	7.10E-04	0.071	5.03E-02	8.6310	3.92E-02	0.01	
24.0	1.0	23.5	126.3	1.51	1.01	0.701	5	1.25	35.1	0.8	13.7	0.9	1074.951	4.51E-04	8.10E-04	0.081	1.28E-01	8.6310	9.99E-02	0.00	
25.0	1.0	24.5	126.3	1.57	1.05	0.727	5	1.25	35.1	0.8	13.5	0.9	1093.561	4.55E-04	8.10E-04	0.081	1.30E-01	8.6310	1.01E-01	0.00	
26.0	1.0	25.5	126.3	1.64	1.10	0.752	6	1.25	36.2	0.8	15.1	0.9	1157.047	4.40E-04	8.10E-04	0.081	1.14E-01	8.6310	8.86E-02	0.02	
27.0	1.0	26.5	126.3	1.70	1.14	0.778	6	1.25	36.2	0.8	14.9	0.9	1175.186	4.43E-04	8.10E-04	0.081	1.15E-01	8.6310	8.96E-02	0.02	
28.0	1.0	27.5	126.3	1.76	1.18	0.802	6	1.25	36.2	0.8	14.8	0.9	1192.965	4.45E-04	8.10E-04	0.081	1.16E-01	8.6310	9.07E-02	0.02	
29.0	1.0	28.5	126.3	1.83	1.22	0.827	6	1.25	36.2	0.8	14.7	0.9	1210.406	4.47E-04	8.10E-04	0.081	1.18E-01	8.6310	9.17E-02	0.02	
30.0	1.0	29.5	126.3	1.89	1.27	0.851	6	1.25	36.2	0.7	14.5	0.9	1227.526	4.49E-04	8.10E-04	0.081	1.19E-01	8.6310	9.27E-02	0.02	
31.0	1.0	30.5	126.3	1.95	1.31	0.875	6	1.25	36.2	0.7	14.4	0.9	1244.342	4.51E-04	8.10E-04	0.081	1.20E-01	8.6310	9.36E-02	0.02	
32.0	1.0	31.5	126.3	2.02	1.35	0.898	38	1.25	86.3	0.7	48.3	0.9	1891.672	3.02E-04	5.20E-04	0.052	1.81E-02	8.6310	1.41E-02	0.00	
33.0	1.0	32.5	126.3	2.08	1.39	0.920	38	1.25	86.3	0.7	47.5	0.9	1911.444	3.03E-04	5.20E-04	0.052	1.84E-02	8.6310	1.43E-02	0.00	
34.0	1.0	33.5	126.3	2.14	1.44	0.943	38	1.25	86.3	0.7	46.9	0.8	1930.825	3.05E-04	5.20E-04	0.052	1.87E-02	8.6310	1.46E-02	0.00	
35.0	1.0	34.5	126.3	2.21	1.48	0.965	38	1.25	86.3	0.7	46.2	0.8	1949.835	3.06E-04	5.20E-04	0.052	1.90E-02	8.6310	1.49E-02	0.00	
36.0	1.0	35.5	126.3	2.27	1.52	0.986	38	1.25	86.3	0.7	45.6	0.8	1968.490	3.07E-04	5.20E-04	0.052	1.94E-02	8.6310	1.51E-02	0.00	
37.0	1.0	36.5	126.3	2.33	1.56	1.007	15	1.25	51.7	0.7	24.3	0.8	1618.731	3.78E-04	5.20E-04	0.052	4.11E-02	8.6310	3.21E-02	0.01	
38.0	1.0	37.5	126.3	2.40	1.60	1.028	15	1.25	51.7	0.7	24.1	0.8	1635.318	3.79E-04	5.20E-04	0.052	4.16E-02	8.6310	3.24E-02	0.01	
39.0	1.0	38.5	126.3	2.46	1.65	1.048	15	1.25	51.7	0.7	20.4	0.8	1567.193	4.00E-04	8.10E-04	0.081	7.92E-02	8.6310	6.17E-02	0.01	
40.0	1.0	39.5	126.3	2.52	1.69	1.067	15	1.25	51.7	0.6	20.2	0.8	1581.661	4.01E-04	8.10E-04	0.081	8.02E-02	8.6310	6.25E-02	0.02	
41.0	1.0	40.5	126.3	2.58	1.73	1.087	15	1.25	51.7	0.6	20.0	0.8	1595.912	4.02E-04	8.10E-04	0.081	8.12E-02	8.6310	6.33E-02	0.02	
42.0	1.0	41.5	126.3	2.65	1.77	1.105	21	1.25	58.5	0.6	26.3	0.8	1769.934	3.66E-04	5.20E-04	0.052	3.75E-02	8.6310	2.92E-02	0.01	
43.0	1.0	42.5	126.3	2.71	1.82	1.124	21	1.25	58.5	0.6	26.0	0.8	1784.840	3.66E-04	5.20E-04	0.052	3.80E-02	8.6310	2.96E-02	0.01	
44.0	1.0	43.5	126.3	2.77	1.86	1.142	21	1.25	58.5	0.6	25.7	0.8	1799.534	3.66E-04	5.20E-04	0.052	3.84E-02	8.6310	2.99E-02	0.01	
45.0	1.0	44.5	126.3	2.84	1.90	1.159	21	1.25	58.5	0.6	25.5	0.8	1814.022	3.67E-04	5.20E-04	0.052	3.89E-02	8.6310	3.03E-02	0.01	
46.0	1.0	45.5	126.3	2.90	1.94	1.176	41	1.25	78.4	0.6	46.0	0.8	2232.044	3.00E-04	5.20E-04	0.052	1.92E-02	8.6310	1.49E-02	0.00	
47.0	1.0	46.5	126.3	2.96	1.99	1.193	41	1.25	78.4	0.6	45.5	0.8	2248.750	3.01E-04	5.20E-04	0.052	1.94E-02	8.6310	1.51E-02	0.00	
48.0	1.0	47.5	126.3	3.03	2.03	1.209	41	1.25	78.4	0.6	45.1	0.8	2265.230	3.01E-04	1.00E-02	1.000	3.77E-01	8.6310	2.94E-01	0.07	
49.0	1.0	48.5	126.3	3.09	2.07	1.224	41	1.25	78.4	0.6	44.6	0.8	2281.493	3.01E-04	1.00E-02	1.000	3.82E-01	8.6310	2.98E-01	0.07	
50.0	1.0	49.5	126.3	3.15	2.11	1.239	41	1.25	78.4	0.6	44.2	0.8	2297.547	3.01E-04	1.00E-02	1.000	3.86E-01	8.6310	3.01E-01	0.07	
51.0	1.0	50.5	126.3	3.22	2.16	1.254	41	1.25	78.4	0.6	43.8	0.8	2313.397	3.00E-04	1.00E-02	1.000	3.90E-01	8.6310	3.04E-01	0.00	
52.0	1.0	51.5	126.3	3.28	2.20	1.268	30	1.25	65.4	0.6	35.5	0.8	2177.197	3.21E-04	1.00E-02	1.000	5.03E-01	8.6310	3.92E-01	0.00	
53.0	1.0	52.5	126.3	3.34	2.24	1.282	30	1.25	65.4	0.6	35.2	0.8	2192.322	3.21E-04	1.00E-02	1.000	5.07E-01	8.6310	3.96E-01	0.00	
54.0	1.0	53.5	126.3	3.41	2.28	1.296	30	1.25	65.4	0.6	34.9	0.8	2207.275	3.20E-04	1.00E-02	1.000	5.12E-01	8.6310	3.99E-01	0.00	
55.0	1.0	54.5	126.3	3.47	2.32	1.309	30	1.25	65.4	0.5	34.7	0.8	2222.062	3.20E-04	1.00E-02	1.000	5.17E-01	8.6310	4.03E-01	0.00	
56.0	1.0	55.5	126.3	3.53	2.37	1.321	30	1.25	65.4	0.5	34.4	0.7	2236.688	3.20E-04	1.00E-02	1.000	5.21E-01	8.6310	4.07E-01	0.00	
57.0	1.0	56.5	126.3	3.60	2.41	1.334	30	1.25	65.4	0.5	34.2	0.7	2251.157	3.19E-04	1.00E-02	1.000	5.26E-01	8.6310	4.10E-01	0.00	
58.0	1.0	57.5	126.3	3.66	2.45	1.345	24	1.25	57.4	0.5	27.9	0.7	2123.259	3.40E-04	1.00E-02	1.000	6.70E-01	8.6310	5.22E-01	0.00	
59.0	1.0	58.5	126.3	3.72	2.49	1.357	24	1.25	57.4	0.5	27.7	0.7	2136.680	3.39E-04	1.00E-02	1.000	6.75E-01	8.6310	5.27E-01	0.00	
60.0	1.0	59.5	126.3	3.78	2.54	1.368	24	1.25	57.4	0.5	27.6	0.7	2149.966	3.39E-04	1.00E-02	1.000	6.81E-01	8.6310	5.31E-01	0.00	
61.0	1.0	60.5	126.3	3.85	2.58	1.379	24	1.25	57.4	0.5	27.4	0.7	2163.120	3.38E-04	1.00E-02	1.000	6.86E-01	8.6310	5.35E-01	0.00	
62.0	1.0	61.5	126.3	3.91	2.62	1.389	24	1.25	57.4	0.5	27.2	0.7	2176.147	3.37E-04	1.00E-02	1.000	6.91E-01	8.6310	5.39E-01	0.00	

SUBTERRANEAN EXCAVATION & GRADING

TOTAL SETTLEMENT = **0.59**

Figure 20

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 1

TECHNICAL ENGINEERING AND DESIGN GUIDES AS ADAPTED FROM THE US ARMY CORPS OF ENGINEERS, NO. 9
EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS IN DRY SANDY SOILS
MAXIMUM CONSIDERED EARTHQUAKE

MCE EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.71
Peak Horiz. Acceleration (g):	0.840

