PRELIMINARY SOILS ENGINEERING REPORT
SOUTHEAST GONZALES SPECIFIC PLAN
GLORIA ROAD AT IVERSON ROAD
APNS': 223-032-011, -012, -018, AND -019 (PTN) AND 257-021-021 (PTN) AND -022

PROJECT SL06790-3

Prepared for

Jackson Family Investments II, Inc.
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November 2, 2009

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November 2, 2009
Project No. SL06790-3

Jackson Family Investments II, Inc.
Attn: Ms. Karen Massey
421 Aviation Boulevard
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Subject: **Preliminary Soils Engineering Report**
Southeast Gonzales Specific Plan, Gloria Road at Iverson Road
APNs: 223-032-011, -012, -018, -019 (ptn) and 257-021-021 (ptn) -022
Gonzales Area, Monterey County, California

Dear Ms. Massey:

This Preliminary Soils Engineering Report has been prepared for the proposed mixed use development project referred to as Jackson Green to be located at Gloria Road and Iverson Road in the Gonzales area of Monterey County, California. Geotechnically, the site is suitable for the proposed development provided the recommendations in this report for site preparation, earthwork, foundations, slabs, retaining walls, and pavement sections are incorporated into the design.

It is anticipated that graded pads will be constructed for all proposed structures and that all foundations will be excavated into engineered fill material. All foundations are to be excavated into uniform material to limit the potential for distress of the foundation systems due to differential settlement. If cuts steeper than allowed by State of California Construction Safety Orders for "Excavations, Trenches, Earthwork" are proposed, a numerical slope stability analysis may be necessary for temporary construction slopes.

Thank you for the opportunity to have been of service in preparing this report. If you have any questions or require additional assistance, please feel free to contact the undersigned at (805) 543-8539.

Sincerely,
GeoSolutions, Inc.

Kraig R. Crozier, PE
Principal, C61361

REGISTERED PROFESSIONAL ENGINEER
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AND 257-021-021 (PTN) AND -022
GONZALES AREA OF MONTEREY COUNTY, CALIFORNIA

PROJECT SL06790-3

1.0 INTRODUCTION

This report presents the results of the preliminary geotechnical investigation for the proposed mixed use development project referred to as Jackson Green to be located at Gloria Road and Iverson Road in the Gonzales area of Monterey County, California. See Figure 1: Site Location Map for the general location of the project area. Figure 1: Site Location Map was obtained from the computer program *Topo USA 6.0* (DeLorme, 2006).

The site is located at approximately 36.50514 degrees north latitude and approximately 121.40591 degrees west longitude at an elevation of approximately (average elevation) 270 feet above mean sea level. The property is rectangular in shape and is approximately 670 acres in size. The nearest intersection is where Iverson Road intersects Gloria Road at the southeast corner of the property. The project property will hereafter be referred to as the "Site." See Figure 2: Site Plan for the general layout of the Site. Figure 2: Site Plan was obtained from the client.

The Site is situated on a gradual slope that dips down to the west towards Highway 101. Surface drainage follows the topography to the southwest towards the Salinas River. The Site is currently in use for agricultural production, with associated water storage ponds, canals and unpaved access roads.

Figure 1: Site Location Map

The proposed development is to include; very low to high density housing, commercial/retail, mixed-use, light industrial/business park, heavy industrial/agriculture, schools, parks, and open space. At the time of the preparation of this report, we anticipate that structures associated with the proposed development may be constructed using a combination of building materials and practices including; light wood framing, reinforced concrete and/or structural masonry.

It is anticipated that structures within the proposed development will utilize either slab-on-grade and/or raised wood lower floor systems. Dead and sustained live loads are currently unknown, but they are anticipated to be relatively light, particularly for the residential areas with maximum continuous footing and column loads estimated to be approximately 1.5 kips per linear foot and 15 kips, respectively.

2.0 PURPOSE AND SCOPE

The purpose of this study was to explore and evaluate the surface and sub-surface soil conditions at the Site and to develop geotechnical information and design criteria. The scope of this study includes the following items:

1. A literature review of available published and unpublished geotechnical data pertinent to the project site.
2. A field study consisting of site reconnaissance and exploratory borings in order to formulate a description of the sub-surface conditions at the Site.
3. Laboratory testing performed on representative soil samples that were collected during our field study.
4. Engineering analysis of the data gathered during our literature review, field study, and laboratory testing.
5. Development of recommendations for site preparation and grading as well as geotechnical design criteria for building foundations, retaining walls, pavement sections, underground utilities, and drainage facilities.

3.0 FIELD AND LABORATORY INVESTIGATION

The field investigation was conducted on August 18 thru 20, 2009 using a track-mounted CME 55 drill rig. A total of seven, 8-inch and 4-inch diameter exploratory borings were advanced to a maximum depth of 50 feet below ground surface (bgs) at the approximate locations indicated on Figure 2: Site Plan. Sampling methods included the Standard Penetration Test utilizing a standard split-spoon sampler (SPT) without liners and a Modified California sampler (CA) with liners. The CME 55 drill rig was equipped with an automatic hammer, which has an efficiency of approximately 80 percent and was used to obtain test blow counts in the form of N-values.

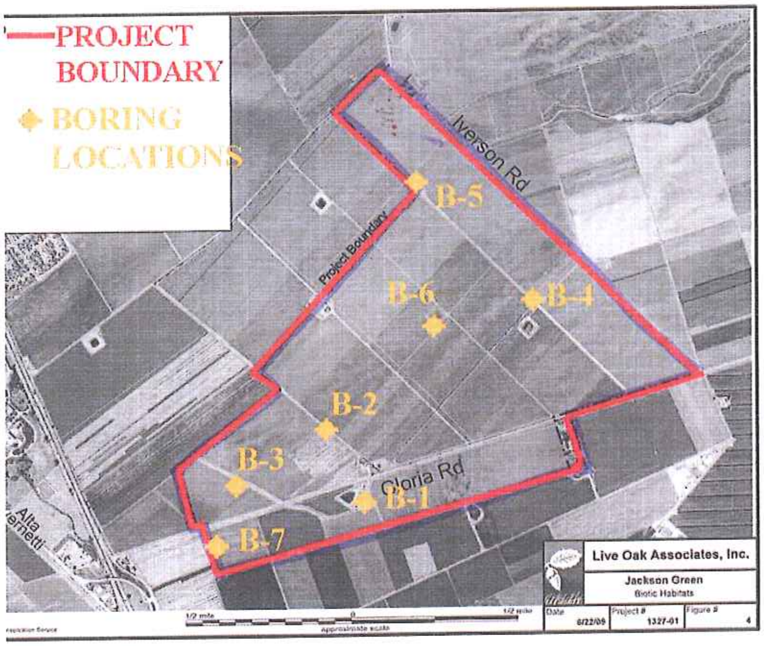

Figure 2: Site Plan

Data gathered during the field investigation suggest that the soil materials at the Site consist of alluvial soils. The surface materials encountered in all boring locations within the Site generally consisted of olive brown to dark brown clayey SAND (SC) encountered in a moist and dense condition to approximately 15 feet bgs. The upper 4 feet bgs of soil encountered within borings B-1, B-2, B-3 and B-7 were generally encountered in a loose to medium dense condition. The sub-surface materials consisted of varying shades of yellowish brown to olive brown sandy CLAY (CL) and clayey SAND (SC) encountered in moist and hard/dense conditions to termination of the borings at a maximum depth of 50 feet. Groundwater was not encountered in any of the borings.

During the boring operations the soils encountered were continuously examined, visually classified, and sampled for general laboratory testing. A project engineer has reviewed a continuous log of the soils encountered at the time of field investigation. See **Appendix A** for the Boring Logs from the field investigation.

Laboratory tests were performed on soil samples that were obtained from the Site during the field investigation. Following a review by the project engineer of all the soil samples obtained during the field investigation, two soil samples were selected for testing as representative of the surface materials encountered in all boring locations. The results of these tests are listed below in Table 1: Engineering Properties. Laboratory data reports and detailed explanations of the laboratory tests performed during this investigation are provided in **Appendix B**.

Table 1: Engineering Properties

Sample Name	Sample Description	USCS Specification	Expansion Index	Expansion Potential	Maximum Dry Density, γ_d (pcf)	Optimum Moisture (%)	Angle of Internal Friction, ϕ (deg.)	Cohesion, c (psf)
A	Olive Brown Clayey SAND	SC	3	Very Low	128.0	8.9	-	-
B-1 @ 5.0 Ft.	Olive Brown Clayey SAND	SC	-	-	-	-	29.7	454

4.0 SEISMIC DESIGN CONSIDERATIONS

4.1 Seismic Hazard Analysis

1. According to section 1613 of the 2007 CBC (CBSC, 2007), all structures and portions of structures should be designed to resist the effects of seismic loadings caused by earthquake ground motions in accordance with the *Minimum Design Loads for Buildings and Other Structures* (ASCE7) (ASCE, 2006). ASCE7 considers the most severe earthquake ground motion to be the ground motion caused by the Maximum Considered Earthquake (MCE) (ASCE, 2006). The MCE can be defined as an earthquake having a two percent chance of being exceeded in 50 years. A probabilistic seismic hazard analysis was performed in order to estimate the horizontal ground motion acceleration (a_{max}) produced at the Site during the MCE. The probabilistic seismic hazard evaluation for the Site was performed using the computer program FRISKSP (Blake, 2000). The program FRISKSP is based on an earlier computer program, FRISK (McGuire, 1978), which was modified for the probabilistic estimations of seismic hazards using three-dimensional earthquake sources.

2. The a_{max} of the Site depends on several factors, which include the distance of the Site from known active faults, the expected magnitude of the MCE, and the Site soil profile characteristics. The computer program FRISKSP produces a Probability of Exceedance Chart using latitude and longitude coordinates of the Site, a database of known active faults, and a specified attenuation curve that is representative of the soil characteristics at the Site. The a_{max} of the Site can be determined from this Probability of Exceedance Chart.

The closest known fault identified in this analysis of the Site is the Rinconada Fault which is located 4.8 miles from the Site.

3. In order to perform the seismic hazard analysis, an attenuation curve was chosen based on the Site soil profile classification, which was determined from data gathered during the field investigation. As per section 1613.5.5 of the 2007 CBC (CBSC, 2007), the Site soil profile classification is determined by the average soil properties in the upper 100 feet of the Site profile. Based on the $(N_1)_{60}$ values calculated for the in-situ tests performed during the field investigation, the Site was defined as Site Class D, Stiff Soil profile per Table 1613.5.2 of the 2007 CBC (CBSC, 2007). Due to this site profile classification, the seismic hazard analysis was performed using the Horiz. - NEHRP D (250) attenuation relation by Boore et al., 1997. Using this attenuation relation, this analysis produced an a_{max} of 0.710g for the Site. See **Appendix D** for the latitude and longitude data used in this analysis and for the Probability of Exceedance Chart.

4. According to section 11.2 of ASCE7 (ASCE, 2006) and section 1613 of the 2007 CBC (CBSC, 2007), buildings and structures should be specifically proportioned to resist Design Earthquake Ground Motions (Design a_{max}). ASCE7 defines the Design a_{max} as "the earthquake ground motions that are two-thirds of the corresponding MCE ground motions" (ASCE, 2006, p. 109). Therefore, the **Design a_{max} for the Site is 0.473g**, which is equal to two-thirds of the a_{max} for the Site.

5. Site coordinates of 35.50514 degrees north latitude and 121.40591 degrees west longitude and a search radius of 100 miles were used in the probabilistic seismic hazard analysis.

4.2 Structural Building Design Parameters

1. Structural building design parameters within chapter 16 of the 2007 CBC (CBSC, 2007) and sections 11.4.3 and 11.4.4 of ASCE7 (ASCE, 2006) are dependent upon several factors, which include site soil profile characteristics and the locations and characteristics of faults near the Site. As described in section 4.1 of this report, the Site soil profile classification was determined to be Site Class D. This Site soil profile classification and the latitude and longitude coordinates for the Site were used to determine the structural building design parameters.

