GEOTECHNICAL ENGINEERING STUDY
for
SUNRISE BOULEVARD (8220) SENIOR CARE
8220 Sunrise Boulevard
Citrus Heights, California

Project No. E07361.000
October 2007

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Project No. E07361.000
9 October 2007

John Steitz
8310 Sunrise Boulevard
Citrus Heights, CA 95610

Subject: **SUNRISE BOULEVARD (8220) SENIOR CARE**
8220 Sunrise Boulevard, Citrus Heights, Sacramento County, California
GEOTECHNICAL ENGINEERING STUDY

Reference: 1. Proposal and Contract for Sunrise Boulevard (8220) Senior Care, prepared by Youngdahl Consulting Group, Inc., dated 31 August 2007 (Proposal No. PE07-315).

Dear Mr. Steitz:

In accordance with your authorization, Youngdahl Consulting Group, Inc. has performed a geotechnical engineering study for the project site located on the east side of Sunrise Boulevard at 8220 Sunrise Boulevard in Citrus Heights, California. The purpose of this study was to explore and evaluate the surface and subsurface conditions at the site and to develop geotechnical information and design criteria for the proposed project. Our scope was limited to a subsurface investigation, laboratory testing, and preparation of this report per our proposal dated 31 August 2007.

Based upon our field study, subsurface exploration program, laboratory testing and engineering analysis, we believe the primary geotechnical issues to be addressed consist of loose debris and fill, and shallow cemented soils which may cause a perched groundwater condition. Other geotechnical issues may become more apparent during site preparations which are not listed above. The descriptions, findings, conclusions and recommendations provided in this report are formulated as a whole, and specific conclusions or recommendations should not be derived or used out of context. Please review the limitations and uniformity of conditions section of this report.

This report has been prepared for the exclusive use of John Steitz and his consultants, for specific application to this project, in accordance with generally accepted geotechnical engineering practice. Should you have any questions or require additional information, please contact our office at your convenience.

Very truly yours,
Youngdahl Consulting Group, Inc.

Jesse W. Hogan
Staff Engineer

Reviewed by:

Robert F. Black, P.E., G.E.
Senior Engineer

Distribution: (4) to Client

TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING STUDY
for
SUNRISE BOULEVARD (8220) SENIOR CARE

1.0 INTRODUCTION

This report presents the results of our Geotechnical Engineering Study performed for the proposed senior care facility planned to be constructed at 8220 Sunrise Boulevard in Citrus Heights, California. Refer to Figure A-1 for a vicinity map for the project site.

Purpose and Scope

The purpose of this study was to explore and evaluate the surface and subsurface conditions at the site and to develop geotechnical information and design criteria for the proposed project. The scope of this study includes the following:

- A review of geotechnical and geologic data available to us at the time of our study.
- A field study consisting of a visual site reconnaissance, followed by an exploratory test pit program to characterize the subsurface conditions.
- A laboratory testing program performed on representative samples collected during our field study.
- Engineering analysis of the data and information obtained from our field study, laboratory testing, and literature review. Development of recommendations for site preparation and grading, and geotechnical design criteria for foundations, slabs-on-grade, pavements and underground facilities.
- Preparation of this report summarizing our findings, conclusions, and recommendations regarding the geotechnical aspects for the project.

2.0 PROJECT UNDERSTANDING

Based on the layout plan provided by the client we understand that the proposed development will consist of the construction of a senior care facility along with associated driveways, parking lot, and underground utilities. The structure is expected to be of wood or steel frame construction supported by conventional shallow spread foundations and concrete slab-on-grade floors.

For the purposes of this report, we have assumed that grading operations will consist of cuts and fills on the order of 5 feet or less. Foundation loads, once available, should be made available for our review and to confirm the applicability of our current recommendations.

Background

Review of available information and aerial photos indicate that the project site once contained additional buildings which were not present during our recent subsurface program. The site is also used for growing strawberries, and has a residential building and shed.

If studies or plans exist that pertain to the site which are not cited as a reference in this report, we should be afforded the opportunity to review and modify our conclusions and recommendations as necessary.

3.0 FINDINGS

Surface Observations

The project site consists of an approximate 4.3 acre, rectangular shaped parcel located on the east side of Sunrise Boulevard at 8220 Sunrise Boulevard in Citrus Heights, California. Project boundaries are generally delineated by residential property on the east and south, Sunrise

Boulevard on the west and a storage yard on the north. Site topography consists of mildly sloping terrain with total vertical relief of 12 feet, sloping down to the east, west, and north from the central portion of the site. Strawberry fields are located along the southern boundary and an active creek borders the property on the east and north. There is an occupied residence and storage building on the southwest corner of the property. Various stockpiled debris was also observed in various locations across the property, which is not considered suitable as engineered fill materials. Scattered trees were observed on the southwest corner of the property and scattered around the south, east, and north property boundaries. Thick vegetation was observed on the northeast corner of the property adjacent to the creek.

Subsurface Conditions

Our field study included a site reconnaissance by a Youngdahl Consulting Group, Inc. representative followed by a subsurface exploration program conducted on 28 September 2007, which included the excavation of 5 test pits under her direction at the approximate locations shown on Figure A-2, Appendix A. A description of the field exploration is provided in Appendix A.

Test Pits TP-2, TP-4 and TP-5 encountered fill materials consisting of silty SAND in a loose and dry condition to a maximum depth of approximately 1 ½ feet below the current site grades. Below the fill materials and at the surface of Test Pits TP-1 and TP-3, silty SAND in a medium dense and dry to slightly moist condition was encountered to a maximum depth of 5 feet below the current site grade. In general, underlying the surface materials, silty SANDS in a medium dense and variably cemented and slightly moist condition were encountered to the maximum depth of exploration.

A more detailed description of the subsurface conditions encountered is presented graphically on the "Exploratory Test Pit Logs", Figures A-3 through A-7, presented in Appendix A. These logs show a graphic interpretation of the subsurface profile, the location and depths at which samples were collected.

Groundwater Conditions

Groundwater was not encountered during our explorations. However, subsurface water conditions typically vary at varying times of year and may become perched on the underlying hardpan layer. A review of DWR groundwater elevations suggests that the average groundwater levels are approximately 40 feet below the existing ground surface.

Laboratory Testing

The laboratory testing of collected samples was directed towards determining the physical and engineering properties of the soil underlying the site. A description of the tests performed and their results are presented in Appendix B. The following tests were performed:

- Maximum Dry Density (ASTM D1557);
- Direct Shear (ASTM D3080);
- R-Value tests (ASTM 2844/California Test Method 301 - F).

Soil Expansion Potential

The materials encountered in our explorations are non-plastic materials which are considered to be relatively non-expansive. We do not anticipate that special design considerations for expansive soils will need to be addressed for the design or construction of the proposed If expansive soils are encountered which were not disclosed during our study, recommendations can be made at that time based on our observations.

Geologic Conditions
The geologic portion of this report included a review of geologic data pertinent to the site, and an interpretation of our observations and the Logs of Exploratory Test Pits excavated during the field study.

The site is located within the Great Valley geomorphic province of California. According to the 1:250,000 scale Sacramento Quadrangle of the California State Geology map, the project site is underlain by sand, silt, and gravel of the Turlock Lake Formation of Quaternary Age (Wagner and others, 1981).

Seismicity
According to the Fault Activity Map of California and Adjacent Areas (Jennings, 1994) and the Peak Acceleration from Maximum Credible Earthquakes in California (CDMG, 1992), no active faults or Earthquake Fault Zones (Special Studies Zones) are located on the project site. No evidence of recent or active faulting was observed during our field study. The nearest mapped faults to the site are related to the Bear Mountains and Melones Fault Zones located from 17 to 40 kilometers east of the site. The nearest mapped active fault to the site is the Dunnigan Hills fault located about 55 kilometers to the west.

Based on our literature review of shear-wave velocity characteristics of geologic units in California (Wills and Silva; August 1998: Earthquake Spectra, Volume 14, No. 3) and subsurface interpretations, we recommend that the project be designed in accordance with the 2007 California Building Code (CBC), Chapter 16. This site is classified as Site Class C in accordance with Table 1613.5.2.

Liquefaction, Slope Instability and Surface Rupture Potential
Liquefaction is the sudden loss of soil shear strength and sudden increase in porewater pressure caused by shear strains, as could result from an earthquake. Research has shown that saturated, loose to medium-dense sands with a silt content less than about 25 percent located within the top 40 feet are most susceptible to liquefaction and surface rupture/lateral spreading.

Due to the lack of an elevated groundwater table, the relatively dense nature of the onsite soils and the flat terrain, the potential for damage due to site liquefaction, slope instability and surface rupture are considered negligible. For the above-mentioned reasons, mitigation for these potential hazards is not considered necessary.

4.0 RECOMMENDATIONS

General
Based upon the results of our field explorations and analysis, it is our opinion that construction of the proposed improvements is feasible from a geotechnical standpoint, provided the recommendations contained in this report are incorporated into the design plans and implemented during construction. The native soils and/or engineered fills composed of like materials and processed and compacted as recommended below are considered suitable for support of the planned improvements. **The existing fills, fill stockpiles, and debris are relatively loose and are not considered suitable for support of the proposed improvements in their current condition. Recommendations are presented below for the overexcavation and recompaction of the existing fill materials on the site.**

4.1 SITE GRADING AND IMPROVEMENTS

Site Preparation
Preparation of the project site should involve demolition, site drainage controls, dust control, clearing, stripping, addressing existing fills, and exposed grade compaction considerations. The following paragraphs state our geotechnical comments and recommendations concerning site preparation.

Demolition: As part of the demolition operation, all structural improvement elements should be exhumed and removed from the site. In addition, any underground storage tanks, abandoned wells or other utilities not intended for reuse should be removed or backfilled in accordance with the appropriate regulations.

Concrete and asphalt separated from the other debris, and adequately broken down in particle size, may be mixed thoroughly with native soils and placed as engineered fill as described below. If this option is exercised, a representative from our firm should be contacted to observe the adequacy of grading operations associated with the breaking and mixing of these elements.

Site Drainage Controls: We recommend that initial site preparation involve intercepting and diverting any potential sources of surface or near-surface water within the construction zones. Because the selection of an appropriate drainage system will depend on the water quantity, season, weather conditions, construction sequence, and contractor's methods, final decisions regarding drainage systems are best made in the field at the time of construction. All drainage and/or water diversion performed for the site should be in accordance with the Clean Water Act and applicable Storm Water Pollution Prevention Plan.

Dust Control: Dust control provisions should be provided for as required by the local jurisdiction's grading ordinance (i.e. water truck or other adequate water supply during grading).

Clearing and Stripping: Clearing and stripping operations should remove all organic laden materials including trees, bushes, root balls, root systems, and any soft or loose material generated from removal operations. Surface grass stripping operations are necessary based upon our observations during our site visit. Short or mowed dry grasses may be pulverized and lost within fill materials provided no concentrated pockets of organics result. It is the responsibility of the grading contractor to remove excess organics from the fill materials. No more than 2 percent of organic material, by weight, should be allowed within the fill materials at any given location.

General site clearing should also include removal of any loose or saturated materials from the proposed structural improvement and pavement areas, as well as any additional debris not removed during the residential demolition. A representative of our firm should be present during site clearing operations to identify the location and depth of potential fills not disclosed by this report, to observe removal of deleterious materials, and to identify any existing site conditions which may require mitigation prior to site development.