Fig 4.1 Fig 4.2 Fig 4.4

Depth of Base of Strata (ft)	Thickness of Layer (ft)	Depth of Mid-point of Layer (ft)	Soil Unit Weight (pcf)	Overburden Pressure at Mid-point (tsf)	Mean Effective Pressure at Mid-point (tsf)	Average Cyclic Shear Stress [Tav]	Field SPT [N]	Correction Factor [Cer]	Relative Density [Dr] (%)	Correction Factor [Cn]	Corrected [N1]60	rd Factor	Maximum Shear Mod. [Gmax] (tsf)	[yeff]*[Geff] [Gmax]	yeff Shear Strain	[yeff]*100%	Volumetric Strain M7.5 [E15] (%)	Number of Strain Cycles [Nc]	Corrected Vol. Strains [Ec]	Estimated Settlement [S] (inches)	
1.0	1.0	0.5	130.1	0.03	0.02	0.018	3	1.25	41.9	2.0	7.8	1.0	130.638	1.35E-04	2.30E-04	0.023	7.16E-02	8.7005	5.60E-02		
2.0	1.0	1.5	130.1	0.10	0.07	0.053	3	1.25	40.6	2.0	7.8	1.0	226.272	2.28E-04	3.00E-03	0.300	9.34E-01	8.7005	7.31E-01		
3.0	1.0	2.5	130.1	0.16	0.11	0.089	3	1.25	39.5	2.0	7.8	1.0	292.115	2.89E-04	8.10E-04	0.081	2.52E-01	8.7005	1.97E-01		
4.0	1.0	3.5	130.1	0.23	0.15	0.124	3	1.25	38.4	2.0	7.8	1.0	345.636	3.36E-04	5.00E-03	0.500	1.56E+00	8.7005	1.22E+00		
5.0	1.0	4.5	130.1	0.29	0.20	0.159	3	1.25	37.4	1.9	7.3	1.0	384.507	3.81E-04	5.00E-03	0.500	1.67E+00	8.7005	1.30E+00		
6.0	1.0	5.5	130.1	0.36	0.24	0.195	3	1.25	36.5	1.7	6.6	1.0	411.107	4.27E-04	2.70E-03	0.270	1.02E+00	8.7005	7.95E-01		
7.0	1.0	6.5	130.1	0.42	0.28	0.230	3	1.25	35.7	1.6	6.1	1.0	434.649	4.68E-04	2.70E-03	0.270	1.12E+00	8.7005	8.79E-01		
8.0	1.0	7.5	130.1	0.49	0.33	0.265	3	1.25	34.9	1.5	5.7	1.0	455.884	5.06E-04	1.00E-02	1.000	4.53E+00	8.7005	3.55E+00		
9.0	1.0	8.5	130.1	0.55	0.37	0.300	3	1.25	34.2	1.4	5.3	1.0	475.306	5.39E-04	1.00E-02	1.000	4.88E+00	8.7005	3.82E+00		
10.0	1.0	9.5	130.1	0.62	0.41	0.334	3	1.25	33.5	1.3	12.0	1.0	659.252	4.27E-04	2.70E-03	0.270	4.96E-01	8.7005	3.88E-01		
11.0	1.0	10.5	130.1	0.68	0.46	0.369	3	1.25	33.5	1.2	11.8	1.0	688.326	4.44E-04	2.70E-03	0.270	5.09E-01	8.7005	3.98E-01		
12.0	1.0	11.5	130.1	0.75	0.50	0.403	3	1.25	33.5	1.2	11.6	0.9	715.989	4.59E-04	1.20E-03	0.120	2.31E-01	8.7005	1.81E-01		
13.0	1.0	12.5	130.1	0.81	0.54	0.437	3	1.25	33.5	1.1	11.4	0.9	742.427	4.72E-04	1.20E-03	0.120	2.36E-01	8.7005	1.84E-01		
14.0	1.0	13.5	130.1	0.88	0.59	0.471	3	1.25	33.5	1.1	11.2	0.9	767.788	4.85E-04	1.20E-03	0.120	2.40E-01	8.7005	1.88E-01		
15.0	1.0	14.5	139.6	0.95	0.63	0.506	9	1.25	54.8	1.1	16.8	0.9	910.885	4.32E-04	1.20E-03	0.120	1.48E-01	8.7005	1.16E-01	0.03	
16.0	1.0	15.5	139.6	1.02	0.68	0.541	9	1.25	54.8	1.0	16.4	0.9	935.814	4.44E-04	1.20E-03	0.120	1.53E-01	8.7005	1.20E-01	0.03	
17.0	1.0	16.5	139.1	1.08	0.73	0.577	7	1.25	44.3	1.0	17.1	0.9	982.448	4.44E-04	1.20E-03	0.120	1.44E-01	8.7005	1.13E-01	0.00	
18.0	1.0	17.5	139.1	1.15	0.77	0.612	7	1.25	44.3	1.0	16.8	0.9	1007.295	4.53E-04	1.20E-03	0.120	1.48E-01	8.7005	1.16E-01	0.00	
19.0	1.0	18.5	139.1	1.22	0.82	0.646	7	1.25	44.3	0.9	16.5	0.9	1031.335	4.61E-04	1.20E-03	0.120	1.51E-01	8.7005	1.18E-01	0.00	
20.0	1.0	19.5	139.1	1.29	0.87	0.680	14	1.25	62.7	0.9	23.2	0.9	1187.277	4.17E-04	1.20E-03	0.120	1.00E-01	8.7005	7.85E-02	0.02	
21.0	1.0	20.5	139.1	1.36	0.91	0.714	14	1.25	62.7	0.9	22.7	0.9	1210.323	4.23E-04	1.20E-03	0.120	1.03E-01	8.7005	8.05E-02	0.02	
22.0	1.0	21.5	119.3	1.43	0.96	0.745	29	1.25	83.9	0.9	40.0	0.9	1494.917	3.53E-04	7.10E-04	0.071	3.09E-02	8.7005	2.42E-02	0.01	
23.0	1.0	22.5	119.3	1.49	1.00	0.773	29	1.25	83.9	0.8	39.2	0.9	1515.542	3.57E-04	7.10E-04	0.071	3.17E-02	8.7005	2.48E-02	0.01	
24.0	1.0	23.5	119.3	1.55	1.04	0.800	29	1.25	83.9	0.8	38.4	0.9	1535.625	3.61E-04	5.20E-04	0.052	2.38E-02	8.7005	1.86E-02	0.00	
25.0	1.0	24.5	119.3	1.61	1.08	0.828	29	1.25	83.9	0.8	37.7	0.9	1555.200	3.64E-04	5.20E-04	0.052	2.43E-02	8.7005	1.90E-02	0.00	
26.0	1.0	25.5	119.3	1.67	1.12	0.854	29	1.25	83.9	0.8	37.0	0.9	1574.299	3.67E-04	5.20E-04	0.052	2.48E-02	8.7005	1.94E-02	0.00	
27.0	1.0	26.5	119.3	1.73	1.16	0.881	29	1.25	83.9	0.8	36.4	0.9	1592.950	3.70E-04	5.20E-04	0.052	2.53E-02	8.7005	1.98E-02	0.00	
28.0	1.0	27.5	136.8	1.79	1.20	0.909	20	1.25	65.8	0.8	30.3	0.9	1526.881	3.94E-04	5.20E-04	0.052	3.15E-02	8.7005	2.47E-02	0.01	
29.0	1.0	28.5	136.8	1.86	1.25	0.938	20	1.25	65.8	0.7	29.9	0.9	1547.555	3.97E-04	5.20E-04	0.052	3.21E-02	8.7005	2.52E-02	0.01	
30.0	1.0	29.5	136.8	1.93	1.29	0.968	20	1.25	65.8	0.7	29.4	0.9	1567.770	4.00E-04	8.10E-04	0.081	5.10E-02	8.7005	3.99E-02	0.01	
31.0	1.0	30.5	136.8	2.00	1.34	0.997	20	1.25	65.8	0.7	29.0	0.9	1587.551	4.03E-04	8.10E-04	0.081	5.19E-02	8.7005	4.06E-02	0.01	
32.0	1.0	31.5	136.8	2.06	1.38	1.025	28	1.25	73.5	0.7	38.9	0.9	1780.984	3.66E-04	5.20E-04	0.052	2.34E-02	8.7005	1.83E-02	0.00	
33.0	1.0	32.5	136.8	2.13	1.43	1.053	28	1.25	73.5	0.7	38.3	0.9	1801.608	3.68E-04	5.20E-04	0.052	2.38E-02	8.7005	1.86E-02	0.00	
34.0	1.0	33.5	136.8	2.20	1.47	1.080	28	1.25	73.5	0.7	37.8	0.8	1821.824	3.70E-04	5.20E-04	0.052	2.42E-02	8.7005	1.89E-02	0.00	
35.0	1.0	34.5	136.8	2.27	1.52	1.107	28	1.25	73.5	0.7	37.3	0.8	1841.653	3.72E-04	5.20E-04	0.052	2.46E-02	8.7005	1.93E-02	0.00	
36.0	1.0	35.5	131.6	2.34	1.57	1.133	30	1.25	72.3	0.7	35.7	0.8	1841.233	3.77E-04	5.20E-04	0.052	2.60E-02	8.7005	2.03E-02	0.00	
37.0	1.0	36.5	131.6	2.40	1.61	1.157	30	1.25	72.3	0.7	35.2	0.8	1858.632	3.79E-04	5.20E-04	0.052	2.64E-02	8.7005	2.06E-02	0.00	
38.0	1.0	37.5	131.6	2.47	1.65	1.181	30	1.25	72.3	0.7	34.8	0.8	1875.723	3.80E-04	5.20E-04	0.052	2.68E-02	8.7005	2.10E-02	0.01	
39.0	1.0	38.5	131.6	2.53	1.70	1.205	30	1.25	72.3	0.6	34.3	0.8	1892.518	3.81E-04	5.20E-04	0.052	2.72E-02	8.7005	2.13E-02	0.01	
40.0	1.0	39.5	122.8	2.60	1.74	1.227	30	1.25	72.3	0.6	33.9	0.8	1908.478	3.82E-04	5.20E-04	0.052	2.76E-02	8.7005	2.16E-02	0.01	
41.0	1.0	40.5	122.8	2.66	1.78	1.247	30	1.25	72.3	0.6	33.5	0.8	1923.641	3.82E-04	5.20E-04	0.052	2.80E-02	8.7005	2.19E-02	0.01	
42.0	1.0	41.5	122.8	2.72	1.82	1.267	30	1.25	72.3	0.6	33.2	0.8	1938.576	3.83E-04	5.20E-04	0.052	2.83E-02	8.7005	2.22E-02	0.01	
43.0	1.0	42.5	131.8	2.78	1.86	1.287	28	1.25	66.9	0.6	30.7	0.8	1910.929	3.92E-04	5.20E-04	0.052	3.11E-02	8.7005	2.44E-02	0.01	
44.0	1.0	43.5	131.8	2.85	1.91	1.308	28	1.25	66.9	0.6	30.3	0.8	1926.162	3.92E-04	5.20E-04	0.052	3.15E-02	8.7005	2.47E-02	0.01	
45.0	1.0	44.5	131.8	2.92	1.95	1.329	28	1.25	66.9	0.6	30.0	0.8	1941.166	3.93E-04	5.20E-04	0.052	3.20E-02	8.7005	2.50E-02	0.01	
46.0	1.0	45.5	131.8	2.98	2.00	1.349	28	1.25	66.9	0.6	29.7	0.8	1955.951	3.93E-04	5.20E-04	0.052	3.24E-02	8.7005	2.53E-02	0.01	
47.0	1.0	46.5	131.8	3.05	2.04	1.368	28	1.25	66.9	0.6	29.4	0.8	1970.525	3.93E-04	1.00E-02	1.000	6.31E-01	8.7005	4.94E-01	0.12	
48.0	1.0	47.5	131.8	3.11	2.09	1.387	11	1.25	40.2	0.6	18.0	0.8	1691.479	4.62E-04	1.00E-02	1.000	1.14E+00	8.7005	8.89E-01	0.21	
49.0	1.0	48.5	128.6	3.18	2.13	1.405	11	1.25	40.2	0.6	17.9	0.8	1705.483	4.61E-04	1.00E-02	1.000	1.14E+00	8.7005	8.96E-01	0.21	
50.0	1.0	49.5	128.6	3.24	2.17	1.422	20	1.25	52.8	0.6	26.6	0.8	1966.123	4.03E-04	1.00E-02	1.000	7.11E-01	8.7005	5.56E-01	0.13	
51.0	1.0	50.5	137.2	3.31	2.22	1.440	20	1.25	52.8	0.6	26.4	0.8	1981.236	4.03E-04	1.00E-02	1.000	7.17E-01	8.7005	5.61E-01	0.00	
52.0	1.0	51.5	137.2	3.38	2.26	1.458	20	1.25	52.8	0.6	26.2	0.8	1996.657	4.02E-04	1.00E-02	1.000	7.24E-01	8.7005	5.67E-01	0.00	
53.0	1.0	52.5	137.2	3.45	2.31	1.475	20	1.25	52.8	0.6	26.0	0.8	2011.897	4.02E-04	1.00E-02	1.000	7.30E-01	8.7005	5.72E-01	0.00	
54.0	1.0	53.5	137.2	3.51	2.35	1.492	20	1.25	52.8	0.5	25.8	0.8	2026.963	4.02E-04	1.00E-02	1.000	7.37E-01	8.7005	5.76E-01	0.00	
55.0	1.0	54.5	137.2	3.58	2.40	1.508	20	1.25	52.8	0.5	25.6	0.8	2041.860	4.01E-04	1.00E-02	1.000	7.43E-01	8.7005	5.81E-01	0.00	
56.0	1.0	55.5	128.6	3.65	2.45	1.524	22	1.25	55.4	0.5	27.3	0.7	2104.665	3.92E-04	1.00E-02	1.000	6.88E-01	8.7005	5.39E-01	0.00	
57.0	1.0	56.5	128.6	3.71	2.49	1.537	22	1.25	55.4	0.5	27.1	0.7	2118.539	3.91E-04	1.00E-02	1.000	6.94E-01	8.7005	5.43E-01	0.00	
58.0	1.0	57.5	141.3	3.78	2.53	1.552	58	1.25	88.1	0.5	53.7	0.7	2683.781	3.10E-04	1.00E-02	1.000	3.06E-01	8.7005	2.39E-01	0.00	
59.0	1.0	58.5	141.3	3.85	2.58	1.567	58	1.25	88.1	0.5	53.2	0.7	2700.564	3.10E-04	1.00E-02	1.000	3.09E-01	8.7005	2.42E-01	0.00	
60.0	1.0	59.5	141.3	3.92	2.63	1.582	58	1.25	88.1	0.5	52.8	0.7	2718.913	3.10E-04	1.00E-02	1.000	3.12E-01	8.7005	2.44E-01	0.00	
61.0	1.0	60.5	141.3	3.99	2.68	1.596	58	1.25	88.1	0.5	52.6	0.7	2738.796	3.09E-04	1.00E-02	1.000	3.14E-01	8.7005	2.46E-01	0.00	
62.0	1.0	61.5	141.3	4.06	2.72	1.610	58	1.25	88.1	0.5	52.3	0.7	2758.437	3.08E-04	1.00E-02	1.000	3.16E-01	8.7005	2.47E-01	0.00	
																			TOTAL SETTLEMENT =	**0.91**	

SUBTERRANEAN EXCAVATION & GRADING

Figure 21

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 5

TECHNICAL ENGINEERING AND DESIGN GUIDES AS ADAPTED FROM THE US ARMY CORPS OF ENGINEERS, NO. 9
EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS IN DRY SANDY SOILS
MAXIMUM CONSIDERED EARTHQUAKE

MCE EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.71
Peak Horiz. Acceleration (g):	0.840