2. Spectral Response Accelerations and Site Coefficients were obtained from the Seismic Hazard Curves and Uniform Hazard Response Spectra, Earthquake Ground Motion Tool computer application (USGS, 2007); this program is available from the United States Geological Survey website (USGS, 2008). This computer program utilizes the methods developed in the 1997, 2000, and 2003 editions of the NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures and user-inputted Site latitude and longitude coordinates to calculate seismic design parameters and response spectra (both for period and displacement), for Site Classifications A through E. This data is presented in tabular form in Table 2: 2007 California Building Code, Chapter 16, Structural Design Parameters. Analysis of the Design Spectral Response Acceleration Parameters for the Site and of the Occupancy Category for the proposed structures assign to this project a **Seismic Design Category of D** per Tables 1613.3.5.6(1) and 1613.3.5.6(2) of the 2007 CBC (CBSC, 2007).

Table 2: 2007 California Building Code, Chapter 16, Structural Design Parameters

Site Class - Soil Profile Type	D – Stiff Soil
Mapped Spectral Response Accelerations and Site Coefficients	$S_S = 1.226$, $S_1 = 0.50$ $F_a = 1.01$, $F_v = 1.50$
Adjusted Maximum Considered Earthquake Spectral Response Accelerations	$S_{MS} = S_S{*}F_a = 1.085{*}1.000 = 1.238$ $S_{M1} = S_1{*}F_v = 0.458{*}1.342 = 0.750$
Design Spectral Response Acceleration Parameters	$S_{DS} = 2/3(S_{MS}) = 2/3(1.085) = 0.826$ $S_{D1} = 2/3(S_{M1}) = 2/3(0.615) = 0.500$
Occupancy Category (from Table 1604.5, 2007 CBC)	II
Seismic Design Category – Short Period Accel. (from Table 1613.5.6(1), 2007 CBC)	D
Seismic Design Category – Long Period Accel. (from Table 1613.5.6(2), 2007 CBC)	D

4.3 Design Response Spectra – 2007 CBC

According to section 11.4.5 of ASCE7 (ASCE, 2006), a design response spectrum for a site may be required in order to design structures to resist lateral forces caused by ground motions at the Site. The design spectral response acceleration parameters, listed in Table 2: 2007 California Building Code, Chapter 16, Structural Design Parameters, are used to produce the design response spectrum. The Seismic Hazard Curves and Uniform Hazard Response Spectra computer program (USGS, 2007) was used to construct a design response spectrum for the Site, which is shown in Figure 3: Design Response Spectra – 2007 CBC.

4.4 Liquefaction Potential

1. In the context of soil mechanics, liquefaction is the process that occurs when the dynamic loading of a soil mass causes the shear strength of the soil mass to rapidly decrease. Liquefaction can occur in saturated cohesionless soils.

2. The most typical liquefaction-induced failures include consolidation of liquefied soils, surface sand boils, lateral spreading of the ground surface, bearing capacity failures of structural foundations, flotation of buried structures, and differential settlement of above-ground structures.

3. Liquefiable soils must undergo dynamic loading before liquefaction occurs. Ground motion from an earthquake may induce large-amplitude cyclic reversals of shear stresses within a soil mass. Repetitive lateral and vertical loading and unloading usually results from this process. This process is considered to be dynamic loading. In a liquefiable soil mass, liquefaction may occur as a result of the dynamic loading caused by ground motion produced by an earthquake.

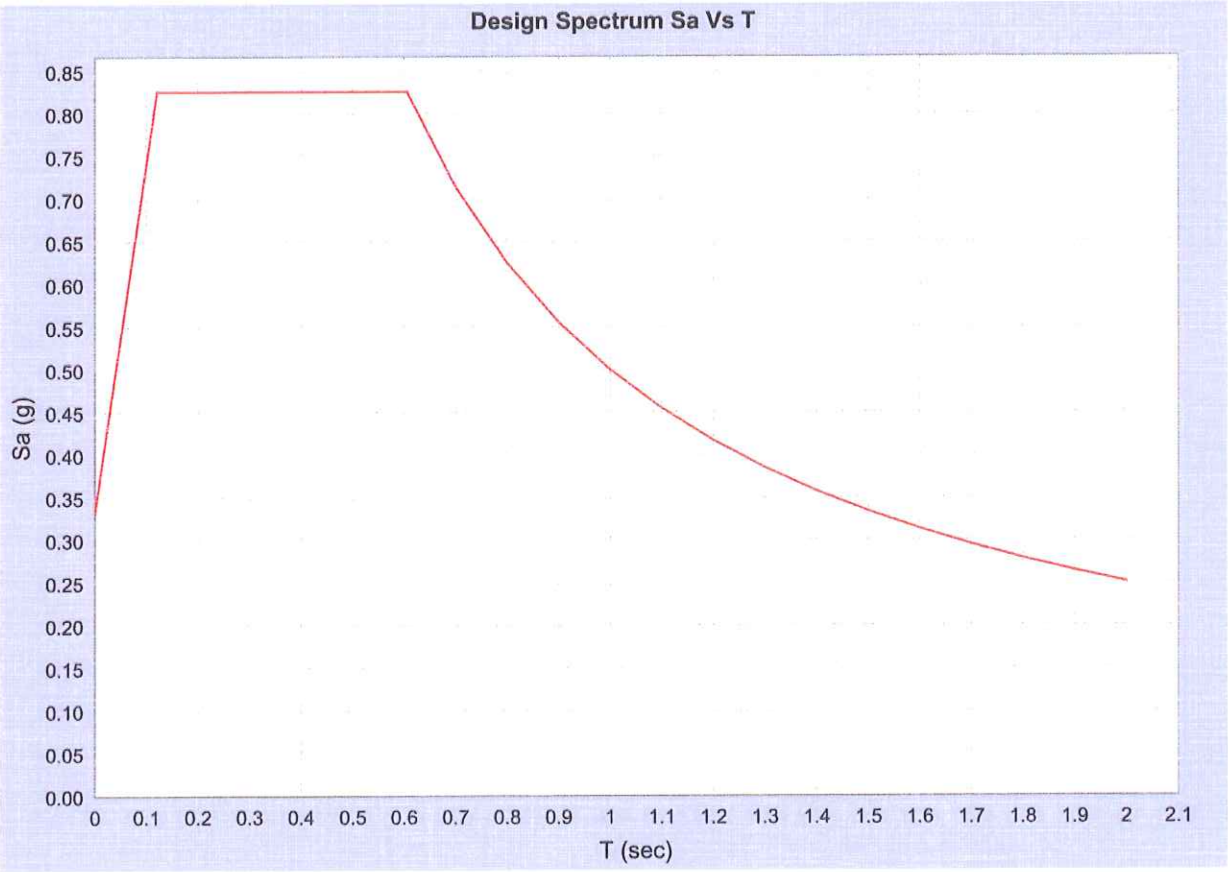

Figure 3: Design Response Spectra – 2007 CBC

4. The presence of loose, poorly graded, fine sand material that is saturated by groundwater within an area that is known to be subjected to high intensity earthquakes and long-duration ground motion are the key factors that indicate potentially liquefiable areas and conditions that lead to liquefaction.

5. Based on the consistency and relative density of the in-situ soils, the depth to groundwater, and the Design a_{max}, the potential for seismic liquefaction of soils at the Site appears to be low. Assuming that the recommendations of the Soils Engineering Report are implemented, the potential for seismically induced settlement and differential settlement at the Site is considered to be low.

5.0 GENERAL SOIL-FOUNDATION DISCUSSION

It is anticipated that graded pads will be constructed for all proposed structures and that all foundations will be excavated into engineered fill material. All foundations are to be excavated into uniform material to limit the potential for distress of the foundation systems due to differential settlement. If cuts steeper than allowed by State of California Construction Safety Orders for "Excavations, Trenches, Earthwork" are proposed, a numerical slope stability analysis may be necessary for temporary construction slopes.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The Site is suitable for the proposed development provided the recommendations presented in this report are incorporated into the project plans and specifications.

The primary geotechnical concerns at the Site are:

1. The presence of loose surface and subsurface soils.

2. The potential for differential settlement occurring between foundations supported on two soil materials having different settlement characteristics, such as native soil and engineered fill. Therefore, it is important that all of the foundations are founded in equally competent uniform material in accordance with this report.

6.1 Preparation of Building Pads

1. It is anticipated that graded engineered fill pads will be developed for the proposed structures with footings founded in engineered fill. In general, building pad preparation will require over-excavation and re-processing of the upper 4 feet of site soils. Some areas may require additional depth of soil processing due to residual soil moisture from previous agricultural operations. Site-specific Soils Engineering Reports may be performed following preliminary design of the proposed structures to address specific soil conditions.

2. In general, for the development of engineered fill pads, the native material should be over-excavated at least 48 inches below existing grade, 24 inches below the bottom of the footings, to competent material, or to one-half the depth of the deepest fill; whichever is greatest. The limits of over-excavation should extend a minimum of 5 feet beyond the perimeter foundation. The exposed surface should be scarified to a depth of 12 inches; moisture conditioned to near optimum moisture content, and compacted to a minimum relative density of 90 percent (ASTM D1557-07). The over-excavated material should then be processed as engineered fill. Refer to section 6.5 Slab-On-Grade Construction and Figure 4: Sub-Slab Detail for additional information regarding preparation of slab areas and under-slab drainage material. Refer to **Appendix C** for more details on fill placement.

3. If fill areas are constructed on slopes greater than 10-to-1 (horizontal-to-vertical), we recommend that benches be cut every four feet as fill is placed. Each bench shall be a minimum of 10 feet wide with a minimum of two percent gradient into the slope. If fill areas are constructed on slopes greater than 5-to-1, we recommend that the toe of all areas to receive fill be keyed a minimum of 24 inches into underlying dense material. Sub-drains shall be placed in the keyway and benches as required. See **Appendix C**, Detail A, Key and Bench with Backdrain for details on key and bench construction.

6.2 Preparation of Paved Areas

1. Pavement areas should be over-excavated 12 inches below existing grade or finished sub-grade; whichever is deeper. The exposed surface should be scarified an additional depth of eight inches, moisture conditioned to near optimum moisture content, and compacted to a minimum relative density of 90 percent (ASTM D1557-07 test method). The over-excavated soil should then be moisture conditioned to produce a water-content of at least one to two percent above optimum value and then compacted to a minimum relative density of 90 percent. The top 12 inches of sub-grade soil under all pavement sections should be compacted to a minimum relative density of 95 percent based on the ASTM D1557-07 test method at slightly above optimum.

2. Sub-grade soils should not be allowed to dry out or have excessive construction traffic between moisture conditioning and compaction, and placement of the pavement structural section.

6.3 Pavement Design

1. All pavement construction and materials used should conform to Sections 25, 26 and 39 of the latest edition of the State of California Department of Transportation Standard Specifications (State of California, 1999).

2. As indicated previously in Section 6.2, the top 12 inches of sub-grade soil under pavement sections should be compacted to a minimum relative density of 95 percent based on the ASTM D1557-07 test method at slightly above optimum moisture content. Aggregate bases and sub-bases should also be compacted to a minimum relative density of 95 percent based on the aforementioned test method.

3. A minimum of six inches of Class II Aggregate Base is recommended for all pavement sections. Final design pavement sections should be determined based on R-Value testing performed on representative soil materials obtained during construction of improvements. All pavement sections should be crowned for good drainage.

6.4 Conventional Foundations

1. Conventional continuous and spread footings with grade beams may be used for support of the proposed structures. Isolated pad footings should be a minimum of two feet square in size and are permitted for single floor loads only.

2. Minimum footing and grade beam sizes and depths in engineered fill should conform to the following table, as observed and approved by the Soils Engineer.

Table 3: Minimum Footing and Grade Beam Dimensions

Excavated in Engineered Fill		
Building Type	**Minimum Depth Below Lowest Adjacent Grade**	**Minimum Width**
One-Story	12 inches	12 inches
Two-Story	18 inches	15 inches

3. Minimum reinforcing for footings should be four No. 4 bars, placed two at the top and two at the bottom, or as directed by the project Structural Engineer.

