APPENDIX D-6
GEOTECHNICAL INVESTIGATION SUPPLEMENTAL ANALYSIS
OTAY RANCH RESORT VILLAGE 13 – ALTERNATIVE H

AUGUST 21, 2018

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GEOTECHNICAL INVESTIGATION

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

BALDWIN & SONS, LLC
SAN DIEGO, CALIFORNIA

MOLLER OTAY LAKES INVESTMENT, LLC
% OTAY LAKES LP
CHULA VISTA, CALIFORNIA

AUGUST 21, 2018
PROJECT NO. G1012-52-02

Project No. G1012-52-02
August 21, 2018

Baldwin & Sons, LLC
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Attention: Mr. Stephen Haase

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% Otay Lakes LP
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Attention: Mr. Theodore R. L. Shaw

Subject: GEOTECHNICAL INVESTIGATION
OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

Dear Mr. Haase and Mr. Shaw:

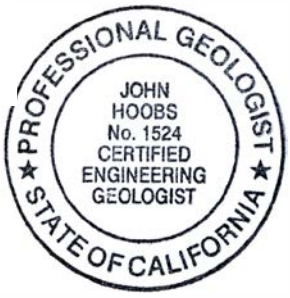
In accordance with your authorization, we herein submit the results of our geotechnical investigation for the subject site. The accompanying report presents our findings, conclusions and recommendations pertaining to the geotechnical aspects of the proposed development. The study also includes an evaluation of the geologic units, geologic hazards, and rock rippability. Based on the results of this study, it is our opinion the site is considered suitable for development provided the recommendations of this report are followed.

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

Very truly yours,

GEOCON INCORPORATED

John Hoobs
CEG 1524



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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed Otay Ranch Resort Village development located in south San Diego County, California (see Vicinity Map, Figure 1). The purpose of the investigation is to evaluate subsurface soil and geologic conditions at the site and, based on the conditions encountered, to provide recommendations pertaining to the geotechnical aspects of developing the property. The proposed development will include the construction of single-family residential neighborhoods, a mixed use residential and commercial use neighborhood, a resort hotel complex with associated ancillary facilities, an elementary school, a site for public safety facilities, open space, Preserve land, park and recreational uses, and roadway and infrastructure improvements. Plans for development are presented on the Geologic Map, Figures 2 through 8 (map pocket). We understand that developed will occur in conjunction with the widening and realignment of Otay Lakes Road located south and west of the property.

The scope of our investigation included geologic mapping, subsurface exploration, laboratory testing, engineering analyses, and the preparation of this report. As a part of our investigation, we have reviewed stereoscopic aerial photographs, published geologic maps, published geologic reports, and previous geotechnical reports related to the property. A summary of the background information reviewed for this study is presented in the *List of References*.

The field investigation performed for the 1,869-acre Otay Ranch Resort Village included geologic mapping and the excavation of 17 large-diameter borings, 48 excavator trenches, 10 small-diameter borings, 71 trackhoe trenches, 22 air track borings, and 18 seismic refraction survey lines. A discussion of the field investigation and logs of the borings, excavator trenches, and trackhoe trenches are presented in Appendix A. Logs of the air-track borings are presented in Appendix B. The results of the seismic refraction surveys prepared by Southwest Geophysics are presented in Appendix C. We also used geologic information from a previous report prepared by Neblett & Associates (2004) as a part of this investigation. The boring and trench logs and seismic survey information prepared by Neblett & Associates are presented in Appendix D. The approximate locations of the exploratory excavations and seismic surveys for Area A are presented on the Geologic Map (Figures 2 through 8). A rippability study on the metavolcanic rock materials based on the exploratory excavations is presented in Appendix E. We performed laboratory tests on soil and rock samples obtained from the exploratory excavations to evaluate pertinent physical and chemical properties for engineering analysis and to evaluate aggregate suitability. The results of the laboratory testing are presented in Appendix F. We performed engineering analyses to evaluate the stability of the proposed slopes. The results of our slope stability analyses are discussed herein and also presented in Appendix G.

Hunsaker & Associates San Diego, Inc. provided the topographic information and proposed grading and development plans used during our field investigation and preparation of the Geologic Map. References to elevations presented in this report are based on the referenced topographic information. Geocon does not practice in the field of land surveying and is not responsible for the accuracy of such topographic information.

2. SITE AND PROJECT DESCRIPTION

The Otay Ranch Resort Village is located north of Lower Otay Lake in south San Diego County. The site is located within the Proctor Valley Parcel of the County's Otay Subregional Plan, Volume 2 (Otay SRP), and is approximately one-mile east of the City of Chula Vista. Access is provided via Telegraph Canyon Road, which transitions into Otay Lakes Road and forms the southern boundary of the Project site.

The Otay Ranch Resort Village planning area is approximately 1,869-acres consisting of a broad mesa sloping to the south, broken by several steep canyons draining southward. Portions of the gently sloping mesa extend north into the Jamul Mountains, becoming part of steeper slopes. Site elevations within the area of development range from approximately 520 feet above mean sea level (MSL) at the southwestern end of the site to approximately 855 feet MSL in the northeastern portion. Additionally, a water tank is proposed at an elevation of 950 feet MSL. The project area lies within the watershed of the Otay River, a westerly flowing stream that drains an area of approximately 145 square miles. The site is upstream of Savage Dam, which creates Lower Otay Lake. Site vegetation consists of native coastal sage scrub and grassland habitats disturbed by grazing. Some riparian vegetation occurs in the drainage areas of the site.

The Otay Ranch Resort Village is located at the interface of urban development and scenic open space. The Otay Valley Parcel of Otay Ranch, the Eastlake Vistas residential community, the Eastlake Woods residential community, and the U.S. Olympic Training Center compose the edge of urban development to the west. Lower Otay Lake, a recreational reservoir and water supply owned by the City of San Diego, is located to the southwest. Upper Otay Lake and the Birch Family Estate are located to the northwest. A temporary ultra-light gliding and parachuting airport is located at the eastern end of Lower Otay Lake. An inactive quarry operation is located further to the east.

The land uses proposed by Otay Ranch Resort Village Alternative H consist of single-family residential neighborhoods, a site for public safety facilities, a school site, park and recreational uses, a resort site, open space, and Preserve land. The proposed Alternative H plan includes nine single-family neighborhoods with lot sizes ranging from 4,250 square feet to over 6,800 square feet. The proposed Alternative H reserves a 2.3-acre public safety site and a community homeowner facility of 3.1 acres, which includes meeting space and fitness center, recreation courts, a swimming pool and picnic areas. Six parks are planned on a total of 25.1 acres, ranging from 1.5 to 10.4 acres along with

a 10.3-acre resort site and a 10.1-acre elementary school site. A mixed-use area of approximately 6.7 acres includes 57 multi-family dwelling units and up to 20,000 square feet of neighborhood serving commercial/retail space. Alternative H would convey 1,107 acres to the Otay Ranch RMP Preserve and 69.3 acres of additional habitat land would be dedicated to Conservation Open Space. Additionally, 76.5 acres would be used for manufactured open space, which consists of homeowner association maintained manufactured slopes, water basin lots, and fuel management zones. Other land uses include 32.3 acres for internal circulation. Preserve land is usually undisturbed lands or restored habitats set aside for dedication to the Otay Ranch Preserve Owner Manager in satisfaction of Otay Ranch RMP conveyance requirements.

Grading will consist of maximum cuts and fills of approximately 70 and 105 feet, respectively, with cut and fill slopes having a maximum height of 75 and 115 feet, respectively, with a maximum slope inclination of 2:1 (horizontal to vertical). Cut slopes located along the northern perimeter of the project excavated within metavolcanic rock will have slope inclinations of 1.5:1 (horizontal to vertical) with a maximum height of about 65 feet. The proposed grading will require approximately 13.2 million cubic yards of excavation and potentially 2.5 million cubic yards of remedial grading. Six water quality basins will also be constructed on the north side of Otay Lakes Road. The geotechnical recommendations for the widening and realignment of Otay Lakes Road is provided in a separate report (see List of References).

The locations and descriptions provided herein are based on a site reconnaissance, and review of the grading plans and project information provided by the client and Hunsaker & Associates, San Diego.

3. GEOLOGIC SETTING

The site is located in the coastal plain of the Peninsular Ranges province of southern California. The Peninsular Ranges is a geologic and geomorphic province that extends from the Imperial Valley to the Pacific Ocean and from the Transverse Ranges to the north and into Baja California to the south. Crystalline basement rocks exist along the western side of the Peninsular Ranges and are dominated by pre-batholithic andesitic Metavolcanic Rock previously known as the Santiago Peak Volcanics with a late Jurassic and early Cretaceous age. The Metavolcanic Rock was intruded during the early to mid-Cretaceous by a variety of granitic to gabbroic plutons of the Southern California batholith. The coastal plain of San Diego County is underlain by a thick sequence of relatively undisturbed and non-conformable sedimentary rocks that range in age from Upper Cretaceous through the Pleistocene with intermittent deposition. In places, the outliers of metavolcanic and granitic rock protrude through the Tertiary sedimentary sequence to form resistant isolated hills. Geomorphically, the coastal plain is characterized by a stair stepped series of marine terraces which young to the west and have been dissected by west flowing rivers that drain the Peninsular Ranges to the east. The coastal plain is a relatively stable block that is dissected by relatively few faults consisting of the potentially active La Nacion Fault zone and the active Rose Canyon Fault Zone. The Peninsular Ranges is also

dissected by the Elsinore Fault zone that is associated with and sub-parallel to the San Andreas Fault zone, which is the plate boundary between the Pacific and North American Plates.

The site is located on the eastern edge of the coastal plain and is in contact with the Metavolcanic Rock of the Jamul Mountains. The Metavolcanic Rock makes up the northern, western and eastern portions of the site. Marine sedimentary units unconformably overlie the Metavolcanic Rock, make up the southern portions of the site, and consist of the Tertiary age Otay Formation and late Tertiary to Pleistocene age Fanglomerate Deposits. The Otay Formation typically consists of three lithostratagraphic members composed of a basal conglomerate member, a middle gritstone member and an upper sandstone-claystone member with a maximum reported regional thickness of roughly 400 feet. The thickness of the Otay Formation varies at the site as it is underlain by the Metavolcanic Rock but generally increases to the south. The Fanglomerate Deposits consist of conglomeratic sandstone that provides a resistant cap on the more gently sloping areas of the site. The site was dissected by a series of south trending canyons that have locally exposed the Otay Formation on the steeper sloping areas and along the sides of the canyon drainages.

4. GEOLOGIC MATERIALS

4.1 General

During our field investigation, we encountered six surficial deposits, consisting of undocumented fill, topsoil, lacustrine deposits, alluvium, colluvium and older alluvium. Three geologic formations exist at the site consisting of Late Tertiary- to Pleistocene-age Fanglomerate Deposits, Tertiary-age Otay Formation, and the Jurassic- to Cretaceous-age Metavolcanic Rock. The lateral extent of the materials encountered is shown on the Geologic Map, Figures 2 through 8 (map pocket). Figures 9 and 10 (map pocket) present Geologic Cross-Sections providing an interpretation of the subsurface geologic conditions. The descriptions of the soil and geologic conditions are shown on the boring and trench logs located in Appendix A and described herein in order of increasing age.

4.2 Undocumented Fill (Qudf)

Undocumented fill has been placed at several locations across the site within canyon drainages for the construction of water impoundments used in previous cattle grazing operations. In general, the fill consists of loose, slightly moist to moist, silt and sand with rock fragments and cobbles. In its present condition, the fill soil is not suitable for support of additional fill or structures and remedial grading will be necessary. However, the fill is generally suitable for reuse as compacted fill, provided it is substantially free of organics and debris.

4.3 Topsoil (unmapped)

Holocene-age topsoil is present as a relatively thin veneer locally overlying formational materials across the site. The topsoil has an average thickness of approximately 3 feet and can be characterized as soft to stiff and loose to medium dense, dry to damp, dark brown, sandy clay to clayey sand with gravel and cobble. The topsoil is typically expansive and compressible. Removal of the topsoil will be necessary in areas to support proposed fill or structures. Due to the relatively thin thickness and discontinuity of these deposits, topsoil is not shown on the Geologic Map.

4.4 Lacustrine Deposits (Ql)

Lacustrine Deposits underlie the areas of the Upper and Lower Otay Lakes and the canyon drainage between the two lakes. These sediments, derived from the surrounding landforms, were deposited at the bottom or adjacent to the existing lakes. This soil is typically saturated and difficult to excavate for reuse as fill soil. We do not expect Lacustrine Deposits to be encountered during grading of the site since it is generally located south of Otay lakes Road or within the connecting drainage with Upper Otay Lake, outside of the planned grading areas.

4.5 Alluvium (Qal)

Holocene-age alluvium is sheet-flow or stream deposited material found within the canyon drainages and generally vary in thickness dependent upon the size of the canyon and extent of the drainage area. The alluvium within the canyon drainages is loose to medium dense and can become saturated and difficult to excavate during the rainy season. The thickness of the alluvium encountered in our exploratory excavations and in previous trenches excavated by Neblett & Associates (2004) ranged up to approximately 10 feet and may be thicker in the larger canyon drainages. Due to the relatively unconsolidated nature of these deposits, remedial grading will be necessary in areas to receive proposed fill or structures.

4.6 Colluvium (unmapped)

Holocene-age colluvium, derived from weathering of the underlying bedrock materials at higher elevations and deposited by gravity and sheet-flow, is locally present on the side slopes of canyon drainages. The colluvium can be characterized as sandy clay and clayey sand with varying amounts of gravel and cobble. The thickness of colluvium generally ranges from approximately 2 to 7 feet, but can be thicker along the lower portions of canyons and toes of natural slopes. Due to the relatively thin thickness and discontinuity of these deposits, the colluvium is not shown on the Geologic Map. Remedial grading of the colluvium will be required in areas that will support proposed fill or structures.

4.7 Older Alluvium (Qoal)

Pleistocene-age older alluvium is located south of the roadway along a portion of the eastern limits of the project. This unit typically consists of dark to reddish brown, dense, slightly cemented, clayey sand and sandy clay with some gravel and cobble. This unit will not be encountered during site grading and we do not expect that remedial grading of the unit would be required.

4.8 Fanglomerate Deposits (Tof)

Late Tertiary- to Pleistocene-age Fanglomerate Deposits are located throughout the site and provide a resistant cap on the more gently sloping areas with an estimated maximum thickness of up to 20 to 25 feet. This unit typically consists of dense to very dense, moderately cemented, clayey to silty sandstone and occasional sandy claystone with cobbles and boulders. Subrounded to subangular cobbles and boulders up to 40 percent and generally up to 2 feet in diameter are present within the formation. We expect excavations within this unit will be very difficult and require specialized heavy-duty grading equipment and oversized cemented boulders will likely be generated during grading operations. The Fanglomerate Deposits are generally suitable for the support of proposed fill and structural loads and they are generally stable when excavated to construct cut slopes. However, this unit will not be suitable for capping lots and streets without screening of the oversize cobble and boulders.

4.9 Otay Formation (To)

Tertiary-age Otay Formation is located along most of the southern portion of the site on the steeper sloping areas and along the side slopes of canyon drainages. This unit consists of dense to very dense and hard, slightly and moderately cemented, clayey sandstone and sandy claystone with interbeds of gravel, cobble, and boulders up to 30 percent and generally with a maximum dimension of 2½ feet. In addition, localized and discontinuous layers of sheared claystone bedding are present within this unit that can create slope instability. Excavations within the unit will generally be possible with heavy-duty grading equipment with moderate to heavy effort; however, moderately cemented zones will create very difficult ripping and generate oversize cemented boulders. The Otay Formation is suitable for the support of proposed fill and structural loads. However, the cobble and boulder layers will not be suitable for capping lots and streets without screening the oversize material. The sandstone portions of this unit are generally stable when excavated to construct cut slopes. The sheared claystone layers may require slope stabilization in cut slopes, if encountered during grading operations. Slope drains may be necessary to intercept potential seepage on cut slopes created by landscape irrigation.

4.10 Metavolcanic Rock (KJmv)

Metavolcanic Rock is present on the northern, northwestern and northeastern portions of the site and is generally moderately strong to strong, highly to slightly weathered, and jointed. Highly weathered portions of the Metavolcanic Rock consist of highly expansive clay and soft rock. The highly weathered portion is generally rippable to shallow depths with heavy-duty grading equipment. The majority of this unit is moderately to slightly weathered and will generally be unrippable. Blasting will be required to excavate the rock and will generate oversize material. The Metavolcanic rock is generally suitable for the support of proposed fill and structural loads; however, the intensely weathered clayey upper portions of this unit will require remedial grading. This unit is not suitable to cap streets and lots unless properly crushed. The Metavolcanic Rock is considered stable for construction of the proposed cut slopes if free of loose rock after blasting and excavation. Areas of rock fall mitigation of adjacent open space areas will be required as discussed in the *Rock Fall Hazard* section of the report.

5. GEOLOGIC STRUCTURE

The geologic structure within the sedimentary units at the site is characterized by a gentle southwesterly dip. The contact between the sedimentary units and the underlying metavolcanic rock generally slopes down to the west and south.

The geologic structure within the portions of the metavolcanic rock not subject to intense weathering is characterized as a hard rock mass displaying a relatively consistent, northwest-southeast trending foliation with dips generally ranging between 70 and 82 degrees to the southwest and 78 to 86 degrees to the northeast. The dominant structural feature within the rock mass is jointing. Joints are surfaces, fractures or partings within a rock mass that do not show evidence of displacement. Jointing within the rock mass formed because of regional tectonic stresses and joints generally have dips between 70 and 88 degrees. The joints are generally tight or filled with precipitated clay minerals and are typically 1 to 3 feet apart. The orientations of geologic structure are presented on the Geologic Map, Figures 2 through 8.

Structural orientations within the Metavolcanic Rock suggest several dominant joint sets with attitudes conducive to block or toppling failures if exposed along cut slopes. Geologic structure within the hard rock units is highly variable and should be evaluated for each proposed cut slope individually during grading operations. We used structural data obtained during our field exploration, structural data presented by Neblett & Associates (2004), and structural orientations mapped by the California Geologic Survey (2002) for the kinematic slope stability analysis presented herein.

6. GROUNDWATER

We did not encounter a static groundwater table in the exploratory excavations performed for this study. However, we did encounter seepage conditions within localized layers of the formational units and surficial deposits especially during the rainy season. It is common for seepage conditions to develop where none previously existed due to the permeability characteristics of the geologic units encountered. During the rainy season, perched water conditions are likely to develop within the drainage areas that may require special consideration during grading operations. Groundwater elevations are dependent on seasonal precipitation, irrigation, and land use, among other factors, and vary as a result.

7. GEOLOGIC HAZARDS

7.1 Seismic Hazard Analysis

We opine the site is not located on any known active, potentially active, or inactive fault traces based on a review of published geologic maps and reports. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,000 years. The site is not located within a State of California Earthquake Special Study Zone.

According to the computer program *EZ-FRISK (Version 7.65),* six known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the Newport-Inglewood and Rose Canyon Fault Zones, located approximately 14 miles west of the site, are the nearest known active faults and are the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood and Rose Canyon Fault Zones or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood Fault are 7.5 and 0.20g, respectively. Table 7.1.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relation to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 acceleration-attenuation relationships.

TABLE 7.1.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
Newport-Inglewood	14	7.5	0.20	0.16	0.19
Rose Canyon	14	6.9	0.19	0.13	0.18
Coronado Bank	23	7.4	0.14	0.10	0.12
Palos Verde Connected	23	7.7	0.16	0.11	0.14
Elsinore	36	7.85	0.12	0.09	0.11
Earthquake Valley	40	6.8	0.07	0.05	0.04

In the event of a major earthquake on the referenced faults or other significant faults in the southern California and northern Baja California area, the site could be subjected to moderate to severe ground shaking. With respect to this hazard, the site is considered comparable to others in the general vicinity.

We performed a site-specific probabilistic seismic hazard analysis using the computer program *EZ-FRISK*. Geologic parameters not addressed in the deterministic analysis are included in this analysis. The program operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 7.1.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedance.

TABLE 7.1.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedance	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2007 (g)
2% in a 50 Year Period	0.32	0.32	0.35
5% in a 50 Year Period	0.23	0.23	0.24
10% in a 50 Year Period	0.17	0.17	0.17

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be performed in accordance with the 2016 California Building Code (CBC) guidelines currently adopted by the County of San Diego.

7.2 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless, static groundwater is encountered within 50 feet of the surface, and soil relative densities are less than about 70 percent. If the four previous criteria are met, a seismic event could result in a rapid pore-water pressure increase from the earthquake-generated ground accelerations. Seismically induced settlement may occur whether the potential for liquefaction exists or not. The potential for liquefaction and seismically induced settlement occurring within the site soil is considered to be very low due to the dense nature of proposed fill and the very dense nature of the formational materials.

7.3 Expansive Soil

The majority of the geologic units will likely possess a “very low” to “medium” expansion potential (expansion index [EI] of 90 or less). However, some of the geologic units may contain a “high” expansive potential (EI of 91 to 130). These units can include topsoil, colluvium, alluvium, and the claystone beds within the Otay Formation, Fanglomerate Deposits, and the highly weathered Metavolcanic Rock. We expect the proposed grading will expose claystone within cut slopes and near finish grade within lots and public rights-of-ways. Consequently, undercutting of lots, and street, curb and gutter, and sidewalk subgrade will be required where highly expansive clay is exposed or located near grade. Stability fills may also be required if sheared claystone beds are exposed in cut slopes.

7.4 Landslides

Examination of stereoscopic aerial photographs in our files, our geologic reconnaissance, and review of available geotechnical and geologic reports for the site vicinity indicate that landslides are not present at the property or at a location that could affect the site. The California Geologic Survey geologic map for the Jamul Mountain Quadrangle indicates a landslide roughly 3,000 feet to the north of the proposed development. We do not consider landsliding to be a geologic hazard to the project.

7.5 Rock Fall Hazard

Due to the steep terrain and localized areas of large boulder outcrops in the northern and eastern portions of the property, the potential hazard for future rock fall is a consideration for development. The natural slopes were evaluated for their potential rock fall impact to proposed development by performing detailed field mapping of the rock slopes. The purpose of the mapping was to categorize the risk of rock fall by assigning a risk factor of low, medium or high to the existing slopes. A low risk is defined as having no potential impact to proposed development and mitigation will not be required. A medium risk is defined as having some potential impact to proposed development and mitigation may be required. A high risk is an area that rock fall is eminent and significant mitigation will be required. The site has been classified as having both a low and medium risk. We did not observe areas that would be classified as having a high risk. A Rock Fall Hazard Map has been provided on Figure 11. The map indicates areas of development that encroach into the medium risk rock fall areas. Based on our experience with rock fall potential, mitigation measures will be required along portions of the edge of grading when cut slopes or daylight cuts encroach within the medium risk zone. Mitigation measures will not be required when fill slopes are constructed at the edge of grading that encroach into the medium risk zone as the fill slope provides a manufactured mitigation barrier to the adjacent development. The areas of potential rock fall mitigation have been plotted on the Geologic Map, Figures 2 through 8. The areas are located on the northwestern and eastern portions of the site. The mitigation may consist of the construction of a rock fall debris fence or other acceptable catchment devise at the toe of proposed cut slopes or at the edge of daylight cut or fill areas. The hard rock slopes should be evaluated by an engineering geologist during site development and final locations of the debris fences or alternative method can be provided at that time. Based upon the available information including detailed field mapping of the rock slopes and the mitigation measures suggested and included on the Geologic Map (Figures 2 through 8), it is our professional opinion that the potential risk for rockfall hazards to impact the proposed development would be less than significant once mitigation measures are implemented. With mitigation measures incorporated per our recommendations, the proposed development would be considered safe for human occupancy.