Fig 4.1 Fig 4.2 Fig 4.4

Depth of Base of Strata (ft)	Thickness of Layer (ft)	Depth of Mid-point of Layer (ft)	Soil Unit Weight (pcf)	Overburden Pressure at Mid-point (tsf)	Mean Effective Pressure at Mid-point (tsf)	Average Cyclic Shear Stress [Tav]	Field SPT [N]	Correction Factor [Cer]	Relative Density [Dr] (%)	Correction Factor [Cn]	Corrected [N1]60	rd Factor	Maximum Shear Mod. [Gmax] (tsf)	[yeff]*[Geff] [Gmax]	yeff Shear Strain	[yeff]*100%	Volumetric Strain M7.5 [E15] (%)	Number of Strain Cycles [Nc]	Corrected Vol. Strains [Ec]	Estimated Settlement [S] (inches)
1.0	1.0	0.5	126.3	0.03	0.02	0.017	8	1.25	68.4	2.0	20.7	1.0	178.531	9.56E-05	1.90E-04	0.019	1.82E-02	8.7005	1.43E-02	
2.0	1.0	1.5	126.3	0.09	0.06	0.052	8	1.25	66.4	2.0	20.7	1.0	309.225	1.62E-04	2.30E-04	0.023	2.21E-02	8.7005	1.73E-02	
3.0	1.0	2.5	126.3	0.16	0.11	0.086	8	1.25	64.6	2.0	20.7	1.0	399.207	2.06E-04	8.10E-04	0.081	7.77E-02	8.7005	6.08E-02	
4.0	1.0	3.5	126.3	0.22	0.15	0.121	8	1.25	62.9	2.0	20.7	1.0	472.348	2.39E-04	8.10E-04	0.081	7.77E-02	8.7005	6.08E-02	
5.0	1.0	4.5	126.3	0.28	0.19	0.155	8	1.25	61.3	1.9	19.8	1.0	528.036	2.69E-04	8.10E-04	0.081	8.18E-02	8.7005	6.40E-02	
6.0	1.0	5.5	126.3	0.35	0.23	0.189	8	1.25	59.9	1.7	17.9	1.0	564.565	3.02E-04	1.00E-03	0.100	1.14E-01	8.7005	8.92E-02	
7.0	1.0	6.5	126.3	0.41	0.28	0.223	8	1.25	58.5	1.6	23.5	1.0	671.552	2.94E-04	4.50E-04	0.045	3.71E-02	8.7005	2.90E-02	
8.0	1.0	7.5	126.3	0.47	0.32	0.257	8	1.25	57.3	1.5	22.4	1.0	709.510	3.15E-04	1.00E-03	0.100	8.74E-02	8.7005	6.84E-02	
9.0	1.0	8.5	126.3	0.54	0.36	0.291	8	1.25	56.1	1.4	21.4	1.0	744.689	3.34E-04	1.00E-03	0.100	9.20E-02	8.7005	7.20E-02	
10.0	1.0	9.5	126.3	0.60	0.40	0.325	8	1.25	55.0	1.3	20.7	1.0	777.598	3.51E-04	1.00E-03	0.100	9.62E-02	8.7005	7.53E-02	
11.0	1.0	10.5	126.3	0.66	0.44	0.358	7	1.25	48.6	1.3	18.4	1.0	786.099	3.77E-04	1.00E-03	0.100	1.11E-01	8.7005	8.67E-02	
12.0	1.0	11.5	126.3	0.73	0.49	0.391	7	1.25	48.6	1.2	17.9	0.9	815.066	3.91E-04	1.00E-03	0.100	1.15E-01	8.7005	8.97E-02	
13.0	1.0	12.5	126.3	0.79	0.53	0.424	7	1.25	48.6	1.1	17.4	0.9	842.673	4.04E-04	1.20E-03	0.120	1.42E-01	8.7005	1.11E-01	
14.0	1.0	13.5	126.3	0.85	0.57	0.457	7	1.25	48.6	1.1	17.0	0.9	869.092	4.16E-04	1.20E-03	0.120	1.46E-01	8.7005	1.14E-01	
15.0	1.0	14.5	131.0	0.92	0.61	0.490	7	1.25	44.7	1.1	12.2	0.9	806.343	4.74E-04	1.20E-03	0.120	2.17E-01	8.7005	1.70E-01	0.04
16.0	1.0	15.5	131.0	0.98	0.66	0.524	7	1.25	44.7	1.0	11.8	0.9	826.024	4.87E-04	1.20E-03	0.120	2.26E-01	8.7005	1.77E-01	0.04
17.0	1.0	16.5	131.0	1.05	0.70	0.557	7	1.25	44.7	1.0	16.3	0.9	950.294	4.44E-04	1.20E-03	0.120	1.53E-01	8.7005	1.20E-01	0.03
18.0	1.0	17.5	131.0	1.11	0.75	0.590	7	1.25	44.7	1.0	16.0	0.9	973.345	4.52E-04	1.20E-03	0.120	1.57E-01	8.7005	1.23E-01	0.03
19.0	1.0	18.5	131.0	1.18	0.79	0.622	7	1.25	44.7	0.9	15.7	0.9	995.656	4.60E-04	1.20E-03	0.120	1.60E-01	8.7005	1.25E-01	0.03
20.0	1.0	19.5	134.4	1.25	0.83	0.655	23	1.25	75.4	0.9	39.7	0.9	1393.114	3.42E-04	7.10E-04	0.071	3.12E-02	8.7005	2.44E-02	0.01
21.0	1.0	20.5	134.4	1.31	0.88	0.688	23	1.25	75.4	0.9	38.8	0.9	1419.640	3.48E-04	7.10E-04	0.071	3.20E-02	8.7005	2.51E-02	0.01
22.0	1.0	21.5	134.4	1.38	0.92	0.720	23	1.25	75.4	0.9	38.0	0.9	1445.350	3.53E-04	7.10E-04	0.071	3.28E-02	8.7005	2.57E-02	0.01
23.0	1.0	22.5	134.4	1.45	0.97	0.752	23	1.25	75.4	0.8	37.3	0.9	1470.307	3.58E-04	7.10E-04	0.071	3.36E-02	8.7005	2.63E-02	0.01
24.0	1.0	23.5	134.4	1.51	1.01	0.783	23	1.25	75.4	0.8	36.6	0.9	1494.568	3.63E-04	5.20E-04	0.052	2.52E-02	8.7005	1.97E-02	0.00
25.0	1.0	24.5	130.2	1.58	1.06	0.814	23	1.25	75.4	0.8	35.9	0.9	1517.823	3.67E-04	5.20E-04	0.052	2.57E-02	8.7005	2.01E-02	0.00
26.0	1.0	25.5	130.2	1.65	1.10	0.844	23	1.25	75.4	0.8	35.3	0.9	1540.143	3.70E-04	5.20E-04	0.052	2.63E-02	8.7005	2.06E-02	0.00
27.0	1.0	26.5	125.2	1.71	1.15	0.872	26	1.25	75.3	0.8	34.5	0.9	1556.641	3.75E-04	5.20E-04	0.052	2.71E-02	8.7005	2.12E-02	0.01
28.0	1.0	27.5	125.2	1.77	1.19	0.899	26	1.25	75.3	0.8	33.8	0.9	1575.457	3.78E-04	5.20E-04	0.052	2.77E-02	8.7005	2.16E-02	0.01
29.0	1.0	28.5	125.2	1.83	1.23	0.926	26	1.25	75.3	0.8	33.3	0.9	1593.837	3.81E-04	5.20E-04	0.052	2.82E-02	8.7005	2.21E-02	0.01
30.0	1.0	29.5	125.2	1.90	1.27	0.953	26	1.25	75.3	0.7	32.7	0.9	1611.804	3.83E-04	5.20E-04	0.052	2.88E-02	8.7005	2.25E-02	0.01
31.0	1.0	30.5	125.2	1.96	1.31	0.979	26	1.25	75.3	0.7	32.2	0.9	1629.381	3.86E-04	5.20E-04	0.052	2.94E-02	8.7005	2.30E-02	0.01
32.0	1.0	31.5	121.0	2.02	1.35	1.004	33	1.25	80.4	0.7	44.4	0.9	1841.493	3.47E-04	5.20E-04	0.052	2.00E-02	8.7005	1.56E-02	0.00
33.0	1.0	32.5	121.0	2.08	1.39	1.028	33	1.25	80.4	0.7	43.8	0.9	1860.397	3.48E-04	5.20E-04	0.052	2.03E-02	8.7005	1.59E-02	0.00
34.0	1.0	33.5	121.0	2.14	1.44	1.052	33	1.25	80.4	0.7	43.2	0.8	1878.955	3.49E-04	5.20E-04	0.052	2.06E-02	8.7005	1.62E-02	0.00
35.0	1.0	34.5	121.0	2.20	1.48	1.075	33	1.25	80.4	0.7	42.6	0.8	1897.183	3.50E-04	5.20E-04	0.052	2.10E-02	8.7005	1.64E-02	0.00
36.0	1.0	35.5	121.0	2.26	1.52	1.097	33	1.25	80.4	0.7	42.1	0.8	1915.096	3.51E-04	5.20E-04	0.052	2.13E-02	8.7005	1.67E-02	0.00
37.0	1.0	36.5	121.0	2.32	1.56	1.120	19	1.25	58.2	0.7	29.0	0.8	1712.951	3.98E-04	5.20E-04	0.052	3.33E-02	8.7005	2.61E-02	0.00
38.0	1.0	37.5	121.0	2.38	1.60	1.141	19	1.25	58.2	0.7	28.7	0.8	1729.484	3.98E-04	5.20E-04	0.052	3.37E-02	8.7005	2.64E-02	0.00
39.0	1.0	38.5	121.0	2.44	1.64	1.162	19	1.25	58.2	0.7	28.4	0.8	1745.773	3.99E-04	5.20E-04	0.052	3.41E-02	8.7005	2.67E-02	0.00
40.0	1.0	39.5	140.7	2.51	1.68	1.186	13	1.25	45.9	0.6	21.5	0.8	1610.952	4.37E-04	8.10E-04	0.081	7.44E-02	8.7005	5.82E-02	0.01
41.0	1.0	40.5	140.7	2.58	1.73	1.210	13	1.25	45.9	0.6	21.3	0.8	1628.321	4.38E-04	8.10E-04	0.081	7.53E-02	8.7005	5.89E-02	0.01
42.0	1.0	41.5	140.7	2.65	1.78	1.235	13	1.25	45.9	0.6	21.1	0.8	1645.426	4.39E-04	8.10E-04	0.081	7.61E-02	8.7005	5.95E-02	0.01
43.0	1.0	42.5	140.7	2.72	1.82	1.258	13	1.25	45.9	0.6	20.9	0.8	1662.276	4.40E-04	8.10E-04	0.081	7.69E-02	8.7005	6.02E-02	0.01
44.0	1.0	43.5	140.7	2.79	1.87	1.282	13	1.25	45.9	0.6	20.7	0.8	1678.883	4.41E-04	8.10E-04	0.081	7.77E-02	8.7005	6.08E-02	0.01
45.0	1.0	44.5	140.7	2.86	1.92	1.304	13	1.25	45.9	0.6	20.5	0.8	1695.255	4.41E-04	8.10E-04	0.081	7.84E-02	8.7005	6.14E-02	0.01
46.0	1.0	45.5	140.7	2.93	1.96	1.326	13	1.25	45.9	0.6	20.4	0.8	1711.404	4.42E-04	8.10E-04	0.081	7.92E-02	8.7005	6.20E-02	0.01
47.0	1.0	46.5	135.1	3.00	2.01	1.347	100	1.25	121.9	0.6	103.3	0.8	2973.931	2.57E-04	1.00E-02	1.000	1.39E-01	8.7005	1.09E-01	0.03
48.0	1.0	47.5	135.1	3.07	2.06	1.367	100	1.25	121.9	0.6	102.2	0.8	2996.239	2.57E-04	1.00E-02	1.000	1.41E-01	8.7005	1.11E-01	0.03
49.0	1.0	48.5	135.1	3.14	2.10	1.386	100	1.25	121.9	0.6	101.1	0.8	3018.226	2.57E-04	1.00E-02	1.000	1.43E-01	8.7005	1.12E-01	0.03
50.0	1.0	49.5	135.1	3.20	2.15	1.405	100	1.25	121.9	0.6	100.0	0.8	3039.901	2.57E-04	1.00E-02	1.000	1.45E-01	8.7005	1.13E-01	0.03
51.0	1.0	50.5	135.1	3.27	2.19	1.423	100	1.25	121.9	0.6	99.0	0.8	3061.277	2.58E-04	1.00E-02	1.000	1.47E-01	8.7005	1.15E-01	0.00
52.0	1.0	51.5	126.6	3.34	2.24	1.440	37	1.25	72.2	0.6	37.2	0.8	2231.925	3.56E-04	1.00E-02	1.000	4.74E-01	8.7005	3.71E-01	0.00
53.0	1.0	52.5	126.6	3.40	2.28	1.455	37	1.25	72.2	0.6	36.9	0.8	2246.238	3.55E-04	1.00E-02	1.000	4.79E-01	8.7005	3.75E-01	0.00
54.0	1.0	53.5	126.6	3.46	2.32	1.470	37	1.25	72.2	0.5	36.6	0.8	2260.379	3.55E-04	1.00E-02	1.000	4.85E-01	8.7005	3.79E-01	0.00
55.0	1.0	54.5	126.6	3.53	2.36	1.485	37	1.25	72.2	0.5	36.3	0.8	2274.353	3.55E-04	1.00E-02	1.000	4.90E-01	8.7005	3.83E-01	0.00
56.0	1.0	55.5	126.6	3.59	2.41	1.498	37	1.25	72.2	0.5	36.0	0.7	2288.166	3.54E-04	1.00E-02	1.000	4.95E-01	8.7005	3.87E-01	0.00
57.0	1.0	56.5	134.4	3.66	2.45	1.513	45	1.25	78.1	0.5	43.9	0.7	2467.449	3.30E-04	1.00E-02	1.000	3.89E-01	8.7005	3.05E-01	0.00
58.0	1.0	57.5	134.4	3.72	2.49	1.527	45	1.25	78.1	0.5	43.5	0.7	2482.899	3.30E-04	1.00E-02	1.000	3.93E-01	8.7005	3.08E-01	0.00
59.0	1.0	58.5	134.4	3.79	2.54	1.542	45	1.25	78.1	0.5	43.1	0.7	2498.170	3.30E-04	1.00E-02	1.000	3.97E-01	8.7005	3.11E-01	0.00
60.0	1.0	59.5	134.4	3.86	2.58	1.555	45	1.25	78.1	0.5	42.8	0.7	2513.267	3.29E-04	1.00E-02	1.000	4.01E-01	8.7005	3.14E-01	0.00
61.0	1.0	60.5	134.4	3.92	2.63	1.568	45	1.25	78.1	0.5	42.4	0.7	2528.195	3.29E-04	1.00E-02	1.000	4.05E-01	8.7005	3.17E-01	0.00
62.0	1.0	61.5	134.4	3.99	2.67	1.581	45	1.25	78.1	0.5	42.1	0.7	2542.960	3.29E-04	1.00E-02	1.000	4.09E-01	8.7005	3.20E-01	0.00

SUBTERRANEAN EXCAVATION & GRADING

TOTAL SETTLEMENT = **0.46**

Figure 22

GEOCON

Client : 4Terra
File No. : A9377-06-01
Boring : 8

TECHNICAL ENGINEERING AND DESIGN GUIDES AS ADAPTED FROM THE US ARMY CORPS OF ENGINEERS, NO. 9
EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS IN DRY SANDY SOILS
MAXIMUM CONSIDERED EARTHQUAKE

MCE EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.71
Peak Horiz. Acceleration (g):	0.840