4. The Soils Engineer should observe and approve all foundation excavations for required embedment depth prior to the placement of reinforcing steel and/or concrete. Concrete should be placed only in excavations that are free of loose, soft soil and debris and that have been lightly pre-moistened, with no associated testing required.

5. An allowable dead plus live load bearing pressure of **2,500 psf** may be used for the design of footings founded in engineered fill.

6. Lateral forces on structures may be resisted by passive pressure acting against the sides of shallow footings and/or friction between the engineered fill and the bottom of the footings. For resistance to lateral loads, a friction factor of **0.38** may be utilized for sliding resistance at the base of footings extending a minimum of 12 inches into engineered fill. A passive pressure of **400-pcf** equivalent fluid weight may be used against the side of shallow footings in engineered fill. If friction and passive pressures are combined to resist lateral forces acting on shallow footings, the lesser value should be reduced by 50 percent.

7. Foundation excavations should be observed and approved by the Soils Engineer prior to the placement of reinforcing steel and/or concrete.

8. Foundation design should conform to the requirements of Chapter 18 of the latest edition of the CBC (CBSC, 2007).

9. The base of all grade beams and footings should be level and stepped as required to accommodate any change in grade while still maintaining the minimum required footing embedment and slope setback distance.

6.5 Slab-On-Grade Construction

1. Concrete slabs-on-grade and flatwork should not be placed directly on unprepared native materials. Preparation of sub-grade to receive concrete slabs-on-grade and flatwork should be processed as discussed in the preceding sections of this report. Concrete slabs should be placed only over sub-grade that is free of loose, soft soil and debris and that has been lightly pre-moistened, with no associated testing required.

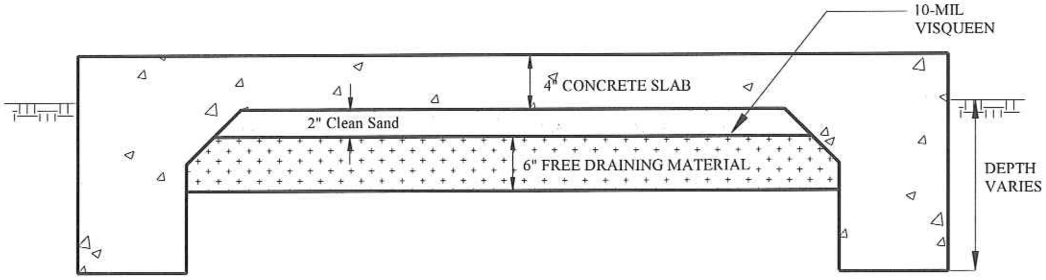

Figure 4: Sub-Slab Detail

2. Concrete slabs-on-grade should be a minimum of 4 inches thick and should be reinforced with No. 3 reinforcing bars placed at 18 inches on-center both ways at or slightly above the center of the structural section. Reinforcing bars should have a minimum clear cover of 1.5 inches. The aforementioned reinforcement may be used for anticipated uniform floor loads not exceeding 200 psf. If floor loads greater than 200 psf are anticipated, a Structural Engineer should evaluate the slab design.

3. Concrete for all slabs should be placed at a maximum slump of less than 5 inches. Excessive water content is the major cause of concrete cracking. If fibers are used to aid in the control of cracking, a water-reducing admixture may be added to the concrete to increase slump while maintaining a water/cement ratio, which will limit excessive shrinkage. Control joints should be constructed as required to control cracking.

4. Based on the soil types encountered during the field investigation, GeoSolutions, Inc. recommends that concrete slabs-on-grade be underlain by a minimum of six inches of clean free-draining material, such as a coarse aggregate mix, to serve as a cushion and a capillary break. Where moisture susceptible storage or floor coverings are anticipated, a 10-mil Visqueen-type membrane should be placed between the free-draining material and the slab to minimize moisture condensation under the floor covering. It is suggested that a two-inch thick sand layer be placed on top of the membrane to assist in the curing of the concrete, increasing the depth of the under-slab material to a total of eight inches. See

Figure 4: Sub-Slab Detail. The sand should be lightly moistened prior to placing concrete. These preliminary recommendations may be modified following a review of completed design plans based on the intended uses of the proposed structures and the results of additional site-specific Soils Engineering Reports prepared during the final design phases.

5. Moisture condensation under floor coverings has become critical due to the use of water-soluble adhesives. Therefore, it is suggested that moisture sensitive slabs not be constructed during inclement weather conditions.

6.6 Retaining Walls

1. Retaining walls should be designed to resist lateral pressures from adjacent soils and surcharge loads applied behind the walls. We recommend using the lateral pressures presented in Table 4: Retaining Wall Design Parameters and Figure 5: Retaining Wall Detail for the design of retaining walls at the Site. The Active Case may be used for the design of unrestrained retaining walls, and the At-Rest Case may be used for the design of restrained retaining walls.

Table 4: Retaining Wall Design Parameters

Lateral Pressure and Condition	Equivalent Fluid Pressure, pcf
Static, Active Case, Engineered Fill ($\gamma' K_A$)	47
Static, At-Rest Case, Engineered Fill ($\gamma' K_O$)	70
Static, Passive Case, Engineered Fill ($\gamma' K_P$)	400

2. The above values for equivalent fluid pressure are based on retaining walls having level retained surfaces, having an approximately vertical surface against the retained material, and retaining granular backfill material or engineered fill composed of native soil within the active wedge. See Figure 6: Retaining Wall Active and Passive Wedges for a description of the location of the active wedge behind a retaining wall.

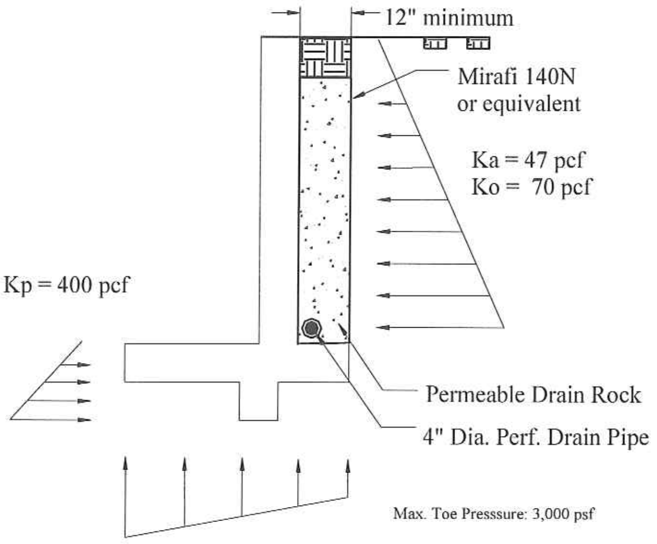

Figure 5: Retaining Wall Detail

3. Proposed retaining walls having a retained surface that slopes upward from the top of the wall should be designed for an additional equivalent fluid pressure of **1 pcf** for the active case and **1.5 pcf** for the at-rest case, for every **two degrees** of slope inclination. This applies for slope angles up to

20 degrees; a 20 degree-slope is approximately equivalent to a slope with a 2.75-to-1 gradient. For slope angles greater than 20 degrees, the Soils Engineer should be consulted to obtain design equivalent fluid pressure values for retaining walls located at the Site.

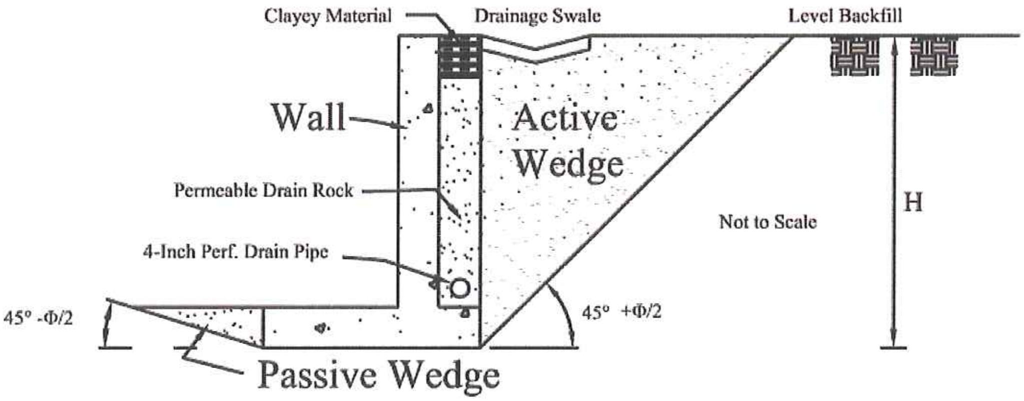

Figure 6: Retaining Wall Active and Passive Wedges

4. We recommend that the proposed retaining walls at the Site have an approximately vertical surface against the retained material. If the proposed retaining walls are to have sloped surfaces against the retained material, the project designers should contact the Soils Engineer to determine the appropriate lateral earth pressure values for retaining walls located at the Site.

5. Retaining wall foundations should be founded a minimum of 12 inches below lowest adjacent grade in engineered fill as observed and approved by the Soils Engineer. A coefficient of friction of **0.38** may be used between engineered fill and concrete footings. Project designers may use a maximum toe pressure of **3,000 psf** for the design of retaining wall footings founded in engineered fill.

6. Seismic active lateral earth pressure values were determined using the Pseudostatic Method and the Design a_{max}. See section 4.1 for a description of the analysis used to determine the Design a_{max}. The seismic at-rest lateral earth pressure value was determined by multiplying the seismic active lateral earth pressure value by approximately 1.5. The dynamic increment in lateral earth pressure due to earthquakes should be considered during the design of retaining walls at the Site. Retaining walls should be designed to resist an additional lateral soil pressure of **32 pcf** equivalent fluid pressure for unrestrained walls and **48 pcf** equivalent fluid pressure for restrained walls. For earthquake conditions, the pressure resultant force should be assumed to act a distance of $^2/_3$H above the base of the retaining wall, where H is the height of the retaining wall.

7. These seismic lateral earth pressure values are appropriate for retaining walls that have level retained surfaces, that have an approximately vertical surface against the retained material, and that retain granular backfill material or engineered fill composed of native soil within the active wedge. For other retaining wall designs, seismic lateral earth pressure values may be obtained using methods such as the Mononobe and Okabe Method developed by Mononobe and Matsuo (1929) and Okabe (1926), which are included in retaining wall computer design software such as Retain Pro.

8. Seismically induced forces on retaining walls are considered to be short-term loadings. Therefore, when performing seismic analyses for the design of retaining wall footings, we recommend that the allowable bearing pressure and the passive pressure acting against the sides of retaining wall footings be increased by a factor of one-third.

9. In addition to the static lateral soil pressure values reported in Table 4: Retaining Wall Design Parameters, the retaining walls at the Site should be designed to support any design live load, such as from vehicle and construction surcharges, etc., to be supported by the wall backfill. If construction vehicles are required to operate within 10 feet of a retaining wall, supplemental pressures will be induced and should be taken into account in the design of the retaining wall.

10. The recommended lateral earth pressure values are based on the assumption that sufficient sub-surface drainage will be provided behind the walls to prevent the build-up of hydrostatic pressure. To achieve this we recommend that a granular filter material be placed behind all proposed walls. The blanket of granular filter material should be a minimum of 12 inches thick and should extend from the bottom of the wall to 12 inches from the ground surface. The top 12 inches should consist of moisture conditioned, compacted, clayey soil. Neither spread nor wall footings should be founded in the granular filter material used as backfill.

11. A 4-inch diameter perforated or slotted drainpipe (ASTM D1785 PVC) should be installed near the bottom of the filter blanket with perforations facing down. The drainpipe should be underlain by at least 4 inches of filter type material and should daylight to discharge in suitably projected outlets with adequate gradients. The filter material should consist of a clean free-draining aggregate, such as a coarse aggregate mix. If the retaining wall is part of a structural foundation, the drainpipe must be placed below finished slab sub-grade elevation.