7.6 Slope Stability

We evaluated the proposed slope configurations, as depicted on the Geologic Map, to evaluate both surficial and global stability based on the current geologic information. The portions of the site

planned for development are generally underlain by Quaternary-age surficial soil, Tertiary-age Otay Formation and Fanglomerate Deposits, and Jurassic- to Cretaceous-age Metavolcanic Rock. The unit most likely to be subject to slope instability is the claystone portion of the Otay Formation encountered at several locations throughout the site. The stability of graded slopes composed of Metavolcanic Rock is highly dependent on the degree of weathering and the geologic structure of the slope face. Slope stability analyses using the two-dimensional computer program *GeoStudio2007* created by Geo-Slope International Ltd. are presented in Appendix G. The proposed slopes should be stable from shallow sloughing conditions provided the recommendations for grading and drainage are incorporated into the design and construction of the proposed slopes.

In general, it is our opinion that permanent, graded fill slopes or cut slopes excavated within the sedimentary formational materials at the site with gradients of 2:1 (horizontal to vertical) or flatter would possess Factors of Safety of 1.5 or greater. However, stability fill construction may be required during grading operations if claystone beds are encountered on proposed cut slopes. The majority of rock cut slopes should be comprised of *good quality* (Hoek and Bray, 1981), moderately strong to very strong Metavolcanic Rock. Based on the results of our slope stability analyses, slopes composed of moderately to slightly weathered rock should possess Factors of Safety of 1.5 or greater against large-scale, deep-seated slope failures at their present and proposed slope inclinations. Graded slopes in metavolcanic rock should possess Factors of Safety of 1.5 or greater at an inclination of 1.5:1 (horizontal to vertical) or flatter.

We performed kinematic analyses of the proposed 1.5:1 (horizontal to vertical) rock cut slopes along a representative geologic cross-section using structural data obtained during our field exploration, structural data presented by Neblett & Associates (2004), and structural orientations mapped by the California Geologic Survey (2002). The purpose of a kinematic analysis is to evaluate the critical discontinuities within a rock mass that may result in failures of the rock slope based on geologic structure and slope geometry. We used the computer program Rockpack III (2003) to create a stereonet of the dip vectors (dips and dip directions) of the discontinuities within the rock mass. Based on the results of the stereonet analysis, we performed Markland's Tests for kinematically possible failures on the data set. The resulting kinematic stereonet with the Markland's Test results are presented in Figure 12. An angle of internal friction of 20 degrees was used for the Markland's Tests based on parameters for gouge-filled shears (Afrouz, 1992). The Markland's Test results indicate that localized minor hazards due to wedge and toppling failures may exist along portions of the proposed slopes where discontinuities intersect the slope face. The majority of cut slopes within moderately strong to very strong metavolcanic rock should not be subject to localized failures at the proposed slope inclinations. In areas where loose or potentially hazardous rock is encountered during grading, the loose material should be scaled off the slope face to mitigate the hazard.

Because of the potential presence of adverse geologic structures, the geologic structure of permanent cut slopes composed of Metavolcanic Rock should be analyzed in detail by an engineering geologist during the grading operations. Additional recommendations for slope stabilization may be necessary if adverse geologic structure is encountered. Grading of cut and fill slopes and intermediate terrace benching should be designed in accordance with the requirements of the local building codes or the 2016 California Building Code (CBC). Mitigation of unstable cut slopes is achieved by the use of drained stability fills and rock slope stabilization measures such as rock bolting, or rockfall protection systems.

Some accumulation of cobbles and rock should be expected at the base of slopes that possess oversize material. These areas may require routine maintenance to remove the accumulated rock.

7.7 Tsunamis and Seiches

A tsunami is a series of long period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The first order driving force for locally generated tsunamis offshore southern California is expected to be tectonic deformation from large earthquakes (Legg, *et al.,* 2002). The County of San Diego Hazard Mitigation Plan (2004) maps zones of high risk for tsunami run-up for coastal areas throughout the county. The site is not included within one of these high-risk hazard areas. The site is approximately 11 miles from the Pacific Coast and ranges between approximately 500 feet and 900 feet above MSL. Therefore, we consider the risk associated with tsunamis to be negligible.

A seiche is a run-up of water within a lake or embayment triggered by fault- or landslide-induced ground displacement. The lowest elevation at the site proposed for development is located up-gradient from the reservoirs and is at least 30 feet higher than the reservoir water level. It is our opinion that the proposed site elevations are sufficient to mitigate the risk. Therefore, the potential of seiches affecting the site is considered very low.

7.8 Dam Failure Inundation

According to the County of San Diego Hazard Mitigation Plan (2004), the site is located nearly 2 miles upstream from the nearest dam considered to have a “high” relative hazard rating because of the location of the Savage Dam at the Lower Otay Reservoir. A dam is considered to have a high hazard if it stores more than 1,000 acre-feet of water, is higher than 150 feet tall, has a potential for downstream property damage, and potential for downstream evacuation. We consider the risk to the site from dam failure inundation to be negligible.

8. ROCK RIPPABILITY

8.1 Seismic Refraction Surveys

Southwest Geophysics performed a seismic refraction survey to evaluate the rippability of the Metavolcanic Rock along 18 seismic lines. The locations of the seismic traverses are presented on the Geologic Map, Figures 2 through 8 and the report is presented in Appendix C. Neblett & Associates previously performed 17 seismic surveys as part of a prior investigation for the property. The results of their previous seismic surveys are presented in Appendix D.

Based on our experience, we have summarized the estimated rippability characteristics for various excavation methods related to seismic velocity in Table 8.1. Estimates for mass grading rippability are based on using a D-9 Caterpillar Tractor equipped with a single shank hydraulic ripper. Estimates for trenching rippability are based on using a Caterpillar 345 excavator. It is often found to be more cost effective to blast marginally rippable rock.

TABLE 8.1
SUMMARY OF ESTIMATED RIPPABILITY FROM SEISMIC REFRACTION

Excavation Method	Seismic Velocity (ft/s)	Estimated Rippability
Mass Grading	Less than 4,000	Rippable
Mass Grading	4,000 to 5,500	Marginal Ripping (Possible Blasting)
Mass Grading	Greater than 5,500	Non-Rippable (Pre-Blasting Required)
Trenching	Less than 3,500	Rippable
Trenching	3,500 to 4,000	Marginal Ripping
Trenching	Greater than 4,000	Non-Rippable

The results of the seismic refraction surveys indicate that velocities less than approximately 3,000 ft/s are likely associated with surficial soil and highly weathered rock. Velocities between 3,000 and 5,000 ft/s are likely associated with sedimentary units and moderately weathered rock. Velocities between 5,000 and 7,000 ft/s are likely associated with slightly weathered rock, with higher velocities associated with unweathered rock. Rippability is highly dependent upon the degree of weathering, fracturing, and jointing within the rock mass and the rippability of the various soil and rock units is, correspondingly, variable. Appendix E presents a summary of the seismic refraction surveys with rippable and non-rippable depths estimated using approximately 5,500 ft/s as a cut-off between rippable (includes marginally rippable) and non-rippable for the Metavolcanic Rock during grading operations.

8.2 Air-Track Borings

The scope of our services included drilling hydraulic rotary percussion borings (generically referenced herein as air-track borings) in the areas where significant excavations within rock are proposed. In addition, air-track borings were used to assist in delineating the subsurface contact between the Metavolcanic Rock and the overlying Fanglomerate Deposits containing rock clasts. The borings were advanced using an ECM-370 drill rig equipped with a 4-inch drill bit. A total of 22 borings were drilled during this study and 10 air track borings were previously drilled during the exploration by Neblett & Associates (2004). The Air-Track Boring Logs performed by Geocon Incorporated and Neblett & Associates are presented in Appendices B and D, respectively. The approximate locations of the air-track borings are shown on the Geologic Map, Figures 2 through 8 (map pocket). Air-track drill penetration rates can be used to aid in evaluating rock rippability and to estimate the depth at which excavation difficulty will occur. Table 8.2 presents a summary of the estimated rippability of rock based on air-track drill penetration rates as well as developed from our experience with grading operations in rock materials. These general guidelines are typically based on drill rates using a hydraulic rotary percussion drill rig similar to an IR-360 with a 3.5-inch drill bit and a Caterpillar D-9 (or equivalent) bulldozer.

TABLE 8.2
SUMMARY OF ESTIMATED RIPPABILITY FROM AIR-TRACK BORINGS

Drill Penetration Rate (seconds/foot)	Estimated Rippability
0 to 20	Rippable
20 to 30	Marginal Ripping (Possible Blasting)
Greater than 30	Non-Rippable (Blasting Likely)

The penetration rates (recorded in seconds per foot) for each air track boring are presented in Appendix B, Figures B-1 through B-22. The geologic material(s) encountered and the estimated thickness of rippable material for each air-track boring in rock using 20 seconds per foot as the boundary between rippable and non-rippable rock is presented on Table E-I in Appendix E and on the Geologic Map, Figures 2 through 8. The estimate is derived from a literal interpretation of the penetration rate from each air-track boring. Prospective contractors formulating construction cost estimates should consider their experience with productive and non-productive ripping when evaluating the penetration rate boundary between rippable and non-rippable rock.

8.3 Rippability of Fanglomerate Deposits

We excavated exploratory trenches and air track borings, and performed seismic traverses in proposed cut areas to evaluate this units rippability characteristics. In general, the Fanglomerate Deposits are rippable to the proposed cut depths; however, the presence of large boulders and strong

cementation may require the use of specialized rock-breaking equipment and will likely generate oversize material. We encountered refusal during our investigation using a Komatsu PC 400 excavator when excavations extended to depths ranging up to 18 feet into the Fanglomerate Deposits as shown on the excavator trench logs and in several large diameter borings and trackhoe trenches (see Appendix A).

8.4 Rippability of Metavolcanic Rock

We excavated exploratory trenches and air track borings, and performed seismic traverses in the Metavolcanic Rock unit (KJmv), located generally in proposed cut areas, to evaluate rock rippability characteristics. The rippability of this rock unit is variable, and is generally limited to the depth of the weathered mantle. Proposed excavations within the Metamorphic Rock will require very difficult ripping and blasting as excavations extend beyond the rippable weathered mantle. Based on an air-track penetration rate of 20 spf and seismic shear wave velocities of 5,500 ft/s, we estimate the thickness of the rippable rock mantle to vary between 1 foot to 26 feet. Estimates for the rippable depth at each of the exploratory excavation and seismic line locations, or an average if multiple data was obtained, within the Metavolcanic Rock are presented on Table E-I in Appendix E and on the Geologic Map, Figures 2 through 8.

Heavy ripping and/or blasting should also be expected in areas of concentrated surface rock outcroppings. Estimates of the expected volume of hard rock materials generated from proposed excavations should be evaluated based on the information from each air-track boring and drill penetration rate criteria acceptable to the contractor. Roadway/utility corridor and lot undercutting criteria should also be considered when calculating the volume of hard rock. Proposed cuts in hard rock areas can be expected to generate oversized fragments (rocks greater than 12 inches in dimension) which will necessitate typical rock handling and placement procedures during grading operations. The grading contractor may want to perform an additional investigation to observe the rippability characteristics for estimating purposes.

8.5 Capping Material

Capping material refers to select material placed within 3 feet from building pad grade, 8 feet from roadway grade, and to at least 2 feet below the deepest utility within roadways. The capping material should consist of “soil” fill with an approximate maximum particle dimension of 6 inches with a minimum of 40 percent soil passing the ¾-inch sieve. In addition, the upper 3 feet of pad grade should have at least 20 percent of the soil passing the No. 4 screen. In general, capping material can be readily obtained from localized areas within the surficial units and from the sandstone layers of the Otay Formation. Screening will be necessary to remove cobbles and boulders larger than 6 inches in diameter within the cobbly portions of the surficial units, the Otay Formation, and within the Fanglomerate Deposits. High expansive material derived from the claystone portions of the Otay

Formation and Fanglomerate Deposits and the highly weathered clay of the Metavolcanic Rock should not be used as capping material. The availability of capping material easily obtained from the Metavolcanic Rock is considerably less and screening and crushing operations will likely be necessary to generate capping material within this unit. Estimates for the thicknesses of capping material at each of the exploratory excavation and seismic line locations within the Metavolcanic Rock are presented in Appendix E and on the Geologic Map, Figures 2 through 8. It may be cost effective to over excavate the proposed cut and fill areas within the sandstone portions of the Otay Formation to generate capping material and to provide additional areas for disposal of oversize rock material.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 General

9.1.1 We did not encounter soil or geologic conditions during the investigation that would preclude the proposed development of the Otay Ranch Resort Village project provided the recommendations presented herein are followed and implemented during design and construction.

9.1.2 Potential geologic hazards at the site include rock fall, seismic shaking, and expansive and compressible soil. Based on our investigation and available geologic information, active or potentially active faults are not present underlying or trending toward the site.

9.1.3 The existing onsite surficial soil units including undocumented fill, topsoil, colluvium, alluvium, and highly weathered formational materials are potentially compressible and unsuitable in their present condition for the support of compacted fill or settlement-sensitive improvements. Remedial grading of the surficial soil and highly weathered formational materials will be required and recommendations for remedial grading are provided herein. The rock units and dense portions of the Otay Formation and Fanglomerate Deposits are suitable for the support of proposed fill and structural loads.

9.1.4 We did not encounter groundwater during our subsurface exploration and we do not expect it to be a constraint to project development. However, seepage within formational materials and perched groundwater conditions within the canyon drainages may be encountered during the grading operations, especially during the rainy seasons.

9.1.5 The rippability of the surficial units is expected to range from easy to moderate. We expect the Otay Formation and Fanglomerate Deposits to be rippable with moderate to heavy effort to proposed finish grades. Cobbles, boulders, and cemented zones should be expected within portions of the Otay Formation and Fanglomerate Deposits. These will generate oversized material during grading, and screening and crushing should be expected if used as capping material. The rippability of the Metavolcanic Rock is variable and ranges between moderate to very difficult with refusal expected. Rock breaking and blasting should be expected during grading within the Metavolcanic Rock.

9.1.6 In general, cut slopes composed of Otay Formation and/or Fanglomerate Deposits should possess Factors of Safety at least 1.5 at inclinations of 2:1 (horizontal to vertical), or flatter. Cut slopes composed of metavolcanic rock should possess Factors of Safety greater than 1.5 at inclinations of 1.5:1 (horizontal to vertical), or flatter. The geologic structure of cut

slopes composed of hard rock should be evaluated during grading operations by the geotechnical consultant.

9.1.7 Proposed cut slopes that expose sheared claystone within the formational units may require slope stabilization. Recommendations for stabilization of potentially unstable slopes consisting of stability fills are discussed herein.

9.1.8 The proposed structures and site retaining walls may be supported on conventional foundations bearing in either competent formational materials or properly compacted fill. We expect the building pads will be undercut and replaced with compacted fill to help with the excavation of planned foundations and utilities. Transitioning foundations and slabs from bedrock to compacted fill should not occur. Where fill is utilized for foundation support, the foundation system for the entire structure should be underlain by properly compacted fill. Bedrock over-excavations will be required where engineered fill is utilized for foundation support. General recommendations for the design of shallow foundations are provided herein.

9.1.9 Due to the existence of hard rock at or near the proposed grades at many locations throughout the site, the building pads, streets, and utility corridors underlain by Metavolcanic Rock should be over excavated to facilitate future excavation of footings, subgrade, and utility trenches. Recommendations for overexcavation operations are provided herein.

9.1.10 Due to the potential for rock fall to impact portions of the development, rock fall debris fences or other acceptable mitigation methods will be required at the toe of cut slopes or at the edge of daylight cuts and fills that encroach into the medium risk hazard zone.

9.1.11 Proper drainage should be maintained in order to preserve the engineering properties of the fill in both the building pads and slope areas. Recommendations for site drainage are provided herein.

9.1.12 We understand that improvements to Otay Lakes Road, south and west of the property are also planned.

9.2 Soil Characteristics

9.2.1 The majority of the soils encountered during our investigation is generally considered to be “expansive” (expansion index [EI] greater than 20) as defined by 2016 California

Building Code (CBC) Section 1803.5.3. Table 9.2.1 presents soil classifications based on the expansion index.

TABLE 9.2.1
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2016 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

9.2.2 Based on laboratory tests of representative samples of the materials expected at proposed grades presented in Appendix F, the on-site materials possess a "very low" to "high" expansion potential (EI of 130 or less). We expect the surficial soil and the claystone portions of the Otay Formation and Fanglomerate Deposits and highly weathered clay of the Metavolcanic Rock will likely possess a "medium" to "high" expansion potential (EI of 51 to 130). The sandstone portions of the Otay Formation and Fanglomerate Deposits will likely possess a "very low" to "low" expansion potential (EI of 50 or less). We should perform additional testing for expansion potential once final grades are achieved.

9.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate content tests are presented in Appendix F and indicate that the on-site materials at the locations tested possess S0 to S2 sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. Table 9.2.2 presents a summary of concrete requirements set forth by 2016 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 9.2.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class	Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight[1]	Minimum Compressive Strength (psi)
S0	SO_4<0.10	No Type Restriction	n/a	2,500
S1	0.10≤SO_4<0.20	II	0.50	4,000
S2	0.20≤SO_4≤2.00	V	0.45	4,500
S3	SO_4>2.00	V+Pozzolan or Slag	0.45	4,500

[1] Maximum water to cement ratio limits do not apply to lightweight concrete

9.2.4 We performed laboratory tests on a sample of the site materials encountered to check the corrosion potential to subsurface metal structures. We performed the laboratory tests in accordance with California Test Method No. 643. In addition, we performed a laboratory test to check the water-soluble chloride ion content in accordance with AASHTO Test No. T 291. The laboratory test results are presented in Appendix F.

9.2.5 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements that could be susceptible to corrosion are planned.

9.3 Seismic Design Criteria

9.3.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 9.3.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (2016 CBC; based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The structures should be designed using Site Class C where there is less than 20 feet of fill and Site Class D where the fill thickness is 20 feet or greater. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10. The values presented in Table 9.3.1 are for the risk-targeted maximum considered earthquake (MCE_R). We will evaluate the structure site class for each building once the final grading has been completed.

TABLE 9.3.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value		2016 CBC Reference
Site Class	C	D	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.805g	0.805g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.313g	0.313g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.078	1.178	Table 1613.3.3(1)
Site Coefficient, F_V	1.487	1.775	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.868g	0.949g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.465g	0.555g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.579g	0.632g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.310g	0.370g	Section 1613.3.4 (Eqn 16-40)

9.3.2 Table 9.3.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 9.3.2
2016 CBC SITE ACCELERATION DESIGN PARAMETERS

Parameter	Value		ASCE 7-10 Reference or 2016 CBC Reference
Site Class	C	D	Section 1613.3.2
Mapped MCE_G Peak Ground Acceleration, PGA	0.306g	0.306g	Figure 22-7
Site Coefficient, F_{PGA}	1.094	1.194	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.335g	0.365g	Section 11.8.3 (Eqn 11.8-1)

9.3.3 Conformance to the criteria in Tables 9.3.1 and 9.3.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

9.4 Temporary Excavations

9.4.1 The recommendations included herein are provided for stable excavations. It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project.

9.4.2 Temporary slopes should be made in conformance with OSHA requirements. The compacted fill and surficial soil should be considered a Type B soil (Type C if seepage is encountered), and the formational materials should be considered a Type A soil (Type B soil if seepage or groundwater is encountered) in accordance with OSHA requirements. In general, special shoring requirements will not be necessary if temporary excavations will be less than 4 feet in height. Temporary excavations greater than 4 feet in height, however, should be sloped back at an appropriate inclination. These excavations should not be allowed to become saturated or to dry out. Surcharge loads should not be permitted to a distance equal to the height of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

9.5 Slope Stability Analyses

9.5.1 We performed the slope stability analyses using the computer software program *GeoStudio2007*, to calculate the factor of safety with respect to deep-seated stability. This program uses conventional slope stability equations and a two-dimensional, limit-equilibrium method. We performed the rotational-mode and block-mode analyses using Spencer's method. Output of the computer program including the calculated Factor of Safety and the failure surface is shown in Appendix G.

9.5.2 Slope stability analyses utilizing average drained direct shear strength parameters based on laboratory tests and our experience with similar soil types in nearby areas indicates that the proposed cut and fill slopes, constructed of on-site materials, should have calculated factors of safety of at least 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions if the recommendations of this report are followed. The shear strength parameters used in the slope stability analyses are presented on Table G-1 in Appendix G.

9.5.3 We selected Cross-Sections 1-1′, 10-10' and 11-11' (Figures 9 and 10) to perform the slope stability analyses for the proposed slopes. The results and the computer output of the analyses are presented in Appendix G. Table G-II provides a description of the cross-sections, their corresponding factor of safety, and the condition of the slope stability

analyses. The County of San Diego currently requires a factor of safety of 1.5 for static conditions for permanent graded slopes.

9.5.4 If claystone layers are exposed on cut slopes within the Otay Formation or Fanglomerate Deposits, the construction of a stability fill may be required to stabilize the slope face. Figure 13 presents a typical stability fill detail.

9.5.5 We performed surficial slope stability calculations for a 2:1 (horizontal to vertical) slope in compacted fill. The calculated factor of safety for the proposed slopes is greater than the required minimum factor of safety of 1.5 as shown in Appendix G. Plants with variable root depth should be planted as soon as practical once the fill slopes have been constructed.

9.5.6 Stability fill drain locations and elevations should be surveyed during construction and depicted on the As-Graded Geologic Map in the final report of grading.

9.5.7 Excavations including cut slopes, shear keys and stability fills should be observed during grading by an engineering geologist to evaluate whether soil and geologic conditions do not differ significantly from those expected.

9.6 Grading

9.6.1 Grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix H and the County of San Diego Grading Ordinance.

9.6.2 Prior to commencing grading, a preconstruction conference should be held at the site with the county inspector, owner or developer, grading contractor, civil engineer, environmental consultant, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

9.6.3 Site preparation should begin with the removal of deleterious material, debris and vegetation. The depth of removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

9.6.4 Abandoned foundations and buried utilities (if encountered) should be removed and the resultant depressions and/or trenches should be filled with properly compacted material as part of the remedial grading.

9.6.5 Topsoil, colluvium, alluvium, undocumented fill, and highly weathered or decomposed Otay Formation, Fanglomerate Deposits and Metavolcanic Rock within the limits of grading should be removed to expose firm formational materials. The actual depth of removal should be evaluated by the geotechnical engineering consultant during the grading operations. The bottom of the excavations should be scarified to a depth of at least 12 inches (where possible), moisture conditioned as necessary, and properly compacted. Soil with an expansion index greater than 90 should be kept at least 3 feet below finish grade, where practical.