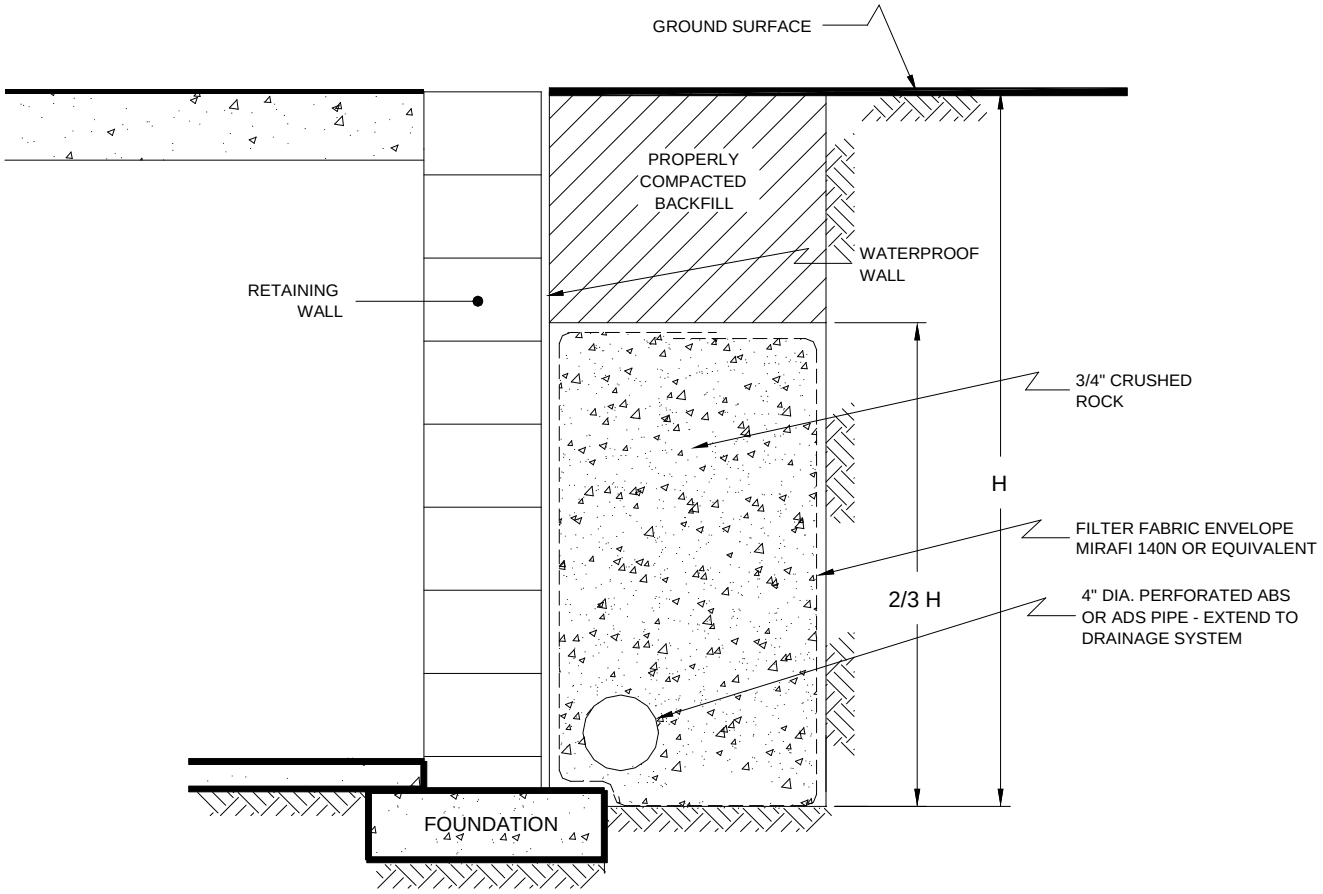
Fig 4.1 Fig 4.2 Fig 4.4

Depth of Base of Strata (ft)	Thickness of Layer (ft)	Depth of Mid-point of Layer (ft)	Soil Unit Weight (pcf)	Overburden Pressure at Mid-point (tsf)	Mean Effective Pressure at Mid-point (tsf)	Average Cyclic Shear Stress [Tav]	Field SPT [N]	Correction Factor [Cer]	Relative Density [Dr] (%)	Correction Factor [Cn]	Corrected [N1]60	rd Factor	Maximum Shear Mod. [Gmax] (tsf)	[yeff]*[Geff] [Gmax]	yeff Shear Strain	[yeff]*100%	Volumetric Strain M7.5 [E15] (%)	Number of Strain Cycles [Nc]	Corrected Vol. Strains [Ec]	Estimated Settlement [S] (inches)
1.0	1.0	0.5	134.0	0.03	0.02	0.018	14	1.25	90.5	2.0	36.2	1.0	221.607	8.17E-05	1.60E-04	0.016	7.84E-03	8.7005	6.14E-03	
2.0	1.0	1.5	134.0	0.10	0.07	0.055	14	1.25	87.7	2.0	36.2	1.0	383.835	1.39E-04	2.30E-04	0.023	1.13E-02	8.7005	8.82E-03	
3.0	1.0	2.5	134.0	0.17	0.11	0.091	14	1.25	85.1	2.0	36.2	1.0	495.528	1.76E-04	1.70E-04	0.017	8.33E-03	8.7005	6.52E-03	
4.0	1.0	3.5	134.0	0.23	0.16	0.128	14	1.25	82.8	2.0	36.2	1.0	586.317	2.04E-04	8.10E-04	0.081	3.97E-02	8.7005	3.11E-02	
5.0	1.0	4.5	134.0	0.30	0.20	0.164	14	1.25	80.6	1.9	33.7	1.0	649.005	2.32E-04	4.50E-04	0.045	2.41E-02	8.7005	1.88E-02	
6.0	1.0	5.5	134.0	0.37	0.25	0.201	14	1.25	78.6	1.7	30.5	1.0	693.902	2.61E-04	4.50E-04	0.045	2.71E-02	8.7005	2.12E-02	
7.0	1.0	6.5	134.0	0.44	0.29	0.237	14	1.25	76.8	1.5	28.0	1.0	733.638	2.86E-04	4.50E-04	0.045	3.00E-02	8.7005	2.35E-02	
8.0	1.0	7.5	126.3	0.50	0.34	0.272	7	1.25	53.1	1.4	20.1	1.0	703.656	3.36E-04	1.00E-03	0.100	9.95E-02	8.7005	7.79E-02	
9.0	1.0	8.5	126.3	0.56	0.38	0.306	7	1.25	52.0	1.4	19.3	1.0	737.251	3.55E-04	1.00E-03	0.100	1.04E-01	8.7005	8.16E-02	
10.0	1.0	9.5	126.3	0.63	0.42	0.339	7	1.25	51.0	1.3	18.7	1.0	768.806	3.71E-04	1.00E-03	0.100	1.08E-01	8.7005	8.49E-02	
11.0	1.0	10.5	126.3	0.69	0.46	0.373	7	1.25	51.0	1.2	18.1	1.0	798.642	3.86E-04	1.00E-03	0.100	1.12E-01	8.7005	8.80E-02	
12.0	1.0	11.5	126.3	0.75	0.50	0.406	7	1.25	51.0	1.2	17.7	0.9	827.004	4.00E-04	1.20E-03	0.120	1.39E-01	8.7005	1.09E-01	
13.0	1.0	12.5	126.3	0.82	0.55	0.439	5	1.25	40.8	1.1	14.3	0.9	802.745	4.39E-04	1.20E-03	0.120	1.79E-01	8.7005	1.40E-01	
14.0	1.0	13.5	126.3	0.88	0.59	0.472	5	1.25	40.8	1.1	14.0	0.9	827.993	4.50E-04	1.20E-03	0.120	1.83E-01	8.7005	1.44E-01	
15.0	1.0	14.5	126.3	0.94	0.63	0.504	11	1.25	58.5	1.1	23.1	0.9	1011.856	3.88E-04	7.10E-04	0.071	5.97E-02	8.7005	4.67E-02	0.01
16.0	1.0	15.5	126.3	1.01	0.67	0.536	11	1.25	58.5	1.0	22.6	0.9	1037.394	3.97E-04	7.10E-04	0.071	6.13E-02	8.7005	4.80E-02	0.01
17.0	1.0	16.5	126.3	1.07	0.72	0.568	5	1.25	37.6	1.0	14.3	0.9	918.084	4.68E-04	1.20E-03	0.120	1.80E-01	8.7005	1.41E-01	0.00
18.0	1.0	17.5	126.3	1.13	0.76	0.600	5	1.25	37.6	1.0	14.1	0.9	940.245	4.76E-04	1.20E-03	0.120	1.83E-01	8.7005	1.43E-01	0.00
19.0	1.0	18.5	126.3	1.20	0.80	0.631	15	1.25	63.3	0.9	28.6	0.9	1223.965	3.80E-04	7.10E-04	0.071	4.61E-02	8.7005	3.61E-02	0.01
20.0	1.0	19.5	126.3	1.26	0.84	0.662	15	1.25	63.3	0.9	28.1	0.9	1247.791	3.86E-04	7.10E-04	0.071	4.72E-02	8.7005	3.70E-02	0.01
21.0	1.0	20.5	126.3	1.32	0.89	0.693	15	1.25	63.3	0.9	27.6	0.9	1270.929	3.91E-04	7.10E-04	0.071	4.83E-02	8.7005	3.78E-02	0.01
22.0	1.0	21.5	126.3	1.38	0.93	0.723	15	1.25	63.3	0.9	27.1	0.9	1293.432	3.96E-04	7.10E-04	0.071	4.93E-02	8.7005	3.86E-02	0.01
23.0	1.0	22.5	126.3	1.45	0.97	0.753	15	1.25	63.3	0.8	26.7	0.9	1315.347	4.01E-04	1.20E-03	0.120	8.50E-02	8.7005	6.65E-02	0.02
24.0	1.0	23.5	126.3	1.51	1.01	0.782	5	1.25	35.1	0.8	13.7	0.9	1074.951	5.03E-04	1.30E-03	0.130	2.06E-01	8.7005	1.61E-01	0.00
25.0	1.0	24.5	126.3	1.57	1.05	0.811	5	1.25	35.1	0.8	13.5	0.9	1093.561	5.07E-04	1.30E-03	0.130	2.08E-01	8.7005	1.63E-01	0.00
26.0	1.0	25.5	126.3	1.64	1.10	0.840	6	1.25	36.2	0.8	15.1	0.9	1157.047	4.91E-04	8.10E-04	0.081	1.14E-01	8.7005	8.89E-02	0.02
27.0	1.0	26.5	126.3	1.70	1.14	0.868	6	1.25	36.2	0.8	14.9	0.9	1175.186	4.94E-04	8.10E-04	0.081	1.15E-01	8.7005	9.00E-02	0.02
28.0	1.0	27.5	126.3	1.76	1.18	0.895	6	1.25	36.2	0.8	14.8	0.9	1192.965	4.97E-04	8.10E-04	0.081	1.16E-01	8.7005	9.10E-02	0.02
29.0	1.0	28.5	126.3	1.83	1.22	0.923	6	1.25	36.2	0.8	14.7	0.9	1210.406	4.99E-04	8.10E-04	0.081	1.18E-01	8.7005	9.20E-02	0.02
30.0	1.0	29.5	126.3	1.89	1.27	0.949	6	1.25	36.2	0.7	14.5	0.9	1227.526	5.01E-04	1.30E-03	0.130	1.91E-01	8.7005	1.49E-01	0.04
31.0	1.0	30.5	126.3	1.95	1.31	0.976	6	1.25	36.2	0.7	14.4	0.9	1244.342	5.03E-04	1.30E-03	0.130	1.93E-01	8.7005	1.51E-01	0.04
32.0	1.0	31.5	126.3	2.02	1.35	1.002	38	1.25	86.3	0.7	48.3	0.9	1891.672	3.37E-04	5.20E-04	0.052	1.81E-02	8.7005	1.41E-02	0.00
33.0	1.0	32.5	126.3	2.08	1.39	1.027	38	1.25	86.3	0.7	47.5	0.9	1911.444	3.38E-04	5.20E-04	0.052	1.84E-02	8.7005	1.44E-02	0.00
34.0	1.0	33.5	126.3	2.14	1.44	1.052	38	1.25	86.3	0.7	46.9	0.8	1930.825	3.40E-04	5.20E-04	0.052	1.87E-02	8.7005	1.47E-02	0.00
35.0	1.0	34.5	126.3	2.21	1.48	1.076	38	1.25	86.3	0.7	46.2	0.8	1949.835	3.41E-04	5.20E-04	0.052	1.90E-02	8.7005	1.49E-02	0.00
36.0	1.0	35.5	126.3	2.27	1.52	1.100	38	1.25	86.3	0.7	45.6	0.8	1968.490	3.43E-04	5.20E-04	0.052	1.94E-02	8.7005	1.52E-02	0.00
37.0	1.0	36.5	126.3	2.33	1.56	1.124	15	1.25	51.7	0.7	24.3	0.8	1618.731	4.22E-04	8.10E-04	0.081	6.41E-02	8.7005	5.02E-02	0.01
38.0	1.0	37.5	126.3	2.40	1.60	1.147	15	1.25	51.7	0.7	24.1	0.8	1635.318	4.23E-04	8.10E-04	0.081	6.48E-02	8.7005	5.07E-02	0.01
39.0	1.0	38.5	126.3	2.46	1.65	1.169	15	1.25	51.7	0.7	20.4	0.8	1567.193	4.47E-04	8.10E-04	0.081	7.92E-02	8.7005	6.20E-02	0.01
40.0	1.0	39.5	126.3	2.52	1.69	1.191	15	1.25	51.7	0.6	20.2	0.8	1581.661	4.47E-04	8.10E-04	0.081	8.02E-02	8.7005	6.27E-02	0.02
41.0	1.0	40.5	126.3	2.58	1.73	1.212	15	1.25	51.7	0.6	20.0	0.8	1595.912	4.48E-04	8.10E-04	0.081	8.12E-02	8.7005	6.35E-02	0.02
42.0	1.0	41.5	126.3	2.65	1.77	1.233	21	1.25	58.5	0.6	26.3	0.8	1769.934	4.08E-04	8.10E-04	0.081	5.84E-02	8.7005	4.57E-02	0.01
43.0	1.0	42.5	126.3	2.71	1.82	1.254	21	1.25	58.5	0.6	26.0	0.8	1784.840	4.08E-04	8.10E-04	0.081	5.91E-02	8.7005	4.63E-02	0.01
44.0	1.0	43.5	126.3	2.77	1.86	1.274	21	1.25	58.5	0.6	25.7	0.8	1799.534	4.09E-04	8.10E-04	0.081	5.98E-02	8.7005	4.68E-02	0.01
45.0	1.0	44.5	126.3	2.84	1.90	1.293	21	1.25	58.5	0.6	25.5	0.8	1814.022	4.09E-04	8.10E-04	0.081	6.05E-02	8.7005	4.74E-02	0.01
46.0	1.0	45.5	126.3	2.90	1.94	1.312	41	1.25	78.4	0.6	46.0	0.8	2232.044	3.35E-04	5.20E-04	0.052	1.92E-02	8.7005	1.50E-02	0.00
47.0	1.0	46.5	126.3	2.96	1.99	1.331	41	1.25	78.4	0.6	45.5	0.8	2248.750	3.35E-04	5.20E-04	0.052	1.94E-02	8.7005	1.52E-02	0.00
48.0	1.0	47.5	126.3	3.03	2.03	1.349	41	1.25	78.4	0.6	45.1	0.8	2265.230	3.35E-04	1.00E-02	1.000	3.77E-01	8.7005	2.95E-01	0.07
49.0	1.0	48.5	126.3	3.09	2.07	1.366	41	1.25	78.4	0.6	44.6	0.8	2281.493	3.35E-04	1.00E-02	1.000	3.82E-01	8.7005	2.99E-01	0.07
50.0	1.0	49.5	126.3	3.15	2.11	1.383	41	1.25	78.4	0.6	44.2	0.8	2297.547	3.35E-04	1.00E-02	1.000	3.86E-01	8.7005	3.02E-01	0.07
51.0	1.0	50.5	126.3	3.22	2.16	1.399	41	1.25	78.4	0.6	43.8	0.8	2313.397	3.35E-04	1.00E-02	1.000	3.90E-01	8.7005	3.05E-01	0.00
52.0	1.0	51.5	126.3	3.28	2.20	1.415	30	1.25	65.4	0.6	35.5	0.8	2177.197	3.58E-04	1.00E-02	1.000	5.03E-01	8.7005	3.93E-01	0.00
53.0	1.0	52.5	126.3	3.34	2.24	1.431	30	1.25	65.4	0.6	35.2	0.8	2192.322	3.58E-04	1.00E-02	1.000	5.07E-01	8.7005	3.97E-01	0.00
54.0	1.0	53.5	126.3	3.41	2.28	1.446	30	1.25	65.4	0.6	34.9	0.8	2207.275	3.58E-04	1.00E-02	1.000	5.12E-01	8.7005	4.01E-01	0.00
55.0	1.0	54.5	126.3	3.47	2.32	1.460	30	1.25	65.4	0.5	34.7	0.8	2222.062	3.57E-04	1.00E-02	1.000	5.17E-01	8.7005	4.04E-01	0.00
56.0	1.0	55.5	126.3	3.53	2.37	1.474	30	1.25	65.4	0.5	34.4	0.7	2236.688	3.57E-04	1.00E-02	1.000	5.21E-01	8.7005	4.08E-01	0.00
57.0	1.0	56.5	126.3	3.60	2.41	1.488	30	1.25	65.4	0.5	34.2	0.7	2251.157	3.56E-04	1.00E-02	1.000	5.26E-01	8.7005	4.12E-01	0.00
58.0	1.0	57.5	126.3	3.66	2.45	1.501	24	1.25	57.4	0.5	27.9	0.7	2123.259	3.79E-04	1.00E-02	1.000	6.70E-01	8.7005	5.24E-01	0.00
59.0	1.0	58.5	126.3	3.72	2.49	1.514	24	1.25	57.4	0.5	27.7	0.7	2136.680	3.79E-04	1.00E-02	1.000	6.75E-01	8.7005	5.29E-01	0.00
60.0	1.0	59.5	126.3	3.78	2.54	1.526	24	1.25	57.4	0.5	27.6	0.7	2149.966	3.78E-04	1.00E-02	1.000	6.81E-01	8.7005	5.33E-01	0.00
61.0	1.0	60.5	126.3	3.85	2.58	1.538	24	1.25	57.4	0.5	27.4	0.7	2163.120	3.77E-04	1.00E-02	1.000	6.86E-01	8.7005	5.37E-01	0.00
62.0	1.0	61.5	126.3	3.91	2.62	1.549	24	1.25	57.4	0.5	27.2	0.7	2176.147	3.76E-04	1.00E-02	1.000	6.91E-01	8.7005	5.41E-01	0.00

SUBTERRANEAN EXCAVATION & GRADING

TOTAL SETTLEMENT = **0.59**

Figure 23



NO SCALE

GEOCON WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
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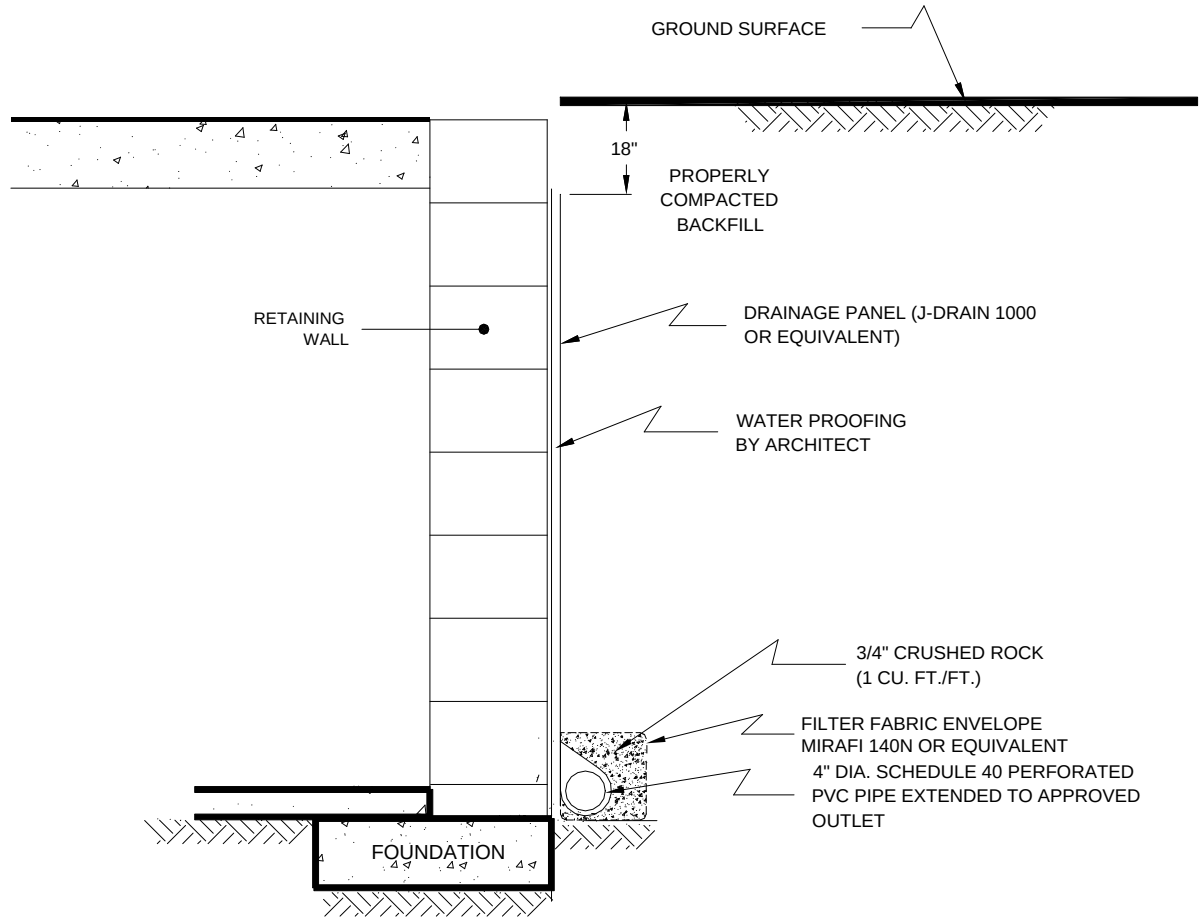
Drafted by: JMT	Checked by: NDB

RETAINING WALL DRAIN DETAIL

4TERRA-LA I LLC
777 NORTH FRONT STREET
BURBANK, CALIFORNIA

FEB. 2016	PROJECT NO. A9377-06-01	FIG. 24



NO SCALE

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FEB. 2016	PROJECT NO. A9377-06-01	FIG. 25

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The site was explored from January 19, 2016 to January 21, 2016 by excavating eight 8-inch diameter boring utilizing a truck-mounted hollow-stem auger drilling machine. The borings were excavated to depths between 7 and 60½ feet below the existing ground surface. Refusal was encountered at a depth of 7 feet during the excavation of B3. Two additional attempts to excavate B3 were made in close proximity to the initial location. However, refusal was also encountered at a similar depth. Representative and relatively undisturbed samples were obtained by driving a 3-inch, O. D., California Modified Sampler into the "undisturbed" soil mass with blows from a 140-pound auto-hammer falling 30 inches. The sampler was equipped with 1-inch by 2$^{3}/_{8}$-inch brass sampler rings to facilitate removal and testing. Bulk samples were also obtained.