12. The filter material should be encapsulated in a permeable geotextile fabric. A suitable permeable geotextile fabric, such as non-woven needle-punched Mirafi 140N or equal, may be utilized to encapsulate the retaining wall drain material and should conform to Caltrans Standard Specification 88-1.03 for underdrains.

13. As an alternative to the above recommended granular filter material with perforated pipe and filter fabric, a system of pre-fabricated geotextile drainage panels and strip drains may be utilized for wall drainage. Proposed alternatives should be reviewed and approved by the Soils Engineer prior to use on the Site.

14. For hydrostatic loading conditions (i.e. no free drainage behind retaining wall), an additional loading of 45-pcf equivalent fluid weight should be added to the active and at-rest lateral earth pressures. If it is necessary to design retaining structures for submerged conditions, the allowed bearing and passive pressures should be reduced by 50 percent. In addition, soil friction beneath the base of the foundations should be neglected.

15. Precautions should be taken to ensure that heavy compaction equipment is not used adjacent to walls, so as to prevent undue pressure against, and movement of the walls.

16. The use of water-stops/impermeable barriers should be used for any basement construction, and for building walls that retain earth.

7.0 ADDITIONAL GEOTECHNICAL SERVICES

The recommendations contained in this report are based on a limited number of borings and on the continuity of the sub-surface conditions encountered. GeoSolutions, Inc. assumes that it or another qualified firm will be retained as the Soils Engineer to provide additional services during future phases of the proposed development. These services would be provided by the Soils Engineer as required by County of Monterey, the 2007 CBC, and/or industry standard practices. These services would be in addition to those included in this report and would include, but are not limited to, the following services:

1. Preparation of site-specific Soils Engineering reports to aid in the design and construction of proposed structures following preparation of preliminary grading and building plans.
2. Consultation during plan development.
3. Plan review of grading and foundation documents prior to construction and a report certifying that the reviewed plans are in conformance with our geotechnical recommendations.
4. Construction inspections and testing, as required, during all grading and excavating operations beginning with the stripping of vegetation at the Site, at which time a site meeting or pre-job meeting would be appropriate.
5. Special inspection services during construction of reinforced concrete, structural masonry, high strength bolting, epoxy embedment of threaded rods and reinforcing steel, and welding of structural steel.
6. Preparation of construction reports certifying that building pad preparation and foundation excavations are in conformance with the geotechnical recommendations.
7. Preparation of special inspection reports as required during construction.
8. In addition to the construction inspections listed above, section 1704.7 of the 2007 CBC (CBSC, 2007) requires the following inspections by the Soils Engineer for controlled fill thicknesses greater than 12 inches as shown in Table 5: Required Verification and Inspections of Soils:

Table 5: Required Verification and Inspections of Soils

Verification and Inspection Task	Continuous During Task Listed	Periodically During Task Listed
1. Verify materials below footings are adequate to achieve the design bearing capacity.	-	X
2. Verify excavations are extended to proper depth and have reached proper material.	-	X
3. Perform classification and testing of controlled fill materials.	-	X
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.	X	-
5. Prior to placement of controlled fill, observe sub-grade and verify that site has been prepared properly.	-	X

8.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed during our study. Should any variations or undesirable conditions be encountered during the development of the Site, GeoSolutions, Inc. should be notified immediately and GeoSolutions, Inc. will provide supplemental recommendations as dictated by the field conditions.

2. This report is issued with the understanding that it is the responsibility of the owner or his/her 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 project plans and specifications. The owner or his/her representative is responsible to ensure that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they are due to natural processes or to the works of man on this or adjacent properties. Therefore, this report should not be relied upon after a period of 10 years without our review nor should it be used or is it applicable for any properties other than those studied. However many events such as floods, earthquakes, grading of the adjacent properties and building and municipal code changes could render sections of this report invalid within that time period.

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REFERENCES

REFERENCES

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APPENDIX A

Field Investigation

Soil Classification Chart

Boring Logs

FIELD INVESTIGATION

The field investigation was conducted August 18-20, 2009 using a track-mounted CME 55 drill rig. The surface and sub-surface conditions were studied by advancing seven exploratory borings. This exploration was conducted in accordance with presently accepted geotechnical engineering procedures consistent with the scope of the services authorized to GeoSolutions, Inc.

The CME 55 drill rig with a four and eight-inch diameter solid and hollow-stem continuous flight auger bored seven exploratory borings near the approximate locations indicated on Figure 2: Site Plan. The drilling and field observation was performed under the direction of the project engineer. A representative of GeoSolutions, Inc. maintained a log of the soil conditions and obtained soil samples suitable for laboratory testing. The soils were classified in accordance with the Unified Soil Classification System. See the Soil Classification Chart in this appendix.

Standard Penetration Tests with a two-inch outside diameter standard split tube sampler (SPT) without liners (ASTM D1586-99) and a three-inch outside diameter Modified California (CA) split tube sampler with liners (ASTM D3550-01) were performed to obtain field indication of the in-situ density of the soil and to allow visual observation of at least a portion of the soil column. Soil samples obtained with the split spoon sampler are retained for further observation and testing. The split spoon samples are driven by a 140-pound hammer free falling 30 inches. The sampler is initially seated six inches to penetrate any loose cuttings and is then driven an additional 12 inches with the results recorded in the boring logs as N-values, which area the number of blows per foot required to advance the sample the final 12 inches.

The CA sampler is a larger diameter sampler than the standard (SPT) sampler with a two-inch outside diameter and provides additional material for normal geotechnical testing such as in-situ shear and consolidation testing. Either sampler may be used in the field investigation, but the N-values obtained from using the CA sampler will be greater than that of the SPT. The N-values for samples collected using the CA can be roughly correlated to SPT N-values using a conversion factor that may vary from about 0.5 to 0.7. A commonly used conversion factor is 0.67 $(^2/_3)$. More information about standardized samplers can be found in ASTM D1586-99 and ASTM D3550-01.

Disturbed bulk samples are obtained from cuttings developed during boring operations. The bulk samples are selected for classification and testing purposes and may represent a mixture of soils within the noted depths. Recovered samples are placed in transport containers and returned to the laboratory for further classification and testing.

Logs of the borings showing the approximate depths and descriptions of the encountered soils, applicable geologic structures, recorded N-values, and the results of laboratory tests are presented in this appendix. The logs represent the interpretation of field logs and field tests as well as the interpolation of soil conditions between samples. The results of laboratory observations and tests are also included in the boring logs. The stratification lines recorded in the boring logs represent the approximate boundaries between the surface soil types. However, the actual transition between soil types may be gradual or varied.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS		LABORATORY CLASSIFICATION CRITERIA		GROUP SYMBOLS	PRIMARY DIVISIONS
COARSE GRAINED SOILS More than 50% retained on No. 200 sieve	GRAVELS More than 50% of coarse fraction retained on No. 4 (4.75mm) sieve	Clean gravels (less than 5% fines*)	C_u greater than 4 and C_z between 1 and 3	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			Not meeting both criteria for GW	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with fines (more than 12% fines*)	Atterberg limits plot below "A" line or plasticity index less than 4	GM	Silty gravels, gravel-sand-silt mixtures
			Atterberg limits plot below "A" line and plasticity index greater than 7	GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 (4.75mm) sieve	Clean sand (less than 5% fines*)	C_u greater than 6 and C_z between 1 and 3	SW	Well graded sands, gravely sands, little or no fines
			Not meeting both criteria for SW	SP	Poorly graded sands and gravelly and sands, little or no fines
		Sand with fines (more than 12% fines*)	Atterberg limits plot below "A" line or plasticity index less than 4	SM	Silty sands, sand-silt mixtures
			Atterberg limits plot above "A" line and plasticity index greater than 7	SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS 50% or more passes No. 200 sieve	SILTS AND CLAYS (liquid limit less than 50)	Inorganic soil	PI < 4 or plots below "A"-line	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
		Inorganic soil	PI > 7 and plots on or above "A" line**	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		Organic Soil	LL (oven dried)/LL (not dried) < 0.75	OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS (liquid limit 50 or more)	Inorganic soil	Plots below "A" line	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		Inorganic soil	Plots on or above "A" line	CH	Inorganic clays of high plasticity, fat clays
		Organic Soil	LL (oven dried)/LL (not dried) < 0.75	OH	Organic silts and organic clays of high plasticity
Peat	Highly Organic	Primarily organic matter, dark in color, and organic odor		PT	Peat, muck and other highly organic soils

*Fines are those soil particles that pass the No. 200 sieve. For gravels and sands with between 5 and 12% fines, use of dual symbols is required (i.e. GW-GM, GW-GC, GP-GM, or GP-GC).

**If the plasticity index is between 4 and 7 and it plots above the "A" line, then dual symbols (i.e. CL-ML) are required.

CLASSIFICATIONS BASED ON PERCENTAGE OF FINES

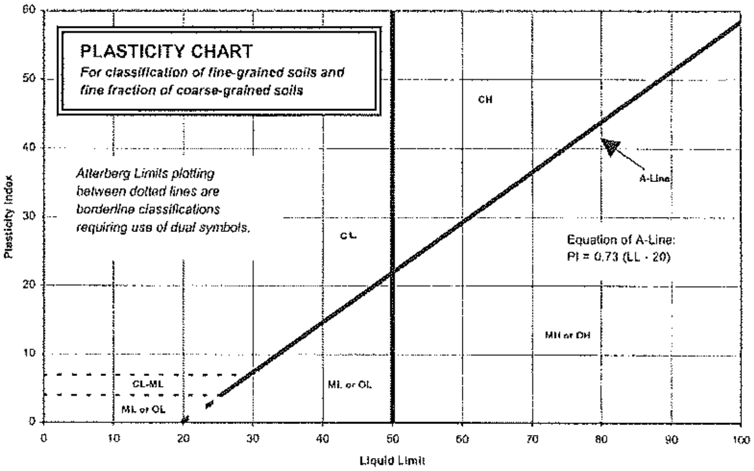
Less than 5%, Pass No. 200 (75mm)sieve)	GW, GP, SW, SP
More than 12% Pass N. 200 (75 mm) sieve	GM, GC, SM, SC
5%-12% Pass No. 200 (75 mm) sieve	Borderline Classification requiring use of dual symbols

CONSISTENCY

CLAYS AND PLASTIC SILTS	STRENGTH TON/SQ. FT ++	BLOWS/ FOOT +
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	Over 4	Over 32

RELATIVE DENSITY

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/ FOOT +
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	Over 50



\+ Number of blows of a 140-pound hammer falling 30-inches to drive a 2-inch O.D. (1-3/8-inch I.D.) split spoon (ASTM D1586).

++ Unconfined compressive strength in tons/sq.ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D1586), pocket penetrometer, torvane, or visual observation.

Drilling Notes:

1. Sampling and blow counts
   a. California Modified – number of blows per foot of a 140 pound hammer falling 30 inches
   b. Standard Penetration Test – number of blows per 12 inches of a 140 pound hammer falling 30 inches

Types of Samples:
X – In-Situ
SPT - Standard Penetration
CA - California Modified
N - Nuclear Gauge
PO – Pocket Penetrometer (tons/sq.ft.)

GeoSolutions, Inc.