9.6.6 If perched groundwater is encountered during remedial grading within the surficial soil, top loading of wet material may be required. This condition may potentially occur within the canyon drainages, especially during the rainy season. The excavated materials should then be moisture conditioned as necessary to near optimum moisture content prior to placement as compacted fill.

9.6.7 We should observe the removal bottoms to check the exposure of the formational materials. Deeper excavations may be required if highly weathered formational materials are present at the base of the removals.

9.6.8 The site should be brought to final finish grade elevations with structural fill compacted in layers. Layers of fill should be no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557. Fill placed in excess of 50 feet from finish grade should be compacted to a dry density of at least 92 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill.

9.6.9 To reduce the potential for differential settlement, the building pads with cut-fill transitions should be undercut at least 3 feet, sloped 1 percent to the adjacent street or deepest fill, and replaced with properly compacted fill with a “very low” to “medium” expansion potential (EI of 90 or less), where practical. Where the thickness of the fill below the building pad exceeds 15 feet, the depth of the undercut for cut-fill transition lots, should be increased to one-fifth of the maximum fill thickness to a maximum depth of 10 feet. The large sheet-graded pads should be undercut at least 6 feet to allow for future re-grading of the pads.

9.6.10 Building pads underlain by formation/hard rock units at grade should also be undercut to facilitate future trenching. Building pads that expose hard rock should be undercut a

minimum of 3 feet and replaced with properly compacted fill and the base of the undercut should be sloped a minimum of 1 percent toward the adjacent street.

9.6.11 Roadways underlain by hard metavolcanic rock should be undercut a minimum of 8 feet for the areas inside of the public right-of-way (including joint utility structures and sidewalk areas). The undercut zone should include the areas at least 1 foot below the lowest utility or drain line. Figure 14 presents a typical detail for the overexcavation of streets.

9.6.12 Recommendations for the handling and disposal of oversized rock in fill areas are presented in Figure 15 and in Appendix H. In general, structural fill placed and compacted at the site should consist of material that can be classified into four zones:

Zone A: Material placed within 3 feet from building pad grade, 8 feet from roadway grade, and to at least 1 foot below the deepest utility within roadways should consist of "soil" fill with an approximate maximum particle dimension of 6 inches with a minimum of 40 percent of the soil passing the ¾-inch sieve. In addition, the upper 3 feet of pad grade should have at least 20 percent of the soil passing the No. 4 sieve.

Zone B: Material placed below 8 feet from grade (below Zone A and C) may consist of "rock" fill or "soil/rock" fill (as defined in Appendix H). Blasted rock should generally consist of 2-foot-minus rock material with occasional rock up to 4 feet in maximum dimension. Alternatively, "soil" fill may be placed in Zone B containing rock with a maximum dimension of 2 feet. Rocks up to 4 feet in maximum dimension can be individually placed in a properly compacted soil matrix with rocks separated at least 8 feet apart.

Zone C: Within 3 to 8 feet of pad grade and between 5 and 15 feet from face of slope, fill material should consist of "soil" fill with an approximate maximum particle dimension of 1 foot. Rocks up to 2 feet in maximum dimension may be placed, provided they are distributed in a matrix of compacted "soil" fill.

Zone D: Within the outer 5 feet of fill slopes, the fill should consist of rock up to 1 foot in maximum dimension in a matrix of compacted "soil" fill.

9.6.13 Import fill (if necessary) should consist of granular materials with a "very low" to "medium" expansion potential (EI of 90 or less) generally free of deleterious material and rock fragments larger than 6 inches in maximum size if used for capping and should be compacted as recommended herein. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to evaluate its suitability as fill material.

9.6.14 Cut slopes located within weak and/or sheared claystone beds may require stability fills as evaluated by the engineering geologist. In addition, cut slopes exposing cohesionless soil or rock slopes with unfavorable geologic structure may require stability fills. In general, the Typical Stability Fill Detail presented on Figure 13 should be used for design and construction of stability fills, where required. The backcut for the stability fills should commence at least 10 feet from the top of the proposed finish-graded slope and should extend at least 3 feet into formational materials. For slopes that exceed 30 feet in height, the inclination of the backcut may be flattened as determined by the engineering geologist during grading operations.

9.6.15 Cut slope excavations including fill slope shear keys should be observed during grading operations to check that soil and geologic conditions do not differ significantly from those expected. Cut slopes excavated in Metavolcanic Rock will need to be scaled of loose rock.

9.6.16 The outer 15 feet (or a distance equal to the height of the slope, whichever is less) of fill slopes should be composed of properly compacted granular "soil" fill to reduce the potential for surficial sloughing. In general, soil with an expansion index of 90 or less and at least 35 percent sand-size particles should be acceptable as "soil" fill. Soil of questionable strength to satisfy surficial stability should be tested in the laboratory for acceptable drained shear strength. The use of cohesionless soil in the outer portion of fill slopes should be avoided. Fill slopes should be overbuilt at least 2 feet and cut back or be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet to maintain the moisture content of the fill. The slopes should be track-walked at the completion of each slope such that the fill is compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content to the face of the finished slope.

9.6.17 Placement of rock fills should be planned in the deeper fill areas to facilitate rock disposal. Overexcavation of fill areas may be required to accommodate the necessary rock volumes generated during blasting. Capping material used for placement near finish grade within roadways, building pads, and slope zones should be stockpiled during excavation and remedial grading operations. Overexcavation of units that generate capping material may be necessary to achieve sufficient volumes to achieve finish grade.

9.6.18 Rock fill placement should be performed in accordance with the Recommended Grading Specifications provided in Appendix H. Blasting of rock material should be performed to maximize rock breakage to 2-foot minus material. Rock fill placement should generally be limited to 2-foot-thick horizontal layers and compacted using rock trucks and bulldozers. Significant volumes of water are typically required during rock fill placement. The

downstream areas can generate large volumes of water that can be re-used during construction.

9.6.19 Finished slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. In addition, the slopes should be drained and properly maintained to reduce erosion.

9.7 Earthwork Grading Factors

9.7.1 Estimates of bulking and shrinkage factors are based on empirical judgments comparing the material in its natural state as encountered in the exploratory excavations to a compacted state. Variations in natural soil density and in compacted fill density render shrinkage value estimates very approximate. As an example, the contractor can compact the fill to a dry density of 90 percent or higher of the laboratory maximum dry density. Thus, the contractor has an approximately 10 percent range of control over the fill volume. Bulking of rock units is a function of rock density, structure, overburden pressure, and the physical behavior of blasted material. Based on our experience, the shrinkage and bulking factors presented in Table 9.7 can be used as a basis for estimating how much the on-site soil may shrink or swell (bulk) when excavated from their natural state and placed as compacted fill. Please note that these estimates are for preliminary quantity estimates only. Due to the variations in the actual shrinkage/bulking factors, a balance area that can also accommodate rock should be provided to accommodate these variations.

TABLE 9.7
SHRINKAGE AND BULK FACTORS

Soil Unit	Shrink/Bulk Factor
Undocumented Fill (Qudf)	10-15% shrink
Topsoil (unmapped)	10-15% shrink
Alluvium (Qal)	10-15% shrink
Colluvium (unmapped)	10-15% shrink
Fanglomerate Deposits (Tof)	4-8% bulk
Otay Formation (To)	4-8% bulk
Metavolcanic Rock (KJmv) – rippable	10-15% bulk
Metavolcanic Rock (KJmv) – blasted	20-30% bulk
Metavolcanic Rock (KJmv) – crushed to Class 2 aggregate base	20-30% bulk

9.8 On-Site Construction Material Resources

9.8.1 We understand that the development plans may include processing the on-site rock and cobble materials to manufacture construction materials including aggregate road base and crushed aggregate rock. Major deposits of aggregate-quality Metavolcanic Rock and cobble within the Fanglomerate Deposits and to a lesser extent within the Otay Formation exist at the site.

9.8.2 We performed laboratory testing on samples of the on-site rock and cobble materials to evaluate the suitability for reuse as construction materials including aggregate base and crushed rock. We performed laboratory testing including Apparent Specific Gravity, Absorption, and Density (ASTM C128); Durability Index (California Test 229); and L.A. Abrasion (ASTM C131) on samples of Metavolcanic Rock (KJmv) and cobble with the Fanglomerate Deposits. The results of our laboratory tests are presented on Table IX in Appendix F and indicate that the tested rock materials generally meet the *Standard Specifications for Public Works Construction (Greenbook)* or *Standard Specifications for the State of California Department of Transportation (Caltrans)* criteria for aggregate quality. The spatial distribution of the geologic units is presented on the Geologic Map, Figures 2 through 8.

9.9 Subdrains

9.9.1 Conditions encountered prior to and during grading do not necessarily reveal the conditions that will be encountered once construction of the proposed homes is completed. Specifically, irrigation in both the subject lots and up gradient lots cannot be reasonably predicted. Therefore, the design and implementation of additional drainage mechanisms may be needed subsequent to construction operations. The geologic units encountered on the site have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to groundwater seepage. The use of canyon subdrains will be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Figure 16 depicts a typical canyon subdrain detail. Subdrains with lengths in excess of 750 feet should use 8-inch-diameter pipes with 9 cubic feet of gravel surrounded by approved filter fabric. Subdrains less than 750 feet in total length should use 6-inch-diameter pipes with 6 cubic feet of gravel surrounded by approved filter fabric. Drains within stability fill keyways should use 4-inch-diameter pipes (see Figure 13). The locations of proposed canyon subdrains are presented on the Geologic Map, Figures 2 through 8, and should be shown on the final 40-scale grading plans. The actual subdrain locations will be determined in the field subsequent to the remedial grading. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

9.9.2 Rock fill areas should be provided with subdrains along their down-slope perimeters to mitigate the potential buildup of water derived from construction or landscape irrigation. Subdrains within and/or at the base of rock fill areas as determined by the engineering geologist should use 6-inch-diameter pipes. Rock fill drains should be constructed using the same requirements as canyon subdrains as shown on Figure 16.

9.9.3 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the junction in accordance with Figure 17. Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure in accordance with Figure 18.

9.9.4 Building pad areas adjacent to large ascending slopes may experience wet to saturated soil conditions due to water migration or seepage. To reduce the potential for this to occur, consideration should be given to placing a subdrain along the base of the slopes to collect potential seepage and convey it to a suitable outlet. The drain should be sufficiently deep to intercept the seepage (about 3 feet below finish grade) and constructed in accordance with the recommendations in the subdrain section of this report. The necessity for the drains should be discussed prior to grading on a slope specific basis. In addition, the project civil engineer should be consulted to evaluate the appropriate drain locations and necessary easements, building restriction zones or disclosure requirements that may be necessary. The drains should be surveyed for location and shown on the project as-built drawings.

9.9.5 The final grading plans should show the location of the proposed subdrains. Upon completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map depicting the existing conditions. The final outlet and connection locations should be determined during grading. Subdrains that will be extended on adjacent projects shortly after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and to check that the pipe has not been crushed. The contractor is responsible for the performance of the drains.

9.10 Foundation and Concrete Slabs-On-Grade Recommendations

9.10.1 The foundation recommendations presented herein are for proposed one- to two-story residential structures. The foundation recommendations have been separated into three categories based on either the maximum and differential fill thickness or Expansion Index.

The foundation category criteria are presented in Table 9.10.1. Final foundation categories for each lot will be provided once site grading has been completed.

TABLE 9.10.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (feet)	Differential Fill Thickness, D (feet)	Expansion Index (EI)
I	T<20	--	EI≤50
II	20≤T<50	10≤D<20	50<EI≤90
III	T≥50	D≥20	90<EI≤130

9.10.2 Table 9.10.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 9.10.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions

9.10.3 The embedment depths presented in Table 9.10.2 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively. Figure 19 presents a wall/column footing dimension detail showing the criteria for depth of the foundations.

9.10.4 The concrete slab-on-grade should be a minimum of 4 inches thick for Foundation Categories I and II and 5 inches thick for Foundation Category III.

9.10.5 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The vapor retarder used should be specified by the project architect or developer based on the

type of floor covering that will be installed and if the structure will possess a humidity-controlled environment.

9.10.6 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. It is common to see 3 inches and 4 inches of sand below the concrete slab-on-grade for 5-inch and 4-inch thick slabs, respectively, in the southern California area. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

9.10.7 As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI) DC10.5-12 *Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils* or *WRI/CRSI Design of Slab-on-Ground Foundations*, as required by the 2016 California Building Code (CBC Section 1808.6.2). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented in Table 9.10.3 for the particular Foundation Category designated. The parameters presented in Table 9.10.3 are based on the guidelines presented in the PTI DC10.5 design manual.

TABLE 9.10.3
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI), DC10.5 Design Parameters	Foundation Category		
	I	II	III
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

9.10.8 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

9.10.9 If the structural engineer proposes a post-tensioned foundation design method other than PTI DC10.5:

- The deflection criteria presented in Table 9.10.3 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

9.10.10 Foundation systems for the lots that possess a foundation Category I and a "very low" expansion potential (expansion index of 20 or less) can be designed using the method described in Section 1808 of the 2016 CBC. If post-tensioned foundations are planned, an alternative, commonly accepted design method (other than PTI DC10.5) can be used. However, the post-tensioned foundation system should be designed with a total and differential deflection of 1 inch. Geocon Incorporated should be contacted to review the plans and provide additional information, if necessary.

9.10.11 If an alternate design method is contemplated, Geocon Incorporated should be contacted to evaluate if additional expansion index testing should be performed to identify the lots that possess a "very low" expansion potential (expansion index of 20 or less).

9.10.12 Our experience indicates post-tensioned slabs may be susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

9.10.13 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system unless designed by the structural engineer.

9.10.14 Category I, II or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be

increased by one-third for transient loads due to wind or seismic forces. The estimated maximum total and differential settlement for the planned structures due to foundation loads is 1 inch and ½ inch, respectively.

9.10.15 Isolated footings outside of the slab area, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular Foundation Category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

9.10.16 Interior stiffening beams should be incorporated into the design of the foundation system in accordance with the PTI design procedures.

9.10.17 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

9.10.18 Where buildings or other improvements are planned near the top of a slope 3:1 (horizontal to vertical) or steeper, special foundation and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high, building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

- When located next to a descending 3:1 (horizontal to vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. A post-tensioned slab and foundation system or mat foundation system can be used to help prevent distress in the structures associates with slope creep and lateral fill extension. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.

- If swimming pools are planned, Geocon Incorporated should be contacted for a review of specific site conditions.

- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures which would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

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

9.10.20 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute (ACI) when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

9.10.21 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

9.11 Exterior Concrete Flatwork

9.11.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein assuming the subgrade materials possess an expansion index of 90 or less. Slab panels should be a minimum of 4 inches thick and when in excess of 8 feet square should be reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh or No. 3 reinforcing bars spaced 18 inches center-to-center in both directions to reduce the potential for cracking. In addition, concrete flatwork should be provided with

crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be verified prior to placing concrete. Base materials will not be required below concrete improvements.

9.11.2 Even with the incorporation of the recommendations of this report, the exterior concrete flatwork has a potential to experience some uplift due to expansive soil beneath grade. The steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.

9.11.3 Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

9.11.4 The recommendations presented herein are intended to reduce the potential for cracking of exterior slabs as a result of differential movement. However, even with the incorporation of the recommendations presented herein, slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

9.12 Retaining Walls

9.12.1 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at 2:1 (horizontal to vertical), we recommend an active soil pressure of 50 pcf. Soil with an expansion index

(EI) of greater than 50 should not be used as backfill material behind retaining walls using these design values.

9.12.2 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 40 pcf. Where the backfill will be inclined at 2:1 (horizontal to vertical), we recommend an active soil pressure of 55 pcf. Soil with an expansion index (EI) of greater than 90 should not be used as backfill material behind retaining walls.

9.12.3 Retaining walls should be designed to ensure stability against overturning sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

9.12.4 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure of 7H psf should be added to the active soil pressure for walls 8 feet or less. For walls greater than 8 feet tall, an additional uniform pressure of 13H psf should be applied to the wall starting at 8 feet from the base of the wall. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

9.12.5 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2016 CBC or Section 11.6 of ASCE 7-10. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2016 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 10H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.365g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.3. Figure 20 presets a retaining wall loading diagram.

9.12.6 The retaining walls may be designed using either the active and restrained (at-rest) loading condition or the active and seismic loading condition as suggested by the structural engineer. Typically, it appears the design of the restrained condition for retaining wall loading may be adequate for the seismic design of the retaining walls. However, the active

earth pressure combined with the seismic design load should be reviewed and also considered in the design of the retaining walls.

9.12.7 Drainage openings through the base of the wall (weep holes) should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted granular (EI of 50 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. Figure 21 presents a typical retaining wall drainage detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

9.12.8 In general, wall foundations having a minimum depth and width of 1 foot may be designed for an allowable soil bearing pressure of 2,000 psf. The allowable soil bearing pressure may be increased by an additional 300 psf for each additional foot of depth and width, to a maximum allowable bearing capacity of 3,000 psf. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, retaining wall foundations should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

9.12.9 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

9.12.10 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time, Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. County or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

9.13 Lateral Loading

9.13.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid density of 300 pounds per cubic foot (pcf) should be used for the design of footings or shear keys.

The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

9.13.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.3 should be used for design. The friction coefficient may be reduced depending on the vapor barrier or waterproofing material used for construction in accordance with the manufacturer's recommendations.

9.13.3 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

9.14 Mechanically Stabilized Earth (MSE) Retaining Walls

9.14.1 MSE retaining walls are alternative walls that consist of modular block facing units with geogrid reinforced earth behind the block. The reinforcement grid attaches to the block units and is typically placed at specified vertical intervals and embedment lengths. The grid length and spacing will be determined by the wall designer.

9.14.2 The geotechnical parameters listed in Table 9.14 can be used for preliminary design of the MSE walls (including proposed plantable MSE walls). Once the location of the backfill soil has been determined, laboratory testing should be performed to check that the shear strength parameters used in the design of the MSE walls meet the required strength within the reinforced zone.

TABLE 9.14
GEOTECHNICAL PARAMETERS FOR MSE WALLS

Parameter	Reinforced Zone	Retained Zone	Foundation Zone
Angle of Internal Friction	28 degrees*	28 degrees*	28 degrees*
Cohesion	200 psf	200 psf	200 psf
Wet Unit Density	130 pcf	130 pcf	130 f

* 30 degrees can be used if selected grading and higher compaction occurs and the material is available on site.

9.14.3 The soil parameters presented in Table 9.14 are based on our experience, direct shear-strength tests performed during the geotechnical investigation and represent some of the onsite materials. The wet unit density values presented in Table 9.14 can be used for design but actual in-place densities may range from approximately 90 to 135 pounds per cubic foot. Geocon has no way of knowing which materials will actually be used as backfill behind the wall during construction. It is up to the wall designers to use their judgment in selection of the design parameters. As such, once backfill materials have been selected and/or stockpiled, sufficient shear tests should be conducted on samples of the proposed backfill materials to check that they conform to actual design values. Results should be provided to the designer to re-evaluate stability of the walls. Dependent upon test results, the designer may require modifications to the original wall design (e.g., longer reinforcement embedment lengths and/or steel reinforcement).

9.14.4 The foundation zone is the area where the footing is embedded, the reinforced zone is the area of the backfill that possesses the reinforcing fabric, and the retained zone is the area behind the reinforced zone.

9.14.5 Wall foundations having a minimum depth and width of one foot may be designed for an allowable soil bearing pressure of 2,000 psf. This soil pressure may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 3,500 psf.

9.14.6 Backfill materials within the reinforced zone should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557. This is applicable to the entire embedment width of the reinforcement. Typically, wall designers specify no heavy compaction equipment within 3 feet of the face of the wall. However, smaller equipment (e.g., walk-behind, self-driven compactors or hand whackers) can be used to compact the materials without causing deformation of the wall. If the designer specifies no compactive effort for this zone, the materials are essentially not properly compacted and the reinforcement grid within the uncompacted zone should not be relied upon for reinforcement, and overall embedment lengths will have to be increased to account for the difference.

9.14.7 Select backfill materials may be required to be in accordance with the MSE retaining wall system. Materials as outlined in the specifications of the retaining wall plans may be generated and stockpiled during grading, if encountered, or may require import. Geocon should perform laboratory tests during the backfill materials to check that soil properties are in accordance with the retaining wall plans and specifications.

9.14.8 The wall should be provided with a drainage system sufficient to prevent excessive seepage through the wall and the base of the wall, thus preventing hydrostatic pressures behind the wall.

9.14.9 Geosynthetic reinforcement must elongate to develop full tensile resistance. This elongation generally results in movement at the top of the wall. The amount of movement is dependent upon the height of the wall (e.g., higher walls rotate more) and the type of reinforcing grid used. In addition, over time the reinforcement grid has been known to exhibit creep (sometimes as much as 5 percent) and can undergo additional movement. Given this condition, the owner should be aware that structures and pavement placed within the reinforced and retained zones of the wall may undergo movement.

9.14.10 The MSE wall contractor should provide the estimated deformation of wall and adjacent ground in associated with wall construction. The calculated horizontal and vertical deformations should be determined by the wall designer. The estimated movements should be provided to the project structural engineer to determine if the planned improvements can tolerate the expected movements.

9.14.11 The MSE wall designer/contractor should review this report, including the slope stability requirements, and incorporate our recommendations as presented herein. We should be provided the plans for the MSE walls to check if they are in conformance with our recommendations prior to issuance of a permit and construction.

9.15 Preliminary Pavement Recommendations

9.15.1 The final pavement sections for the roadways should be based on the R-Value of the subgrade soils encountered at final subgrade elevation. Streets should be designed in accordance with the County of San Diego specifications when final Traffic Indices and R-Value test results of subgrade soil are completed. Based on the results of our laboratory R-Value testing, we have assumed R-Values of 5 and 25 for the subgrade soil for the purposes of this preliminary analysis. Preliminary flexible pavement sections are presented in Table 9.15.1.

TABLE 9.15.1
PRELIMINARY FLEXIBLE PAVEMENT SECTIONS

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Cul-de-sac	5.0	5	3	10
		25	3	7
Local Residential	6.0	5	3.5	13
		25	3.5	9
Collector Residential	7.0	5	4	16
		25	4	11
Arterial Roadways	8.0	5	5	18
		25	5	12

9.15.2 The upper 12 inches of the subgrade soil should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content beneath pavement sections.

9.15.3 Base materials should conform to Section 26-1.028 of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* with a ¾-inch maximum size aggregate. Base materials should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook)*. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

9.15.4 A rigid Portland cement concrete (PCC) pavement section should be placed in all roadway cross-gutters. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R-08 Guide for Design and Construction of Concrete Parking Lots using the parameters presented in Table 9.15.2.

TABLE 9.15.2
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of Subgrade Reaction, k	100 pci
Modulus of Rupture for Concrete, M_R	500 psi
Traffic Category, TC	A and C
Average Daily Truck Traffic, ADTT	10, 100 and 300

9.15.5 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 9.15.3.

TABLE 9.15.3
RIGID PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Residential Alleyways	5.5
Medium Truck Traffic (TC=C, ADTT=100)	7.0
Heavy Truck Traffic and Roadway Cross-Gutters (TC=C, ADTT=300)	7.5

9.15.6 The PCC pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,000 psi (pounds per square inch).

9.15.7 A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the recommended slab thickness 4 feet behind the face of the slab (e.g., a 7-inch-thick slab would have a 9-inch-thick edge). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

9.15.8 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should not exceed 30 times the slab thickness with a maximum spacing of 12.5 feet and 15 feet for the 5.5 and 6-inch and thicker slabs, respectively (e.g., a 7.5-inch-thick slab would have a 15-foot spacing pattern), and should be sealed

with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be determined by the referenced ACI report.