The soil conditions encountered in the excavations were visually examined, classified and logged in general accordance with Unified Soil Classification System. Logs of the borings are presented on Figures A1 through A10. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The approximate locations of the borings are indicated the Site Exploration Plan (see Figure 2).

PROJECT NO. A9377-06-01

BORING 1

ELEV. (MSL.) - - DATE COMPLETED **1/19/16**

EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**AC: 5"**			
					ARTIFICIAL FILL			
2					Silty Sand, loose, slightly moist, grayish brown, fine- to coarse-grained.			
4								
6	B1@5'					12	120.7	7.7
8	B1@7.5'					3	- -	9.1
10	B1@10'				- medium dense, fine- to medium-grained	12	- -	- -
12	B1@12.5'				- increase in silt content	9	- -	8.0
14					**ALLUVIUM**			
16	B1@15'			SM	Silty Sand, medium dense, slightly moist, yellowish brown, fine- to coarse-grained.	33	127.0	9.9
18	B1@17.5'			ML	Silt with some Sand, soft, slightly moist, dark yellowish brown, fine-grained, non-plastic.	7	- -	18.8
20	B1@20'			SM	Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained, trace coarse-grained, some calcium stringers.	25	122.3	13.7
22	B1@22.5'			SP	Sand, poorly graded, very dense, slightly moist, light brown, fine- to coarse-grained, fine gravel, trace silt.	29	- -	0.4
24	B1@25'					69	112.8	5.9
26								
28	B1@27.5'			SM	Sand with some Silt, medium dense, slightly moist, brown, fine- to coarse-grained, fine gravel.	20	- -	9.9

A9377-06-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 1 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9377-06-01

BORING 1

ELEV. (MSL.) - - DATE COMPLETED **1/19/16**

EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B1@30'			SM	- trace coarse gravel (to 2")	75	128.3	7.5
32	B1@32.5'					28	- -	8.3
34								
36	B1@35'			SP	Sand, poorly graded, medium dense, slightly moist, grayish brown, fine- to coarse-grained, fine gravel.	44	124.9	5.4
38	B1@37.5'					27	- -	8.1
40	B1@40'					51	115.6	6.2
42	B1@42.5'				- trace silt, fining down	28	- -	4.4
44								
46	B1@45'					51	126.0	4.6
48	B1@47.5'			ML	Silt with Sand, soft to medium dense, slightly moist, brown, fine-grained.	11	- -	16.1
50	B1@50'				- hard to dense, fine- to medium-grained	42	117.4	16.9
52	B1@52.5'					20	- -	17.5
54								
56	B1@55'			ML	Sandy Silt, slightly moist, stiff, light yellowish brown, fine-grained.	40	105.2	22.2
58	B1@57.5'			SP	Sand, poorly graded, dense, slightly moist, orangish brown, fine- to coarse-grained.	58	- -	2.8

A9377-06-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 2 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9377-06-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 1** ELEV. (MSL.) - - DATE COMPLETED **1/19/16** EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	B1@60'			SP	- fine to coarse gravel	50 (5")	126.4	11.8
					Total depth of boring: 60.5 feet Fill to 14 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. *Penetration resistance for 140-pound hammer falling 30 inches by auto hammer.			

A9377-06-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 3 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9377-06-01

BORING 2

ELEV. (MSL.) - - DATE COMPLETED **1/19/16**

EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**AC**			
					ARTIFICIAL FILL			
2					Silty Sand, loose, slightly moist, grayish brown, fine- to coarse-grained, gravel (to 3").			
	B2@3'					50 (6")		
4								
6	B2@6'					11		
8								
	B2@9'					50 (5")		
10								
					Silty Sand, loose, slightly moist, brown, fine- to medium-grained, gravel (to 3").			
12	B2@12'					7		
14					**ALLUVIUM**			
	B2@15'				Sandy Silt, stiff, slightly moist, dark yellowish brown, fine-grained.	14		
16								
18								
20	B2@20'			ML		15		
22								
24								
	B2@25'					21		
26								
28				SM	Silty Sand, loose, slightly moist, yellowish brown to dark yellowish brown, fine- to medium-grained.			

A9377-06-01 BORING LOGS.GPJ

Figure A2,
Log of Boring 2, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9377-06-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 2** ELEV. (MSL.) - - DATE COMPLETED **1/19/16** EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	B2@30'			SM		18		
					Total depth of boring: 31.5 feet Fill to 14 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. *Penetration resistance for 140-pound hammer falling 30 inches by auto hammer.			

A9377-06-01 BORING LOGS.GPJ

Figure A2,
Log of Boring 2, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9377-06-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 3** ELEV. (MSL.) - - DATE COMPLETED **1/21/16** EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**AC & REBAR: 7"** **ARTIFICIAL FILL** Silty Sand, loose, slightly moist, brown, fine- to medium-grained, gravel (to 3").			
2								
4					Sandy Silt, soft, slightly moist, brown, fine-grained, fine to coarse gravel.			
6	B3@5'					5		
					Total depth of boring: 7 feet Boring terminated due to refusal. No groundwater encountered. Backfilled with soil cuttings and tamped. *Penetration resistance for 140-pound hammer falling 30 inches by auto hammer.			

A9377-06-01 BORING LOGS.GPJ

Figure A3,
Log of Boring 3, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9377-06-01

BORING 4

ELEV. (MSL.) - - DATE COMPLETED **1/21/16**

EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**AC: 5"**			
2					**ARTIFICIAL FILL**			
4					Silty Sand, loose, slightly moist, light brown, fine- to coarse-grained, gravel (to 2").			
6	B4@5'					8		
8								
10	B4@10'					11		
12								
14					**ALLUVIUM**			
16	B4@15'			SP-SM	Sand with Silt and Gravel, dense, dry, light yellowish brown, fine- to coarse-grained, gravel (to 2").	32		
18					Silt with Sand, stiff, slightly moist, brown, fine-grained.			
20	B4@20'			ML		17		
22								
24					Silty Sand, dense to very dense, slightly moist, yellowish brown, fine- to coarse-grained, gravel (to 2").			
26	B4@25'			SM		50 (5")		
28								

A9377-06-01 BORING LOGS.GPJ

Figure A6,
Log of Boring 4, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9377-06-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 4** ELEV. (MSL.) - - DATE COMPLETED **1/21/16** EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	B4@30'			SM		53		
					Total depth of boring: 31.5 feet Fill to 14 feet. No groundwater encountered. Boring covered with metal, contaminated soil segregated and covered. *Penetration resistance for 140-pound hammer falling 30 inches by auto hammer.			

A9377-06-01 BORING LOGS.GPJ

Figure A6,
Log of Boring 4, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9377-06-01

BORING 5

ELEV. (MSL.) - - DATE COMPLETED **1/20/16**

EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**AC: 4"**			
					ARTIFICIAL FILL			
2					Silt and Sand, soft to loose, slightly moist, grayish brown, fine- to medium-grained, some fine gravel.			
4								
6	B5@5'				- yellowish brown	8	113.6	11.2
8	B5@7.5'				- increase in silt content	7	- -	13.5
10	B5@10'				- no recovery	50 (4")		
12	B5@12.5'				- no recovery	7		
14					**ALLUVIUM**			
16	B5@15'			SP-SM	Sand with Silt, loose, slightly moist, yellowish brown, fine- to coarse-grained.	13	119.3	9.8
18	B5@17.5'				Silty Sand, soft, slightly moist, yellowish brown to dark yellowish brown, fine- to coarse-grained, trace gravel (to 1").	7	- -	6.9
20	B5@20'				- medium dense	23	127.4	5.5
22	B5@22.5'			SM		23	- -	6.0
24	B5@25'				- abundant coarse-grained sand	49	121.5	7.2
26					Sand, poorly graded, medium dense, slightly moist, light brown, fine- to coarse-grained, trace silt and fine gravel.			
28	B5@27.5'			SP		26	- -	2.1

A9377-06-01 BORING LOGS.GPJ

Figure A7,
Log of Boring 5, Page 1 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9377-06-01

BORING 5

ELEV. (MSL.) - - DATE COMPLETED **1/20/16**

EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B5@30'			SP		64	122.4	2.3
32	B5@32.5'			SM	Sand with some Silt, very dense, slightly moist, dark yellowish brown, fine- to medium-grained.	33	- -	6.3
34	B5@35'					50 (5")	113.8	6.3
36				ML	Silt with Sand, stiff to medium dense, slightly moist, dark brown, fine-grained.			
38	B5@37.5'					19	- -	10.9
40	B5@40'			SM	Silty Sand, very dense, slightly moist, brown, fine- to coarse-grained.	61	127.0	10.8
42	B5@42.5'				- fine- to medium-grained sand	13	- -	14.7
44	B5@45'				- fine- to coarse-grained sand	35	129.2	10.4
46				SP	Sand, poorly graded, hard, slightly moist, light brown to orangish brown, fine- to coarse-grained, gravel (to 3").			
48	B5@47.5'					50 (6")	- -	2.2
50	B5@50'					82	130.5	3.5
52	B5@52.5'			SW	Sand, well graded, dense, slightly moist, orangish brown, fine- to coarse-grained, fine to coarse gravel, trace silt. - light brown, increase in coarse-grained sand content	37	- -	2.5
54	B5@55'				Sand with some Silt, medium dense to dense, slightly moist, light brown, fine- to medium-grained.	43	112.1	12.9
56								
58	B5@57.5'			SP-SM		45	- -	7.4

A9377-06-01 BORING LOGS.GPJ

Figure A7,
Log of Boring 5, Page 2 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9377-06-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 5** ELEV. (MSL.) - - DATE COMPLETED **1/20/16** EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	B5@60'			SP-SM	- sample disturbed	50 (6")	125.3	7.3
					Total depth of boring: 61.5 feet Fill to 14 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Concrete patched. *Penetration resistance for 140-pound hammer falling 30 inches by auto hammer.			

A9377-06-01 BORING LOGS.GPJ

Figure A7,
Log of Boring 5, Page 3 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9377-06-01

BORING 6

ELEV. (MSL.) - - DATE COMPLETED **1/20/16**

EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**AC: 5"**			
					ARTIFICIAL FILL			
2					Silty Sand, loose, slightly moist, brown, fine- to medium-grained.			
	B6@2.5'				- medium dense	21		
4								
6					**ALLUVIUM**			
					Silty Sand, loose, slightly moist, yellowish brown, fine- to medium-grained.			
8	B6@7.5'					11		
10								
12					- some coarse-grained sand			
	B6@12.5'					16		
14								
16								
				SM				
18	B6@17.5'				- medium dense, no coarse-grained sand, increase in silt content	23		
20								
22								
	B6@22.5'					19		
24								
26								
28	B6@27.5'				- fine- to coarse-grained sand, fine gravel	40		
					Total depth of boring: 29 feet			

A9377-06-01 BORING LOGS.GPJ

Figure A8,
Log of Boring 6, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9377-06-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 6** ELEV. (MSL.) - - DATE COMPLETED **1/20/16** EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
					Fill to 6 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Concrete patched. *Penetration resistance for 140-pound hammer falling 30 inches by auto hammer.			

Figure A8,
Log of Boring 6, Page 2 of 2

A9377-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9377-06-01

BORING 7

ELEV. (MSL.) - - DATE COMPLETED **1/21/16**

EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	BULK 0-5'				**AC: 6"** **ARTIFICIAL FILL** Silty Sand, loose, slightly moist, brown, fine- to coarse-grained, trace fine gravel.			
2								
4								
6	B7@5'				- no recovery			
8	B7@6.5'				- medium dense	18	113.2	9.9
10	B7@10'					21	116.2	10.5
12								
14					**ALLUVIUM** Silty Sand, medium dense, slightly moist, yellowish brown, fine- to coarse-grained, trace fine gravel.			
16	B7@15'					22	- -	2.5
18								
20	B7@20'			SM	- dense, dark yellowish brown	34	125.4	10.9
22								
24								
26	B7@25'					39	- -	8.5
28								

A9377-06-01 BORING LOGS.GPJ

Figure A9,
Log of Boring 7, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9377-06-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 7** ELEV. (MSL.) - - DATE COMPLETED **1/21/16** EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	B7@30'			SM		58	124.0	6.2
					Total depth of boring: 31.5 feet Fill to 14 feet. No groundwater encountered. Backfilled with soil cuttings and tamped.			

A9377-06-01 BORING LOGS.GPJ

Figure A9,
Log of Boring 7, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9377-06-01

BORING 8

ELEV. (MSL.) - - DATE COMPLETED **1/20/16**

EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**AC: 7"**			
					ARTIFICIAL FILL			
2					Silt with Sand, soft to loose, slightly moist, orangish brown, fine- to coarse-grained, fine gravel.			
4								
	B8@5'				- dark brown	26	118.4	13.2
6								
8	B8@7.5'					2	- -	14.2
10	B8@10'				- brown	7	111.0	13.8
12	B8@12.5'				- increase in fine-grained sand content	5	- -	11.0
14					**ALLUVIUM**			
	B8@15'			SM	Silty Sand, medium dense, slightly moist, dark yellowish brown, fine- to coarse-grained.	20	99.7	11.5
16					Silt with Sand, very soft to loose, slightly moist, yellowish brown, fine-grained.			
18	B8@17.5'					5	- -	15.6
				ML	- stiff to medium dense, fine- to carse-grained			
20	B8@20'					27	121.5	8.9
22	B8@22.5'					5	- -	- -
24				ML	Sandy Silt, very soft, slightly moist, yellowish brown, fine-grained.			
	B8@25'				Silty Sand, medium dense, slightly moist, yellowish brown, fine-grained.	17	- -	- -
26				SM				
28	B8@27.5'				- some coarse-grained sand	6	- -	2.6

A9377-06-01 BORING LOGS.GPJ

Figure A10,
Log of Boring 8, Page 1 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9377-06-01

BORING 8

ELEV. (MSL.) - - DATE COMPLETED **1/20/16**

EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B8@30'	SM	- trace silt	37	96.0	5.8
32	B8@32.5'	SP	Sand, poorly graded, dense, slightly moist, light brown, fine- to coarse-grained, fine gravel.	38	- -	2.3
34						
36	B8@35'		- trace silt	45	127.5	7.4
38	B8@37.5'		- some silt	15	- -	6.2
40	B8@40'	SM	Silty Sand, very dense, slightly moist, brown, fine- to coarse-grained.	57	129.6	8.2
42	B8@42.5'	SP-SM	Sand with Silt, poorly graded, medium dense, slightly moist, light brown, fine- to coarse-grained, fine gravel. - silty sand interval (3")	21	- -	8.2
44						
46	B8@45'		- very dense	50 (4")	112.8	3.9
48	B8@47.5'			41	- -	4.4
50	B8@50'		- some silt	66	121.5	2.3
52	B8@52.5'	SM	Silty Sand, medium dense, slightly moist, brown, fine- to coarse-grained, some fine gravel.	30	- -	11.7
54						
56	B8@55'		- very dense, orangish brown, fine- to medium-grained sand, some coarse-grained sand	50 (5")	120.2	13.2
58	B8@57.5'			24	- -	11.0

A9377-06-01 BORING LOGS.GPJ

Figure A10,
Log of Boring 8, Page 2 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. A9377-06-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 8** ELEV. (MSL.) - - DATE COMPLETED **1/20/16** EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	B8@60'			SM	Sand, poorly graded, dense, slightly moist, orange, fine- to coarse-grained, fine gravel (to 2"), oxidation staining.	65	119.5	2.4
					Total depth of boring: 61.5 feet Fill to 13.5 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Concrete patched. *Penetration resistance for 140-pound hammer falling 30 inches by auto hammer.			