Addressing Existing Fills: Following general site clearing, all existing fills and fill stockpiles should be over-excavated down to firm native materials. Reference should be made to the site description and test pit logs for anticipated fill locations. Any depressions extending below final grade resulting from the removal of fill materials or other deleterious materials should be properly prepared as discussed below and backfilled with engineered fill. Prior to placement of engineered fill, the exposed soil surfaces receiving fills should be scarified to a minimum depth of 8 inches, moisture conditioned as necessary, and compacted to at least 90 percent of the maximum dry density based on the ASTM D1557 test method. Additionally, test pits should be re-excavated and backfilled with engineered fill.

Pavement and Flatwork Areas: The proposed paved areas should be scarified to a depth of at least 12 inches below the proposed pavement subgrade elevation, moisture conditioned as necessary, and recompacted to at least 95 percent of the maximum dry density based on the latest version of ASTM D1557 test method.

Any localized zones of soft or pumping soils observed within a subgrade should either be scarified and recompacted or be overexcavated and replaced with engineered fill as detailed in the engineered fill section below.

Soil Moisture Considerations

The near-surface fine grained soils may become partially or completely saturated during the rainy season. Grading operations during this time period may be difficult since compaction efforts may be hampered by saturated materials. It is, therefore, suggested that consideration be given to the seasonal limitations and costs of winter grading operations on the site. Special attention should be given regarding the drainage of the project site. If the project is expected to work through the wet season, the contractor should install appropriate temporary drainage systems at the construction site and should minimize traffic over exposed subgrades due to the moisture-sensitive nature of the on-site soils. During wet weather operations, the soil should be graded to drain and should be sealed by rubber tire rolling to minimize water infiltration.

Excavation Characteristics

The test pits were excavated using a CASE 580 SM backhoe equipped with an 18 inch wide bucket. The degree of difficulty encountered in excavating our test pits is an indication of the effort that will be required for excavation during construction. Based on our test pits, we expect that the site soils can be excavated using conventional earthmoving equipment such as a Caterpillar D6 to D8 for mass grading and rubber tired backhoe for shallow trench excavations.

Engineered Fills

All materials placed as fills on the site should be placed as “Engineered fill" observed and compacted as described in the following paragraphs.

Suitability of On-Site Materials: We anticipate that a small amount of on-site soils will be generated during mass grading operations. We expect that soil generated from excavations on the site, excluding deleterious material, may be used as engineered fill.

Fill Placement and Compaction: All areas proposed to receive fill should be scarified to a minimum depth of 8 inches, moisture conditioned as necessary, and compacted to at least 90 percent of the maximum dry density based on the ASTM D1557 test method. The fill should be placed in thin horizontal lifts not to exceed 12 inches in uncompacted thickness. The fill should be moisture conditioned as necessary and compacted to a relative compaction of not less than 90 percent based on the ASTM D1557 test method. The upper 8 inches of fills placed under proposed pavement areas should be compacted to a relative compaction of not less than 95 percent based on the ASTM D1557 test method.

Fill soil compaction should be verified by means of in-place density tests performed during fill placement so that adequacy of soil compaction efforts may be evaluated as earthwork progresses.

Compaction Equipment: In areas to receive structural fill, a Caterpillar 815 steel-wheel compactor or large self propelled padded vibratory drum compactor, or other approved equivalent should be employed for compaction.

Soils exposed in excavations should be moisture conditioned and compacted in place by a minimum of four completely covering passes with a Caterpillar 815, or approved equivalent. The compactor's last two passes should be at 90 degrees to the initial passes. In areas where 95 percent relative compaction is designated, an additional two passes should be applied, with three completely covering passes made at 90 degrees to the initial three passes. Engineered fill should be constructed in lifts not exceeding 12 inches in uncompacted thickness, moisture conditioned and compacted in accordance with the above specification. Additional passes as deemed necessary during fill placement to achieve the desired condition based upon field conditions may be recommended.

Import Materials: If imported fill material is needed for this project, import material should be approved by the Geotechnical Engineer prior to transporting it to the project. It is preferable that import material meet the following requirements:

1. Expansion Index not to exceed 30.
2. "R"-value of equal to or greater than 40.
3. Should not contain rocks larger than 6 inches in diameter.
4. Not more than 15% passing through the No. 200 sieve.

If these requirements are not met, additional testing and evaluation may be necessary to determine the appropriate design parameters for foundations, pavement and other improvements.

Slope Configuration and Grading

The project site is relatively flat with no existing slopes that would be of concern in regards to instability. The project site is proposed to have minor cuts and fill with a maximum slope orientation of 2H:1V (horizontal: vertical). Generally a cut slope orientation of 2H:1V is considered stable with the material types encountered on the site. A fill slope constructed at the same orientation is considered stable if compacted to the engineered fill recommendations as stated in the recommendations section of this report. All slopes should have appropriate drainage and vegetation measures to minimize erosion of slope soils.

Slope Face Compaction: All slope fills should be laterally overbuilt and cut back such that the required compaction is achieved at the proposed finish slope face. As a less preferable alternative, the slope face could be tracked walked or compacted with a wheel. If this second alternative is used, additional slope maintenance may be necessary.

Slope Drainage: Surface drainage should not be allowed to flow uncontrolled over any slope face. Adequate surface drainage control should be designed by the project civil engineer in accordance with the latest applicable edition of the CBC. All slopes should have appropriate drainage and vegetation measures to minimize erosion of slope soils.

Underground Improvements

Trench Excavation: Trenches or excavations in soil should be shored or sloped back in accordance with current OSHA regulations prior to persons entering them. The potential use of a shield to protect workers cannot be precluded. Refer to the Excavation Characteristics section of Site Grading and Improvements of this report for anticipated excavation conditions.

Backfill Materials: Backfill materials for utilities should conform to the local jurisdiction's requirements. It should be realized that permeable backfill materials will likely carry water at some time in the future.

When backfilling within structural footprints, compacted low permeability materials are recommended to be used a minimum of 5 feet beyond the structural footprint to minimize moisture intrusion. If a permeable material is used as backfill within this zone, subdrainage measures may be required. In addition, if the structure is oriented below the roadway and associated utilities, grout cutoffs or plug and drains around all utility penetrations are useful to keep moisture out from underneath the structure.

Backfill Compaction: All backfill, placed after the underground facilities have been installed, including site wet/dry utilities and lateral connections, should be compacted a minimum of 90 percent relative compaction. Compaction should be accomplished using lifts which do not exceed 12 inches. However, thickness of the lifts should be determined by the contractor. If the contractor can achieve the required compaction using thicker lifts, the method may be judged acceptable based on field verification by a representative of our firm using standard density testing procedures. Light weight compaction equipment may require thinner lifts to achieve the required densities.

Drainage Considerations: In sites with the potential for a perched groundwater condition (i.e. cemented soil), underground utilities can become collections points for subsurface water. When these conditions are present, we recommend permanent subdrainage mitigation measures be installed. Such measures may include plug and drains within the utility trenches to collect and convey water to the storm drain system or other approved outlet. Temporary dewatering measures may be necessary and could include the installation of submersible pumps and/or point wells.

4.2 DESIGN RECOMMENDATIONS

Foundations

In our opinion, shallow spread or continuous footings will provide adequate support for the proposed building if the subgrades are properly prepared as described in the Site Grading and Improvement section. We offer the following comments and recommendations for purposes of footing design and construction. The provided minimums do not constitute a structural design of foundations which should be performed by the structural engineer. Our firm should be afforded the opportunity to review the project grading and foundation plans to confirm the applicability of the recommendations provided below. Modifications to these recommendations may be made at the time of our review.

Bearing Capacities: An allowable dead plus live load bearing pressure of 3,000 psf may be used for design of footings based on native soils or engineered fills. These capacities are based upon minimum foundations depths of 18 inches below lowest adjacent grade. The above allowable pressures are for support of dead plus live loads and may be increased by 1/3 for short term wind and seismic loads.

A total settlement of less than 1 inch is anticipated; a differential settlement of ½ of the total is anticipated where foundations are bearing on like materials. This settlement is based upon the assumption that foundation loads will be typical of structures with foundations sized in accordance with the provided allowable bearing capacities.

Lateral Pressures: Lateral forces on structures may be resisted by passive pressure acting against the sides of shallow footings and/or friction between the soil and the bottom of the footing. For resistance to lateral loads, a friction factor of 0.35 may be utilized for sliding resistance at the base of spread footings in undisturbed native materials or engineered fill. An allowable passive resistance of 350 pcf equivalent fluid weight may be used against the side of shallow footings in native soil or engineered fill. The total allowable lateral resistance can be taken as the sum of the friction resistance and passive resistance provided that the passive resistance does not exceed 2/3 of the total allowable resistance. The passive resistance values may be increased by one-third when considering wind or seismic loading.

Footing Configuration: Foundation reinforcement should be provided by the structural engineer. The reinforcement schedule should account for typical construction issues such as load consideration, concrete cracking, and the presence of isolated irregularities. At a minimum, we recommend that continuous spread footing foundations be reinforced with two No. 4 reinforcing bars, one located near the bottom of the footing and one near the top of the stem wall.

All footings should be founded below an imaginary 2.5H:1V plane projected up from the bottoms of adjacent footings, downhill slopes and/or parallel utility trenches, or to a depth that achieves a minimum horizontal clearance of 6 feet from the outside toe of the footings to the slope face, whichever requires a deeper excavation.

Foundations for concrete slab-on-grade structures should be a minimum of 12 inches in width, and be founded a minimum of 18 inches below the lowest adjacent grade. Isolated pad footings should be a minimum of 24 inches wide.

Subgrade Conditions: Footings should never be cast atop soft, loose, organic, slough, debris, nor atop subgrades covered by ice or standing water. A representative of our firm should be retained to observe all subgrades during footing excavations and prior to concrete placement so that a determination as to the adequacy of subgrade preparation can be made.

Shallow Footing Backfill: All footing backfill soil should be compacted to at least 90 percent of the maximum dry density (based on ASTM D1557).

Seismic Criteria

Based on the 2007 California Building Code, Chapter 16, and our previous site investigation findings, the following seismic parameters are recommended from a geotechnical perspective for structural design. The final choice of design parameters, however, remains the purview of the project structural engineer.

IBC/CBC - CHAP. 16	SEISMIC PARAMETER	RECOMMENDED VALUE
Table No. 1613.5.2	Site Class	C
Figure No. 1613.5(3)	Short-Period MCE at 0.2s, S_S	0.42g
Figure No. 1613.5(4)	1.0s Period MCE, S_1	0.20g
Table No. 1613.5.3(1)	Site Coefficient, F_a	1.2
Table No. 1613.5.3(2)	Site Coefficient, F_v	1.6
Equation 16-37	Adjusted MCE Spectral Response Parameters, $S_{MS} = F_aS_s$	0.50
Equation 16-38	Adjusted MCE Spectral Response Parameters, $S_{M1} = F_vS_1$	0.32
Equation 16-39	Design Spectral Acceleration Parameters, $S_{DS} = ⅔S_{MS}$	0.34
Equation 16-40	Design Spectral Acceleration Parameters, $S_{D1} = ⅔S_{M1}$	0.22
Table 1613.5.6(1)	Seismic Design Category (Short Period), Occupancy I to III	C
Table 1613.5.6(1)	Seismic Design Category (Short Period), Occupancy IV	D
Table 1613.5.6(2)	Seismic Design Category (1-Second Period), Occupancy I to III	D
Table 1613.5.6(2)	Seismic Design Category (1-Second Period), Occupancy IV	D

Slab-on-Grade Construction
It is our opinion that soil-supported slab-on-grade floors could be used for the main floor, contingent on proper subgrade preparation. Often the geotechnical issues regarding the use of slab-on-grade floors include proper soil support and subgrade preparation, proper transfer of loads through the slab underlayment materials to the subgrade soils, and the anticipated presence or absence of moisture at or above the subgrade level. We offer the following comments and recommendations concerning support of slab-on-grade floors. *The slab design (concrete mix, reinforcement, joint spacing, moisture protection and underlayment materials) is the purview of the project Structural Engineer.*

Slab Subgrade Preparation: All subgrades proposed to support slab-on-grade floors should be prepared and compacted to the requirements of engineered fill as discussed in the Site Grading and Improvements section of this report.