220 High Street
San Luis Obispo, CA 93401

BORING LOG

BORING NO. **B-1**

JOB NO. **SL06790-3**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Gloria Road at Iverson Road**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2, Site Plan**	HOLE DIAMETER:	**8 Inches**
DATE DRILLED:	**August 18, 2009**	SAMPLING METHOD:	**CA/SPT**
LOGGED BY:	**KRC**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **50.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	(N 1)60	FRICTION ANGLE, (degrees)	COHESION, C (psf)	IN-SITU WATER CONTENT (%)	IN-SITU DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)
0	CLAYEY SAND: olive brown, fine grained, moist, loose	SC										
-1												
-2												
-3												
-4	very dense			A/CA	82	126						38.6
-5												
-6	CLAYEY SAND: olive brown, medium grained, moist	SC										
-7				B							3	42.2
-8												
-9				X/CA	86	87						
-10	very dense											
-11												
-12												
-13	very dense											
-14	SANDY CLAY: light olive brown, moist, fine grained, hard	CL		C/SPT	30	51						46.7
-15												
-16												
-17												
-18												
-19												
-20	SANDY CLAY: yellowish brown, moist, dense	CL										
-21												
-22												
-23												

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **50.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE (degrees)	COHESION, C (psf)	IN-SITU WATER CONTENT (%)	IN-SITU DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)
-24	CLAYEY SAND: light olive brown, moist, very dense	SC										
-25												
-26												
-27												
-28												
-29				D/SPT	33	43						64.1
-30												
-31												
-32												
-33												
-34												
-35												
-36												
-37												
-38												
-39												
-40	SANDY CLAY: yellowish brown, moist, stiff	CL										
-41												
-42												
-43												
-44												
-45												
-46												
-47	CLAYEY SAND: light olive brown, moist, very dense	SC										
-48												
-49				E/SPT	33	35						31.9
-50												

GeoSolutions, Inc.

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BORING LOG

BORING NO. **B-2**
JOB NO. **SL06790-3**

PROJECT INFORMATION

PROJECT: **Gloria Road at Iverson Road**
DRILLING LOCATION: **See Figure 2, Site Plan**
DATE DRILLED: **August 19, 2009**
LOGGED BY: **KRC**

DRILLING INFORMATION

DRILL RIG: **CME 55**
HOLE DIAMETER: **4 Inches**
SAMPLING METHOD: **CA/SPT**
HOLE ELEVATION: **Not Recorded**

▼ Depth of Groundwater: **Not Encountered**
Boring Terminated At: **15.0 Feet**
Page 3 of 9

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	IN-SITU WATER CONTENT (%)	IN-SITU DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)
0	CLAYEY SAND: dark yellowish brown, fine grained, moist	SC										
-1												
-2												
-3												
-4	very dense			F/CA	54	72			10.5	114.6		
-5												
-6												
-7	very moist, medium grained, medium dense											
-8												
-9				G/CA	12	11						22.2
-10												
-11	medium dense											
-12												
-13												
-14				H/SPT	9	13						29.2
-15												
-16												
-17												
-18												
-19												
-20												
-21												
-22												
-23												

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BORING LOG

BORING NO. **B-3**

JOB NO. **SL06790-3**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Gloria Road at Iverson Road**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2, Site Plan**	HOLE DIAMETER:	**4 Inches**
DATE DRILLED:	**August 19, 2009**	SAMPLING METHOD:	**CA/SPT**
LOGGED BY:	**KRC**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **15.0 Feet** Page 4 of 9

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	IN-SITU WATER CONTENT (%)	IN-SITU DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)
0	CLAYEY SAND: dark yellowish brown, very moist	SC										
-4	very dense			I/CA	54	72			12.9	119.3		
-9	medium dense			CA	12	11						
-14	medium dense			SPT	9	13						
-15												

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BORING LOG

BORING NO. **B-4**
JOB NO. **SL06790-3**

PROJECT INFORMATION

PROJECT: **Gloria Road at Iverson Road**
DRILLING LOCATION: **See Figure 2, Site Plan**
DATE DRILLED: **August 19, 2009**
LOGGED BY: **KRC**

DRILLING INFORMATION

DRILL RIG: **CME 55**
HOLE DIAMETER: **4 Inches**
SAMPLING METHOD: **CA/SPT**
HOLE ELEVATION: **Not Recorded**

▼ Depth of Groundwater: **Not Encountered**
Boring Terminated At: **15.0 Feet**
Page 5 of 9

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	IN-SITU WATER CONTENT (%)	IN-SITU DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)
0	GRAVEL AND SAND											
-1	CLAYEY SAND: dark yellowish brown, medium to coarse grained, moist	SC										
-4	very dense			J/CA	43	57			7.5	120.0		
-9	CLAYEY SAND: dark yellowish brown, with some gravel very dense	SC		K/SPT	49	43						
-19	medium to coarse grained, moist, dense			L/SPT	22	32						

0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23

BORING LOG

BORING NO. **B-5**

JOB NO. **SL06790-3**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Gloria Road at Iverson Road**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2, Site Plan**	HOLE DIAMETER:	**8 Inches**
DATE DRILLED:	**August 19, 2009**	SAMPLING METHOD:	**CA/SPT**
LOGGED BY:	**KRC**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **31.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	IN-SITU WATER CONTENT (%)	IN-SITU DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)
0	CLAYEY SAND: dark yellowish brown	SC										
-1												
-2												
-3												
-4	medium to coarse grained, moist, very dense			M/CA	67	103			8.5	123.0		24.9
-5												
-6												
-7												
-8												
-9				N/SPT	27	41						17.0
-10	medium to coarse grained, moist, very dense											
-11												
-12												
-13												
-14												
-15												
-16												
-17	CLAYEY SAND: yellowish brown, with gravels, well graded, moist, very dense	SC										
-18												
-19				O/SPT	32	46						7.1
-20												
-21												
-22												
-23												

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BORING LOG

BORING NO (cont). **B-5**

JOB NO. **SL06790-3**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **31.0 Feet** Page 7 of 9

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	(N 1) 60	FRICTION ANGLE (degrees)	COHESION, C (psf)	IN-SITU WATER CONTENT (%)	IN-SITU DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)
-24			▨									
-25			▨									
-26			▨									
-27			▨									
-28	CLAYEY SAND: olive brown, fine to medium grained, very dense	SC	▨									
-29			▨	P/SPT	4/50"							28.0
-30												
-31												
-32												
-33												
-34												
-35												
-36												
-37												
-38												
-39												
-40												
-41												
-42												
-43												
-44												
-45												
-46												
-47												
-48												
-49												
-50												

GeoSolutions, Inc.

220 High Street
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BORING LOG

BORING NO. **B-6**

JOB NO. **SL06790-3**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Gloria Road at Iverson Road**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2, Site Plan**	HOLE DIAMETER:	**4 Inches**
DATE DRILLED:	**August 19, 2009**	SAMPLING METHOD:	**CA/SPT**
LOGGED BY:	**KRC**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **15.0 Feet** Page 8 of 9

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	IN-SITU WATER CONTENT (%)	IN-SITU DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)
0	CLAYEY SAND: dark yellowish brown	SC	▨									
-1			▨									
-2			▨									
-3			▨									
-4			▨	Q/CA	50	67			10.6	113.6		
-5			▨									
-6	very dense		▨									
-7			▨									
-8			▨									
-9			▨	R/SPT	55	87						
-10	very dense		▨									
-11			▨									
-12			▨									
-13			▨									
-14	very dense		▨	S/SPT	32	47						
-15												
-16												
-17												
-18												
-19												
-20												
-21												
-22												
-23												

GeoSolutions, Inc.

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BORING LOG

BORING NO. **B-7**

JOB NO. **SL06790-3**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Gloria Road at Iverson Road**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2, Site Plan**	HOLE DIAMETER:	**4 Inches**
DATE DRILLED:	**August 19, 2009**	SAMPLING METHOD:	**CA/SPT**
LOGGED BY:	**KRC**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **15.0 Feet** Page 9 of 9

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	(N_1)60	FRICTION ANGLE, (degrees)	COHESION, C (psf)	IN-SITU WATER CONTENT (%)	IN-SITU DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)
0	CLAYEY SAND: dark brown, loose farm field	SC	▨									
-1												
-2												
-3												
-4	CLAYEY SAND: dark yellowish brown, dense	SC	▨	Q/CA	15	20			14.1	111.5		24.9
-5												
-6												
-7												
-8												
-9	dense			R/SPT	15	23						17.0
-10												
-11												
-12												
-13												
-14	medium dense			S/SPT	9	13						7.1
-15												
-16												
-17												
-18												
-19												
-20												

APPENDIX B

Laboratory Testing

Soil Test Reports

LABORATORY TESTING

This appendix includes a discussion of the test procedures and the laboratory test results performed as part of this investigation. The purpose of the laboratory testing is to assess the engineering properties of the soil materials at the Site. The laboratory tests are performed using the currently accepted test methods, when applicable, of the American Society for Testing and Materials (ASTM).

Undisturbed and disturbed bulk samples used in the laboratory tests are obtained from various locations during the course of the field exploration, as discussed in **Appendix A** of this report. Each sample is identified by sample letter and depth. The Unified Soils Classification System is used to classify soils according to their engineering properties. The various laboratory tests performed are described below:

Expansion Index of Soils (ASTM D4829-03) is conducted in accordance with the ASTM test method and the California Building Code Standard, and are performed on representative bulk and undisturbed soil samples. The purpose of this test is to evaluate expansion potential of the site soils due to fluctuations in moisture content. The sample specimens are placed in a consolidometer, surcharged under a 144-psf vertical confining pressure, and then inundated with water. The amount of expansion is recorded over a 24-hour period with a dial indicator. The expansion index is calculated by determining the difference between final and initial height of the specimen divided by the initial height.

Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557-07) is performed to determine the relationship between the moisture content and density of soils and soil-aggregate mixtures when compacted in a standard size mold with a 10-lbf hammer from a height of 18 inches. The test is performed on a representative bulk sample of bearing soil near the estimated footing depth. The procedure is repeated on the same soil sample at various moisture contents sufficient to establish a relationship between the maximum dry unit weight and the optimum water content for the soil. The data, when plotted, represents a curvilinear relationship known as the moisture density relations curve. The values of optimum water content and modified maximum dry unit weight can be determined from the plotted curve.

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318-00) are the water contents at certain limiting or critical stages in cohesive soil behavior. The liquid limit (LL or W_L) is the lower limit of viscous flow, the plastic limit (PL or W_P) is the lower limit of the plastic stage of clay and plastic index (PI or I_P) is a range of water content where the soil is plastic. The Atterberg Limits are performed on samples that have been screened to remove any material retained on a No. 40 sieve. The liquid limit is determined by performing trials in which a portion of the sample is spread in a brass cup, divided in two by a grooving tool, and then allowed to flow together from the shocks caused by repeatedly dropping the cup in a standard mechanical device. To determine the Plastic Limit a small portion of plastic soil is alternately pressed together and rolled into a 1/8-inch diameter thread. This process is continued until the water content of the sample is reduced to a point at which the thread crumbles and can no longer be pressed together and re-rolled. The water content of the soil at this point is reported as the plastic limit. The plasticity index is calculated as the difference between the liquid limit and the plastic limit.

Direct Shear Tests of Soils Under Consolidated Drained Conditions (ASTM D3080-04) is performed on undisturbed and remolded samples representative of the foundation material. The samples are loaded with a predetermined normal stress and submerged in water until saturation is achieved. The samples are then sheared horizontally at a controlled strain rate allowing partial drainage. The shear stress on the sample is recorded at regular strain intervals. This test determines the resistance to deformation, which is shear strength, inter-particle attraction or cohesion c, and resistance to interparticle slip called the angle of internal friction ϕ.

Particle Size Analysis of Soils (ASTM D422-63R02) is used to determine the particle-size distribution of fine and coarse aggregates. In the test method the sample is separated through a series of sieves of progressively smaller openings for determination of particle size distribution. The total percentage passing each sieve is reported and used to determine the distribution of fine and coarse aggregates in the sample.

Density of Soil in Place by the Drive-Cylinder Method (ASTM D2937-04) and **Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass** (ASTM D2216-05) are used to obtain values of in-place water content and in-place density. Undisturbed samples, brought from the field to the laboratory, are weighed, the volume is calculated, and they are placed in the oven to dry. Once the samples have been dried, they are weighed again to determine the water content, and the in-place density is then calculated. The moisture density tests allow the water content and in-place densities to be obtained at required depths.

GeoSolutions, Inc.