9.15.9 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab. As an alternative to the butt-type construction joint, dowelling can be used between construction joints for pavements of 7 inches or thicker. As discussed in the referenced ACI guide, dowels should consist of smooth, 1-inch-diameter reinforcing steel 14 inches long embedded a minimum of 6 inches into the slab on either side of the construction joint. Dowels should be located at the midpoint of the slab, spaced at 12 inches on center and lubricated to allow joint movement while still transferring loads. In addition, tie bars should be installed at the as recommended in Section 3.8.3 of the referenced ACI guide. The structural engineer should provide other alternative recommendations for load transfer.

9.15.10 The performance of pavement is highly dependent on providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement will likely result in pavement distress and subgrade failure. Drainage from landscaped areas should be directed to controlled drainage structures. Landscape areas adjacent to the edge of asphalt pavements are not recommended due to the potential for surface or irrigation water to infiltrate the underlying permeable aggregate base and cause distress. Where such a condition cannot be avoided, consideration should be given to incorporating measures that will significantly reduce the potential for subsurface water migration into the aggregate base. If planter islands are planned, the perimeter curb should extend at least 6 inches below the level of the base materials.

9.16 Site Drainage and Moisture Protection

9.16.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.3 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

9.16.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or

similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

9.16.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods.

9.16.4 We understand the planned storm water management basins will be lined to help provide water to the adjacent reservoirs. We should be contacted to provide recommendations if the planned storm water devices are not planned to be lined.

9.16.5 The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

9.17 Grading and Foundation Plan Review

9.17.1 Geocon Incorporated should review the 40-scale grading plans and building foundation plans for the project prior to final design submittal to evaluate whether additional analysis and/or recommendations are required.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

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

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

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

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

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JH / RA		DSK/GTYPD

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 1

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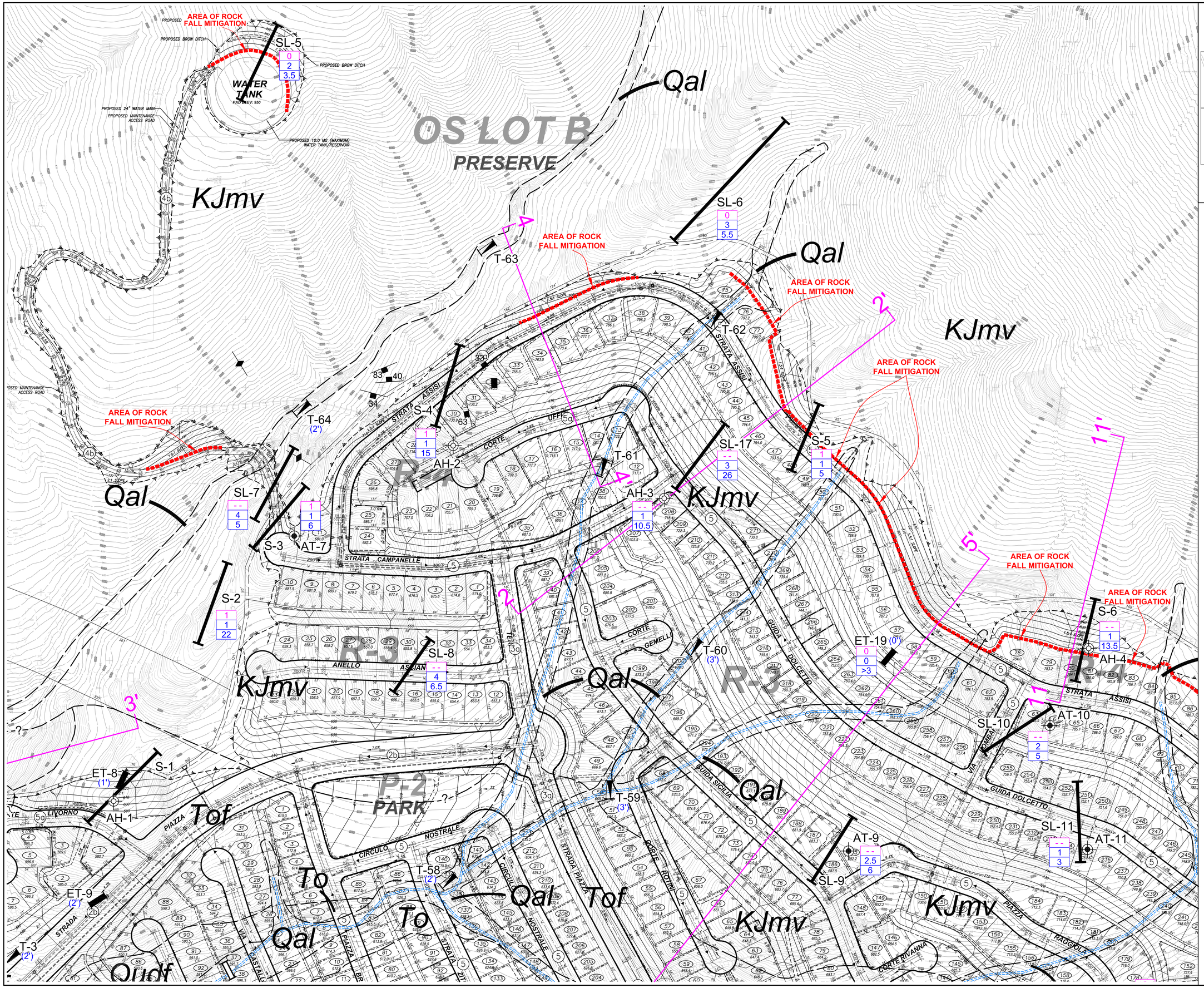

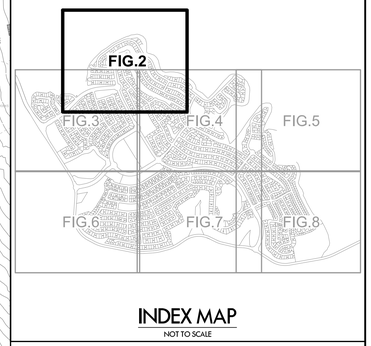

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- Qal ..... ALLUVIUM
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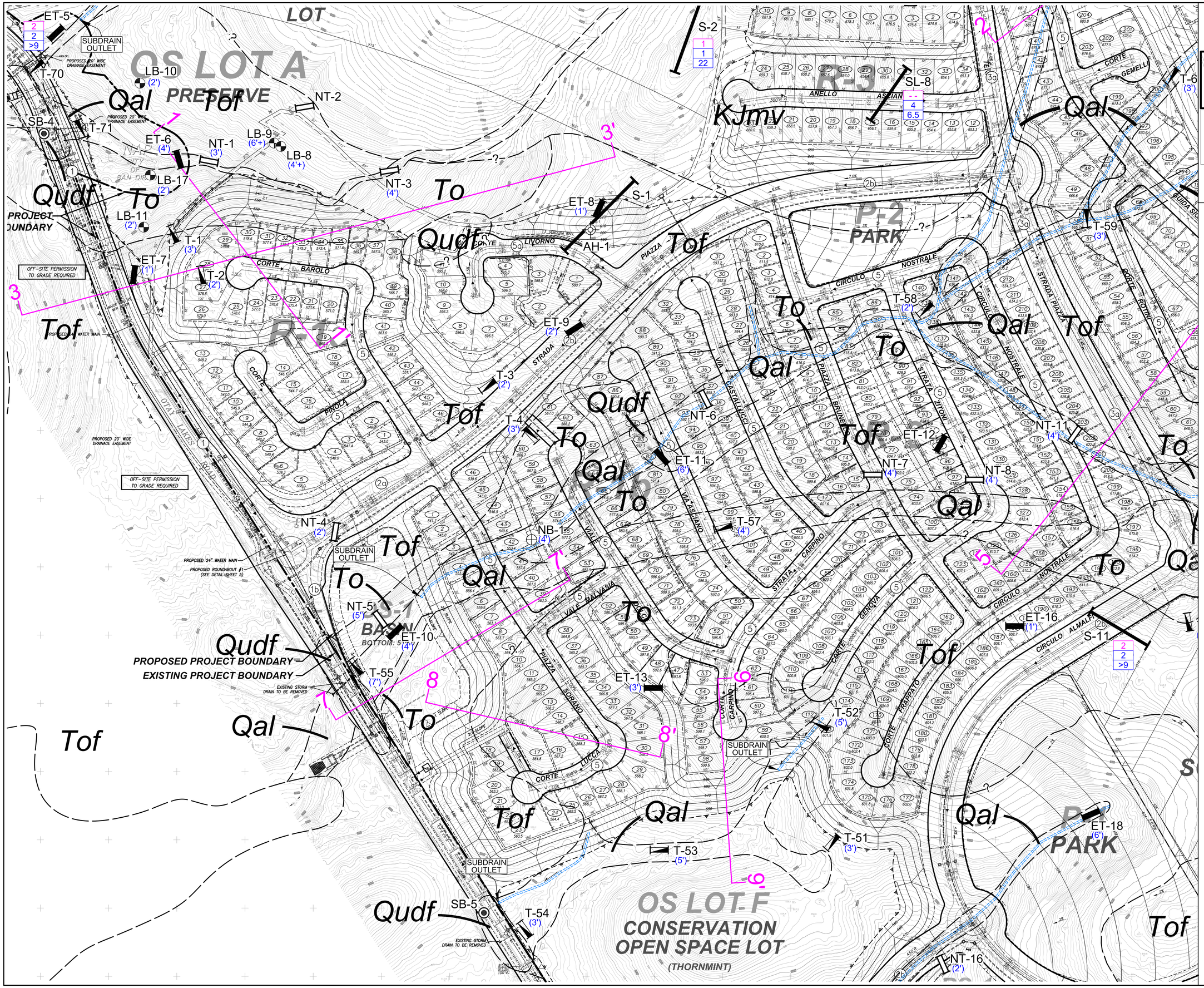

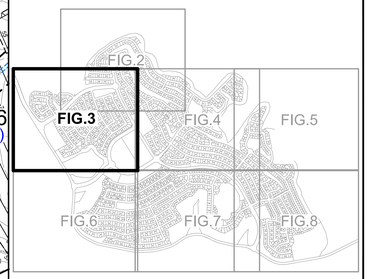

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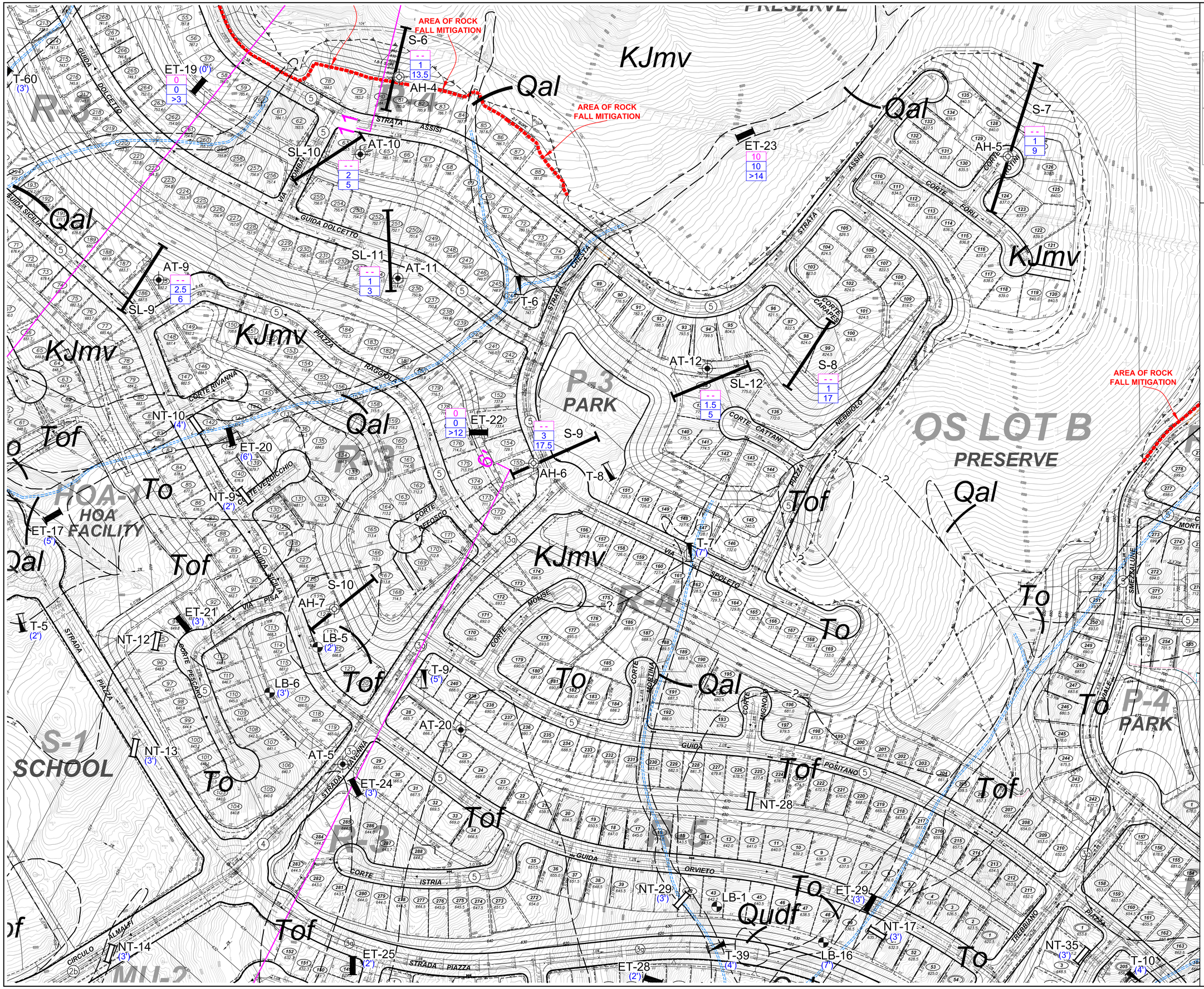

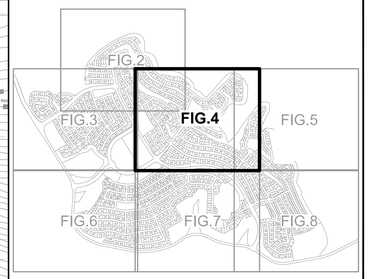

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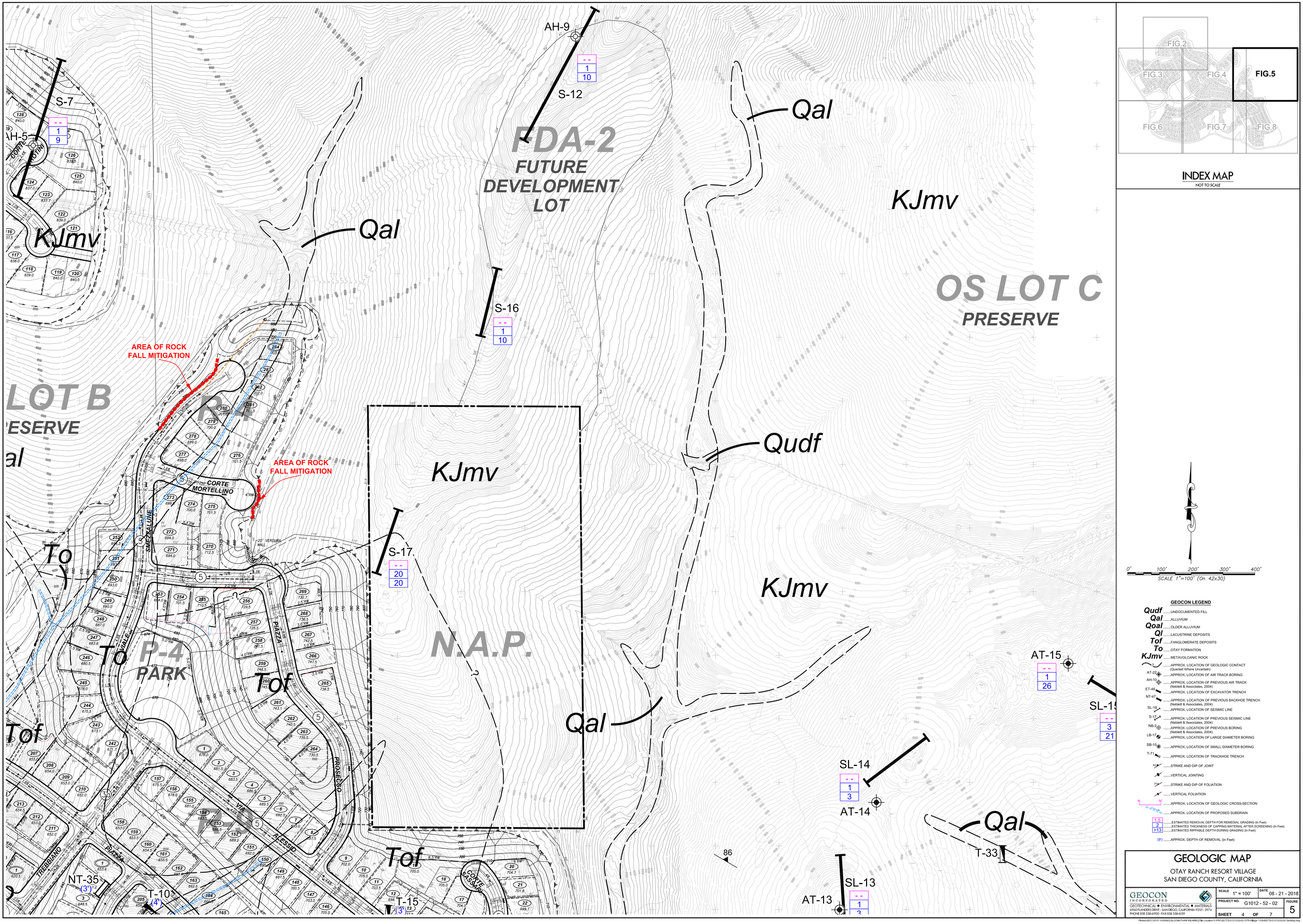

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FIGURE	5
SHEET	4 OF 7

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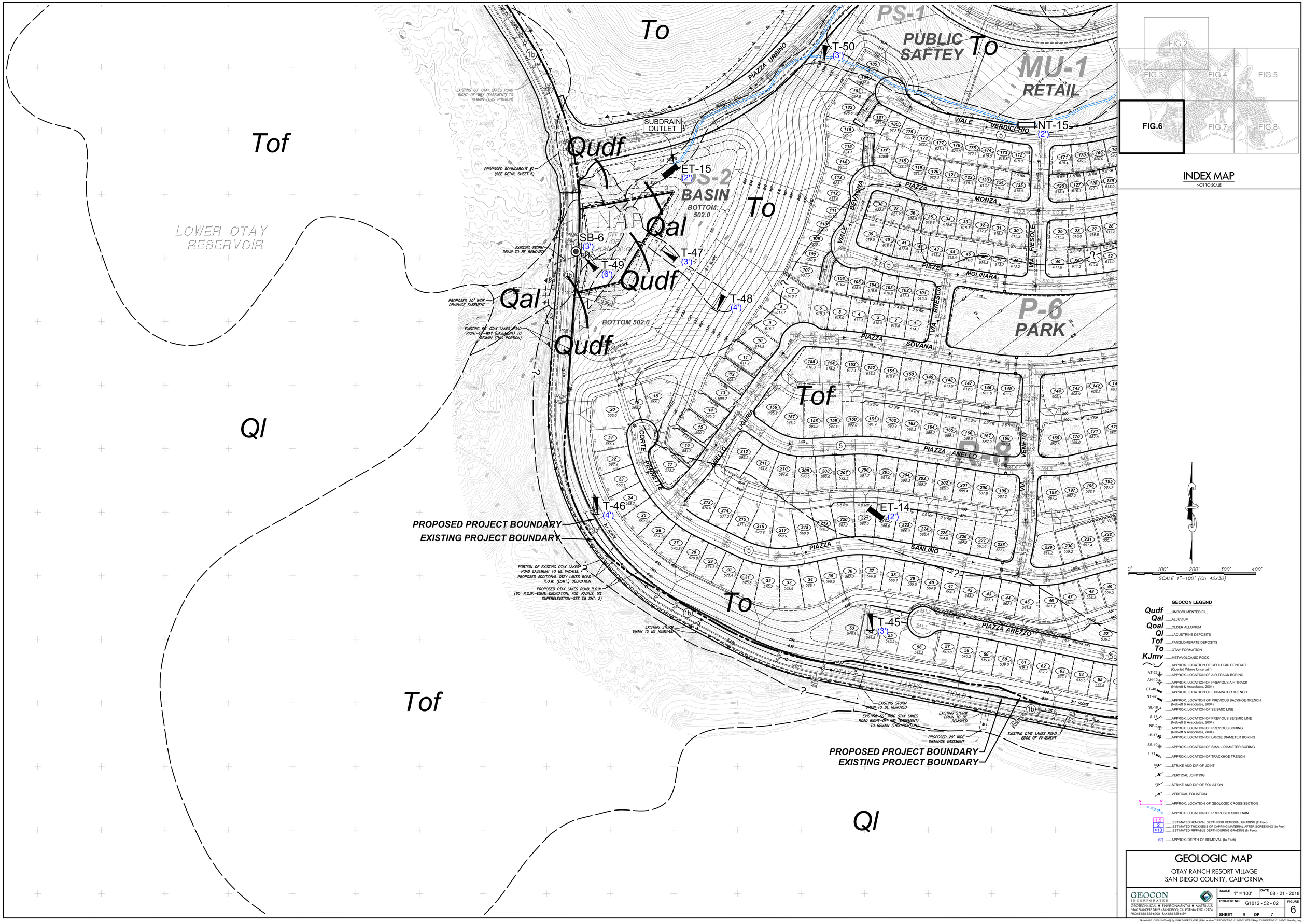


INDEX MAP
NOT TO SCALE

GEOCON LEGEND

- Qudf .....UNDOCUMENTED FILL
- Qal .....ALLUVIUM
- Qoal .....OLDER ALLUVIUM
- Ql .....LACUSTRINE DEPOSITS
- Tof .....FANGLOMERATE DEPOSITS
- To .....OTAY FORMATION
- KJmv .....METAVOLCANIC ROCK
- .....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- AT-22 .....APPROX. LOCATION OF AIR TRACK BORING
- AH-10 .....APPROX. LOCATION OF PREVIOUS AIR TRACK (Neblett & Associates, 2004)
- ET-48 .....APPROX. LOCATION OF EXCAVATOR TRENCH
- NT-47 .....APPROX. LOCATION OF PREVIOUS BACKHOE TRENCH (Neblett & Associates, 2004)
- SL-18 .....APPROX. LOCATION OF SEISMIC LINE
- S-17 .....APPROX. LOCATION OF PREVIOUS SEISMIC LINE (Neblett & Associates, 2004)
- NB-2 .....APPROX. LOCATION OF PREVIOUS BORING (Neblett & Associates, 2004)
- LB-17 .....APPROX. LOCATION OF LARGE DIAMETER BORING
- SB-10 .....APPROX. LOCATION OF SMALL DIAMETER BORING
- T-71 .....APPROX. LOCATION OF TRACKHOE TRENCH
- 83 .....STRIKE AND DIP OF JOINT
- .....VERTICAL JOINTING
- 75 .....STRIKE AND DIP OF FOLIATION
- .....VERTICAL FOLIATION
- N N' .....APPROX. LOCATION OF GEOLOGIC CROSS-SECTION
- .....APPROX. LOCATION OF PROPOSED SUBDRAIN
- 1.5 .....ESTIMATED REMOVAL DEPTH FOR REMEDIAL GRADING (In Feet)
- 2 .....ESTIMATED THICKNESS OF CAPPING MATERIAL AFTER SCREENING (In Feet)
- >13 .....ESTIMATED RIPPABLE DEPTH DURING GRADING (In Feet)
- (9') .....APPROX. DEPTH OF REMOVAL (In Feet)