Slab Underlayment: As a minimum for slab support conditions, the slab should be underlain by a minimum 4 inch crushed rock layer and covered by a moisture retarding plastic membrane. An optional 1 inch blotter sand layer above the plastic membrane is sometimes used to aid in curing of the concrete. If the blotter is omitted, special curing procedures may be necessary. The blotter layer can become a reservoir for excessive moisture if inclement weather occurs prior to pouring the slab, excessive water collects in it from the concrete pour, or an external source of water enters above or bypasses the membrane. The membrane may only be functional when it is above the vapor sources. The bottom of the crushed rock layer should be above the exterior grade to act as a capillary break and not a reservoir, unless it is provided with an underdrain system. The slab design and underlayment should be in accordance with ASTM E1643 and E1745.

Slab Moisture Protection: Due to the potential for landscape to be present directly adjacent to the slab edge/foundation or for drainage to be altered following our involvement with the project, varying levels of moisture below, at, or above the pad subgrade level should be anticipated. The slab designer should include the potential for moisture vapor transmission when designing the slab. Our experience has shown that vapor transmission through concrete is controlled through slab thickness as well as proper concrete mix design.

It should be noted that placement of the recommended plastic membrane, proper mix design, and proper slab underlayment and detailing per ASTM E1643 and E1745 will not provide a waterproof condition. If a waterproof condition is desired, we recommend that a waterproofing expert be consulted for slab design.

Slab Thickness and Reinforcement: Geotechnical reports have historically provided minimums for slab thickness and reinforcement for general crack control. The concrete mix design and construction practices can additionally have a large impact on concrete crack control. All concrete should be anticipated to crack. As such, these minimums should not be considered to be stand alone items to address crack control, but are suggested to be considered in the slab design methodology.

In order to help control the growth of cracks in interior concrete from becoming significant, we suggest the following minimums. Interior concrete slabs-on-grade not subject to heavy loads should be a minimum of 4 inches thick. A 4 inch thick slab should be reinforced. A minimum of No. 3 deformed reinforcing bars placed at 30 inches on center both ways, at the center of the structural section is suggested. Joint spacing should be provided by the structural engineer. Troweled joints recovered with paste during finishing or "wet sawn" joints should be considered every 10 feet on center. Expansion joint felt should be provided to separate floating slabs from foundations and at least at every third joint. Cracks will tend to occur at recurrent corners, curved or triangular areas and at points of fixity. Trim bars can be utilized at right angle to the predicted crack extending 40 bar diameters past the predicted crack on each side.

Vertical Deflections: Soil-supported slab-on-grade floors can deflect downward when vertical loads are applied, due to elastic compression of the subgrade. For design of concrete floors, a modulus of subgrade reaction of k = 150 psi per inch would be applicable for native soils and engineered fills.

Exterior Flatwork: Exterior concrete flatwork need not be underlain by a rock cushion where non-expansive soils are encountered. However, some vertical movement of concrete should be anticipated when arranging outside concrete flatwork joints where rock is omitted.

If exterior flatwork concrete is placed against the foundation without a moisture separator it may transfer moisture to the floor slab. Expansion joint felt should be provided to separate exterior flatwork from foundations and at least at every third joint. Contraction / groove joints should be provided to a depth of at least 1/4 of the slab thickness and at a spacing of less than 30 times the slab thickness for unreinforced flatwork, dividing the slab into nearly square sections. Cracks will tend to occur at recurrent corners, curved or triangular areas and at points of fixity. Trim bars can be utilized at right angle to the predicted crack extending 40 bar diameters past the predicted crack on each side.

Pavement Design
We understand that asphaltic pavements will be used for the associated driveways and parking lots. The following comments and recommendations are given for pavement design and construction purposes. All pavement construction and materials used should conform to

applicable sections of the latest edition of the California Department of Transportation Standard Specifications.

Subgrade Compaction: After installation of any underground facilities, the upper 8 inches of subgrade soils under pavements sections should be compacted to a minimum relative compaction of 95 percent based on the ASTM D1557 test method at a moisture content above optimum. Aggregate bases should also be compacted to a minimum relative compaction of 95 percent based on the aforementioned test method. All subgrades and aggregate base should be prepared just prior to placement of the base course and proof-rolled with a full water truck or equivalent immediately before paving, in order to verify their condition. Positive drainage of the pavement and pavement subgrade areas should be provided since moisture infiltration into the subgrade may decrease the life of pavements. Curbing located adjacent to paved areas should be founded in the subgrade, not the aggregate base, in order to provide a cutoff, which reduces water infiltration into the base course.

Design Criteria: Critical features that govern the durability of a pavement section include the stability of the subgrade; the presence or absence of moisture, free water, and organics; the fines content of the subgrade soils; the traffic volume; and the frequency of use by heavy vehicles. Soil conditions can be defined by a soil resistance value, or “R”-Value, and traffic conditions can be defined by a Traffic Index (TI).

Asphalt Concrete Pavement
Design Values: Table 1 provides recommended pavement sections based on the "R" - Value test (California Test Method 301-F) performed on a bulk sample representative of the silty SAND materials expected to be exposed at subgrade. An R-value of 55 was determined for the silty SANDS tested; however, to account for variability in materials an R-value of 40 was used for design purposes. *If clay soils are encountered, we should review pavement subgrades to determine the appropriateness of the provided sections, and provide additional pavement design recommendations as field conditions dictate. Even minor clay constituents will greatly reduce the design R-Value.* The recommended design thicknesses presented in Table 1 were calculated in accordance with the methods presented in the latest update of the Fifth Edition of the California Department of Transportation Highway Design Manual. A varying range of traffic indices are provided for use by the project Civil Engineer for roadway design.

Design values provided are based upon properly drained subgrade conditions. Although the R-Value design to some degree accounts for wet soil conditions, proper surface and landscape drainage design is integral in performance of adjacent street sections with respect to stability and degradation of the asphalt. Proper drainage design is particularly important for pavements constructed on relatively flat sites with subgrades consisting of finer grained, low permeability materials (i.e. silts and clays) and/or cemented soil horizons.

Table 1
Recommended Pavement Design Thickness

Design Traffic Indices	Alternative Pavement Sections (inches)	
	Asphalt Concrete*	Aggregate Base**
4.5	2.5 3.0	4.0 4.0
5.0	2.5 3.0	5.0 4.0
5.5	3.0 3.5	5.5 4.0
6.0	3.0 3.5	6.5 5.5
6.5	3.5 4.0	7.0 6.0

NOTES:
* Asphaltic Concrete: must meet specifications for CAL TRANS Type B Asphaltic Concrete
** Aggregate Base: must meet specifications for CAL TRANS Class II Aggregate Base ("R"-Value = minimum 78)

Drainage Considerations
Building Pads: In order to maintain the engineering strength characteristics of the soil presented for use in this Geotechnical Engineering Study, maintenance of the site will need to be performed. This maintenance generally includes, but is not limited to, proper drainage and control of surface and subsurface water which could affect structural support and fill integrity. A difficulty exists in determining which areas are prone to the negative impacts resulting from high moisture conditions due to the diverse nature of potential sources of water; some of which are outlined in the paragraph below. We suggest that measures be installed to minimize exposure to the adverse effects of moisture, but this will not guarantee that excessive moisture conditions will not affect the structure.

Some of the diverse sources of moisture could include water from landscape irrigation, annual rainfall, offsite construction activities, runoff from impermeable surfaces, collected and channeled water, and water perched in the subsurface soils. Some of these sources can be controlled through drainage features installed either by the owner or builder. Others may not become evident until they, or the effects of the presence of excessive moisture, are visually observed on the property.

Some measures that can be employed to minimize the build up of moisture include, but are not limited to; proper backfill materials and compaction of utility trenches on the site and within the footprint of the proposed building to minimize the transmission of moisture through these areas; grout plugs at foundation penetrations; collection and channeling of drained water from impermeable surfaces (i.e. roofs, concrete or asphalt paved areas); installation of subdrain/cut-off drain provisions; utilization of low flow irrigation systems.

All grades should provide rapid removal of surface water runoff; ponding water should not be allowed on building pads or adjacent to foundations or other structural improvements (during and following construction). All soils placed against foundations during finish grading should be compacted to minimize water infiltration. Finish and landscape grading should include positive drainage away from all foundations. Section 1805.3.4 of the 2007 California Building Code states that for graded soil sites, the top of any exterior foundation shall extend above the elevation of the street gutter at the point of discharge or the inlet of an approved drainage device a minimum of 12 inches plus 2 percent. Surface grades should slope a minimum of 2 percent away from all foundations. Surface drainage should be designed by the Project Architect/Civil Engineer in general accordance with Section 1803.3 of the 2007 California Building Code. Downspouts should be tight piped via an area drain network and discharged to an appropriate non-erosive outlet.

Pavement Improvements: At sites built on relatively poor draining soils (i.e. cemented soil), prolonged water seepage into pavement sections can result in softening of subgrade soils and subsequent pavement distress. In addition, where shallow cemented or clayey soil conditions are present, water can become perched on the relatively impermeable soil horizon and eventually inundate utility trench backfill. The variable support condition between native soils and compacted trench backfill materials, coupled with prolonged water exposure can lead to subsidence of trench backfill materials if bridging of trench backfill occurs during placement or natural jetting of soils into voids around pipes occurs.

In addition, it has been our experience that landscape watering can be generally excessive. Due to the relatively flat nature of the project site, it is anticipated that heavy landscape watering could enter and pond within the pavement aggregate base section as it permeates through the aggregate base under the sidewalks. As detailed above, prolonged seepage within the pavement section could cause distress to pavements.

Some measures that can be employed to minimize the saturation of the subgrade and aggregate base materials include, but are not limited to, construction of cut-off drains or moisture barriers alongside the parking lot, overall landscape island, and installation of plug and drain systems within utility trenches. Due to the elusive and discontinuous nature of drainage related issues, a risk based approach should be determined by the owner based on consultation and discussions with the design professionals and the amount of protection of facilities that the owner may want to provide against potential moisture related issues.

Post Construction: All drainage related issues may not become known until after construction and landscaping are complete. Therefore, some mitigation measures may be necessary following site development. Landscape watering is typically the largest source of water infiltration into the subgrade. Given the soil conditions on site, excessive or even normal landscape watering may contribute to perched groundwater levels rising, which could contribute to moisture related problems and/or cause distress to foundations and slabs, pavements, and underground utilities, as well as creating a nuisance where seepage occurs. In order to mitigate these conditions, additional subdrainage measures may be necessary. Any necessary measures to mitigate observed the moisture conditions should be provided on an as requested and site specific basis.