SIEVE ANALYSIS REPORT
ASTM D422-63R07

(805) 543-8539

Project:	Gloria Road at Iverson	Date Tested:	August 27, 2009
Client:		Project #:	SL06790-3
Sample #:	A Depth: 4.0 ft.	Lab #:	14140
Location:	B-1	Sample Date:	August 18, 2009
Material:	Olive Brown Clayey SAND	Sampled By:	KRC

Soil Classification
ASTM D2487-06, D2488-06

Soil Description:	**Olive Brown Clayey SAND**
Specification:	**SC**

Sieve Analysis

U.S. Standard Sieve	Percent Passing TOTAL	Project Specifications	Remarks
3"			
2"			
1 1/2"			
1"			
3/4"			
3/8"			
No. 4	96		
No. 8	89		
No. 16	77		
No. 30	64		
No. 50	54		
No. 100	44		
No. 200	38.6		

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc. **SOILS REPORT** **(805) 543-8539**

Project:	Gloria Road at Iverson	Date Tested:	August 25, 2009
Client:		Project #:	SL06790-3
Sample:	B Depth: 5.5 ft.	Lab #:	14140
Location:	B-1	Sample Date:	August 18, 2009
		Sampled By:	KRC

Soil Classification
ASTM D2487-06, D2488-06

Result: Olive Brown Clayey SAND

Specification: SC

Sieve Analysis
ASTM D422-63R02

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4	97	
No. 8	94	
No. 16	85	
No. 30	72	
No. 50	60	
No. 100	49	
No. 200	42.2	

Sand Equivalent Cal 217 (11/1999)

1		SE
2		
3		
4		

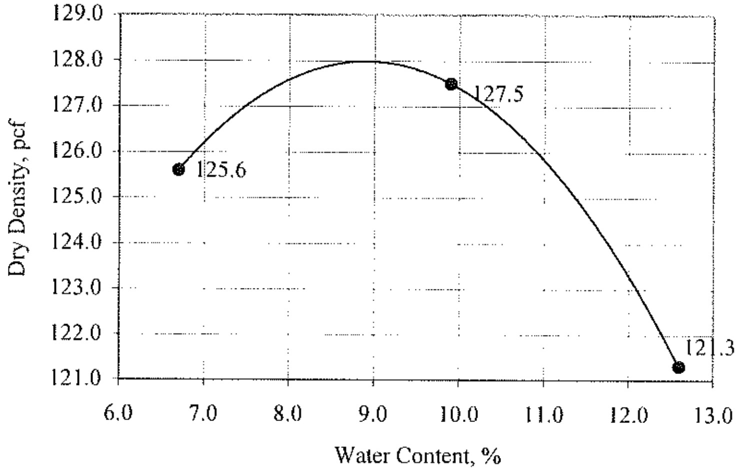
Plasticity Index
ASTM D4318-05

Liquid Limit:	28
Plastic Limit:	13
Plasticity Index:	**15**

Expansion Index
ASTM D4829-08

Expansion Index:	**3**
Expansion Potential:	Very Low
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557-07



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve = 2.6

Trial #	1	2	3	4
Water Content:	6.7	9.9	12.6	
Dry Density:	125.6	127.5	121.3	
Maximum Dry Density, pcf:		**128.0**		
Optimum Water Content, %:		**8.9**		

Moisture-Density ASTM D2937-04, ASTM D2216-05

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description
B-2	4.0	10.6	114.6	89%	Dark Yellowish Brown Clayey SAND
B-3	4.0	12.9	119.3	93%	Dark Yellowish Brown Clayey SAND
B-4	4.0	7.5	120.0	93%	Dark Yellowish Brown Clayey SAND
B-5	4.0	8.5	123.0	96%	Dark Yellowish Brown Clayey SAND
B-6	4.0	10.6	113.6	88%	Light Olive Brown Sandy CLAY
B-7	4.0	14.1	111.5	87%	Very Dark Brown Sandy CLAY

Report By: Aaron Eichman

GeoSolutions, Inc.

SIEVE ANALYSIS REPORT
ASTM D422-63R07

(805) 543-8539

Project:	Gloria Road at Iverson	Date Tested:	August 27, 2009
Client:		Project #:	SL06790-3
Sample #:	C Depth: 19.0 ft.	Lab #:	14140
Location:	B-1	Sample Date:	August 18, 2009
Material:	Light Olive Brown Clayey SAND	Sampled By:	KRC

Soil Classification
ASTM D2487-06, D2488-06

Soil Description:	**Light Olive Brown Clayey SAND**
Specification:	**SC**

Sieve Analysis

U.S. Standard Sieve	Percent Passing TOTAL	Project Specifications	Remarks
3"			
2"			
1 1/2"			
1"			
3/4"			
3/8"			
No. 4	99		
No. 8	93		
No. 16	82		
No. 30	71		
No. 50	62		
No. 100	54		
No. 200	46.7		

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc.

SIEVE ANALYSIS REPORT
ASTM D422-63R07

(805) 543-8539

Project:	Gloria Road at Iverson	Date Tested:	August 27, 2009
Client:		Project #:	SL06790-3
Sample #:	D Depth: 29.0 ft.	Lab #:	14140
Location:	B-1	Sample Date:	August 18, 2009
Material:	Light Olive Brown Sandy CLAY	Sampled By:	KRC

Soil Classification
ASTM D2487-06, D2488-06

Soil Description:	**Light Olive Brown Sandy CLAY**
Specification:	**CL**

Sieve Analysis

U.S. Standard Sieve	Percent Passing TOTAL	Project Specifications	Remarks
3"			
2"			
1 1/2"			
1"			
3/4"			
3/8"			
No. 4	99		
No. 8	95		
No. 16	88		
No. 30	83		
No. 50	78		
No. 100	72		
No. 200	64.1		

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc.

SIEVE ANALYSIS REPORT
ASTM D422-63R07

(805) 543-8539

Project: Gloria Road at Iverson
Date Tested: August 27, 2009
Client:
Project #: SL06790-3
Sample #: E Depth: 49.0 ft.
Lab #: 14140
Location: B-1
Sample Date: August 18, 2009
Material: Light Olive Brown Clayey SAND
Sampled By: KRC

Soil Classification
ASTM D2487-06, D2488-06

Soil Description: Light Olive Brown Clayey SAND

Specification: SC

Sieve Analysis

U.S. Standard Sieve	Percent Passing TOTAL	Project Specifications	Remarks
3"			
2"			
1 1/2"			
1"			
3/4"			
3/8"			
No. 4	98		
No. 8	89		
No. 16	75		
No. 30	62		
No. 50	49		
No. 100	39		
No. 200	31.9		

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc. **SIEVE ANALYSIS REPORT** **(805) 543-8539**

ASTM D422-63R07

Project: Gloria Road at Iverson

Date Tested: August 27, 2009

Client:

Project #: SL06790-3

Sample #: G Depth: 8.0 ft.

Lab #: 14140

Location: B-2

Sample Date: August 18, 2009

Material: Light Olive Brown Clayey SAND

Sampled By: KRC

Soil Classification

ASTM D2487-06, D2488-06

Soil Description:	**Light Olive Brown Clayey SAND**
Specification:	**SC**

Sieve Analysis

U.S. Standard Sieve	Percent Passing TOTAL	Project Specifications	Remarks
3"			
2"			
1 1/2"			
1"			
3/4"			
3/8"			
No. 4	98		
No. 8	86		
No. 16	68		
No. 30	53		
No. 50	40		
No. 100	29		
No. 200	22.2		

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc.

SIEVE ANALYSIS REPORT
ASTM D422-63R07

(805) 543-8539

Project: Gloria Road at Iverson

Date Tested: August 27, 2009

Client:

Project #: SL06790-3

Sample #: H Depth: 14.0 ft.

Lab #: 14140

Location: B-2

Sample Date: August 18, 2009

Material: Light Olive Brown Clayey SAND

Sampled By: KRC

Soil Classification
ASTM D2487-06, D2488-06

Soil Description: **Light Olive Brown Clayey SAND**

Specification: **SC**

Sieve Analysis

U.S. Standard Sieve	Percent Passing TOTAL	Project Specifications	Remarks
3"			
2"			
1 1/2"			
1"			
3/4"			
3/8"			
No. 4	97		
No. 8	90		
No. 16	75		
No. 30	61		
No. 50	48		
No. 100	37		
No. 200	29.2		

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc.

SIEVE ANALYSIS REPORT
ASTM D422-63R07

(805) 543-8539

Project:	Gloria Road at Iverson	Date Tested:	August 27, 2009
Client:		Project #:	SL06790-3
Sample #:	M Depth: 4.0 ft.	Lab #:	14140
Location:	B-5	Sample Date:	August 18, 2009
Material:	Dark Yellowish Brown Clayey SAND	Sampled By:	KRC

Soil Classification
ASTM D2487-06, D2488-06

Soil Description:	**Dark Yellowish Brown Clayey SAND**
Specification:	**SC**

Sieve Analysis

U.S. Standard Sieve	Percent Passing TOTAL	Project Specifications	Remarks
3"			
2"			
1 1/2"			
1"			
3/4"			
3/8"			
No. 4	95		
No. 8	85		
No. 16	67		
No. 30	52		
No. 50	41		
No. 100	31		
No. 200	24.9		

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc.

SIEVE ANALYSIS REPORT
ASTM D422-63R07

(805) 543-8539

Project:	Gloria Road at Iverson	Date Tested:	August 27, 2009
Client:		Project #:	SL06790-3
Sample #:	N Depth: 9.0 ft.	Lab #:	14140
Location:	B-5	Sample Date:	August 18, 2009
Material:	Light Olive Brown Clayey SAND	Sampled By:	KRC

Soil Classification
ASTM D2487-06, D2488-06

Soil Description:	**Light Olive Brown Clayey SAND**
Specification:	**SC**

Sieve Analysis

U.S. Standard Sieve	Percent Passing TOTAL	Project Specifications	Remarks
3"			
2"			
1 1/2"			
1"			
3/4"			
3/8"			
No. 4	98		
No. 8	89		
No. 16	67		
No. 30	45		
No. 50	31		
No. 100	21		
No. 200	17.0		

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc.

SIEVE ANALYSIS REPORT
ASTM D422-63R07

(805) 543-8539

Project:	Gloria Road at Iverson	Date Tested:	August 27, 2009
Client:		Project #:	SL06790-3
Sample #:	O Depth: 19.0 ft.	Lab #:	14140
Location:	B-5	Sample Date:	August 18, 2009
Material:	Yellowish Brown Well Graded SAND with Clay	Sampled By:	KRC

Soil Classification
ASTM D2487-06, D2488-06

Soil Description:	**Yellowish Brown Well Graded SAND with Clay**
Specification:	**SP-SW**

Sieve Analysis

U.S. Standard Sieve	Percent Passing TOTAL	Project Specifications	Remarks
3"			
2"			
1 1/2"			
1"			
3/4"			
3/8"			
No. 4	96		
No. 8	84		
No. 16	58		
No. 30	35		
No. 50	20		
No. 100	11		
No. 200	7.1		

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc.

SIEVE ANALYSIS REPORT
ASTM D422-63R07

(805) 543-8539

Project:	Gloria Road at Iverson	Date Tested:	August 27, 2009
Client:		Project #:	SL06790-3
Sample #:	P Depth: 29.0 ft.	Lab #:	14140
Location:	B-5	Sample Date:	August 18, 2009
Material:	Olive Brown Clayey SAND	Sampled By:	KRC

Soil Classification
ASTM D2487-06, D2488-06

Soil Description:	**Olive Brown Clayey SAND**
Specification:	**SC**

Sieve Analysis

U.S. Standard Sieve	Percent Passing TOTAL	Project Specifications	Remarks
3"			
2"			
1 1/2"			
1"			
3/4"			
3/8"			
No. 4	97		
No. 8	90		
No. 16	76		
No. 30	62		
No. 50	47		
No. 100	35		
No. 200	28.0		

Comments:

Report By: Aaron Eichman

GeoSolutions, Inc.