A9377-06-01 BORING LOGS.GPJ

Figure A10,
Log of Boring 8, Page 3 of 3

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. A9377-06-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 3A** ELEV. (MSL.) - - DATE COMPLETED **1/21/16** EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**AC: 4"** **ARTIFICIAL FILL** Silty Sand, loose, slightly moist, brown to reddish brown, fine- to medium-grained, gravel (to 2").			
2								
4								
6	B3A@5'							
					Total depth of boring: 7 feet Boring terminated due to refusal. All fill. No groundwater encountered. Backfilled with soil cuttings and tamped. Concrete patched. *Penetration resistance for 140-pound hammer falling 30 inches by auto hammer.			

Figure A4,
Log of Boring 3A, Page 1 of 1

A9377-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 3B** ELEV. (MSL.) - - DATE COMPLETED **1/21/16** EQUIPMENT **HOLLOW STEM AUGER** BY: **MDS**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**AC: 5"** **ARTIFICIAL FILL** Silty Sand, loose, moist, brown, fine- to medium-grained.			
2								
4								
6					Total depth of boring: 7 feet Boring terminated due to refusal. All fill. No groundwater encountered. Backfilled with soil cuttings and tamped. Concrete patched. *Penetration resistance for 140-pound hammer falling 30 inches by auto hammer.			

A9377-06-01 BORING LOGS.GPJ

Figure A5,
Log of Boring 3B, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◪ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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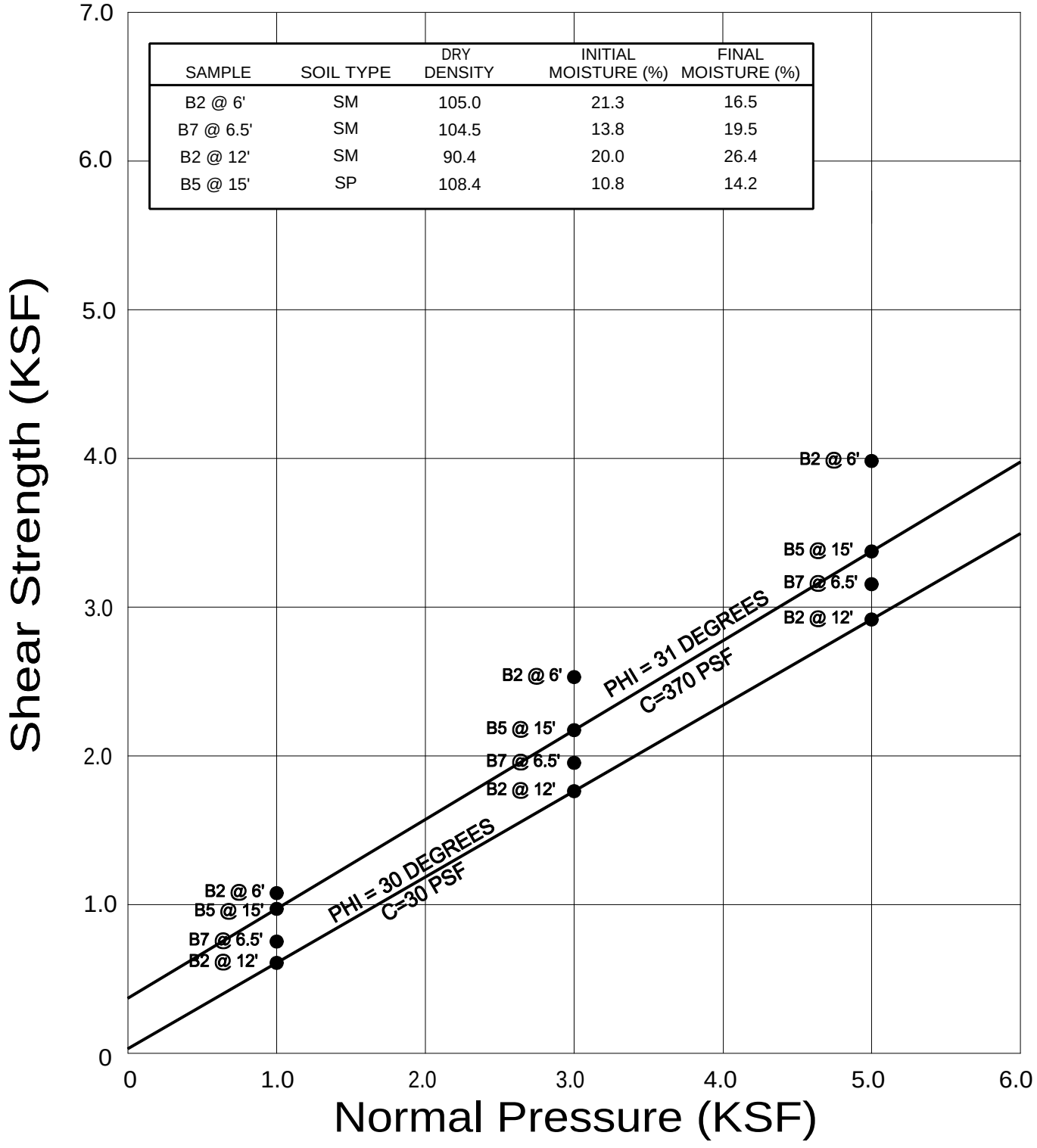
APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the "American Society for Testing and Materials (ASTM)", or other suggested procedures. Selected samples were tested for compaction characteristics, direct shear strength, consolidation and expansion characteristics, grain size distribution, corrosivity, and in-place dry density and moisture content. The results of the laboratory tests are summarized in Figures B1 through B13. The in-place dry density and moisture content of the samples tested are presented on the boring logs, Appendix A.

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2 @ 6'	SM	105.0	21.3	16.5
B7 @ 6.5'	SM	104.5	13.8	19.5
B2 @ 12'	SM	90.4	20.0	26.4
B5 @ 15'	SP	108.4	10.8	14.2



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DIRECT SHEAR TEST RESULTS

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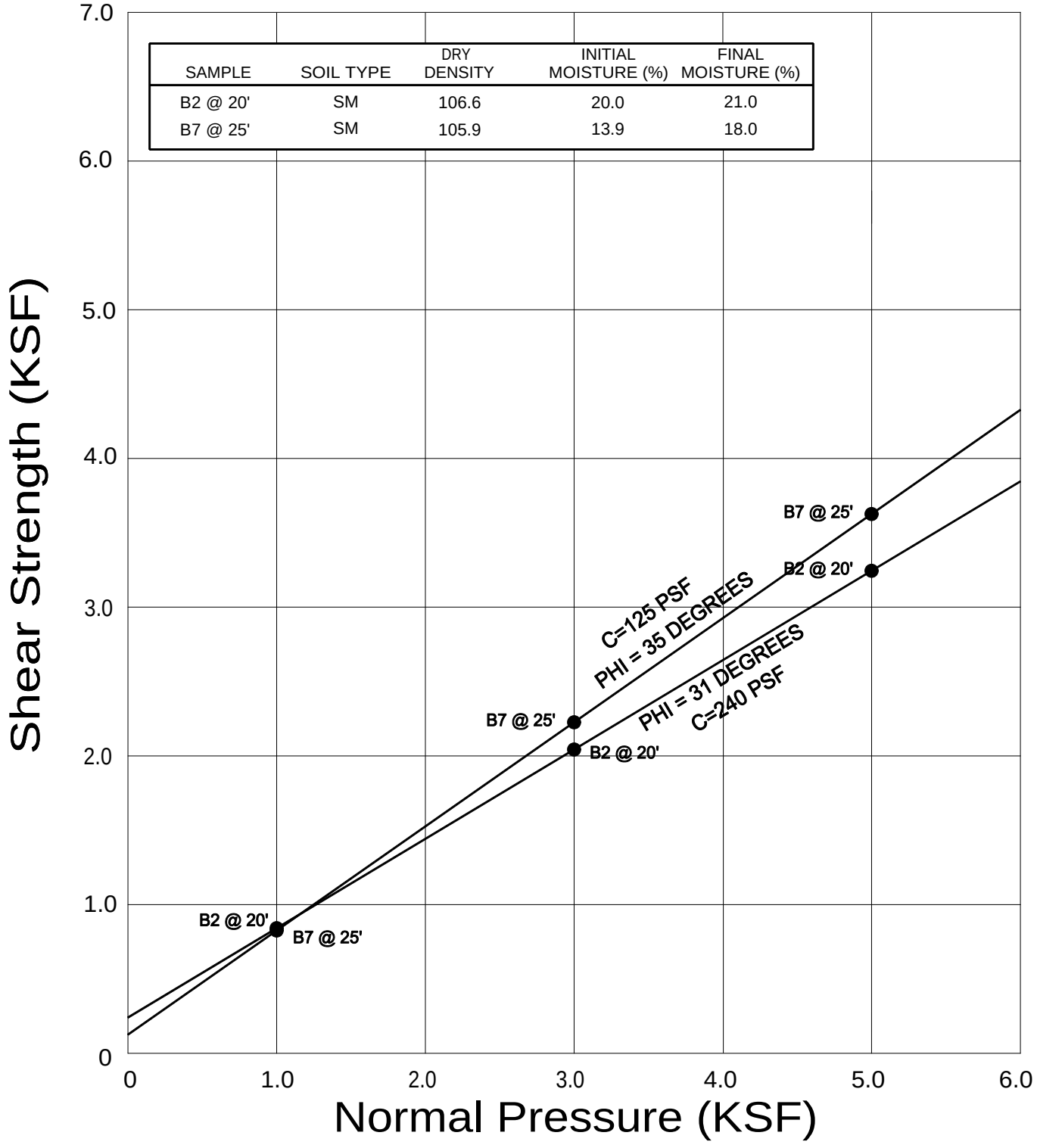
FEB. 2016 | PROJECT NO. A9377-06-01 | FIG. B1

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2 @ 20'	SM	106.6	20.0	21.0
B7 @ 25'	SM	105.9	13.9	18.0



● Direct Shear, Saturated

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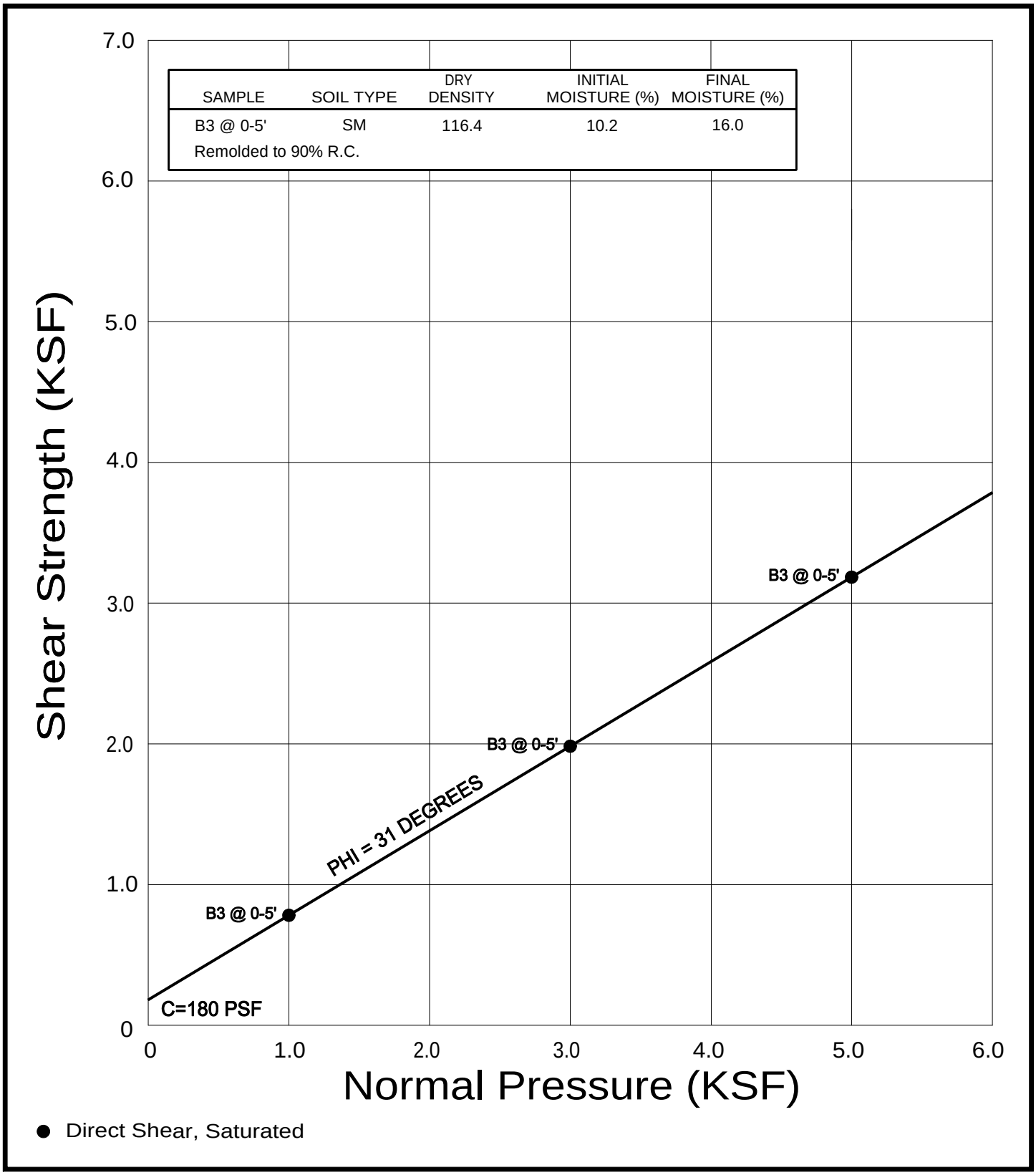