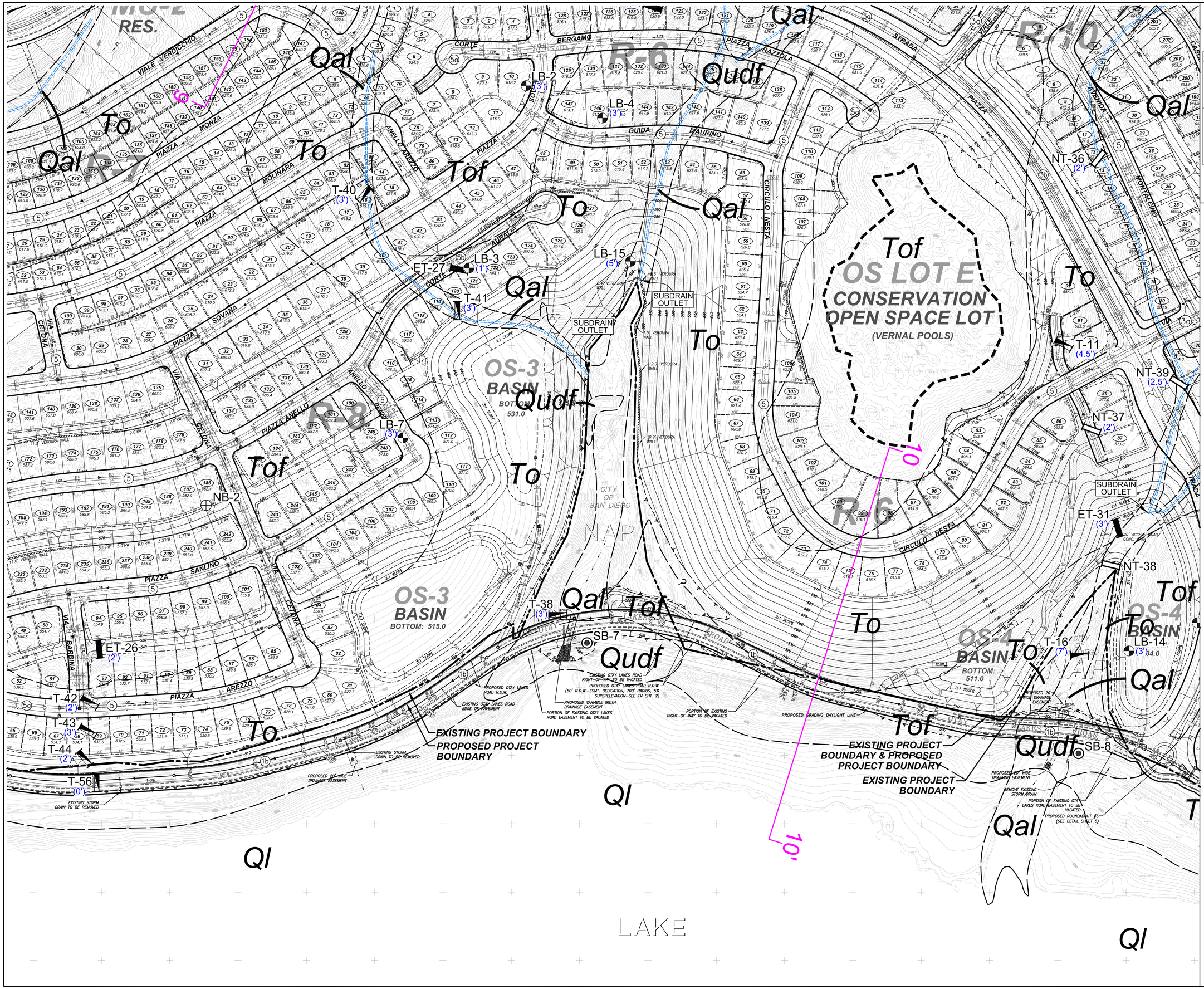
GEOLOGIC MAP

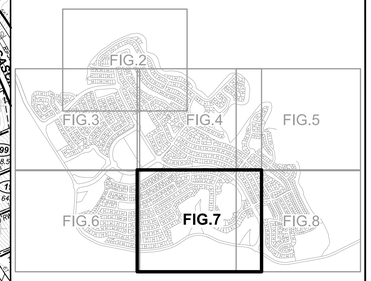
OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 100'	DATE	08 - 21 - 2018
PROJECT NO.	G1012 - 52 - 02	FIGURE	6
SHEET	6 OF 7		

Plotted:08/21/2018 10:02AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR\Maps 13\SHEETS\G1012-52-02 GeoMap.dwg





INDEX MAP
NOT TO SCALE

0' 100' 200' 300' 400'
SCALE 1"=100' (On 42x30)

GEOCON LEGEND

- Qudf .....UNDOCUMENTED FILL
- Qal .....ALLUVIUM
- Qoal .....OLDER ALLUVIUM
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- Tof .....FANGLOMERATE DEPOSITS
- To .....OTAY FORMATION
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- SB-10 ..... APPROX. LOCATION OF SMALL DIAMETER BORING
- T-71 ..... APPROX. LOCATION OF TRACKHOE TRENCH
- 65 ..... STRIKE AND DIP OF JOINT
- ..... VERTICAL JOINTING
- 75 ..... STRIKE AND DIP OF FOLIATION
- ..... VERTICAL FOLIATION
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GEOLOGIC MAP

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
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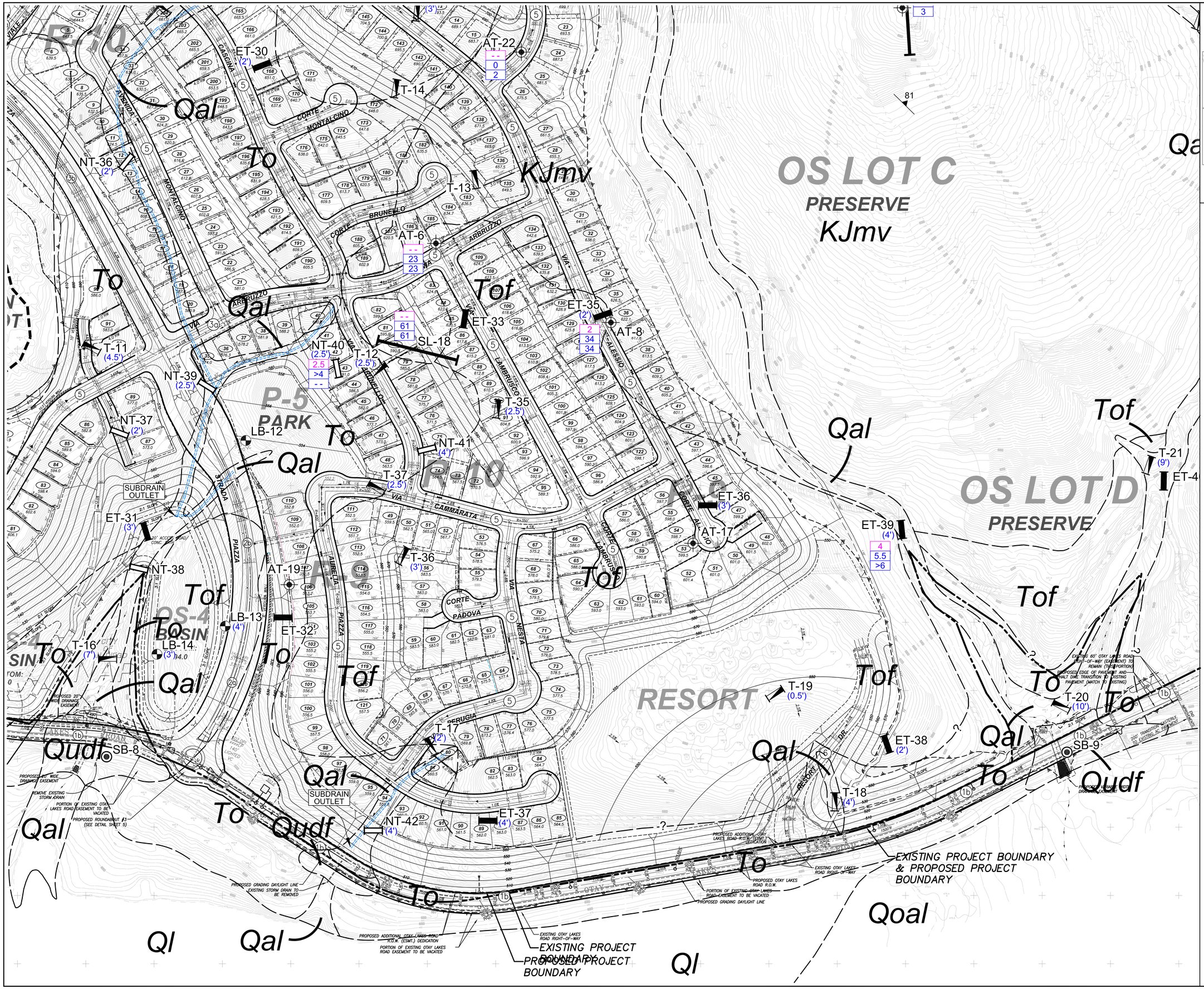
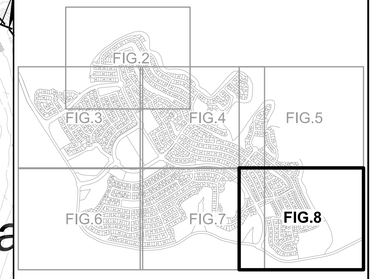
SCALE	1" = 100'
DATE	08 - 21 - 2018
PROJECT NO.	G1012 - 52 - 02
FIGURE	7
SHEET	6 OF 7

Plotted:08/21/2018 10:07AM | By:JONATHAN WILKINS | File Location:N:\PROJECTS\G1012\GDS\DTP\Maps 13\SHEETS\G1012-02-2GS2 GeoMap.dwg





INDEX MAP
NOT TO SCALE

0' 100' 200' 300' 400'
SCALE 1"=100' (On 42x30)

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- .....VERTICAL JOINTING
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GEOLOGIC MAP

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SCALE	1" = 100'
DATE	08 - 21 - 2018
PROJECT NO.	G1012 - 52 - 02
FIGURE	8
SHEET	7 OF 7

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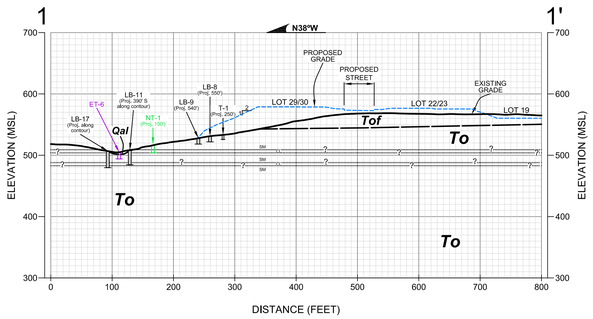

GEOLOGIC CROSS-SECTION 1-1'

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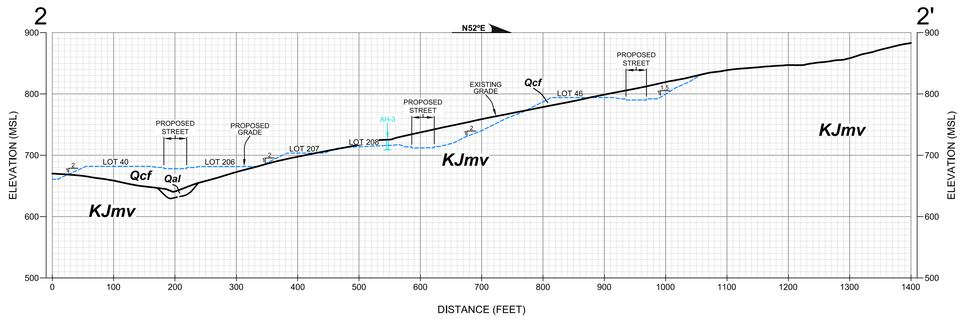

GEOLOGIC CROSS-SECTION 2-2'

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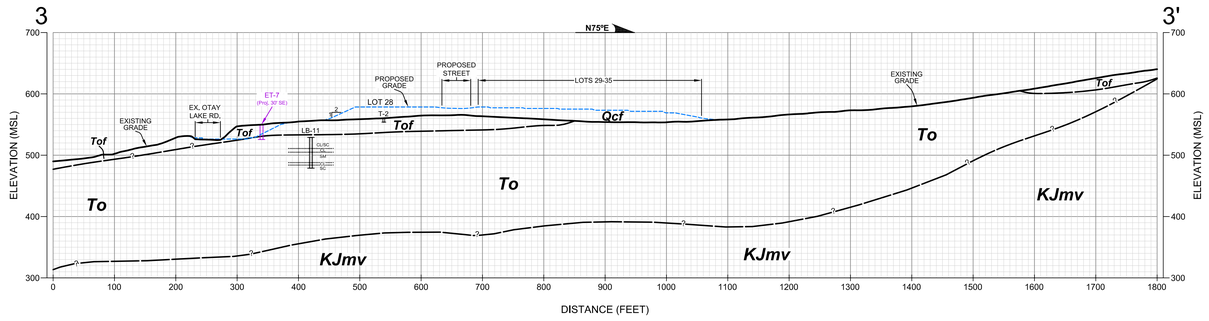
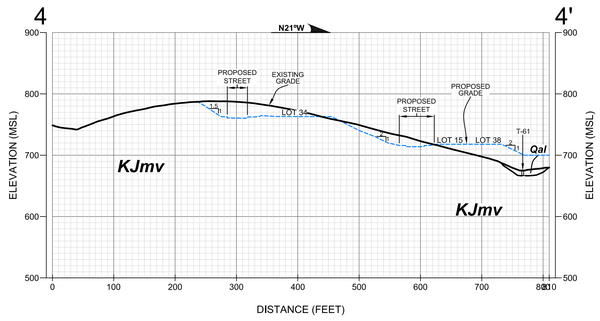


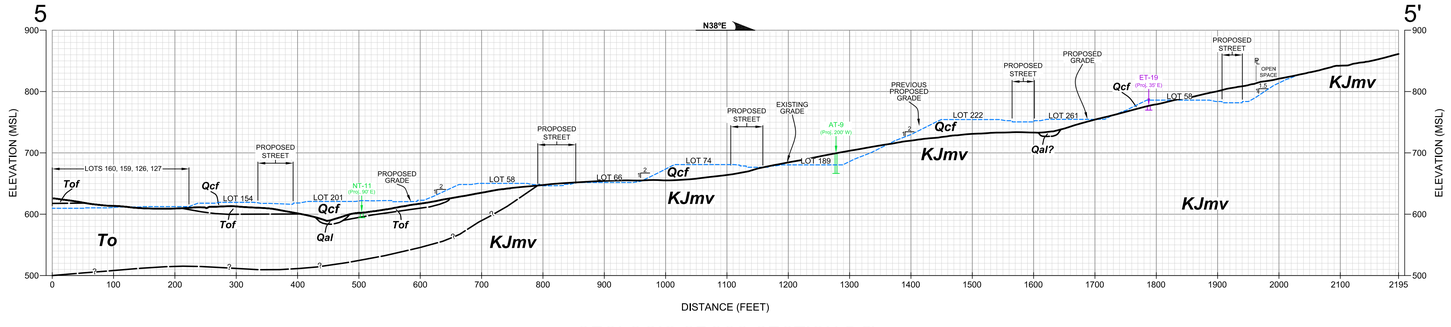
GEOLOGIC CROSS-SECTION 3-3'

SCALE: 1" = 100' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION 4-4'

SCALE: 1" = 100' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION 5-5'

SCALE: 1" = 100' (Vert. = Horiz.)

GEOCON LEGEND

- *Qcf*.....COMPACTED FILL (Proposed)
- *Qudf*.....UNDOCUMENTED FILL
- *Qal*.....ALLUVIAL DEPOSITS
- *Qt*.....TERRACE DEPOSITS
- *Tof*.....TERTIARY-AGE FANGLOMERATE
- *To*.....OTAY FORMATION
- *KJmv*.....METAVOLCANIC BEDROCK
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- NT-47 .....APPROX. LOCATION OF PREVIOUS BACKHOE TRENCH (Neblett & Associates, 2004)
- LB-12 .....APPROX. LOCATION OF LARGE DIAMETER BORING
- SB-3 .....APPROX. LOCATION OF SMALL DIAMETER BORING
- T-9 .....APPROX. LOCATION OF TRENCH

GEOLOGIC CROSS - SECTIONS

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

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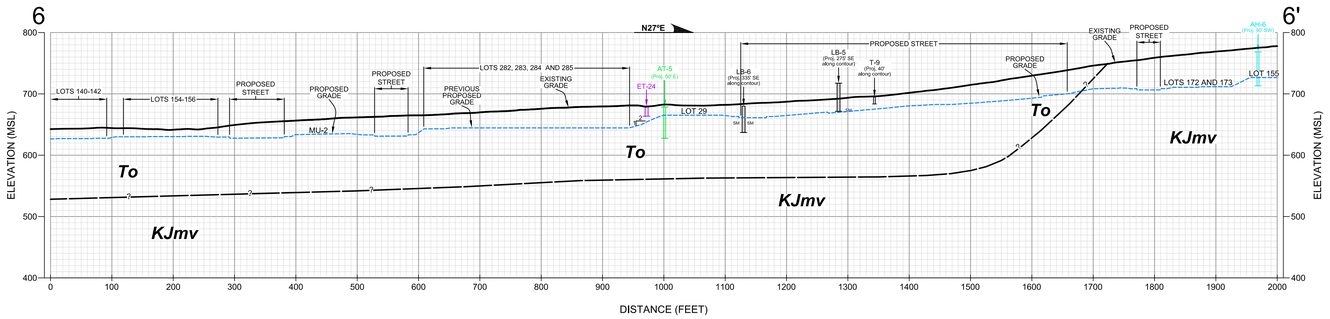
PHONE 858 558-6900 - FAX 858 558-6159

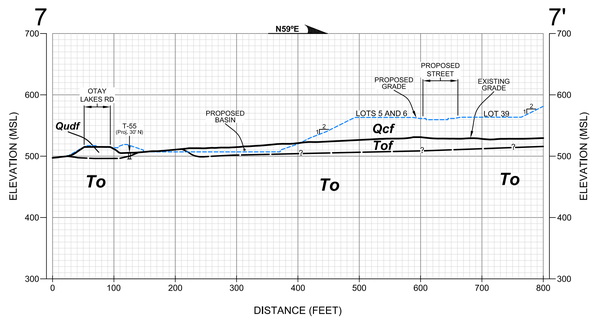
SCALE	1" = 100'	DATE	08 - 21 - 2018
PROJECT NO.	G1012 - 52 - 02	FIGURE	9
SHEET	1 OF 1		

Plotted:08/21/2018 9:45AM | By:JONATHAN WILKINS | File Location:H:\PROJECTS\G1012-52-02 OTR\Village 13\SHEETS\G1012-52-02 Cross-Sections.dwg



GEOLOGIC CROSS-SECTION 6-6'

SCALE: 1" = 100' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION 7-7'

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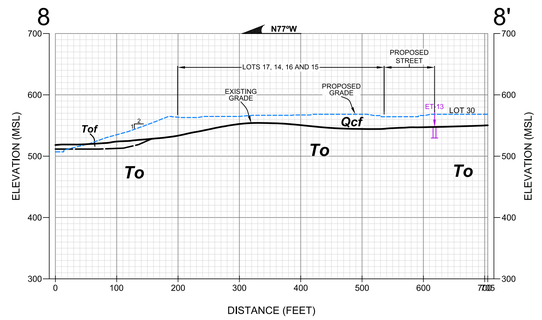

GEOLOGIC CROSS-SECTION 8-8'

SCALE: 1" = 100' (Vert. = Horiz.)

GEOCON LEGEND

- Qcf .....COMPACTED FILL (Proposed)
- Qudf .....UNDOCUMENTED FILL
- Qal .....ALLUVIAL DEPOSITS
- Qt .....TERRACE DEPOSITS
- Tof .....TERTIARY-AGE FANGLOMERATE
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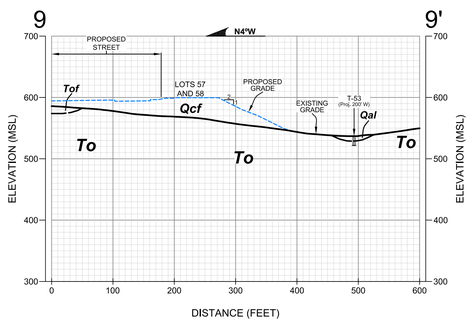
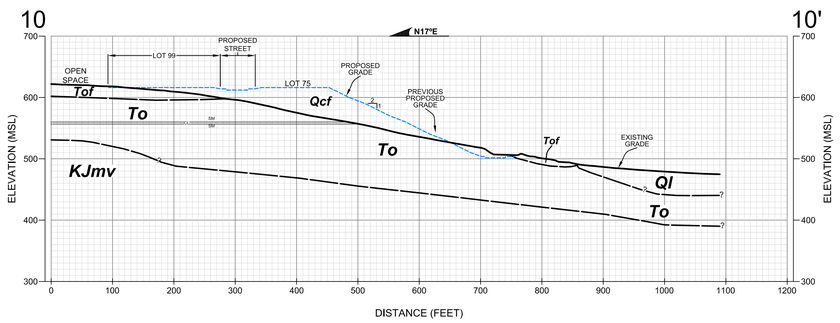
- SB-3 .....APPROX. LOCATION OF SMALL DIAMETER BORING
- T-9 .....APPROX. LOCATION OF TRENCH



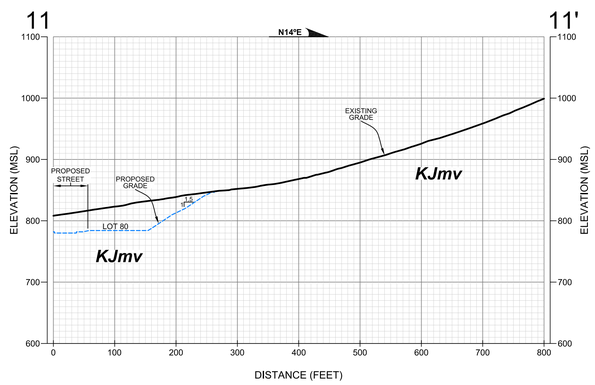
GEOLOGIC CROSS-SECTION 9-9'

SCALE: 1" = 100' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION 10-10'

SCALE: 1" = 100' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION 11-11'

SCALE: 1" = 100' (Vert. = Horiz.)