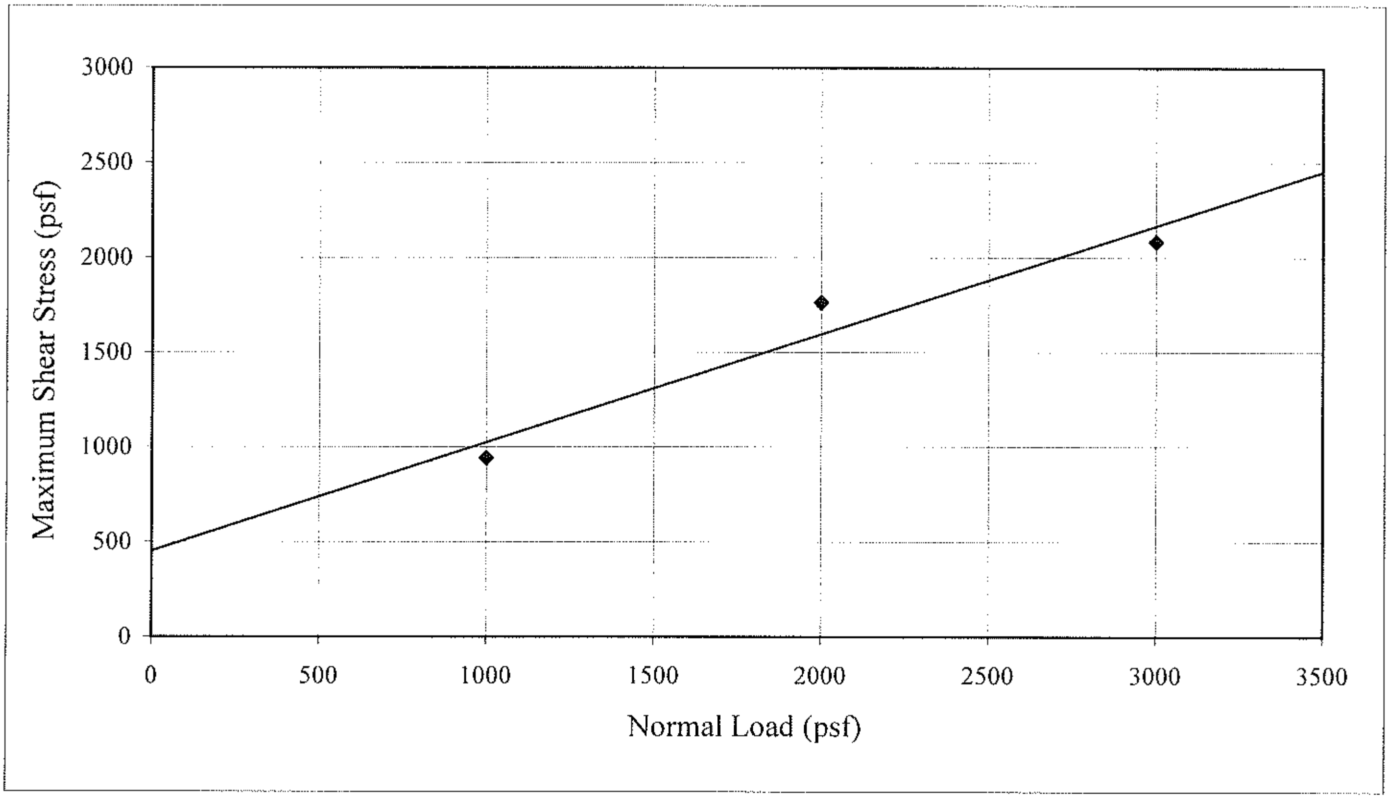
DIRECT SHEAR TEST REPORT
ASTM D3080-04

(805) 543-8539

Project:	Gloria Road at Iverson	Date Tested:	August 27, 2009
Client:		Project #:	SL06790-3
Sample #:	B-1 @ 5' Depth: 5.0 Feet	Lab #:	14140
Location:	B-1	Sample Date:	August 18, 2009
Material:	Olive Brown Clayey SAND	Sampled By:	KRC

Test Data

Specimen Number	Void Ratio	Saturation, %	Normal Load, psf	Max Shear Stress, psf	Water Content, %	Dry Density, pcf	Relative Density*,%
1	-	-	1000	941	15.8	121.1	-
2	-	-	2000	1763	15.2	123.5	-
3	-	-	3000	2083	14.9	123.6	-
4							
5							



The test specimens were in-situ samples.

Angle of Internal Friction (In-Situ), Phi:	29.7 °
Cohesion (In-Situ), C:	454 psf

Report By: Aaron Eichman

APPENDIX C

Preliminary Grading Specifications

Key and Bench with Backdrain

PRELIMINARY GRADING SPECIFICATIONS

A. General

i. These preliminary specifications have been prepared for the subject site; GeoSolutions, Inc. should be consulted prior to the commencement of site work associated with site development to ensure compliance with these specifications.

ii. GeoSolutions, Inc. should be notified at least 72 hours prior to site clearing or grading operations on the property in order to observe the stripping of surface materials and to coordinate the work with the grading contractor in the field.

iii. These grading specifications may be modified and/or superseded by recommendations contained in the text of this report and/or subsequent reports.

iv. If disputes arise out of the interpretation of these grading specifications, the Soils Engineer shall provide the governing interpretation.

B. Obligation of Parties

i. The Soils Engineer should provide observation and testing services and should make evaluations to advise the client on geotechnical matters. The Soils Engineer should report the findings and recommendations to the client or the authorized representative.

ii. The client should be chiefly responsible for all aspects of the project. The client or authorized representative has the responsibility of reviewing the findings and recommendations of the Soils Engineer. During grading the client or the authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

iii. The contractor is responsible for the safety of the project and satisfactory completion of all grading and other operations on construction projects, including, but not limited to, earthwork in accordance with project plans, specifications, and controlling agency requirements.

C. Site Preparation

i. The client, prior to any site preparation or grading, should arrange and attend a meeting which includes the grading contractor, the design Structural Engineer, the Soils Engineer, representatives of the local building department, as well as any other concerned parties. All parties should be given at least 72 hours notice.

ii. All surface and sub-surface deleterious materials should be removed from the proposed building and pavement areas and disposed of off-site or as approved by the Soils Engineer. This includes, but is not limited to, any debris, organic materials, construction spoils, buried utility line, septic systems, building materials, and any other surface and subsurface structures within the proposed building areas. Trees designated for removal on the construction plans should be removed and their primary root systems grubbed under the observations of a representative of GeoSolutions, Inc. Voids left from site clearing should be cleaned and backfilled as recommended for structural fill.

iii. Once the Site has been cleared, the exposed ground surface should be stripped to remove surface vegetation and organic soil. A representative of GeoSolutions, Inc. should determine the required depth of stripping at the time of work being completed. Strippings may either be disposed of off-site or stockpiled for future use in landscape areas, if approved by the landscape architect.

D. Site Protection

i. Protection of the Site during the period of grading and construction should be the responsibility of the contractor.

ii. The contractor should be responsible for the stability of all temporary excavations.

iii. During periods of rainfall, plastic sheeting should be kept reasonably accessible to prevent unprotected slopes from becoming saturated. Where necessary during periods of rainfall, the contractor should install check-dams, de-silting basins, sand bags, or other devices or methods necessary to control erosion and provide safe conditions.

E. Excavations

i. Materials that are unsuitable should be excavated under the observation and recommendations of the Soils Engineer. Unsuitable materials include, but may not be limited to: 1) dry, loose, soft, wet, organic, or compressible natural soils; 2) fractured, weathered, or soft bedrock; 3) non-engineered fill; 4) other deleterious materials; and 5) materials identified by the Soils Engineer or Engineering Geologist.

ii. Unless otherwise recommended by the Soils Engineer and approved by the local building official, permanent cut slopes should not be steeper than 2:1 (horizontal to vertical). Final slope configurations should conform to section 1803 of the 2007 California Building Code unless specifically modified by the Soil Engineer/Engineering Geologist.

iii. The Soil Engineer/Engineer Geologist should review cut slopes during excavations. The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

F. Structural Fill

i. Structural fill should not contain rocks larger than 3 inches in greatest dimension, and should have no more than 15 percent larger than 2.5 inches in greatest dimension.

ii. Imported fill should be free of organic and other deleterious material and should have very low expansion potential, with a plasticity index of 12 or less. Before delivery to the Site, a sample of the proposed import should be tested in our laboratory to determine its suitability for use as structural fill.

G. Compacted Fill

i. Structural fill using approved import or native should be placed in horizontal layers, each approximately 8 inches in thickness before compaction. On-site inorganic soil or approved imported fill should be conditioned with water to produce a soil water content near optimum moisture and compacted to a minimum relative density of 90 percent based on ASTM D1557-07.

ii. Fill slopes should not be constructed at gradients greater than 2-to-1 (horizontal to vertical). The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

iii. If fill areas are constructed on slopes greater than 10-to-1 (horizontal to vertical), we recommend that benches be cut every 4 feet as fill is placed. Each bench shall be a minimum of 10 feet wide with a minimum of 2 percent gradient into the slope.

iv. If fill areas are constructed on slopes greater than 5-to-1, we recommend that the toe of all areas to receive fill be keyed a minimum of 24 inches into underlying dense material. Key depths are to be observed and approved by a representative of GeoSolutions, Inc. Sub-drains shall be placed in the keyway and benches as required. See Detail A: Key and Bench with Backdrain.

H. Drainage

i. During grading, a representative of GeoSolutions, Inc. should evaluate the need for a sub-drain or back-drain system. Areas of observed seepage should be provided with sub-surface drains to release the hydrostatic pressures. Sub-surface drainage facilities may include gravel blankets, rock filled trenches or Multi-Flow systems or equal. The drain system should discharge in a non-erosive manner into an approved drainage area.

ii. All final grades should be provided with a positive drainage gradient away from foundations. Final grades should provide for rapid removal of surface water runoff. Ponding of water should not be allowed on building pads or adjacent to foundations. Final grading should be the responsibility of the contractor, general Civil Engineer, or architect.

iii. Concentrated surface water runoff within or immediately adjacent to the Site should be conveyed in pipes or in lined channels to discharge areas that are relatively level or that are adequately protected against erosion.

iv. Water from roof downspouts should be conveyed in solid pipes that discharge in controlled drainage localities. Surface drainage gradients should be planned to prevent ponding and promote drainage of surface water away from building foundations, edges of pavements and sidewalks. For soil areas we recommend that a minimum of 2 percent gradient be maintained.

v. Attention should be paid by the contractor to erosion protection of soil surfaces adjacent to the edges of roads, curbs and sidewalks, and in other areas where hard edges of structures may cause concentrated flow of surface water runoff. Erosion resistant matting such as Miramat, or other similar products, may be considered for lining drainage channels.

vi. Sub-drains should be placed in established drainage courses and potential seepage areas. The location of sub-drains should be determined after a review of the grading plan. The sub-drain outlets should extend into suitable facilities or connect to the proposed storm drain system or existing drainage control facilities. The outlet pipe should consist of a non-perforated pipe the same diameter as the perforated pipe.

I. Maintenance

i. Maintenance of slopes is important to their long-term performance. Precautions that can be taken include planting with appropriate drought-resistant vegetation as recommended by a landscape architect, and not over-irrigating, a primary source of surficial failures.

ii. Property owners should be made aware that over-watering of slopes is detrimental to long term stability of slopes.

J. Underground Facilities Construction

i. The attention of contractors, particularly the underground contractors, should be drawn to the State of California Construction Safety Orders for "Excavations, Trenches, Earthwork." Trenches or excavations greater than 5 feet in depth should be shored or sloped back in accordance with OSHA Regulations prior to entry.

ii. Bedding is defined as material placed in a trench up to 1 foot above a utility pipe and backfill is all material placed in the trench above the bedding. Unless concrete bedding is required around utility pipes, free-draining sand should be used as bedding. Sand to be used as bedding should be tested in our laboratory to verify its suitability and to measure its compaction characteristics. Sand bedding should be compacted by mechanical means to achieve at least 90 percent relative density based on ASTM D1557-07.

iii. On-site inorganic soils, or approved import, may be used as utility trench backfill. Proper compaction of trench backfill will be necessary under and adjacent to structural fill, building foundations, concrete slabs, and vehicle pavements. In these areas, backfill should be conditioned with water (or allowed to dry), to produce a soil water content of about 2 to 3 percent above the optimum value and placed in horizontal layers, each not exceeding 8 inches in thickness before compaction. Each layer should be compacted to at least 90 percent relative density based on ASTM D1557-07. The top lift of trench backfill under vehicle pavements should be compacted to the requirements given in report under Preparation of Paved Areas for vehicle pavement sub-grades. Trench walls must be kept moist prior to and during backfill placement.