5.0 DESIGN REVIEW AND CONSTRUCTION MONITORING

The design plans and specifications should be reviewed and accepted by Youngdahl Consulting Group, Inc., hereinafter described as the Geotechnical Engineer, prior to contract bidding. A review should be performed to determine whether the recommendations contained within this report are still applicable and/or are properly reflected and incorporated into the project plans and specifications.

Construction Monitoring

Construction monitoring is a continuation of the findings and recommendations provided in this report. It is essential that our representative be involved with all grading activities in order for us to provide supplemental recommendations as field conditions dictate. Youngdahl Consulting

Group, Inc. should be notified at least two working days before site clearing or grading operations commence, and should observe the stripping of deleterious material overexcavation of existing fills and provide consultation to the Grading Contractor in the field.

6.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. This report has been prepared for the exclusive use of John Steitz for specific application to the Sunrise Boulevard (8220) Senior Care project. Youngdahl Consulting Group, Inc. has endeavored to comply with generally accepted geotechnical engineering practice common to the local area. Youngdahl Consulting Group, Inc. makes no other warranty, express or implied.

2. 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 be due to natural processes or to the works of man on this or adjacent properties. Legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may cause this report to be invalid, wholly or partially. Therefore, this report should not be relied upon after a period of three years without our review nor should it be used or is it applicable for any properties other than those studied.

3. Section 106.3.4.1 of the 2006 International Building Code and Appendix Chapter 1 of the 2007 California Building Code states that, in regard to the design professional in responsible charge, the building official shall be notified in writing by the owner if the registered design professional in responsible charge is changed or is unable to continue to perform the duties.

   WARNING: Do not apply any of this report's conclusions or recommendations if the nature, design, or location of the facilities is changed. If changes are contemplated, Youngdahl Consulting Group, Inc. must review them to assess their impact on this report's applicability. Also note that Youngdahl Consulting Group, Inc. is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of this report's subsurface data or engineering analyses without the express written authorization of Youngdahl Consulting Group, Inc.

4 The analyses and recommendations contained in this report are based on limited windows into the subsurface conditions and data obtained from subsurface exploration. The methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations. Should any variations or undesirable conditions be encountered during the development of the site, Youngdahl Consulting Group, Inc., will provide supplemental recommendations as dictated by the field conditions.

5 The recommendations included in this report have been based in part on assumptions about strata variations that may be tested only during earthwork. Accordingly, these recommendations should not be applied in the field unless Youngdahl Consulting Group, Inc. is retained to perform construction observation and thereby provide a complete professional geotechnical engineering service through the observational method. Youngdahl Consulting Group, Inc. cannot assume responsibility or liability for the adequacy of its recommendations when they are used in the field without Youngdahl Consulting Group, Inc. being retained to observe construction. Unforeseen subsurface conditions containing soft native soils, loose or previously placed non-engineered fills

should be a consideration while preparing for the grading of the property. It should be noted that it is the responsibility of the owner or his/her representative to notify Youngdahl Consulting Group, Inc., in writing, a minimum of 48 hours before any excavations commence at the site.

6 Our experience has shown that vapor transmission through concrete is controlled through proper concrete mix design. As such, proper control of moisture vapor transmission should be considered in the design of the slab as provided by the project architect, structural or civil engineer. It should be noted that placement of the recommended plastic membrane, proper mix design, and proper slab underlayment and detailing per ASTM E1643 and E1745 will not provide a waterproof condition. If a waterproof condition is desired, we recommend that a waterproofing expert be consulted for slab design.

7 Following site development, additional water sources (i.e. landscape watering, downspouts) are generally present. The presence of low permeability materials can prohibit rapid dispersion of surface and subsurface water drainage. Utility trenches typically provide a conduit for water distribution. Provisions may be necessary to mitigate adverse effects of perched water conditions. Mitigation measures may include the construction of cut-off systems and/or plug and drain systems. Close coordination between the design professionals regarding drainage and subdrainage conditions may be warranted.

CHECKLIST OF RECOMMENDED SERVICES

Item Description		Recommended	Not Anticipated
1	Provide foundation design parameters	Included	
2	Review grading plans and specifications	T	
3	Review foundation plans and specifications	T	
4	Observe and provide recommendations regarding demolition	T	
5	Observe and provide recommendations regarding site stripping	T	
6	Observe and provide recommendations on moisture conditioning removal, and/or precompaction of unsuitable existing soils	T	
7	Observe and provide recommendations on the installation of subdrain facilities	T	
8	Observe and provide testing services on fill areas and/or imported fill materials	T	
9	Review as-graded plans and provide additional foundation recommendations, if necessary	T	
10	Observe and provide compaction tests on storm drains, water lines and utility trenches	T	
11	Observe foundation excavations and provide supplemental recommendations, if necessary, prior to placing concrete	T	
12	Observe and provide moisture conditioning recommendations for foundation areas and slab-on-grade areas prior to placing concrete	T	
13	Provide design parameters for retaining walls		T
14	Provide finish grading and drainage recommendations	Included	
15	Provide geologic observations and recommendations for keyway excavations and cut slopes during grading	T	
16	Excavate and recompact all test pits within structural areas	T	

APPENDIX A

Field Study

Vicinity Map
Site Plan
Logs of Exploratory Test Pits
Soil Classification Chart and Test Pit Log Explanation

Introduction

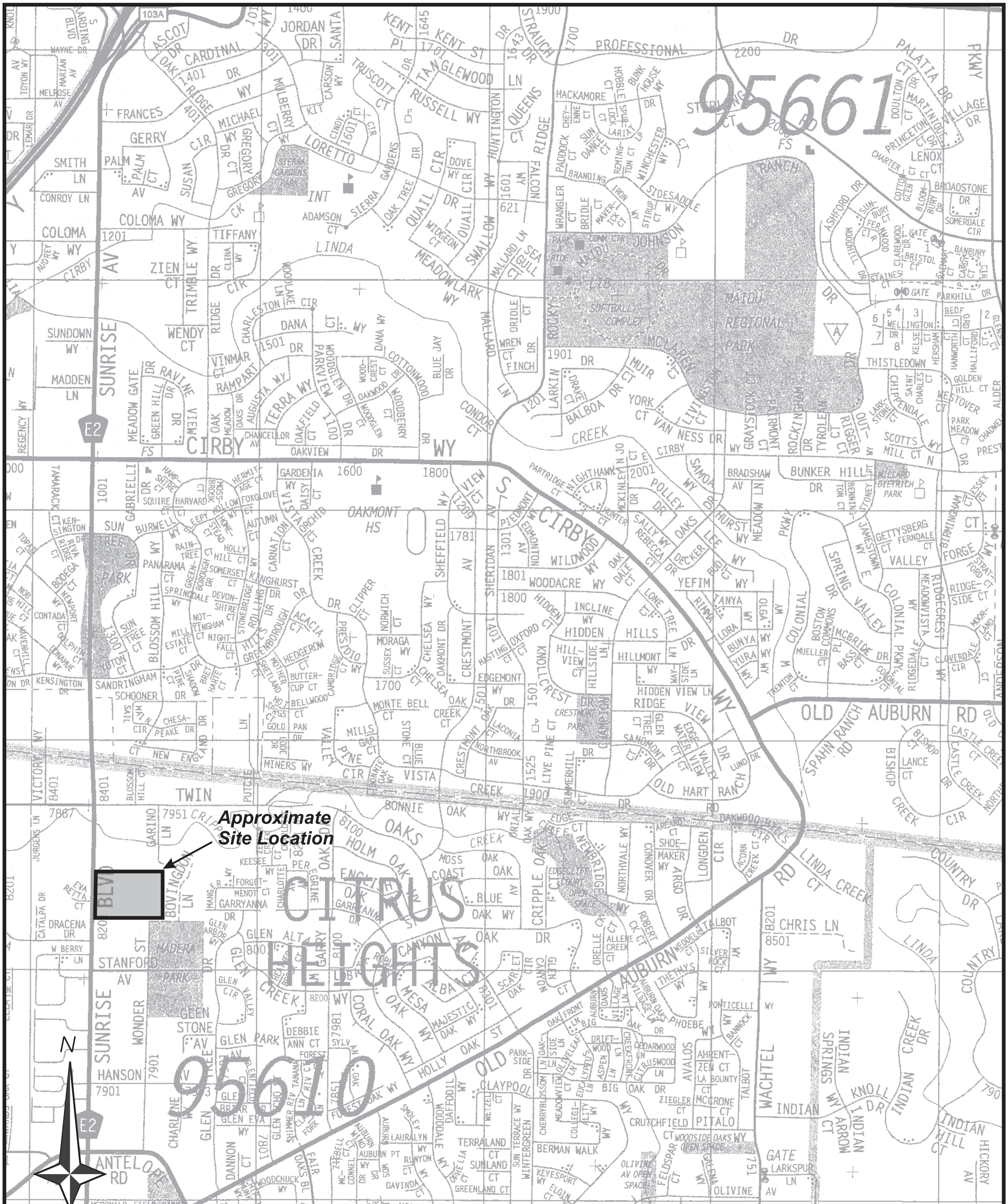
The contents of this appendix shall be integrated with the geotechnical engineering study of which it is a part. They shall not be used in whole or in part as a sole source for information or recommendations regarding the subject site.

Field study

Our field study included a site reconnaissance by a Youngdahl Consulting Group, Inc., representative followed by a subsurface exploration program conducted on 28 September 2007, which included the excavation of 5 test pits under her direction at the approximate locations shown on Figure A-2, this Appendix. Excavation of the test pits was accomplished with a CASE 580 SM rubber tire-mounted backhoe equipped with an 18 inch wide bucket. As the excavation proceeded, nuclear gauge tests (ASTM D2922 and D3017) were performed to obtain the in place dry density and moisture content. Bulk samples were collected from the test pits and returned to our laboratory for testing.