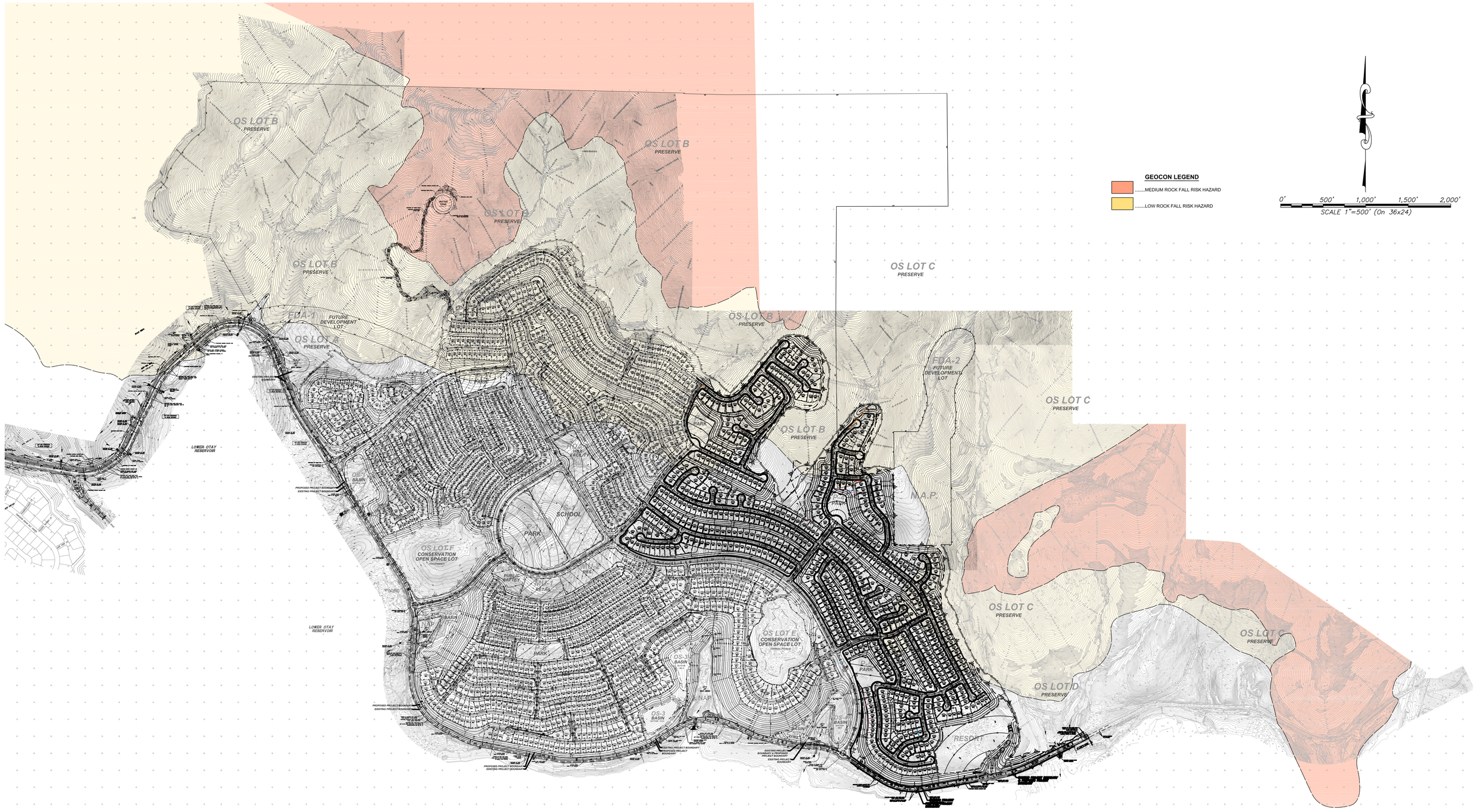
GEOLOGIC CROSS - SECTIONS

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 100'	DATE	02 - 09 - 2018
PROJECT NO.	G1012 - 52 - 02	FIGURE	10
SHEET	1 OF 1		

Plotted:09/21/2018 9:50AM | By:JONATHAN IRLANNI | File Location:C:\PROJECTS\G1012-52-02 OTRA\Base 1\SHEETS\G1012-52-02 Cross-Sections.dwg


OS LOT B
PRESERVE
OS LOT B
PRESERVE
OS LOT B
PRESERVE
OS LOT B
PRESERVE
OS LOT C
PRESERVE
OS LOT C
PRESERVE
OS LOT C
PRESERVE
OS LOT C
PRESERVE
OS LOT C
PRESERVE
OS LOT D
PRESERVE
OS LOT A
PRESERVE
OS LOT E
CONSERVATION OPEN SPACE LOT
OS LOT E
CONSERVATION OPEN SPACE LOT
FDA-1
FUTURE DEVELOPMENT LOT
FDA-2
FUTURE DEVELOPMENT LOT
LOWER OTAY RESERVOIR
LOWER OTAY RESERVOIR
SCHOOL
PARK
PARK
PARK
PARK
PARK
PARK
PARK
PARK
PUBLIC SAFETY
RETAIL
RESORT
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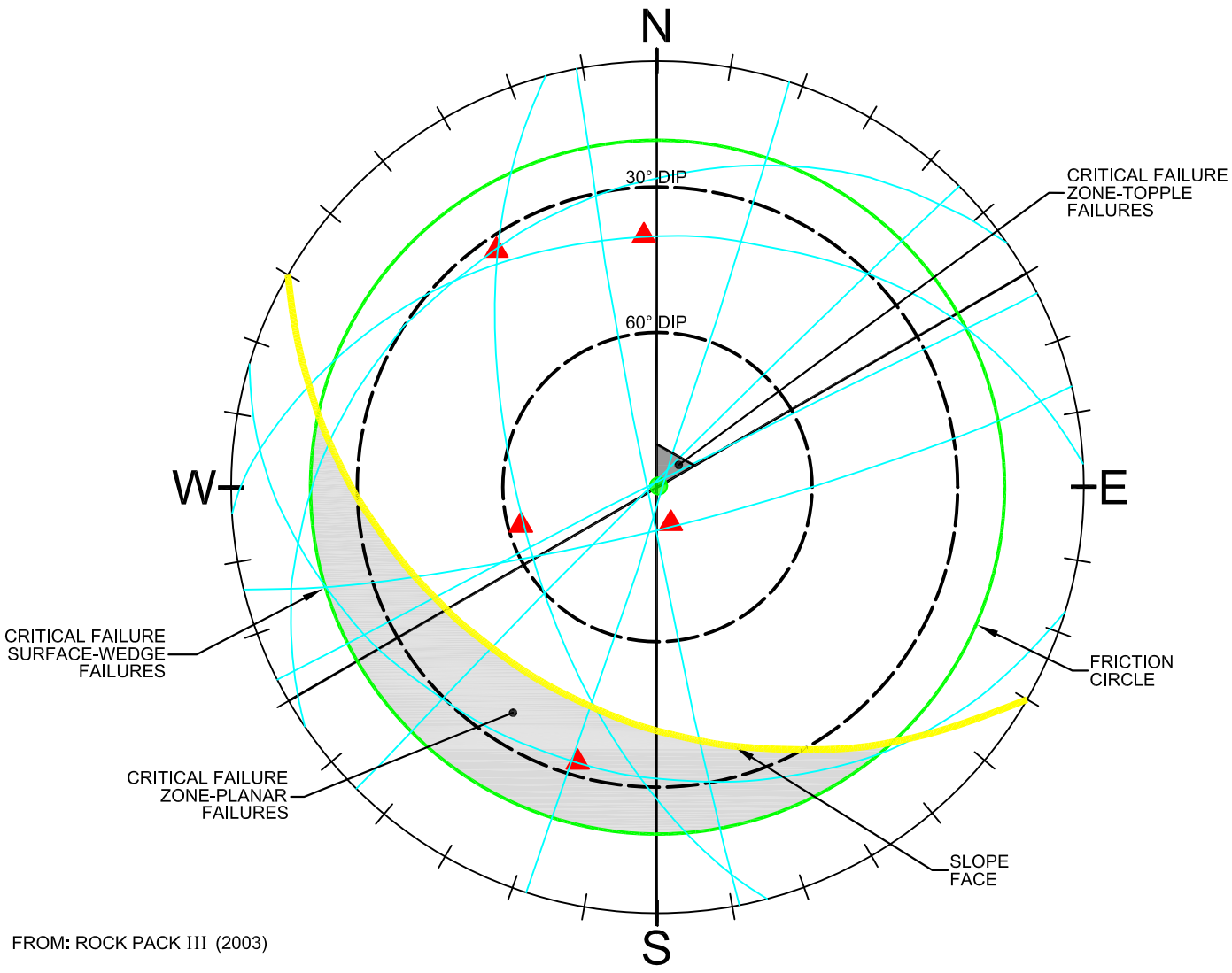

FROM: ROCK PACK III (2003)

GEOCON LEGEND

▲ .....JOINT DIP VECTOR

● .....FOLIATION DIP VECTOR

KINEMATIC STEREONET ANALYSIS

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
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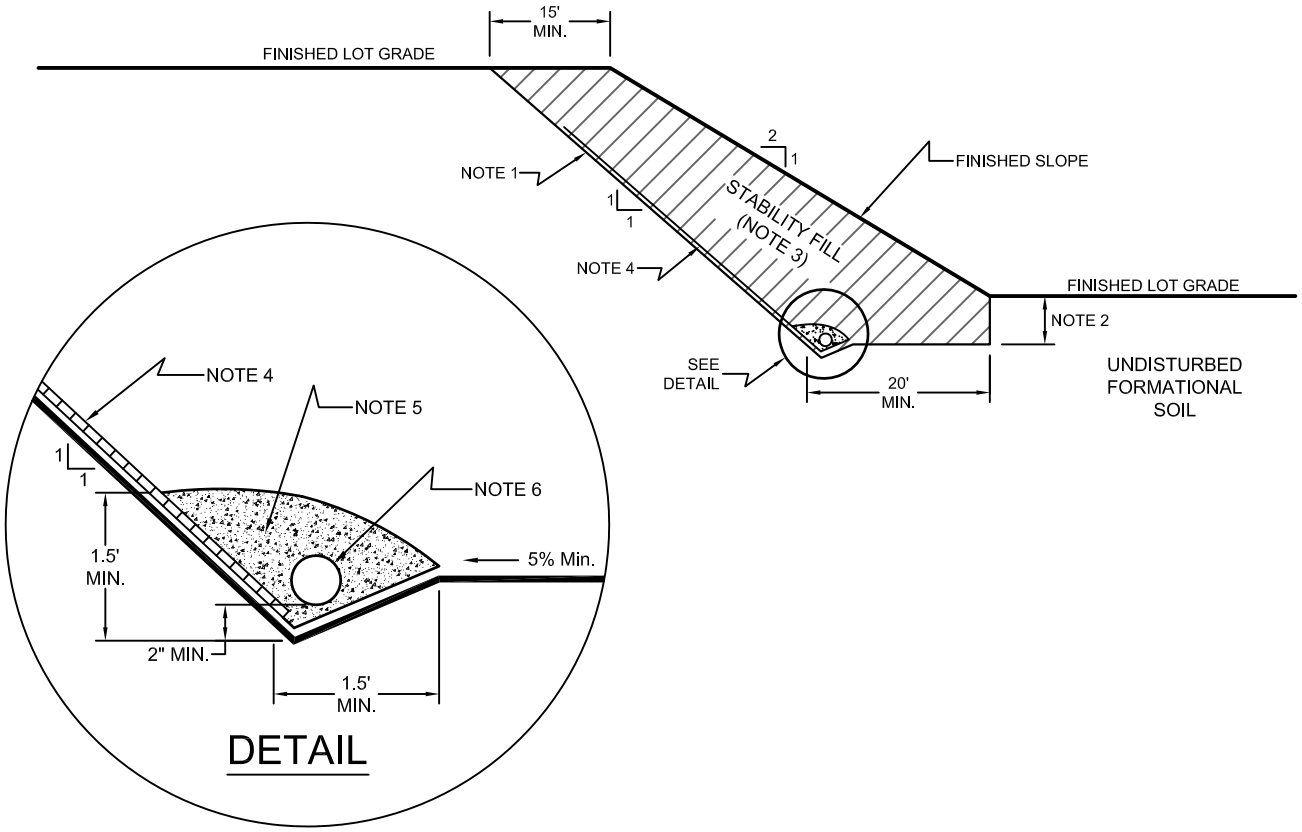
JH / RA		DSK/GTYPD

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 12

Plotted:08/21/2018 10:31AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\Kinematic Stereonet Analyses (KNMTC_STEREONET_ANALY).dwg



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO DENSE, FORMATIONAL SOILS SLOPING A MINIMUM 5% INTO SLOPE.

3.....BUTTRESS FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL WITH MINIMUM SHEAR STRENGTH OF Ø = 28°, C'=250 psf

4.....WHERE SEEPAGE IS ENCOUNTERED IN BACKCUT, CHIMNEY DRAINS TO BE APPROVED. PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN 5000 OR EQUEVALENT) SPACED APPROXIMATELY 30 FEET CENTER TO CENTER OR 12-INCH BY 24-INCH SLOTS FILLED WITH FILTER MATERIALS (SEE NOTE). DRAINS WILL BE REQUIRED WHERE AREAS OF SEEPAGE ARE ENCOUNTERED

5.....FILTER MATERIAL TO BE 1-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC.

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SDR 21 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET. CHIMNEY DRAINS MAY BE REQUIRED IF AREAS OF ACTIVE SEEPAGE ARE ENCOUNTERED.

7.....IF HORIZONTAL EXTENT OF GRADING CONSTRAINED (e.g., THE PRESENCE OF A PROPERTY LINE), THE SLOPE SHOULD BE OVERBUILT, AT LEAST 4 FEET, AND TRIMMED BACK

NO SCALE

TYPICAL STABILITY FILL DETAIL

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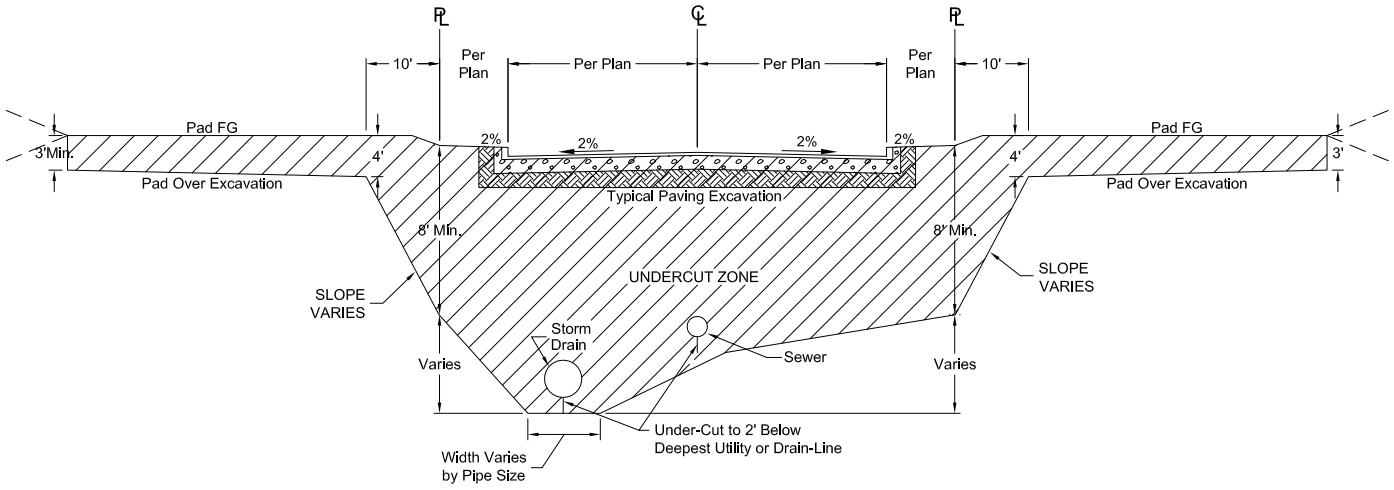
OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

JH / RA		DSK/GTYPD

DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 13

Plotted:08/21/2018 10:19AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\Typical Stability Fill Detail.dwg



NOT TO SCALE

NOTE:
UNDERCUT ZONE SHOULD BE BACKFILLED WITH COMPACTED SOIL FILL WITH MAXIMUM ROCK FRAGMENTS LESS THAN 6 INCHES IN DIMENSION AND A MINIMUM OF 40 PERCENT SOIL PASSING THE 3/4-INCH SIEVE

NO SCALE

TYPICAL STREET OVEREXCAVATION DETAIL

GEOCON INCORPORATED
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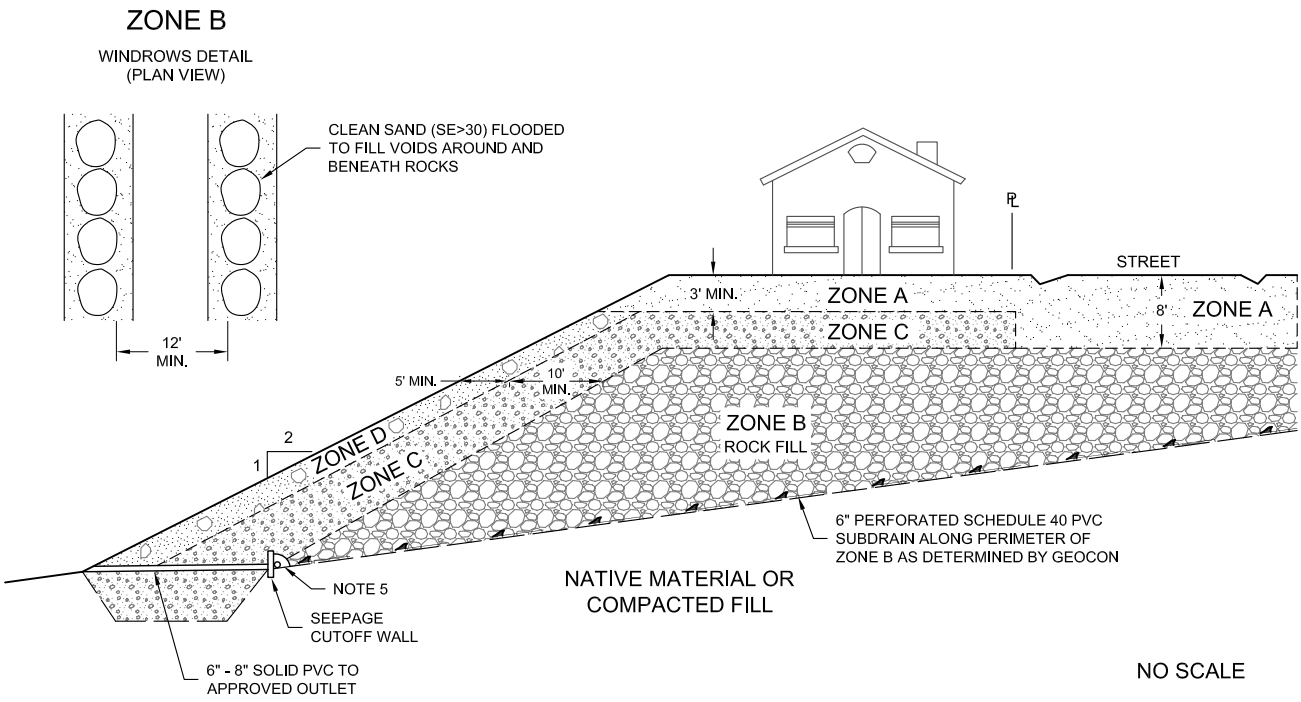
OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

JH / RA		DSK/GTYPD

DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 14

Plotted:08/21/2018 10:17AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\Typical Street Overexcavation Detail (Street Section).dwg



LEGEND

ZONE A: COMPACTED SOIL FILL. NO ROCK FRAGMENTS OVER 6 INCHES IN DIMENSION.

ZONE B: BLASTED ROCK FILL GENERALLY CONSISTING OF 2 FOOT MINUS MATERIAL WITH OCCASIONAL INDIVIDUAL ROCK UP TO 4 FEET MAXIMUM DIMENSION
ALTERNATE: ROCKS 2 TO 4 FEET IN MAXIMUM DIMENSION CAN BE PLACED IN WINDROWS IN COMPACTED SOIL FILL POSSESSING A SAND EQUIVALENT OF AT LEAST 30.

ZONE C: ROCKS UP TO 2 FEET IN MAXIMUM DIMENSION IN A MATRIX OF COMPACTED SOIL FILL WITHIN BUILDING PADS AND SLOPE AREAS ONLY.

ZONE D: ROCKS UP TO 1 FOOT IN MAXIMUM DIMENSION IN A MATRIX OF COMPACTED SOIL FILL.

NOTES

1. COMPACTED SOIL FILL IN UPPER 8 FEET SHALL CONTAIN AT LEAST 40 PERCENT SOIL PASSING THE 3/4 - INCH SIEVE (BY WEIGHT) AND IN THE UPPER 3 FEET OF PAD GRADE AT LEAST 20% SOIL PASSING THE NO. 4 SIEVE (BY WEIGHT) AND COMPACTED IN ACCORDANCE WITH SPECIFICATIONS FOR STRUCTURAL FILL.
2. CONTINUOUS OBSERVATION REQUIRED BY GEOCON DURING ROCK PLACEMENT.
3. ROCK FILL (LESS THAN 40 PERCENT SOIL SIZES) MAY BE PERMITTED IN DESIGNATED AREAS UPON THE RECOMMENDATION OF THE GEOTECHNICAL ENGINEER.
4. DEPTH OF ZONE A SHOULD BE AT LEAST 8 FEET AND EXTENDED TO AT LEAST 2 FEET BELOW DEEPEST UTILITY WITHIN ROADWAYS.
5. 6" PERFORATED SCHEDULE 40 PVC SUBDRAIN ALONG THE TOE AND PORTIONS OF THE PERIMETER OF ZONE B.
6. BASE OF ZONE B SHOULD SLOPE A MINIMUM OF 3 PERCENT.