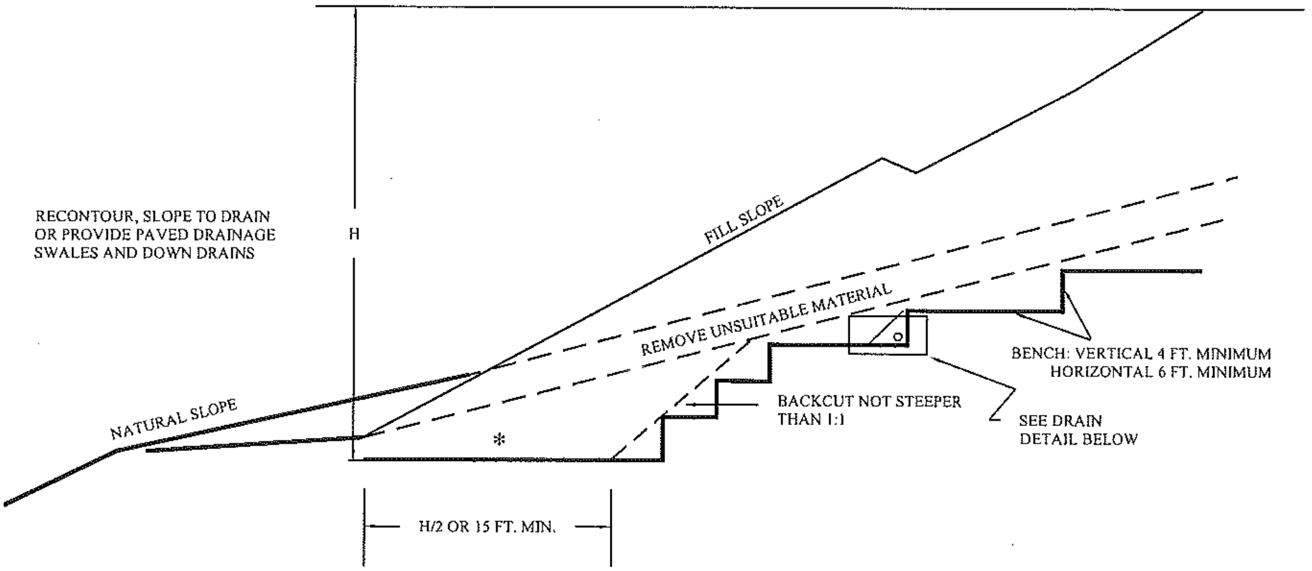
K. Completion of Work

i. After the completion of work, a report should be prepared by the Soils Engineer retained to provide such services in accordance with section 1803.5 of the 2007 CBC. The report should including locations and elevations of field density tests, summaries of field and laboratory tests, other substantiating data, and comments on any changes made during grading and their effect on the recommendations made in the approved Soils Engineering Report.

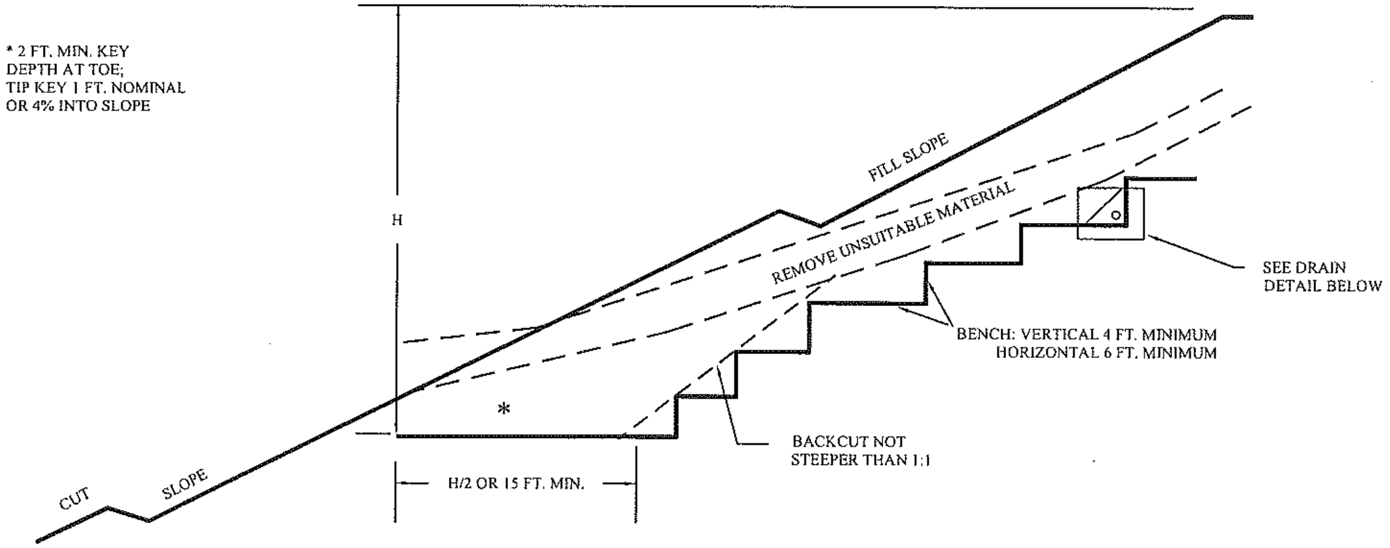
ii. Soils Engineers shall submit a statement that, to the best of their knowledge, the work within their area of responsibilities is in accordance with the approved soils engineering report and applicable provisions within section 1803 of the 2007 CBC.

END OF TEXT

FILL OVER NATURAL SLOPE



FILL OVER CUT SLOPE

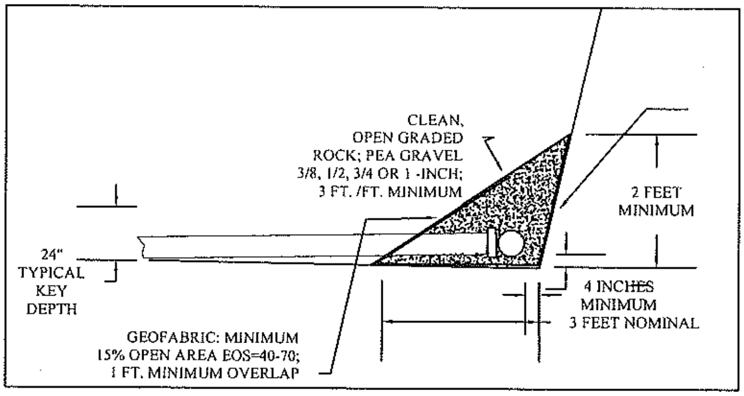


NOTES:

1 - IF OVERFILLING AND CUTTING BACK TO GRADE IS ADOPTED, 15 FT. MIN. FILL WIDTH MAY BE REDUCED TO 12 FT. MIN. IN NO CASE SHOULD THE FILL WIDTH BE LESS THAN 1/2 THE HEIGHT OF FILL REMAINING.

1 - BACKDRAIN AS RECOMMEDNED BY GEOTECHNICAL CONSULTANT PER BUTTRESS BACKDRAIN DETAIL.

DRAIN DETAIL



GeoSolutions, Inc.
220 High Street
San Luis Obispo, CA 93401
(805) 543-8539 Fax: (805) 543-2171

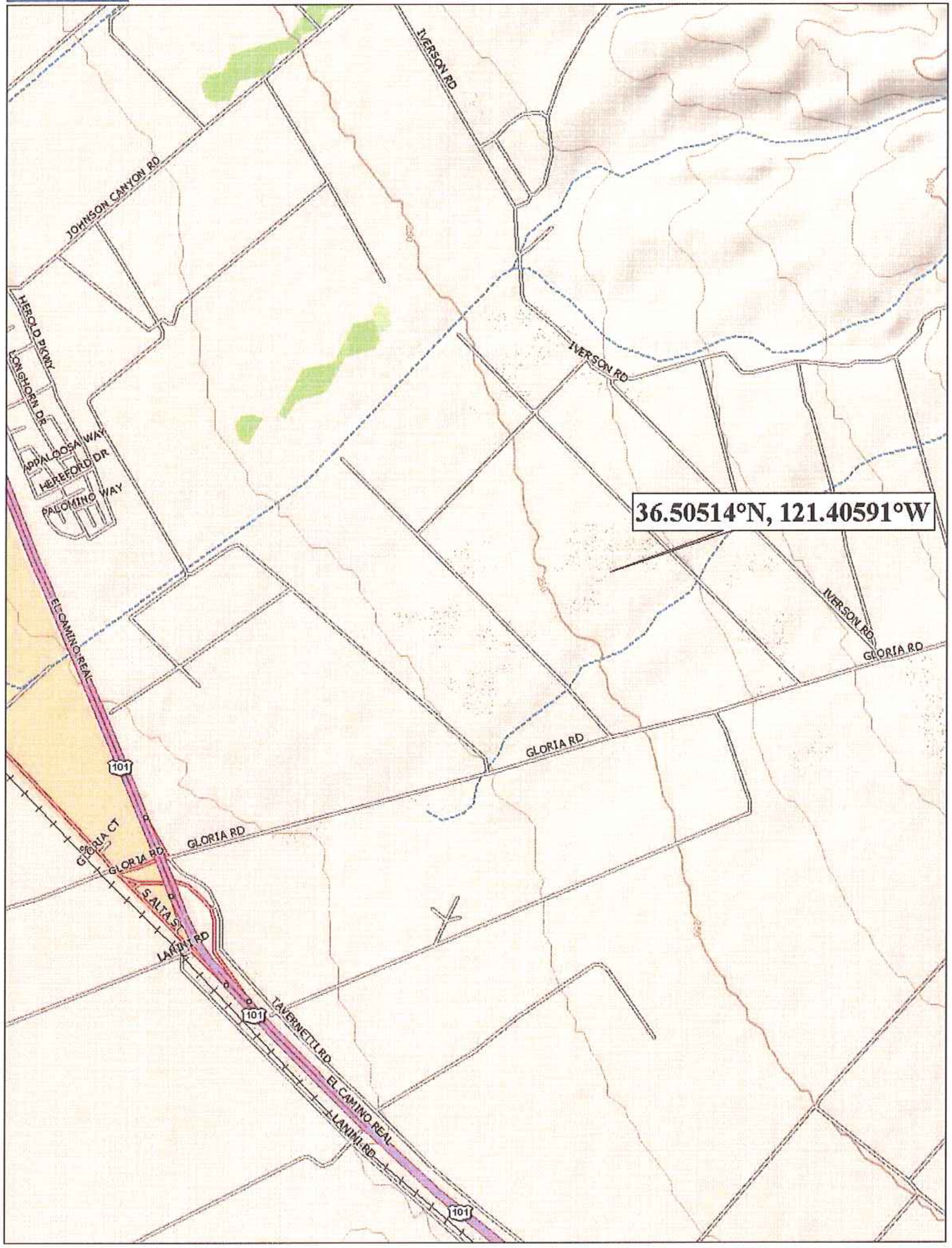
KEY AND BENCH WITH BACKDRAIN

DETAIL
A

APPENDIX D

Latitude and Longitude Data (DeLorme, 2006)

Probability of Exceedance Chart (Blake, 2000)



MN (13.9° E)

0 600 1200 1800 2400 3000 ft
Data Zoom 13-3

PROBABILITY OF EXCEEDANCE

BOORE ET AL(1997) NEHRP D (250)1