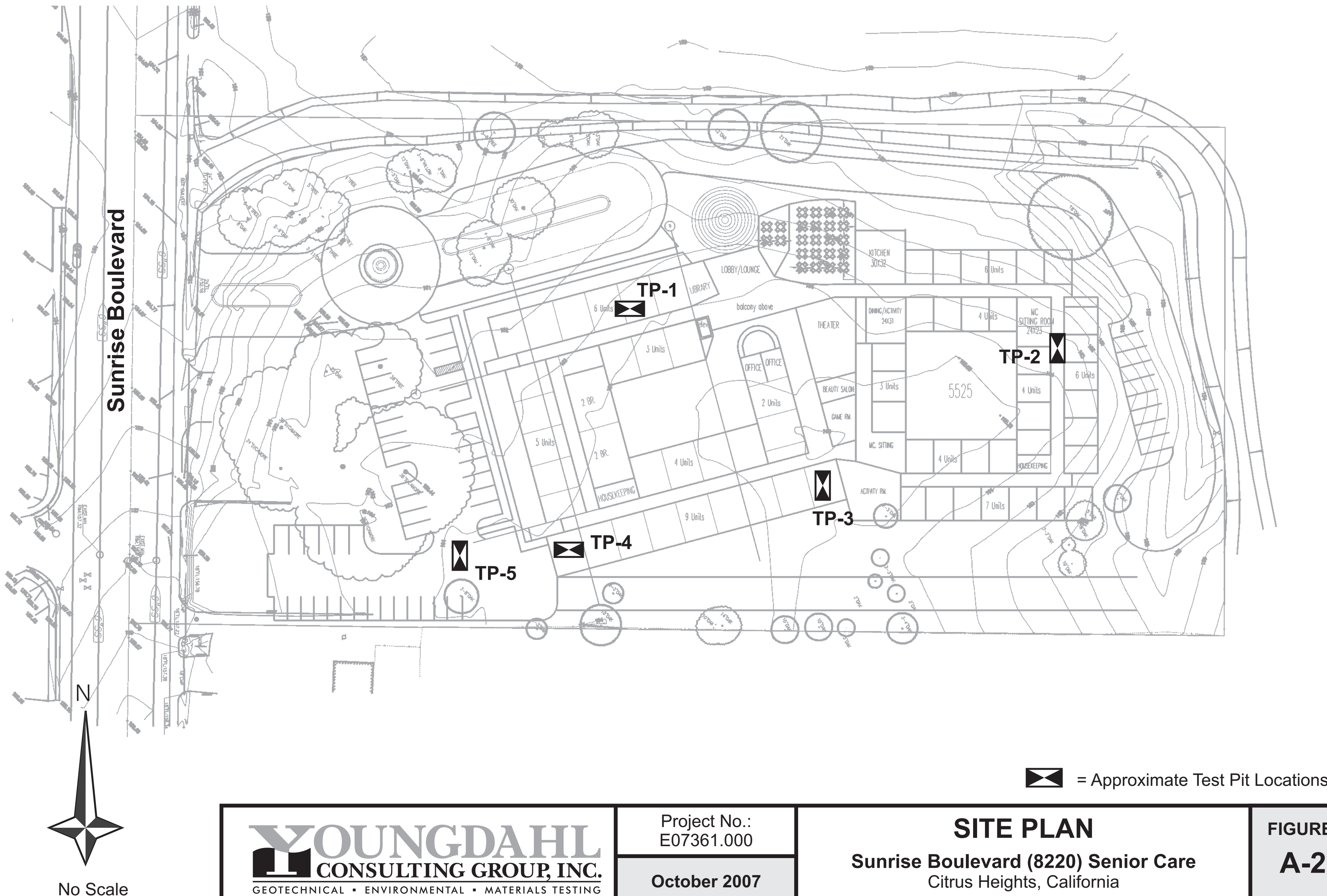
The Exploratory Test Pit Logs describe the vertical sequence of soils and materials encountered in each test pit, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradual, our logs indicate the average contact depth. Our logs also graphically indicate the sample type, sample number and approximate depth of each soil sample obtained from the test pits.

The soils encountered were logged during excavation and provide the basis for the "Logs of Test Pits", Figures A-3 through A-7, this Appendix. These logs show a graphic representation of the soil profile, the location and depths at which samples were collected.



BASE MAP REF: Sacramento & Solano Counties Street Guide,2007, Pages 240

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E07361.000	**VICINITY MAP**	**FIGURE**
	October 2007	**Sunrise Boulevard (8220) Senior Care** Citrus Heights, California	**A-1**

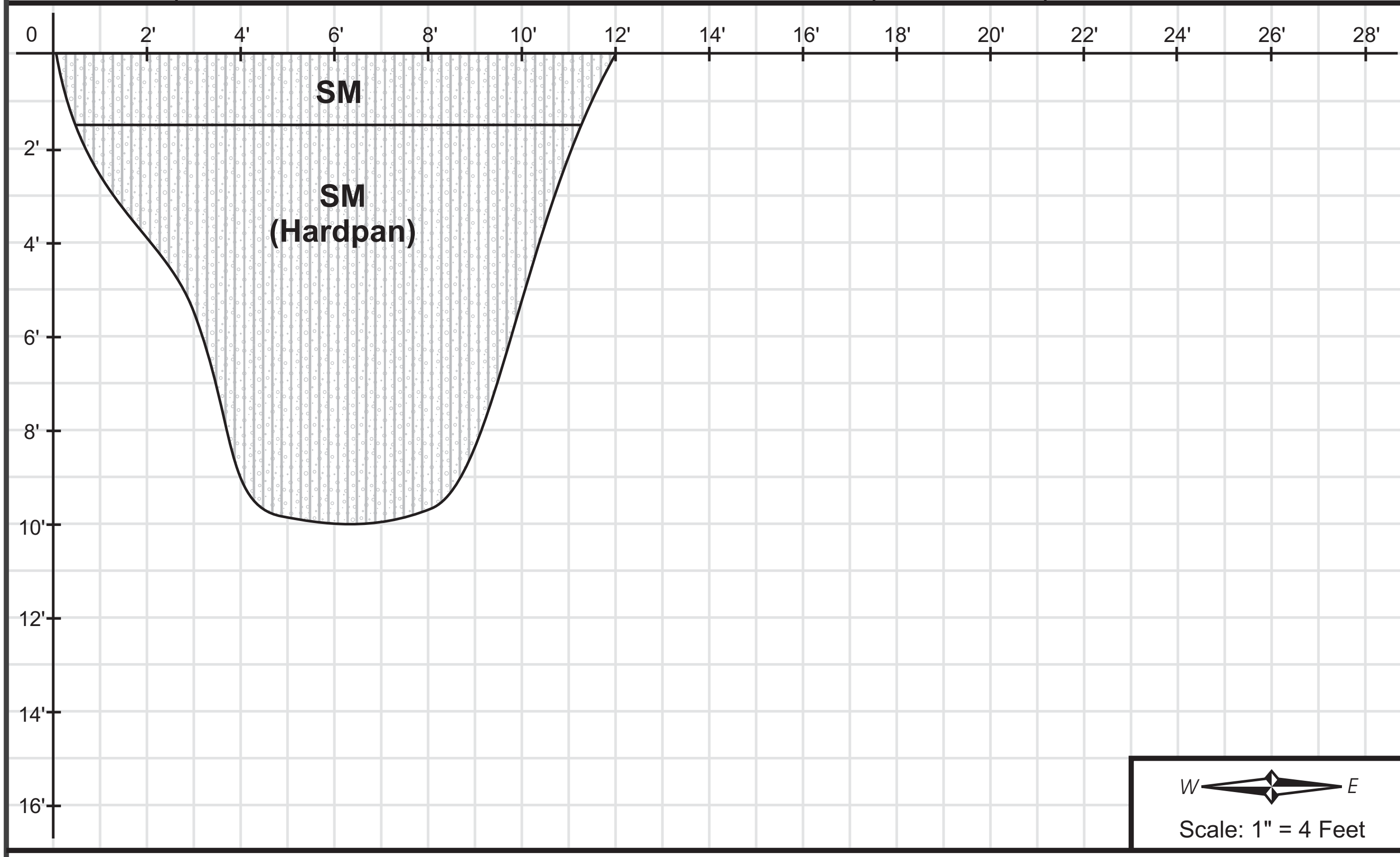


YOUNGDAHL CONSULTING GROUP, INC.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING

Project No.: E07361.000	SITE PLAN	FIGURE
October 2007	**Sunrise Boulevard (8220) Senior Care** Citrus Heights, California	**A-2**

Logged By: **MSS**	Date: **28 September 2007**	Elevation: **~ 157'**	Pit No. **TP-1**
Equipment: **CASE Backhoe With 24" Bucket**		Pit Orientation: **W - E**	

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0 - 1.5'	Red brown silty **SAND (SM)**, medium dense, dry		*Crushed roofing tiles observed on the surface*
@ 1.5' - 4'	Yellow brown silty **SAND (SM)**, medium dense, slightly moist, moderately cemented (hardpan)		
@ 4' - 10'	*Grades highly weathered*		
	Test pit terminated at 10' No free groundwater encountered No caving noted		

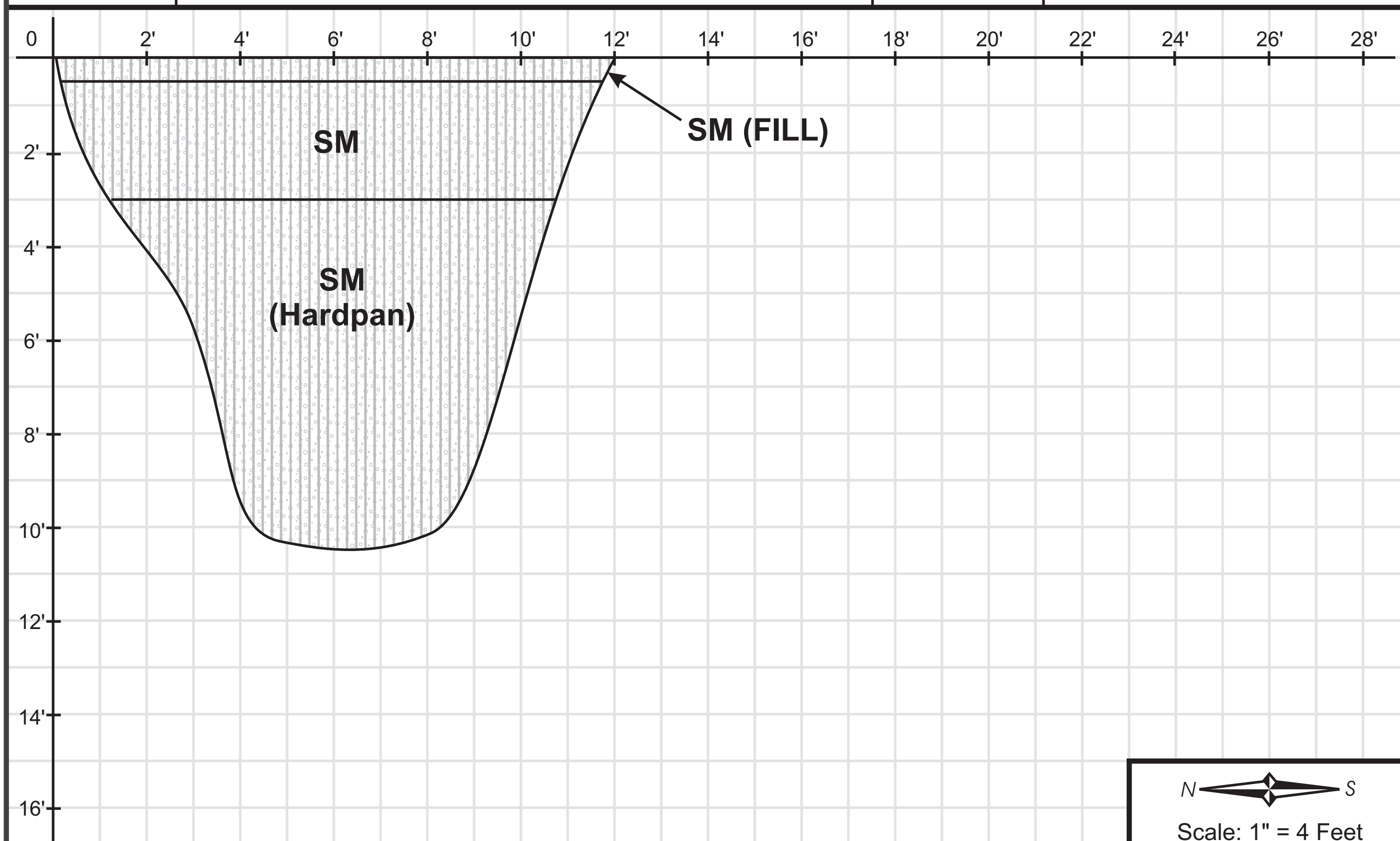


Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL ▪ ENVIRONMENTAL ▪ MATERIALS TESTING	Project No.: E07361.000 **October 2007**	**EXPLORATORY TEST PIT LOG** **Sunrise Boulevard (8220) Senior Care** Citrus Heights, California	**FIGURE A-3**