OVERSIZE ROCK DISPOSAL DETAIL

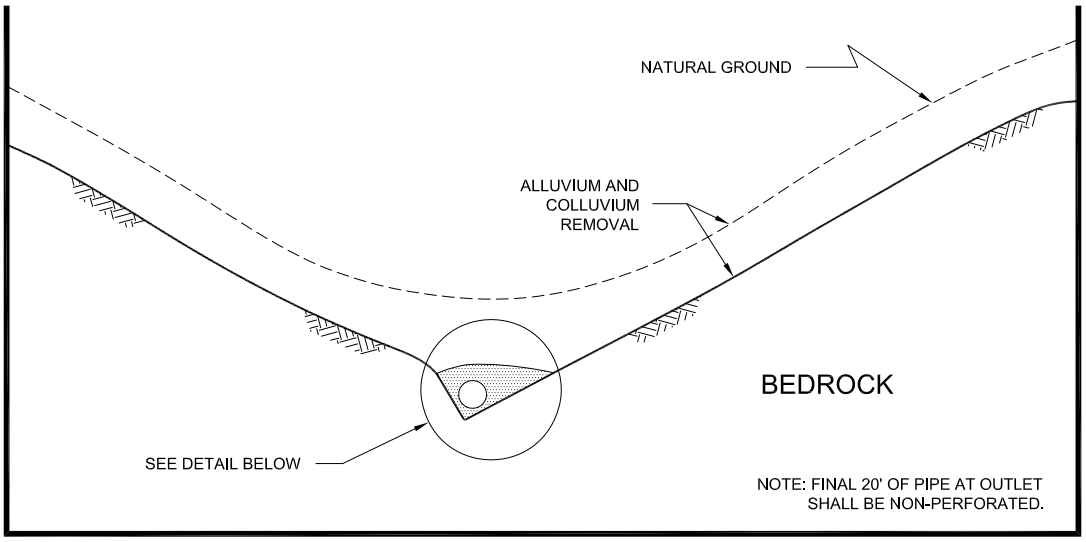
GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

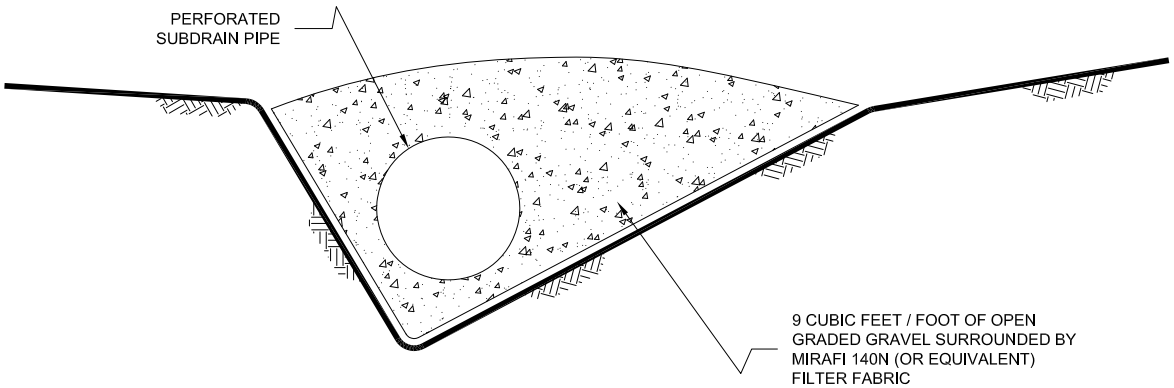
JH / RA		DSK/GTYPD

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 15

Plotted:08/21/2018 10:28AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\Oversize Rock Disposal.dwg





NOTES:

1.....8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS
IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS
LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

TYPICAL CANYON SUBDRAIN DETAIL

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

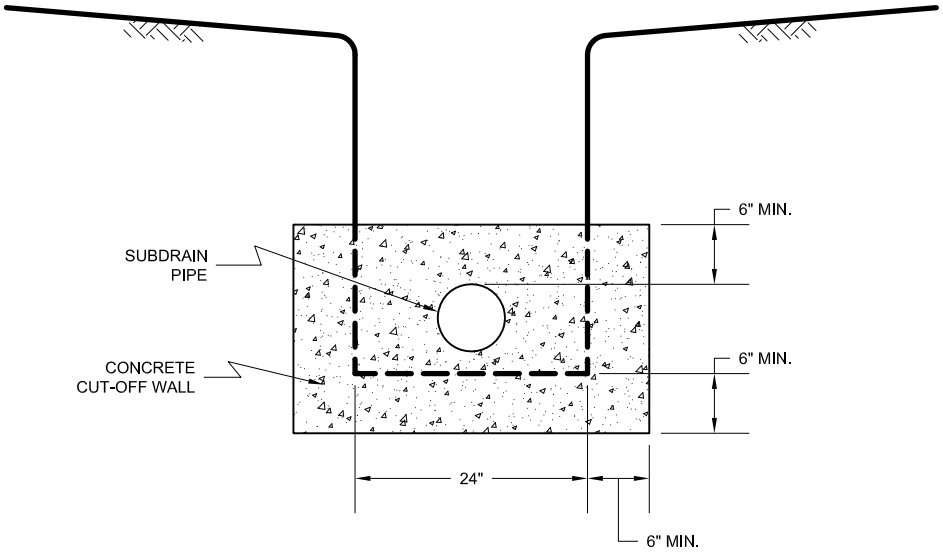
JH / RA		DSK/GTYPD

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 16

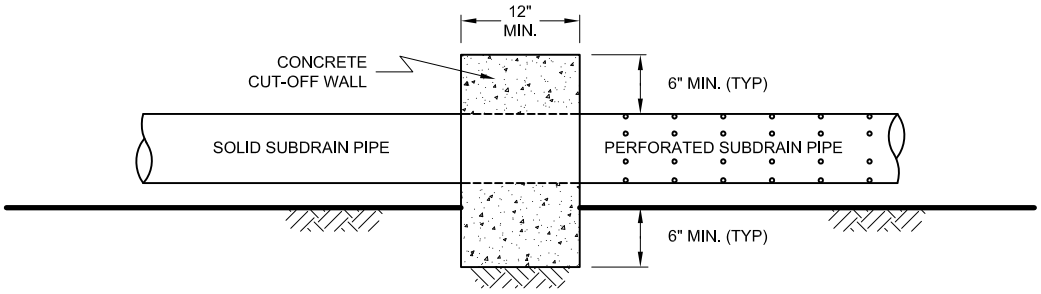
Plotted:08/21/2018 10:32AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\Canyon Drain Detail (TCSD2).dwg

FRONT VIEW



NO SCALE

SIDE VIEW



NO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL DETAIL

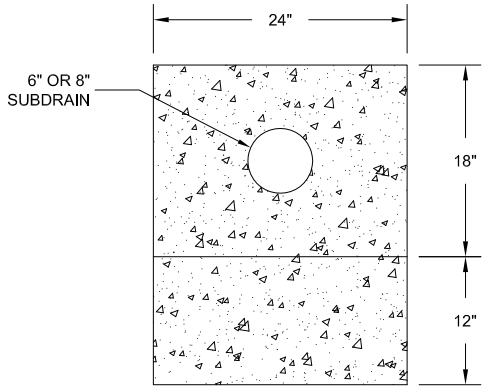
GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

JH / RA		DSK/GTYPD	DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 17

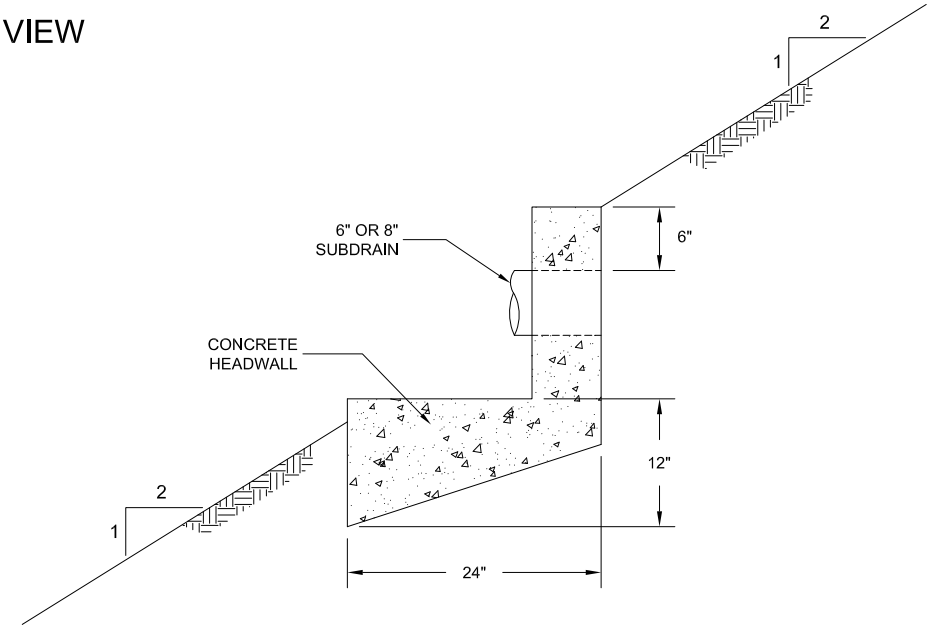
Plotted:08/21/2018 10:27AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\Recommended Subdrain Cut-Off Wall Detail (RSCOW).dwg

FRONT VIEW



NO SCALE

SIDE VIEW



NO SCALE

NOTE: 1. HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE
OR INTO CONTROLLED SURFACE DRAINAGE
2. TO BE APPROVED BY PROJECT CIVIL ENGINEER

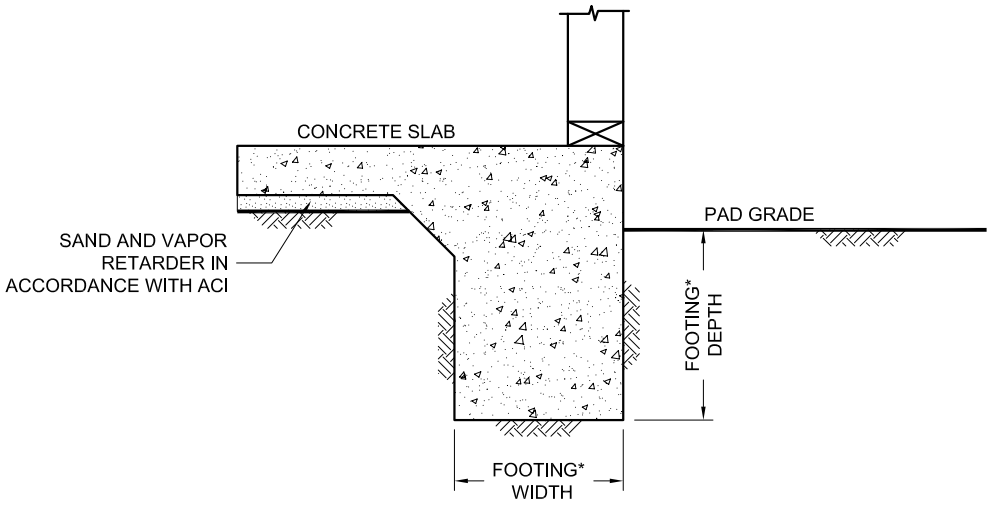
SUBDRAIN OUTLET HEADWALL DETAIL

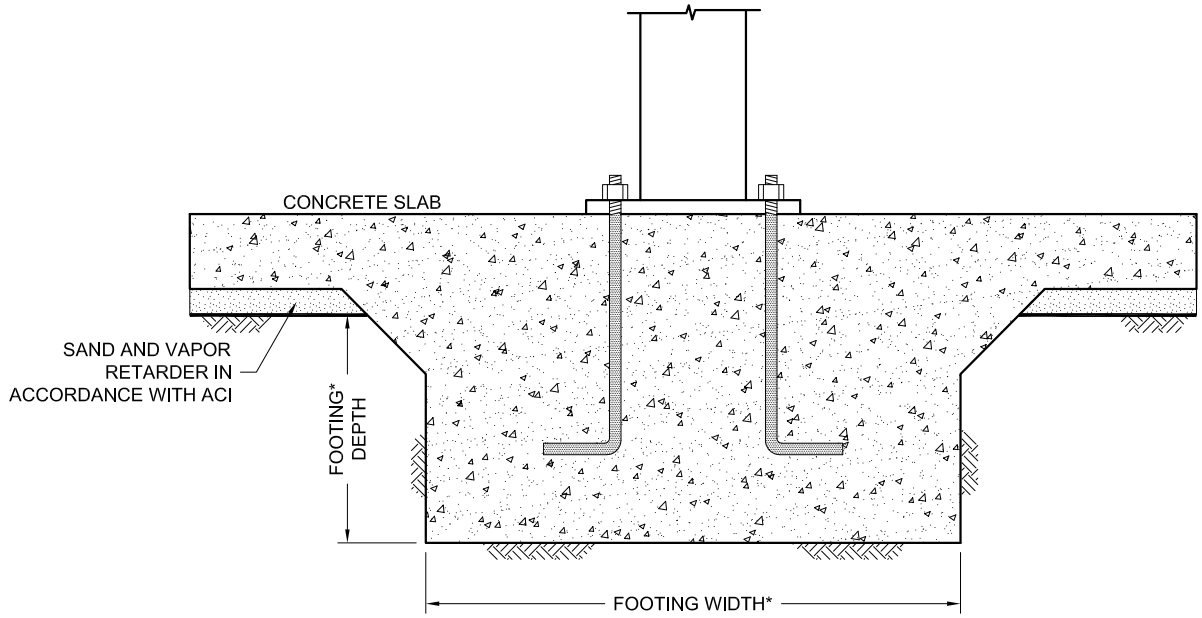
GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

JH / RA		DSK/GTYPD	DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 18

Plotted:08/21/2018 10:23AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\Subdrain Headwall Detail (SOHD).dwg





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

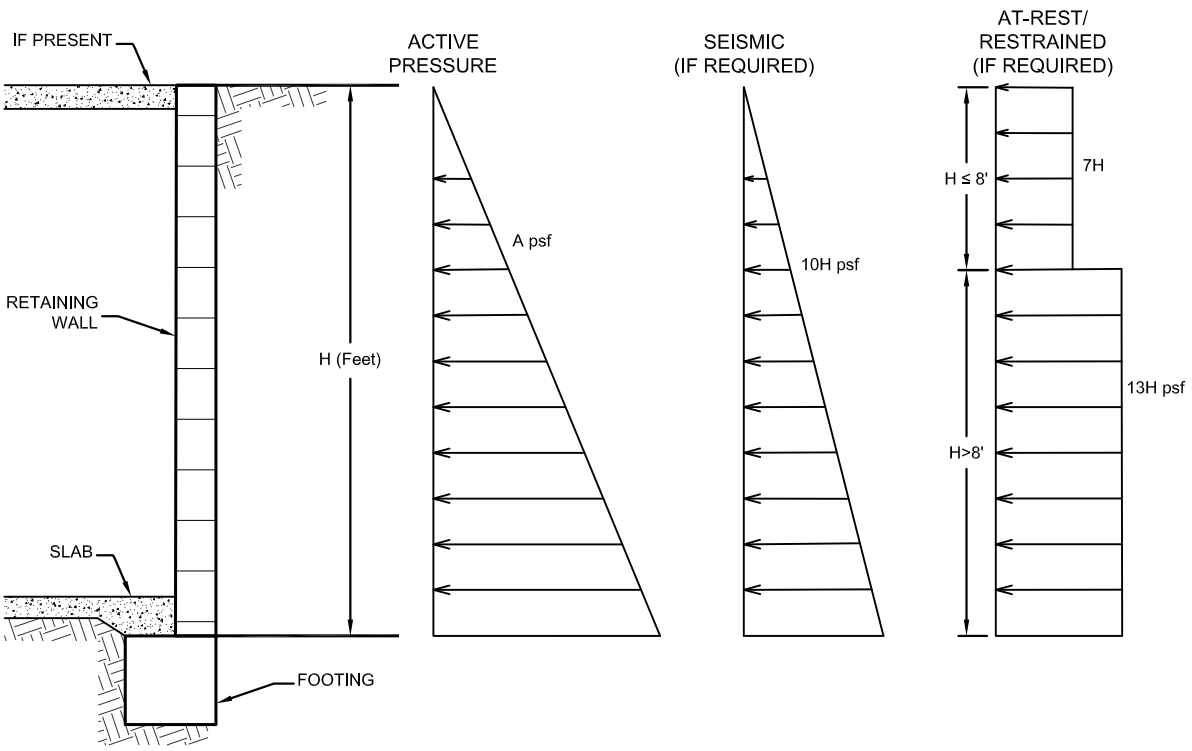
GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

JH / RA		DSK/GTYPD

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 19

Plotted:08/21/2018 10:15AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\Wall-Column Footing Dimension Detail (COLFOOT2).dwg



ACTIVE PRESSURE, A (psf)		
EXPANSION INDEX, EI	LEVEL BACKFILL	2:1 SLOPING BACKFILL
EI ≤ 50	35	50
EI ≤ 90	40	55

NOTES:

1..... A SURCHARGE OF 2 FEET OF SOIL (250 PSF VERTICAL LOAD) SHOULD BE ADDED TO THE DESIGN OF THE WALL WHERE TRAFFIC LOADS ARE WITHIN A HORIZONTAL DISTANCE EQUAL TO ⅔ THE WALL HEIGHT. OTHER SURCHARGES SHOULD BE APPLIED, AS APPLICABLE.

2..... EXPANSION INDEX GREATER THAN 50/90 SHOULD NOT BE USED FOR WALL BACKFILL PER REPORT.

3..... RETAINING WALLS SHOULD BE PROPERLY DRAINED AND WATER PROOFED.

4..... THE PROJECT STRUCTURAL ENGINEER SHOULD EVALUATE THE WALLS LOADING COMBINATIONS.

NO SCALE

RETAINING WALL LOADING DIAGRAM

GEOCON INCORPORATED
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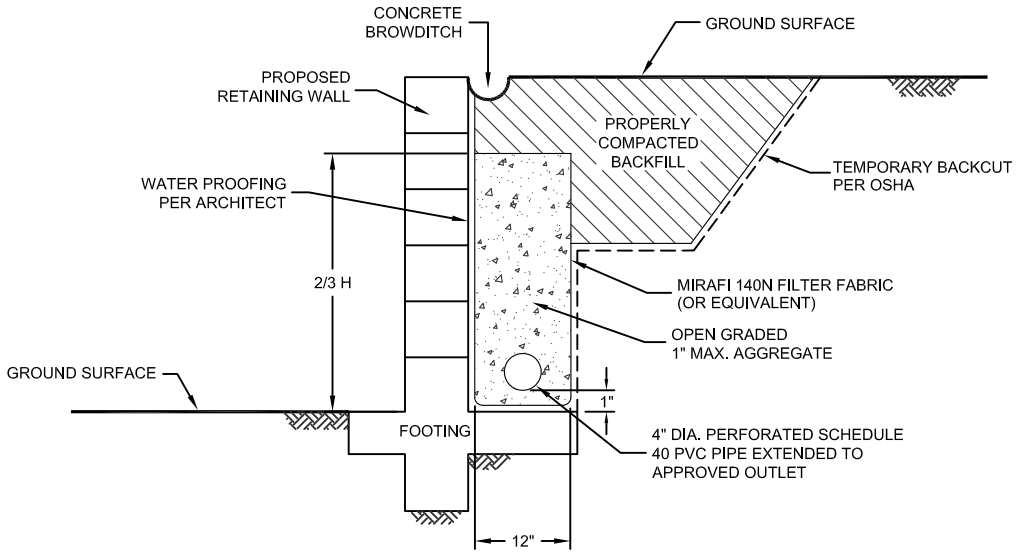
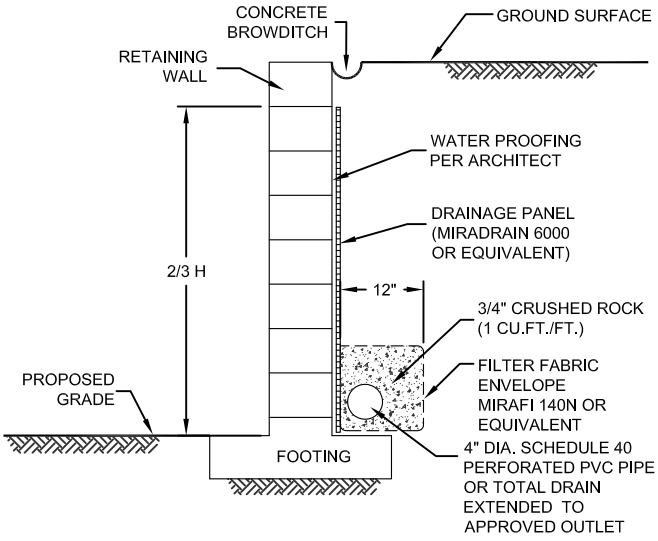
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

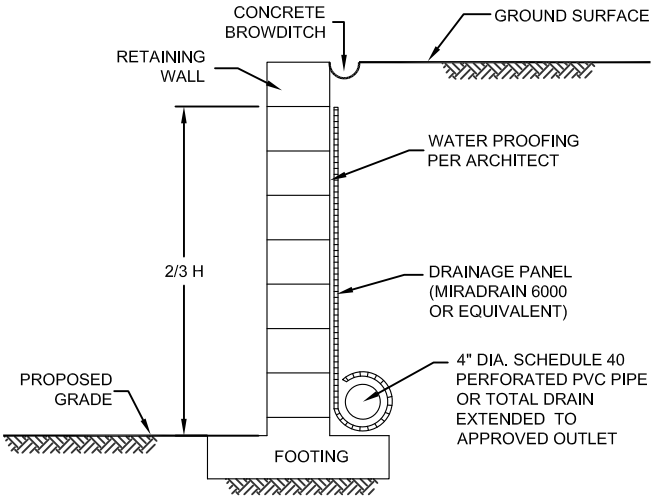
OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

JH / RA		DSK/GTYPD	DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 20

Plotted:08/21/2018 10:26AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\RWLD-NoGroundwater.dwg







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

JH / RA		DSK/GTYPD	DATE 08 - 21 - 2018	PROJECT NO. G1012 - 52 - 02	FIG. 21

Plotted:08/21/2018 10:22AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\Typical Retaining Wall Drainage Detail (RWDD7A).dwg

APPENDIX A

APPENDIX A

EXPLORATORY EXCAVATIONS

Our subsurface exploration consisted of drilling 17 large diameter borings, 48 excavator trenches, 10 small-diameter borings, and 71 trackhoe trenches. We performed the field investigation in two phases in 2008 and 2010. We have also included two large diameter borings, 47 backhoe trenches, 10 air-track borings, and 17 seismic surveys from a previous geotechnical report prepared in 2004 by Neblett & Associates in Appendix D. The locations of some of the exploratory borings and trenches were surveyed by the project civil engineer with the remainder located in the field using compass and tape. We extended the small diameter borings to a maximum depth of approximately 37½ feet using a CME 75 drill rig equipped with 6-inch diameter hollow stem augers. The large diameter borings were excavated to a maximum depth of 70 feet with a truck-mounted drill rig equipped with a 30-inch-diameter bucket-auger. The excavator trenches were extended to a maximum depth of approximately 24 feet using a Komatsu PC 400 excavator equipped with a 36-inch wide bucket. The trackhoe trenches were performed using a John Deere 555 trackhoe equipped with a 24-inch wide bucket and extended to a maximum depth of 13 feet. The approximate boring and trench locations are shown on the Geologic Map (Figures 2 through 8). The logs of the small diameter borings are presented in the geotechnical investigation report for the realignment of Otay Lakes Road dated November 11, 2014 (Project No. G1012-52-01A).

We obtained samples during our subsurface exploration in the borings using a Modified California sampler. The sampler is composed of steel and is driven to obtain ring samples. The Modified California sampler has an inside diameter of 2.5 inches and an outside diameter of 3 inches. Up to 18 rings are placed inside the sampler that is 2.375 inches in diameter and 1 inch in height. We placed the ring samples in moisture-tight containers and transported them to the laboratory for testing. We also obtained bulk samples for laboratory testing.