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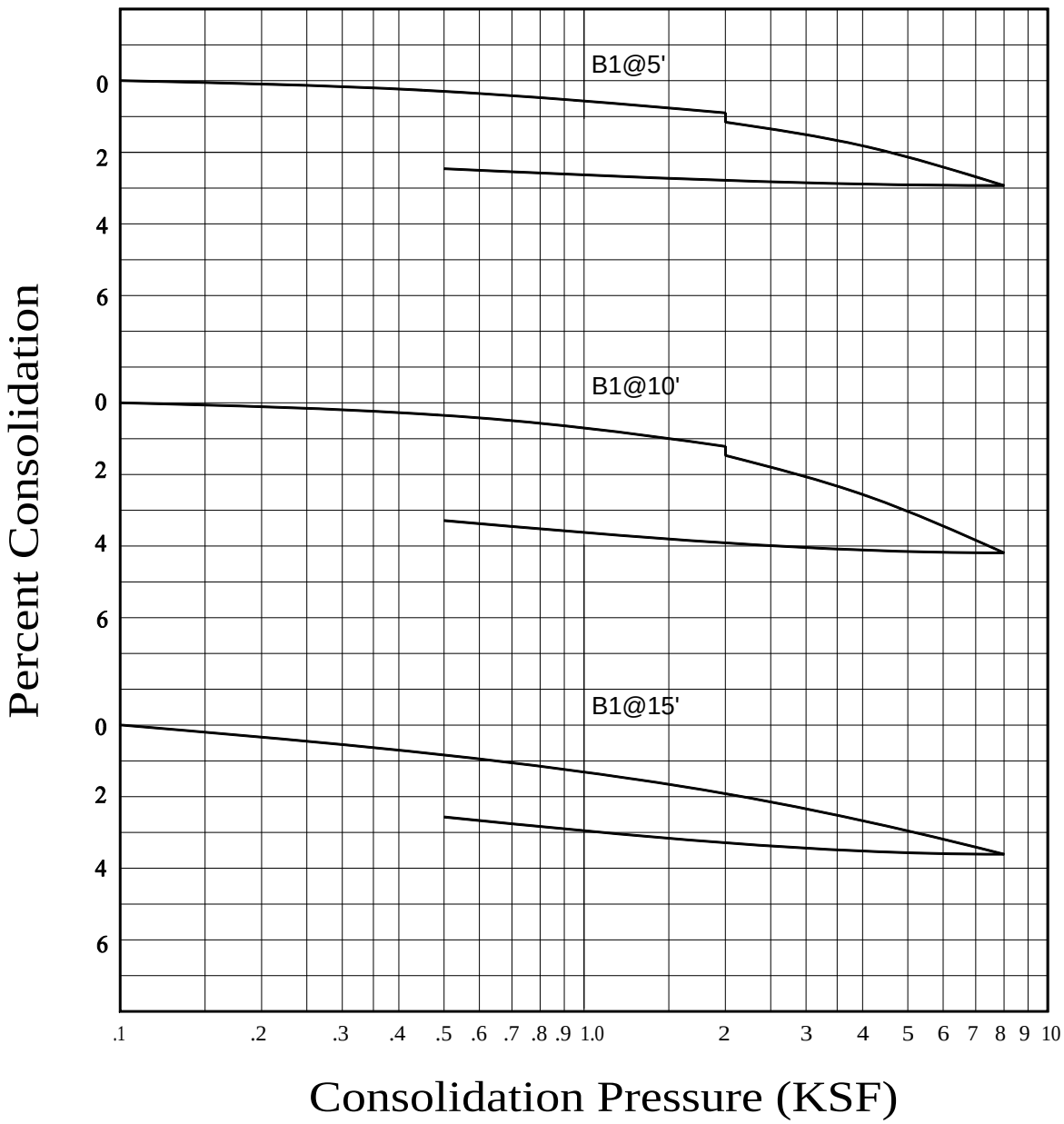
WATER ADDED AT 2 KSF



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CONSOLIDATION TEST RESULTS

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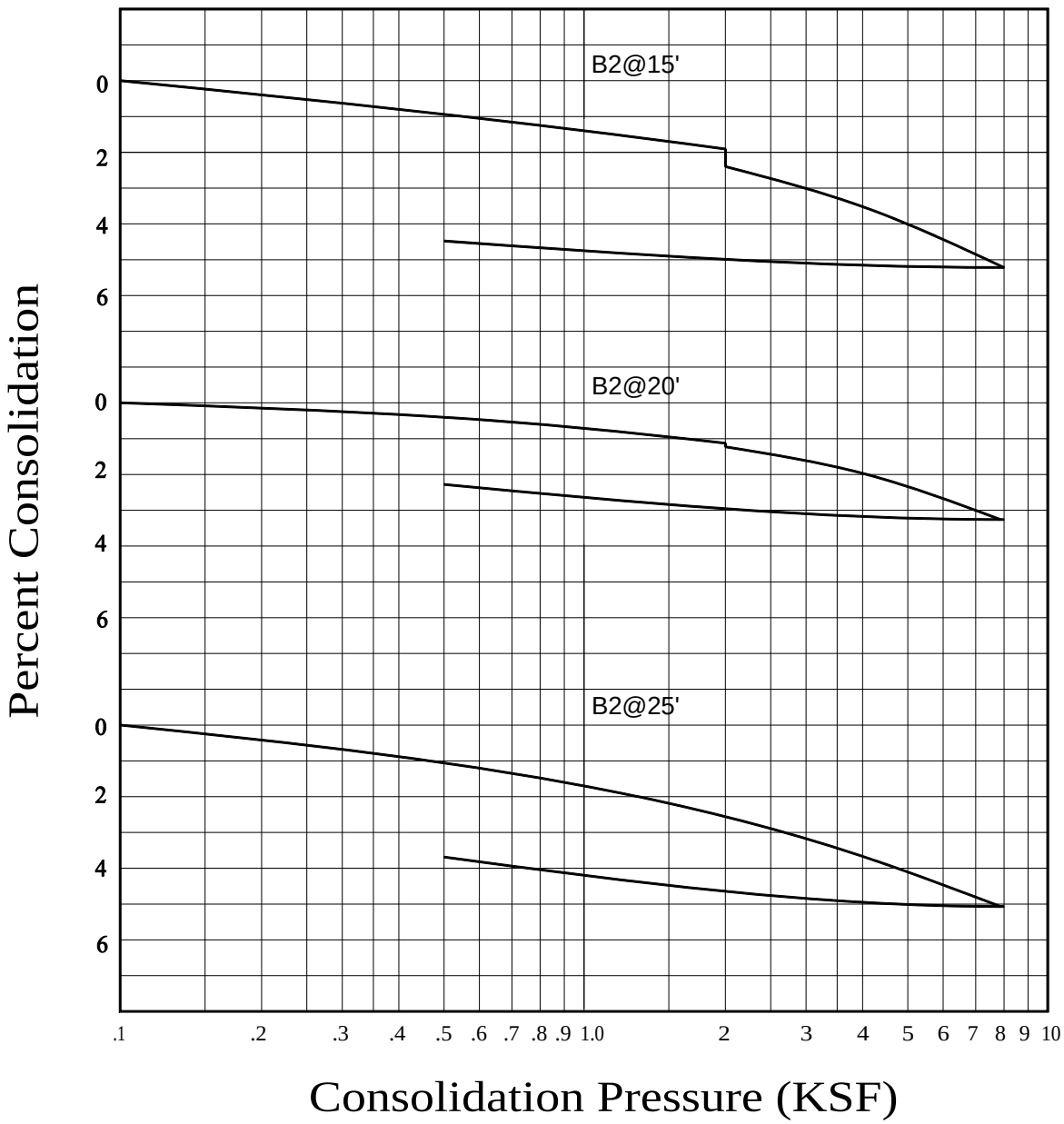
FEB. 2016	PROJECT NO. A9377-06-01	FIG. B4

WATER ADDED AT 2 KSF



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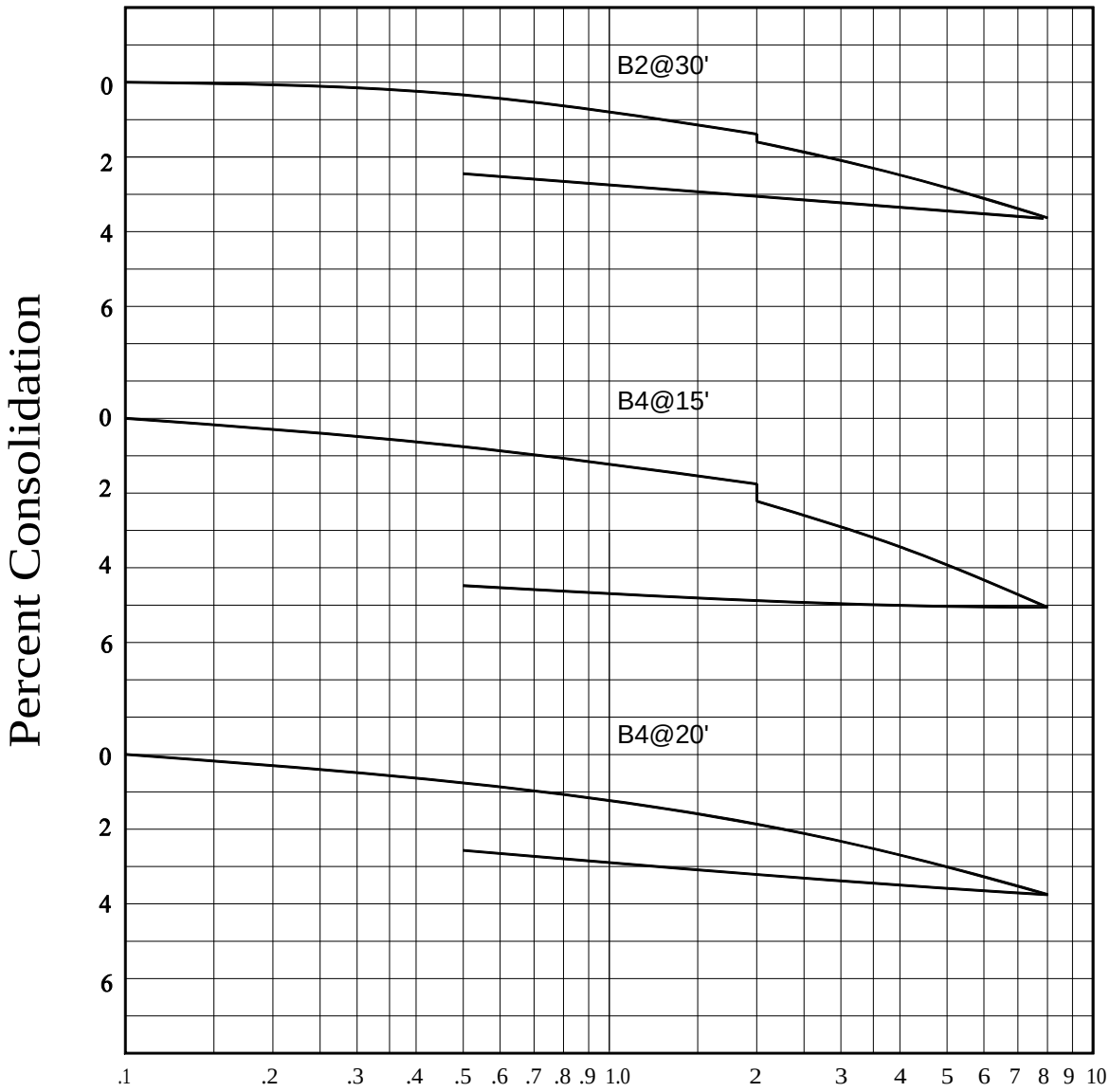
FEB. 2016	PROJECT NO. A9377-06-01	FIG. B5

WATER ADDED AT 2 KSF



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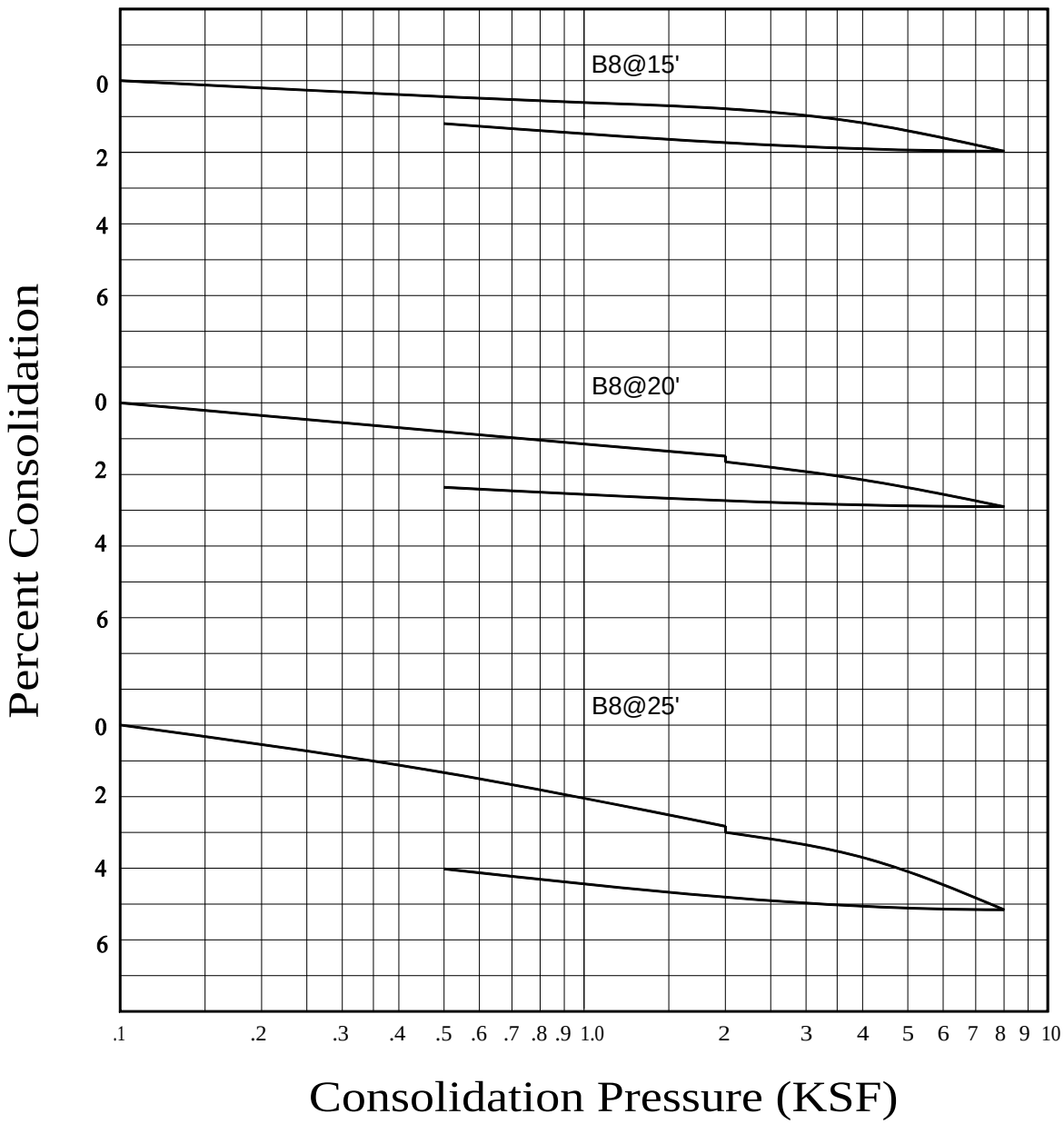
FEB. 2016	PROJECT NO. A9377-06-01	FIG. B6