Logged By: **MSS**	Date: **28 September 2007**	Elevation: **~ 160'**	Pit No. **TP-2**
Equipment: **CASE Backhoe With 24" Bucket**		Pit Orientation: **N - S**	

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0 - 0.5'	Brown silty **SAND (SM)**, loose, dry (FILL)		*Observed organic stockpiles at surface*
@ 0.5' - 3'	Red brown silty **SAND (SM)**, medium dense, dry	**Bag 1** @ 1.5'	**Field Moisture Density Test @ 0.5'** DD = 101.8 pcf MC = 2.9 %
@ 3' - 5'	Yellow brown silty **SAND (SM)**, medium dense, slightly moist, moderately cemented (hardpan)		
@ 5' - 10.5'	*Grades completely weathered*		
	Test pit terminated at 10.5' No free groundwater encountered No caving noted		

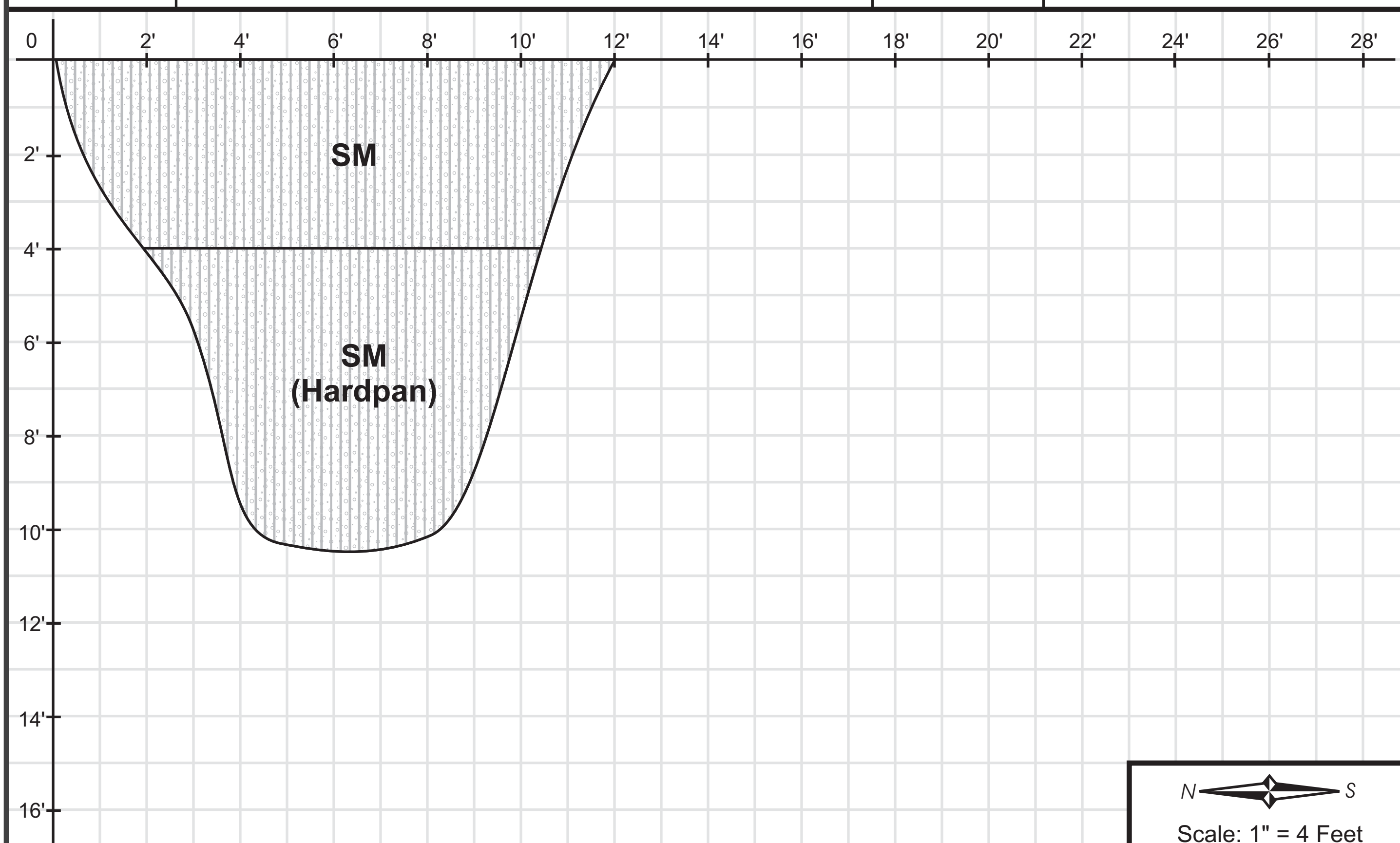


Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E07361.000 **October 2007**	**EXPLORATORY TEST PIT LOG** **Sunrise Boulevard (8220) Senior Care** Citrus Heights, California	FIGURE **A-4**

Logged By: **MSS**	Date: **28 September 2007**	Elevation: **~ 161'**	Pit No.
Equipment: **CASE Backhoe With 24" Bucket**		Pit Orientation: **N - S**	**TP-3**

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0 - 2'	Red brown silty **SAND (SM)**, medium dense, dry	**Bag 2** @ 1' - 2'	*Moderate grasses on surface* **Field Moisture Density Test @ 2'** DD = 102.7 pcf MC = 3.9 %
@ 2' - 4'	*Grades slightly moist*		
@ 4' - 7'	Yellow brown silty **SAND (SM)**, medium dense, slightly moist, weakly cemented (hardpan)		
@ 7' - 10.5'	*Grades highly weathered*		
	Test pit terminated at 10.5' No free groundwater encountered No caving noted		

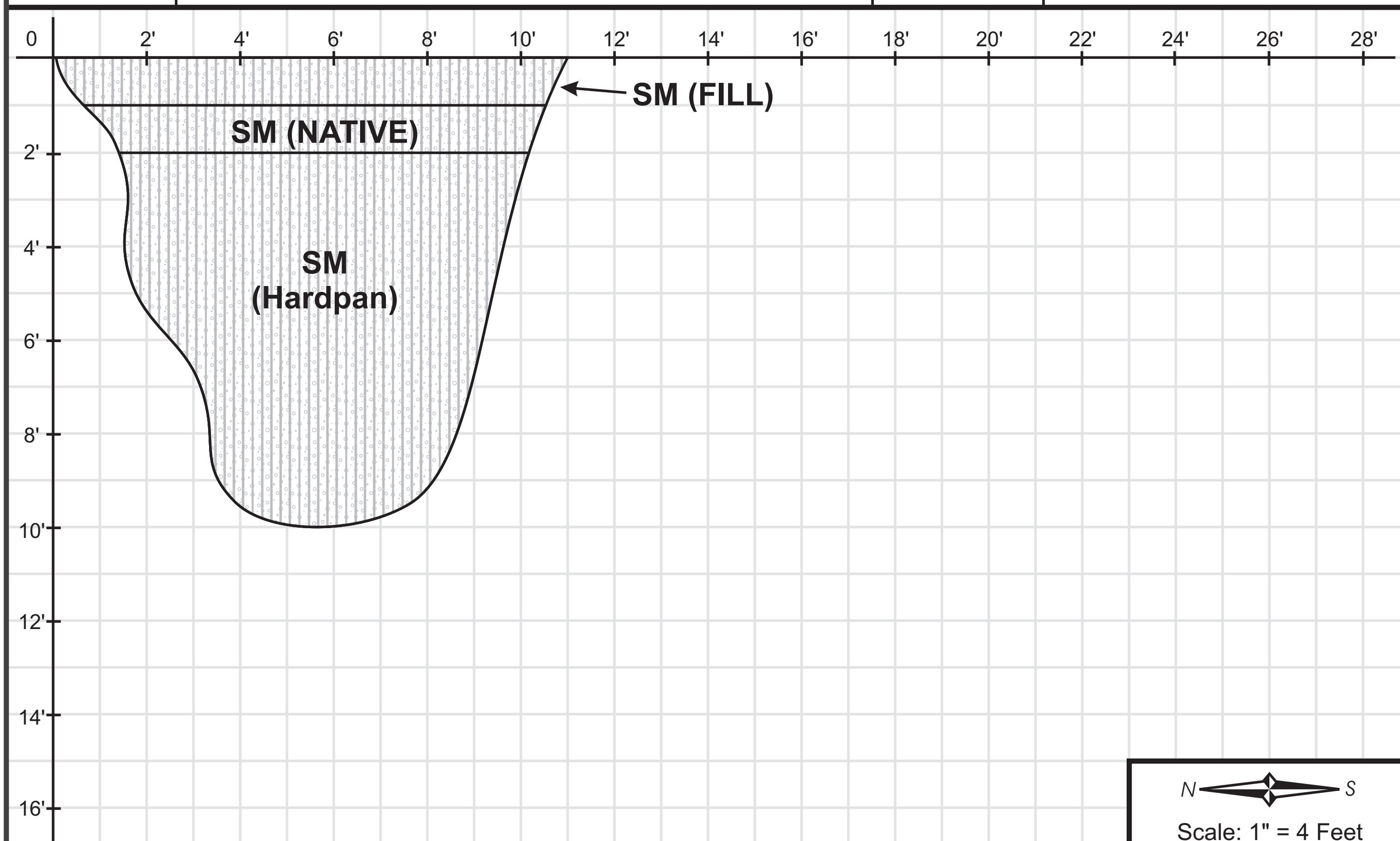


Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E07361.000 **October 2007**	**EXPLORATORY TEST PIT LOG** **Sunrise Boulevard (8220) Senior Care** Citrus Heights, California	FIGURE **A-5**

Logged By: **MSS**	Date: **28 September 2007**	Elevation: **~ 161'**	Pit No. **TP-4**
Equipment: **CASE Backhoe With 24" Bucket**		Pit Orientation: **N - S**	

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0 - 1'	Yellow brown silty **SAND (SM)** with gravel, loose, dry (FILL)		*Moderate grasses on surface*
@ 1' - 2'	Red brown silty **SAND (SM)**, medium dense, dry		
@ 2' - 4'	Yellow brown silty **SAND (SM)**, medium dense, slightly moist, weakly cemented (hardpan)		
@ 4' - 10'	*Grades highly weathered*		
	Test pit terminated at 10' No free groundwater encountered No caving noted		