WATER ADDED AT 2 KSF



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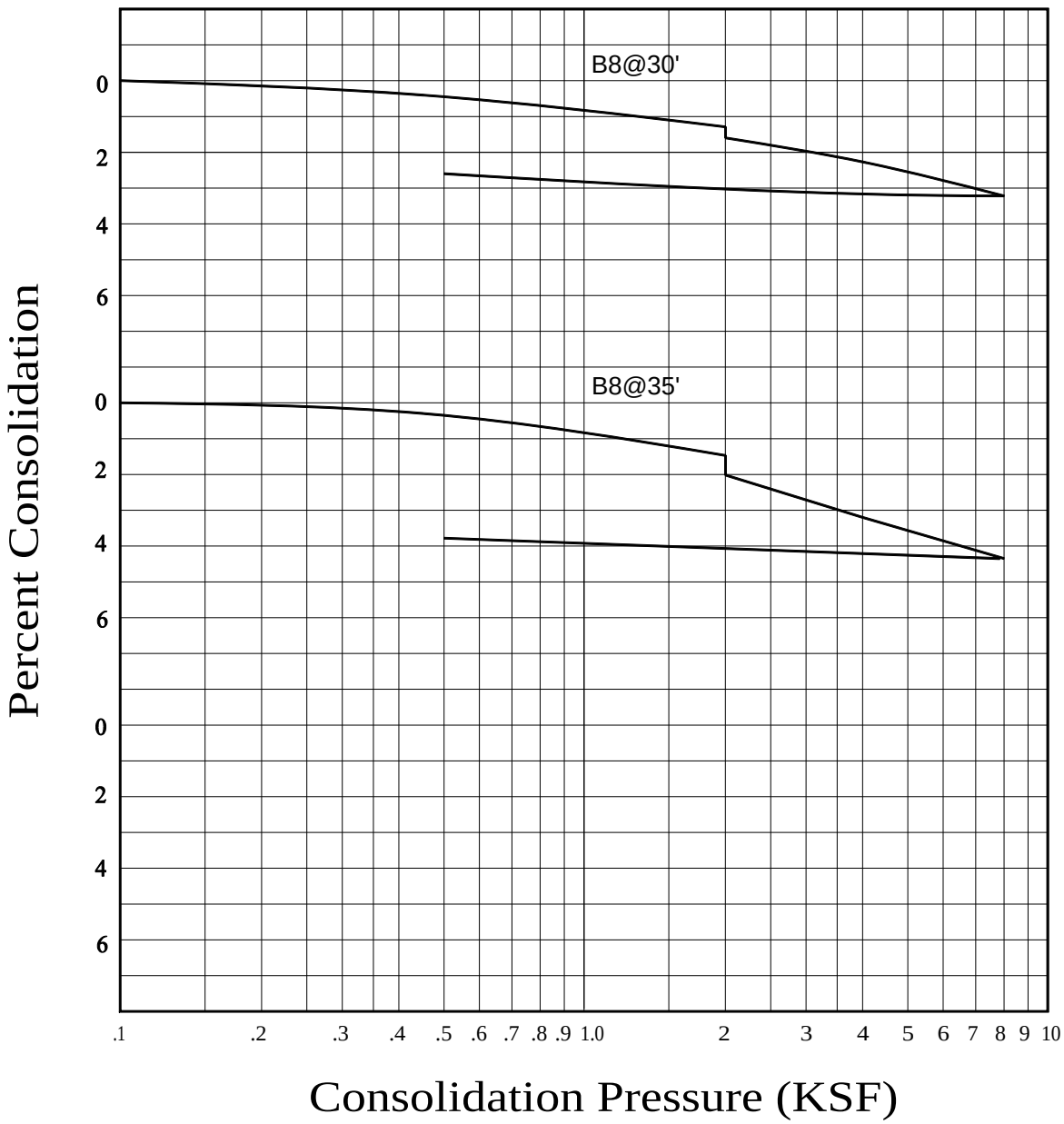
FEB. 2016	PROJECT NO. A9377-06-01	FIG. B7

WATER ADDED AT 2 KSF



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CONSOLIDATION TEST RESULTS

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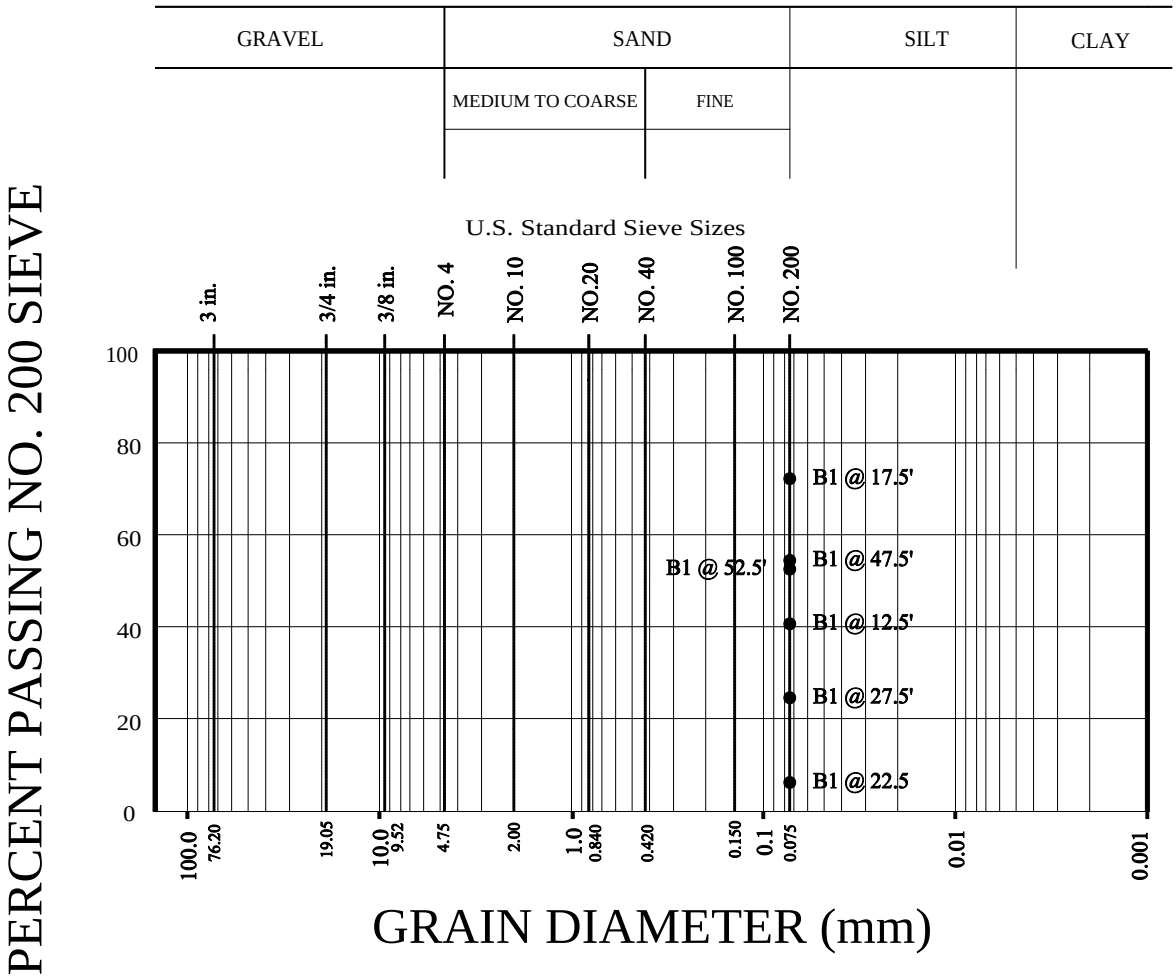
FEB. 2016	PROJECT NO. A9377-06-01	FIG. B8



SAMPLE	PERCENT PASSING NO. 200 SIEVE
B1 @ 12.5'	40.6
B1 @ 17.5'	72.2
B1 @ 22.5	6.3
B1 @ 27.5'	24.5
B1 @ 47.5'	54.4
B1 @ 52.5'	52.5

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GRAIN SIZE ANALYSIS

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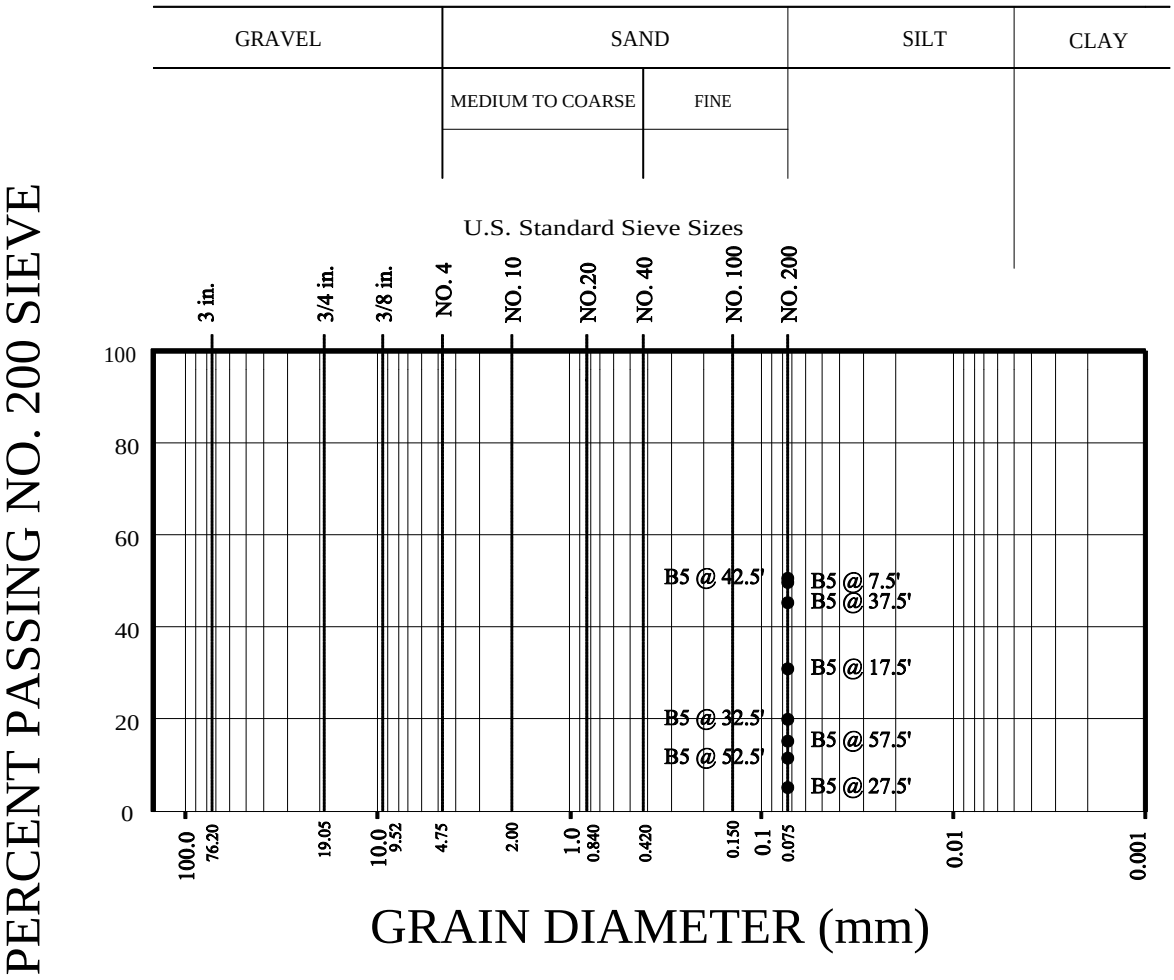
FEB. 2016 | PROJECT NO. A9377-06-01 | FIG. B9



SAMPLE	PERCENT PASSING NO. 200 SIEVE
B5 @ 7.5'	49.6
B5 @ 17.5'	30.8
B5 @ 27.5'	5.2
B5 @ 32.5'	19.8
B5 @ 37.5'	45.2
B5 @ 42.5'	51.5
B5 @ 52.5'	11.6
B5 @ 57.5'	15.3

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GRAIN SIZE ANALYSIS

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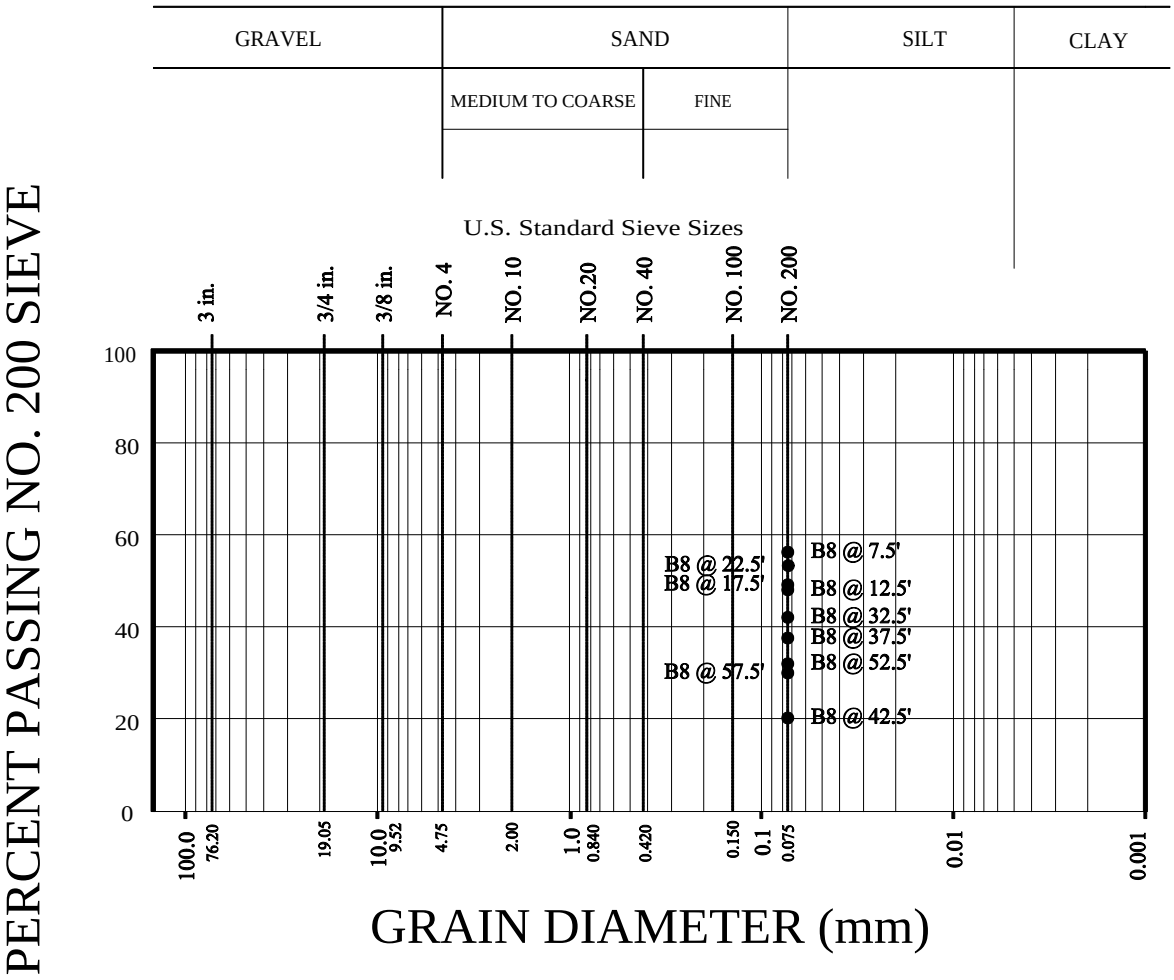
FEB. 2016 | PROJECT NO. A9377-06-01 | FIG. B10



SAMPLE	PERCENT PASSING NO. 200 SIEVE
B8 @ 7.5'	56.2
B8 @ 12.5'	48.0
B8 @ 17.5'	49.1
B8 @ 22.5'	53.4
B8 @ 27.5'	42.0
B8 @ 37.5'	9.7
B8 @ 42.5'	20.1
B8 @ 52.5'	31.9
B8 @ 57.5'	29.9

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GRAIN SIZE ANALYSIS

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SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829-11

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	*UBC Classification	**CBC Classification
	Before	After				
B3 @ 0-5'	7.3	13.2	121.7	3	Very Low	Non Expansive

* Reference: 1997 Uniform Building Code, Table 18-I-B.

** Reference: 2013 California Building Code, Section 1803.5.3

SUMMARY OF LABORATORY MAXIMUM DENSITY AND AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-12

Sample No.	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture (%)
B3 @ 0-5'	Brown Silty Sand with Gravel	136.7	6.8

* Rock Correction Performed

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LABORATORY TEST RESULTS

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SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS CALIFORNIA TEST NO. 643

Sample No.	pH	Resistivity (ohm centimeters)
B3 @ 0-5'	8.42	2700 (Moderately Corrosive)
B6 @ 12.5'	7.72	2000 (Moderately Corrosive)

SUMMARY OF LABORATORY CHLORIDE CONTENT TEST RESULTS EPA NO. 325.3

Sample No.	Chloride Ion Content (%)
B3 @ 0-5'	0.023
B6 @ 12.5'	0.004

SUMMARY OF LABORATORY WATER SOLUBLE SULFATE TEST RESULTS CALIFORNIA TEST NO. 417

Sample No.	Water Soluble Sulfate (% SO_4)	Sulfate Exposure*
B3 @ 0-5'	0.006	Negligible
B6 @ 12.5'	0.004	Negligible

* Reference: 2013 California Building Code, Section 1904.3 and ACI 318-11 Section 4.3.

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CORROSIVITY TEST RESULTS

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