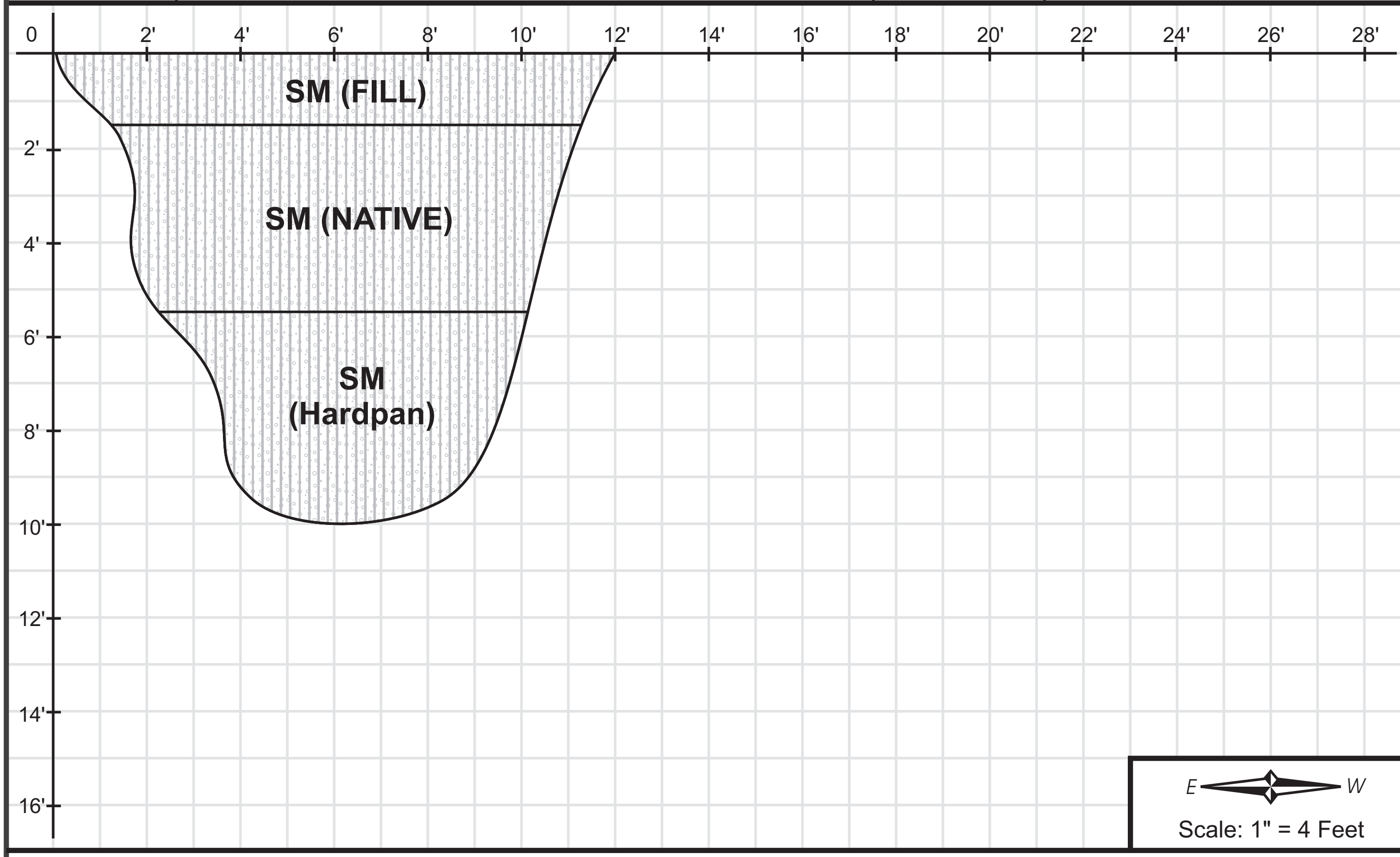


Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E07361.000 **October 2007**	**EXPLORATORY TEST PIT LOG** **Sunrise Boulevard (8220) Senior Care** Citrus Heights, California	**FIGURE** **A-6**

Logged By: **MSS**	Date: **28 September 2007**	Elevation: **~ 161'**	Pit No. **TP-5**
Equipment: **CASE Backhoe With 24" Bucket**		Pit Orientation: **E - W**	

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0 - 1.5'	Yellow brown silty **SAND (SM)** with gravel, loose, dry (FILL)	**Bag 3** @ 1'	*Surface of driveway is combination of crushed roof tiles and recycled AC.*
@ 1.5' - 5'	Red brown silty **SAND (SM)**, medium dense, dry		
@ 5' - 10'	Yellow brown silty **SAND (SM)**, medium dense, slightly moist, weakly cemented (hardpan)		
	Test pit terminated at 10' No free groundwater encountered No caving noted		



Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

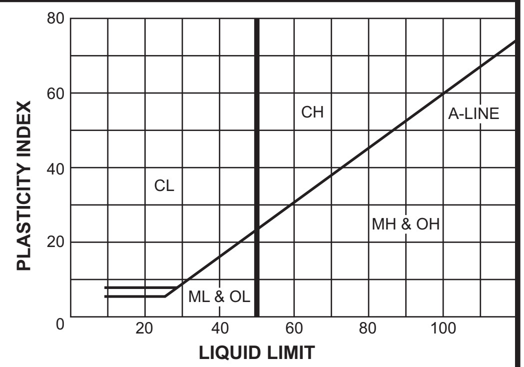
YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E07361.000	**EXPLORATORY TEST PIT LOG**	**FIGURE**
	October 2007	**Sunrise Boulevard (8220) Senior Care** Citrus Heights, California	**A-7**

UNIFIED SOIL CLASSIFICATION SYSTEMS

MAJOR DIVISION			SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS Over 50% > #200 sieve	GRAVELS Over 50% > #4 sieve	Clean **GRAVELS** With Little Or No Fines	GW	Well graded **GRAVELS**, **GRAVEL-SAND** mixtures
			GP	Poorly graded **GRAVELS**, **GRAVEL-SAND** mixtures
		GRAVELS With Over 12% Fines	GM	Silty **GRAVELS**, poorly graded **GRAVEL-SAND-SILT** mixtures
			GC	Clayey **GRAVELS**, poorly graded **GRAVEL-SAND-CLAY** mixtures
	SANDS Over 50% < #4 sieve	Clean **SANDS** With Little Or No Fines	SW	Well graded **SANDS**, gravelly **SANDS**
			SP	Poorly graded **SANDS**, gravelly **SANDS**
		SANDS With Over 12% Fines	SM	Silty **SANDS**, poorly graded **SAND-SILT** mixtures
			SC	Clayey **SANDS**, poorly graded **SAND-CLAY** mixtures
FINE GRAINED SOILS Over 50% < #200 sieve	**SILTS & CLAYS** Liquid Limit < 50		ML	Inorganic **SILTS**, silty or clayey fine **SANDS**, or clayey **SILTS** with plasticity
			CL	Inorganic **CLAYS** of low to medium plasticity, gravelly, sandy, or silty **CLAYS**, lean **CLAYS**
			OL	Organic **CLAYS** and organic silty **CLAYS** of low plasticity
	SILTS & CLAYS Liquid Limit > 50		MH	Inorganic **SILTS**, micaceous or diamacious fine sandy or silty soils, elastic **SILTS**
			CH	Inorganic **CLAYS** of high plasticity, fat **CLAYS**
			OH	Organic **CLAYS** of medium to high plasticity, organic **SILTS**
HIGHLY ORGANIC CLAYS			PT	PEAT & other highly organic soils

PLASTICITY CHART

USED FOR CLASSIFICATION OF FINE GRAINED SOILS



SAMPLE DRIVING RECORD

BLOWS PER FOOT	DESCRIPTION
25	25 Blows drove sampler 12 inches, after initial 6 inches of seating
50/7"	50 Blows drove sampler 7 inches, after initial 6 inches of seating
50/3"	50 Blows drove sampler 3 inches during or after initial 6 inches of seating

Note: To avoid damage to sampling tools, driving is limited to 50 blows per 6 inches during or after seating interval.

SOIL GRAIN SIZE

U.S. STANDARD SIEVE	6"		3"	¾"	4	10	40	200		
SOIL	BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY
			COARSE	FINE	COARSE	MEDIUM	FINE		
GRAIN SIZE IN MILLIMETERS	150		75	19	4.75	2.0	.425	0.075	0.002

KEY TO PIT & BORING SYMBOLS

- Standard Penetration test
- 2.5" O.D. Modified California Sampler
- 3" O.D. Modified California Sampler
- Shelby Tube Sampler
- 2.5" Hand Driven Liner
- Bulk Sample
- Water Level At Time Of Drilling
- Water Level After Time Of Drilling
- P Perched Water

KEY TO PIT & BORING SYMBOLS

	Joint
	Foliation
	Water Seepage
NFWE	No Free Water Encountered
FWE	Free Water Encountered
REF	Sampling Refusal
DD	Dry Density (pcf)
MC	Moisture Content (%)
LL	Liquid Limit
PI	Plasticity Index
PP	Pocket Penetrometer
UCC	Unconfined Compression (ASTM D2166)
TVS	Pocket Torvane Shear
EI	Expansion Index (ASTM D4829)
Su	Undrained Shear Strength

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Project No.: E07361.000

October 2007

SOIL CLASSIFICATION CHART & LOG EXPLANATION
Sunrise Boulevard (8220) Senior Care
Citrus Heights, California

FIGURE **A-8**

APPENDIX B

Laboratory Testing

Direct Shear Test
Modified Proctor Test
R-Value Test

Introduction

Our laboratory testing program for this evaluation included numerous visual classifications, Direct Shear, Modified Proctor, Resistance Value tests. The following paragraphs describe our procedures associated with each type of test. Graphical results of certain laboratory tests are enclosed in this appendix. The contents of this appendix shall be integrated with the geotechnical engineering study of which it is a part. They shall not be used in whole or in part as a sole source for information or recommendations regarding the subject site.

Laboratory Testing

Visual Classification Procedures

Visual soil classifications were conducted on all samples in the field and on selected samples in our laboratory. All soils were classified in general accordance with the United Soil Classification System, which includes color, relative moisture content, primary soil type (based on grain size), and any accessory soil types. The resulting soil classifications are presented on the exploration logs in Appendix A.

Soil Strength Determination Procedures

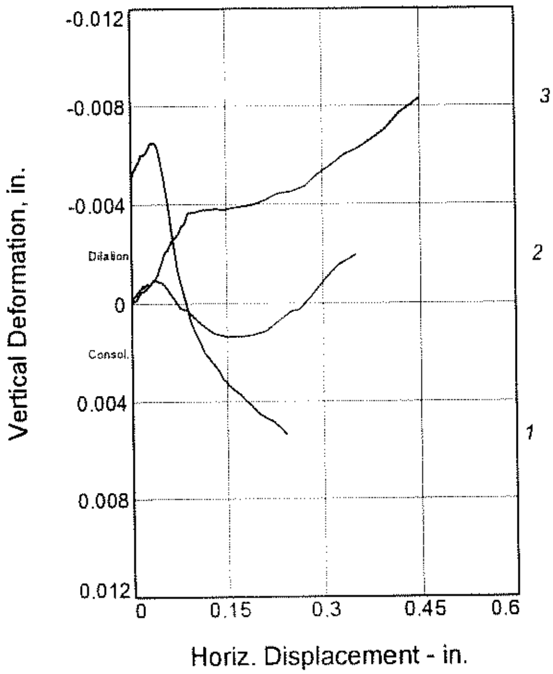
The strength parameters of the foundation soils were based on direct shear tests (ASTM D3080-90) performed on a representative remolded sample of the near-surface soils. The results of this test are presented on Figure B-1, this Appendix.

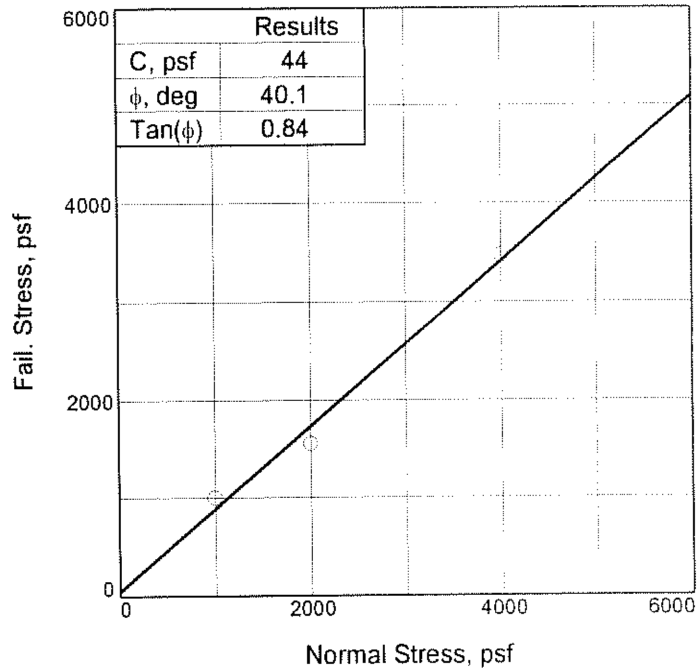
Maximum Dry Density Determination Procedures

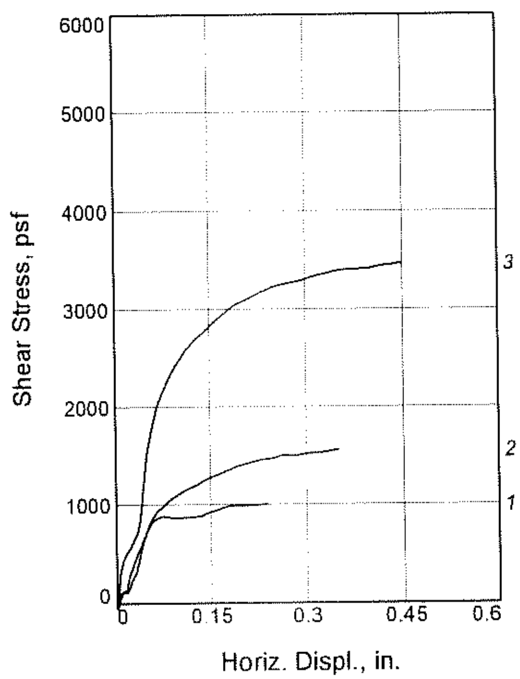
A modified Proctor Test (ASTM D1557-91A) was conducted to provide the optimum moisture and maximum dry density on the near surface material. The results of this test are presented on Figure B-2, this Appendix.

Resistance Value Determination Procedures

R-Value tests (California Test Method 301 - F) were performed to obtain asphalt concrete pavement design parameters. The results of this test are presented on Figure B-3, this Appendix.







	Sample No.	1	2	3
Initial	Water Content, %	9.3	9.3	9.3
	Dry Density, pcf	114.3	114.3	114.3
	Saturation, %	60.4	60.4	60.4
	Void Ratio	0.3925	0.3925	0.3925
	Diameter, in.	2.500	2.500	2.500
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	14.1	12.3	13.2
	Dry Density, pcf	117.0	121.1	118.9
	Saturation, %	99.6	99.5	99.4
	Void Ratio	0.3602	0.3150	0.3387
	Diameter, in.	2.500	2.500	2.500
	Height, in.	0.977	0.944	0.961
	Normal Stress, psf	1000	2000	4000
	Fail. Stress, psf	1003	1552	3471
	Displacement, in.	0.239	0.350	0.446
	Ult. Stress, psf			
	Displacement, in.			
	Strain rate, in./min.	0.003	0.003	0.003

Sample Type: Remold

Description: Brown Silty SAND w/ trace clay

Specific Gravity= 2.55

Remarks: Remolded to 90% of 128.6 pcf

Figure B-1

Client:

Project: Sunrise Blvd (8220)

Source of Sample: Native

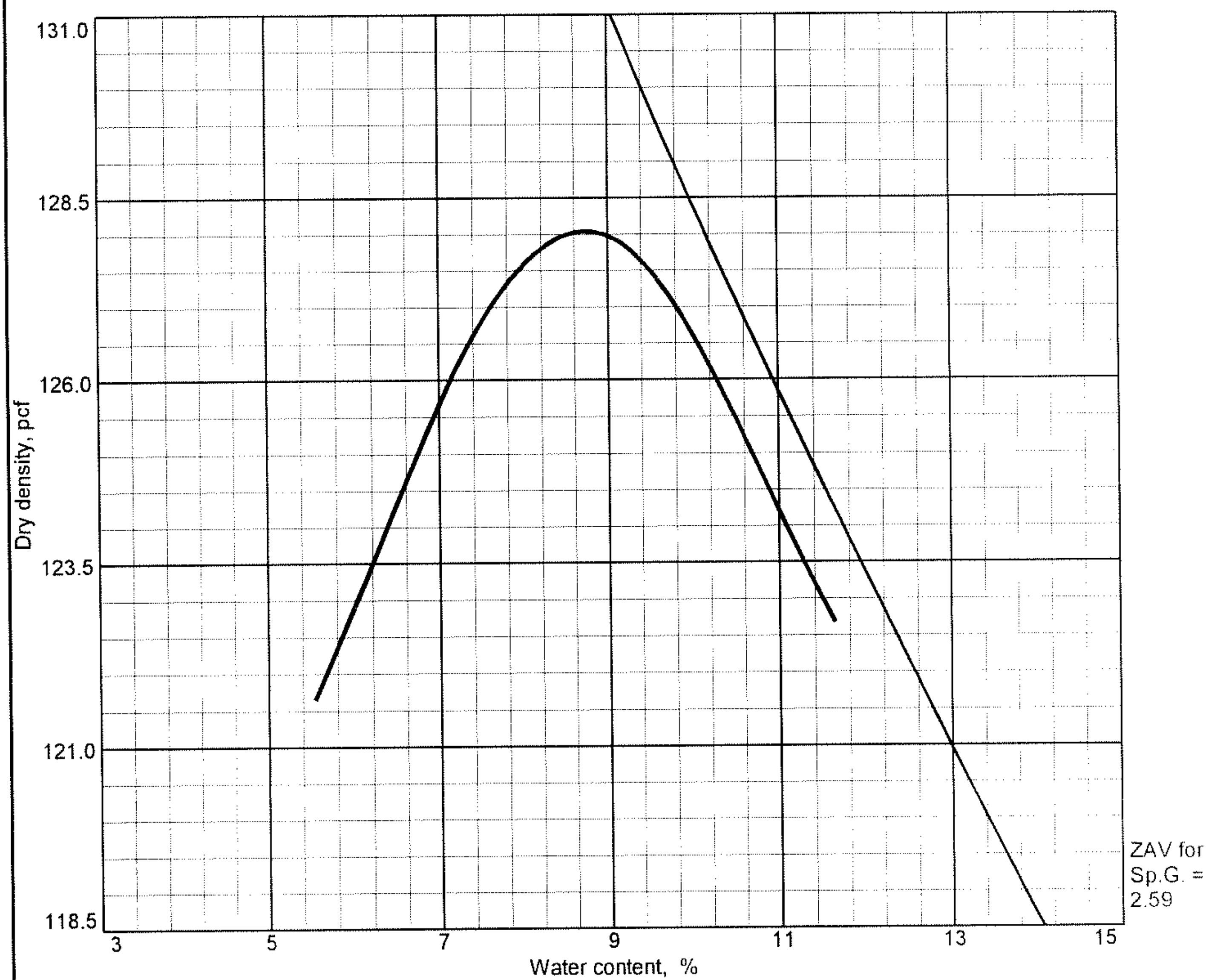
Sample Number: BK-1 and BK-2

Proj. No.: E07361.000 **Date:** 10/11/07

DIRECT SHEAR TEST REPORT

YOUNGDAHL CONSULTING GROUP, INC.

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	SM			2.55				

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 128.0 pcf Optimum moisture = 8.5 %	Brown Silty SAND w/ trace clay

Project No. **Client:**

Project: Sunrise Blvd (8220)

● **Source:** Native **Sample No.:** BK-1 and BK-2

Remarks:

YOUNGDAHL CONSULTING GROUP, INC.

El Dorado Hills, California

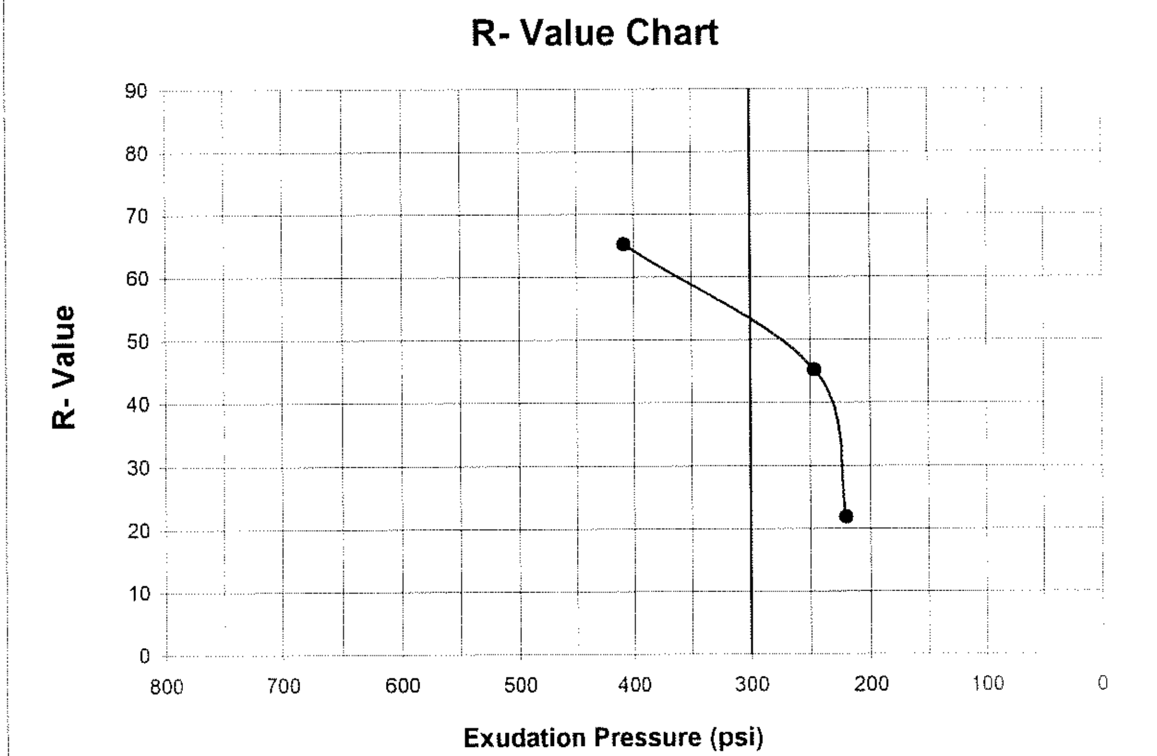
Figure B-2

RESIDENCE VALUE TEST (Cal Test 301, ASTM D2844)

Sample I.D.: BK 3 Depth:

Description: Brown Silty SAND

Test Specimen	E	G	H
Moisture Content (%)	12.0	11.4	10.4
Dry Density (pcf)	123.2	123.5	125.0
Expansion Dial (0.0001")	0	1	4
Expansion Pressure (psf)	0.0	4.3	17.3
Exudation Pressure (psi)	219.6	246.1	408.2
Resistance Value "R"	22	45	65
R Value at 300 psi Exudation Pressure:			**55**



YOUNGDAHL CONSULTING GROUP, INC.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING

Sunrise Blvd (8220) Senior Housing		FIGURE NO
PROJECT NO	DATE	B-3
E07361.000	October 2007	