The small-diameter boring sampler was driven 12 inches into the bottom of the excavation with the use of an automatic hammer. The sampler is connected to A rods and driven into the bottom of the excavation using a 140-pound hammer with a 30-inch drop. Blow counts are recorded for every 6 inches the sampler is driven. The penetration resistances shown on the boring logs are shown in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler. The large-diameter boring sampler was driven 12 to 18 inches into the bottom of the excavation with the use of a telescoping Kelly bar. The weight of the Kelly bar (4,500 pounds maximum) drives the sampler and varies in weight with depth. The height of drop is usually 18 inches. Blow counts are recorded for every 12 inches the sampler is driven. The penetration resistance values shown on the boring logs are shown in terms of blows per foot. These values are not to be taken as N-values and adjustments have not been applied.

We estimated elevations shown on the boring and trench logs either from a topographic map or by using a benchmark. In addition, some elevations were obtained from surveying stakes provided in the field. We visually examined, classified, and logged the soil conditions encountered in the borings and trenches in general conformance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual - Manual Procedure D2844). The logs of the exploratory borings and trenches are presented on Figures A-1 through A-146 and included herein. The logs depict the various soil and rock types encountered and indicate the depths at which samples were obtained.

PROJECT NO. G1012-52-02

BORING LB 1

ELEV. (MSL.) **563'** DATE COMPLETED **01-07-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**TOPSOIL/COLLUVIUM (Qc)** Stiff, moist, dark brown to reddish brown, Silty CLAY with trace gravel			
2					-Becomes grayish brown below 2 feet			
4					-Weathered contact			
				SM	**FANGLOMERATE DEPOSITS (Tof)**			
6	LB1-1				Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with 5-15% gravel up to 3 inches; no discernible bedding; cemented 3-4 inch thick continuous black reduced bed present at 5 feet	5	128.7	7.1
8					-Random pale green 4-12 inch wide claystone rip-up clasts floating in matrix between 8 and 12½ feet			
10	LB1-2					5/10"	127.8	9.3
12				GM/GC	Dense, damp, mottled light brown, green and orange, Gravelly/Clayey SANDSTONE with 20-30% subangular to angular gravel, cobble and boulder size rocks up to 14 inches			
14					-Scoured undulating contact (5-10º, S35W)			
16	LB1-3			CL/CH	**OTAY FORMATION (To)** Very stiff to hard, moist, pale green with orange mottling, Silty CLAYSTONE with trace gravel and cobble up to 6 inches; moderately weak, waxy, random polished high angle parting surfaces; manganese staining	6	122.9	12.0
18	LB1-4				-Gravel and cobble present, with 10-15% up to 10 inches between 16½ to 18 feet -Becomes pale gray with orange mottling below 18 feet			
20	LB1-5				**-PROMINENT SHEAR at 20.1 feet; (35º, N10E)**; paper thin to 1/4-inch thick plastic clay gouge; poorly remolded and continuous	4	115.0	17.0
22					-Gravel and cobble size content increase to 10-20% between 21-22 feet			
24								

Figure A-1,
Log of Boring LB 1, Page 1 of 3

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

BORING LB 1

ELEV. (MSL.) **563'** DATE COMPLETED **01-07-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26	LB1-6				**-PROMINENT SHEAR at 24.9 feet; (30-40º, N30W)**; 1/4 to 1/2-inch thick plastic clay gouge; well developed, continuous and moderately remolded	2	101.9	23.4
28	LB1-7				**-PROMINENT SHEAR at 28.9 feet; (35º, N5W)**; 1/2 to 2-inch thick plastic clay gouge; well defined, moderately to well developed and moderately to highly remolded			
30	LB1-8					3	101.5	23.6
32					**-PROMINENT SHEAR at 31.5 feet; (45º, N45E)**; 1/4 to 1/2-inch thick continuous, poorly remolded plastic clay gouge			
34					**-PROMINENT SHEAR at 33.8 feet; (40º, N60W)**; paper thin to 1/4-inch thick continuous plastic clay gouge with poorly remolded clay in random areas			
36	LB1-9				**-SHEAR ZONE present from 35.1 to 39.8 feet** **-PROMINENT SHEAR at 35.1 feet; (35º, N20W)**; paper thin to 1/4-inch thick poorly developed, poorly remolded plastic clay gouge	2	102.2	25.0
38								
40	LB1-10							
42					**-MINOR SHEAR at 42.0 feet; (high angle)**; paper thin to 1/4-inch thick; very poorly developed			
44								
46	LB1-11					3	100.7	25.0
48					-Becomes pale olive green below 48 feet			

Figure A-1,
Log of Boring LB 1, Page 2 of 3

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

BORING LB 1

ELEV. (MSL.) **563'** DATE COMPLETED **01-07-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50					**-MULTIPLE SHEARS present between 51 and 52 feet; (avg. 10-15°, S50W)**; 1/2 to 3-inch thick, continuous with variable orientation and thickness highly remolded plastic clay gouge			
52								
54				CL	-Distinct change in competency below 54 feet Hard, moist, pale gray to pale olive green, Silty CLAYSTONE; with little fine to coarse, sandy grit, conchoidal fracturing and manganese staining			
	LB1-12					10	104.3	23.0
56								
58								
60								
62								
64					-Becomes mottled pale green and reddish brown and waxy with some shining high angle parting surfaces; competent			
	LB1-13					10/10"	122.1	13.9
66					-18-inch thick clayey sandstone bed present at 65½ feet			
68								
70					BORING TERMINATED AT 70 FEET No groundwater encountered			

Figure A-1,
Log of Boring LB 1, Page 3 of 3

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 2** ELEV. (MSL.) **611'** DATE COMPLETED **01-08-2010** EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM/SC	**TOPSOIL** Loose, damp, dark brown, Silty/Clayey, fine to medium SAND with 10-15% gravel and cobble up to 6 inches			
2				CL/CH	Stiff, moist, reddish brown, Silty CLAY with 10-15% gravel and cobble up to 6 inches			
4				SM	**FANGLOMERATE DEPOSITS (Tof)** Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with 10-20% gravel, cobble and boulders up to 24 inches; rippers used; very difficult drilling			
					REFUSAL AT 5 FEET			

Figure A-2,
Log of Boring LB 2, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

BORING LB 3

ELEV. (MSL.) **575'** DATE COMPLETED **01-08-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL**			
				SM	Loose, damp, brown, Silty, fine to coarse SAND with 10% gravel; drilled on road			
2					**OTAY FORMATION (To)** Dense, damp, mottled pale green, orange and brown, Silty, fine to coarse SANDSTONE with some clay			
4				CL	Very hard, damp, mottled maroon and dark olive green, Silty, CLAYSTONE			
	LB3-1				-Blocky weathering transitional contact	5	111.0	16.1
6				SC/SM	Very dense, damp, mottled brown, dark olive green with some orange oxidation, Silty/Clayey, fine to coarse SANDSTONE			
8								
10	LB3-2					5/10"	119.1	14.3
12								
				SM	Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with 5-15% gravel up to 3 inches			
14								
16								
					-Sharp slightly undulating horizontal contact			
				SC/SM	Very dense, damp, mottled brown, dark olive green with some orange oxidation, Silty/Clayey, fine to coarse SANDSTONE			
18								
20	LB3-3				-Becomes fine to medium below 20 feet	5/10"	118.1	15.5
22								
					-Gradational contact			
24				SM	Very dense, damp, Silty, fine to coarse SANDSTONE; with random 6-inch			

Figure A-3,
Log of Boring LB 3, Page 1 of 3

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

BORING LB 3

ELEV. (MSL.) **575'** DATE COMPLETED **01-08-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26					gravel beds			
28								
30	LB3-4					10/10"	122.2	9.6
32								
34								
36					-Becomes much coarser-grained with increase in gravel and cobble 10-15% up to 6 inches			
38								
40	LB3-5					8/8"	125.0	10.3
42								
44								
46				CL	-Slightly scoured contact with 1 to 2-inch black sandstone lense; (15º, S45E) Very hard, damp, mottled brown and dark olive green, Silty/fine, Sandy CLAYSTONE			
48				SM/SC	-Gradational contact Very dense, damp, mottled brown and dark pale green, Silty/Clayey SANDSTONE with trace gravel			

Figure A-3,
Log of Boring LB 3, Page 2 of 3

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

BORING LB 3

ELEV. (MSL.) **575'** DATE COMPLETED **01-08-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	LB3-6				-Becomes pale green with orange oxidation below 50 feet	8/10"	120.9	13.9
52								
				SM	Very dense, damp, light brown to orange, Silty, fine to coarse SANDSTONE with trace gravel			
54								
56								
58								
	LB3-7			CL	Very hard, damp, dark green, Silty CLAYSTONE	10/8"	108.8	18.2
60					BORING TERMINATED AT 60 FEET No groundwater encountered			

Figure A-3,
Log of Boring LB 3, Page 3 of 3

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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PROJECT NO. G1012-52-02

BORING LB 4

ELEV. (MSL.) **555'** DATE COMPLETED **01-08-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, moist, dark brown, Sandy CLAY with 10-20% gravel and cobble up to 24 inches			
4	LB4-1			SM/SC	**OTAY FORMATION (To)** Dense to very dense, damp, brown and gray with orange mottling, Silty/Clayey, fine to medium SANDSTONE with random 10-20% gravel beds	4	113.5	14.4
12				SM	-Gradational contact Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with 5-10% gravel up to 2 inches			
16	LB4-2					6/10"	124.4	9.3
18					-Becomes much coarser-grained with increase in gravel 10-20% up to 3 inches; also mottled pale green and light brown			
20								
22								
24								

Figure A-4,
Log of Boring LB 4, Page 1 of 3

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

BORING LB 4

ELEV. (MSL.) **555'** DATE COMPLETED **01-08-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26	LB4-3					5/8"	129.1	8.7
28								
30								
32								
34								
				CL	-Sharp contact with 1/2 to 2-inch thick black sandstone bed; slightly undulatory (5-10º, due west)			
36	LB4-4				Very hard, damp, pale green, Silty CLAYSTONE	10/10"	121.6	13.1
					-Gradational contact			
38				SM/SC	Very dense, damp, pale green, Silty/Clayey, fine SANDSTONE -1-foot thick gravelly sandstone bed with 20-30% gravel and cobble up to 5 inches at 37.5 feet -Becomes brown at 38.5 feet			
40								
				SM	Very dense, damp, reddish brown and gray, Silty, fine to coarse SANDSTONE with abundant gravel			
42								
44				CL	Very hard, damp, pale green, Silty CLAYSTONE with random 1/2 to 1½ inches wide sand filled fractures from 44 to 47 feet; waxy but very competent			
46	LB4-5					5/8"	120.7	13.3
48								

Figure A-4,
Log of Boring LB 4, Page 2 of 3

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

BORING LB 4

ELEV. (MSL.) **555'** DATE COMPLETED **01-08-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50								
52					-Gradational contact			
				SM	Very dense, moist, mottled pale green, orange and light brown, Silty, fine to coarse SANDSTONE with abundant gravel			
54								
	LB4-6					25/7"	125.8	8.4
56			▽					
					-Slight seepage observed at 57 feet			
58								
60					BORING TERMINATED AT 60 FEET No groundwater encountered			

Figure A-4,
Log of Boring LB 4, Page 3 of 3

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

BORING LB 5

ELEV. (MSL.) **719'** DATE COMPLETED **01-11-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Very stiff, moist, dark brown, Gravelly CLAY with sand and 20-30% subangular to angular gravel and cobble up to 8 inches			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Very dense, damp, light brown to brown, Gravelly, fine to coarse SANDSTONE with 20-40% subangular to angular gravel and cobble up to 12 inches			
4								
6								
8	LB5-1			SM/SC	-Gravel/cobble lag deposit with up to 16-inch boulders at contact; scoured undulating contact (10-30º, N30W)			
10	LB5-2			CL	**OTAY FORMATION (To)** Dense, damp, mottled brown and pale green, Silty/Clayey, fine to coarse SANDSTONE with 10% gravel up to 1/2 to 2 inches; webbed clay filled fractures	3	109.6	17.5
12					Hard, damp, mottled brown and pale green, Silty/fine to coarse Sandy CLAYSTONE			
14				SM/SC	-Fracture (30º, N10W), 1/2-inch thick white caliche along transitional contact Very dense, damp, brown, Silty/Clayey, fine to medium SANDSTONE			
16								
18				SM	Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with 10-20% gravel up to 1/2 to 1 inch			
20	LB5-3					10	123.5	11.1
22								
24								

Figure A-5,
Log of Boring LB 5, Page 1 of 2

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

BORING LB 5

ELEV. (MSL.) **719'** DATE COMPLETED **01-11-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26								
28					-Scoured undulating contact			
30	LB5-4			SM/SC and CL	Very dense/hard, damp, mottled brown and pale green, Silty/Clayey, fine SANDSTONE/with interbedded fine, Sandy CLAYSTONE	10	113.4	17.8
32								
34				SM	Very dense, damp, light brown, Silty, fine SANDSTONE			
36								
38								
40	LB5-5				-Becomes fine to coarse and tan below 39.5 feet -Sample disturbed	15/6"	118.9	6.7
42								
44					-Gravel and cobble increase to 10-30% up to 5 inches			
46					-Difficult drilling			
					BORING TERMINATED AT 46 FEET No groundwater encountered			

Figure A-5,
Log of Boring LB 5, Page 2 of 2

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 6** ELEV. (MSL.) **684'** DATE COMPLETED **01-11-2010** EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST** MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, moist, dark brown, Silty CLAY with sand and gravel			
2								
4				SM	**OTAY FORMATION (To)** Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with 5-10% gravel and cobble up to 4 inches			
6								
8				SM	Very dense, damp, light brown, Silty/Gravelly, fine to coarse SANDSTONE with 20-35% gravel, cobble and boulders up to 14 inches that decrease with depth			
10								
12								
14								
16				SM/SC	Very dense, damp, mottled light brown and pale green, Silty/Clayey, fine SANDSTONE			
18				SM	Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with 10-20% gravel			
20								
22								
24								

Figure A-6,
Log of Boring LB 6, Page 1 of 2

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 6** ELEV. (MSL.) **684'** DATE COMPLETED **01-11-2010** EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
26				SM	-From 25 to 28 feet, gravel and cobble increase 10-25% up to 8 inches			
28								
30					-Sampler destroyed			
32								
34	LB6-1				-Very slow and difficult drilling below 34 feet; rippers used			
36					-2-foot thick discontinuous, very hard, mottled maroon and pale green, silty claystone; bed truncated by gravel sandstone bed			
38					-Becomes brown to light brown and more clayey with 10-15% gravel and cobble up to 4 inches below 38½ feet			
40								
42								
					PRACTICAL REFUSAL AT 43 FEET			

Figure A-6,
Log of Boring LB 6, Page 2 of 2

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 7** ELEV. (MSL.) **615'** DATE COMPLETED **01-11-2010** EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Stiff, moist, dark brown, Silty/fine to coarse, Sandy CLAY with 10-15% gravel and cobble up to 8 inches			
2								
4				SM	**FANGLOMERATE DEPOSITS (Tof)** Very dense, damp, mottled light brown, to brown, Clayey/Silty, fine to coarse SANDSTONE with 10-30% gravel, cobble and boulders up to 16 inches; very difficult drilling with auger and rippers used			
6					-Larger boulders present below 6 feet up to 24 inches; becomes mottled reddish brown, pale green and brown			
8								
10				GM	Very dense, damp, light brown and brown, Gravelly, fine to coarse SANDSTONE with clay and silt within matrix, 20-40% gravel, cobble and boulders up to 3 feet; very slow difficult drilling			
12					REFUSAL AT 12 FEET			

Figure A-7,
Log of Boring LB 7, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 8** ELEV. (MSL.) **537'** DATE COMPLETED **01-12-2010** EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**COLLUVIUM (Qc)** Stiff, moist, dark brown, Sandy CLAY with cobble and boulders up to 24 inches randomly present; slow difficult drilling; auger used			
2								
4					-Boulder REFUSAL ON BOULDER AT 4 FEET			

Figure A-8,
Log of Boring LB 8, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 9** ELEV. (MSL.) **537'** DATE COMPLETED **01-12-2010** EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**COLLUVIUM (Qc)** Stiff, moist, dark brown, Sandy CLAY, with random cobble and boulders up to 24 inches; slow difficult drilling; rippers used			
2								
4					-Cobble and boulder content increase; becomes light brown; possible fanglomerate contact? -Boulder			
6					REFUSAL ON BOULDER AT 6 FEET			

Figure A-9,
Log of Boring LB 9, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING LB 10

ELEV. (MSL.) **527'** DATE COMPLETED **01-12-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**COLLUVIUM (Qc)** Soft to stiff, moist, dark brown, Sandy CLAY with trace gravel			
2					-Gradational contact			
				CL	**FANGLOMERATE DEPOSITS (Tof)** Very stiff, moist, mottled orange, brown and gray, fine to coarse, Sandy CLAY with 10-25% angular gravel up to 3 inches; no discernible bedding			
4	LB10-1							
6	LB10-2				-Becomes pale green with orange oxidation below 5 feet with random gypsum veins	2	119.5	14.8
8				CL	**OTAY FORMATION (To)** Very dense, damp, mottled orange brown and gray, Gravelly CLAYSTONE with sand, gravel, cobble and boulders up to 8 inches			
10					-1½ thick, stiff, moist, pale green claystone bed with gravel at 10 feet			
12	LB10-3					4/4"	121.6	8.6
14					-Very difficult drilling			
					PRACTICAL REFUSAL AT 15 FEET			

Figure A-10,
Log of Boring LB 10, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

BORING LB 11

ELEV. (MSL.) **529'** DATE COMPLETED **01-13-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, moist, dark brown, fine to coarse, Sandy CLAY with trace gravel			
2				CL/SC	**OTAY FORMATION (To)** Very hard to very dense, damp, mottled light brown, brown and pale green, Sandy, fine to medium CLAYSTONE/Clayey, fine to medium SANDSTONE; clay and sand content vary with depth			
4								
6	LB11-1					5/10"	111.1	15.7
8								
10	LB11-2					5/8"	116.5	16.2
12								
14								
16								
18				SM	Very dense, damp, light gray, Silty, fine to medium SANDSTONE			
20	LB11-3			CL/SC	-Irregular scoured contact with 6 to 8-inch gravel and cobble bed at contact (10-20º, S35W) Very hard to very dense, damp, mottled light brown, brown and pale green, Sandy, fine to medium CLAYSTONE/Clayey, fine to medium SANDSTONE; clay and sand content vary with depth	6	123.1	13.7
22								
24				SM	-Gradational contact Very dense, damp, gray to light brown, Silty, fine to coarse SANDSTONE with 5-10% gravel up to 3 inches			
26								
28								

Figure A-11,
Log of Boring LB 11, Page 1 of 2

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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PROJECT NO. G1012-52-02

BORING LB 11

ELEV. (MSL.) **529'** DATE COMPLETED **01-13-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32					-Sharp slightly scoured contact with coarse sandstone at base (2-3º, S35W) -1½ foot thick pale green and light brown, sandy claystone/clayey sandstone bed at 35½ feet			
34								
36								
38								
40								
42	LB11-4			CL	-Sharp scoured undulating contact Very hard to hard, pale green, Silty CLAYSTONE, waxy but very competent	8	121.0	14.3
44	LB11-5							
46	LB11-6			SC	-Gradational contact Very dense, damp, orange brown, Clayey, fine to coarse SANDSTONE with 10-30% gravel and cobble up to 10 inches	11/10"	125.7	11.0
48								
50					BORING TERMINATED AT 50 FEET No groundwater encountered			

Figure A-11,
Log of Boring LB 11, Page 2 of 2

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

BORING LB 12

ELEV. (MSL.) **532'** DATE COMPLETED **01-13-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**COLLUVIUM (Qc)** Loose, damp to moist, brown to reddish brown, Clayey, fine to medium SAND with trace gravel and cobble up to 6 inches			
2					-Gradational contact			
				CL	Stiff, moist, reddish brown, Silty CLAY with some sand, gravel and cobble up to 4 inches			
4								
6	LB12-1			CL	Stiff to very stiff, moist, mottled gray, light brown and green, Sandy CLAYSTONE with trace gravel	1	108.2	17.7
				SC	**OTAY FORMATION (To)** Dense, damp, mottled pale green, light brown, Clayey/Silty SANDSTONE			
8				SM	Very dense, damp, mottled gray, light brown and pale green, Gravelly, fine to coarse SANDSTONE with clay, gravel, cobble and boulders up to 30 inches; very slow difficult drilling			
10								
12					-Heavily scoured contact			
				SM	Very dense, damp, light brown, pale green and light orange, Silty, fine to coarse SANDSTONE			
14					-Becomes silty/clayey sandstone below 14 feet			
16				SM	Very dense, damp, light brown and gray, Gravelly/Silty, fine to coarse SANDSTONE with 20-40% gravel, cobble and boulders up to 24 inches; difficult drilling, rippers and auger used			
18								
20								
					REFUSAL AT 21 FEET ON BOULDER			

Figure A-12,
Log of Boring LB 12, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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PROJECT NO. G1012-52-02

BORING LB 13

ELEV. (MSL.) **542'** DATE COMPLETED **01-13-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**COLLUVIUM (Qc)** Stiff, moist, brown to reddish brown, Silty/fine to coarse Sandy CLAY with trace gravel			
4					-Gradational contact			
	LB13-1			SC	**FANGLOMERATE DEPOSITS (Tof)** Medium dense to dense, damp to moist, light brown to gray, Clayey, fine to coarse SAND with 10-20% gravel and cobble up to 8 inches; random 12-inch boulder also present; no discernible bedding	4	118.8	12.1
8					-Sharp undulating scoured contact (10-20º, N80W) with increase in cobble and boulders			
				SM	**OTAY FORMATION (To)** Dense to very dense, damp, pale green, orange and light brown, Silty, fine to coarse SANDSTONE with 5-10% gravel			
10					-1½ foot thick silty/clayey, fine to medium sandstone bed with occasional cobble and boulder up to 14 inches			
14					-Gravel and cobble lenses present from 13 to 18 feet up to 20 inches; slow difficult drilling; rippers and auger used			
18					REFUSAL AT 18 FEET ON BOULDER			

Figure A-13,
Log of Boring LB 13, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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PROJECT NO. G1012-52-02

BORING LB 14

ELEV. (MSL.) **512'** DATE COMPLETED **01-14-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, moist, dark brown, fine to coarse Sandy/Silty CLAY with 5% gravel and cobble up 8 inches			
2				SC	**FANGLOMERATE DEPOSITS (Tof)** Dense, damp, mottled light brown and orange, Clayey, fine to coarse SANDSTONE with 10-20% gravel, cobble and boulders up to 14 inches; no discernible bedding; difficult drilling			
4								
6								
8					-Heavily scoured and undulating contact (10-30º, S10E)			
				SM	**OTAY FORMATION (To)** Dense, damp, light brown, orange and pale green, Silty, fine to medium SANDSTONE			
10				SC/SM	Dense, damp, pale green and orange, Clayey/Silty SANDSTONE			
12				SM/SC	Dense, damp, dark gray, Gravelly/Clayey, fine to coarse SANDSTONE with 20-30% gravel, cobble and boulders up to 14 inches; very slow difficult drilling; rippers used			
14					PRACTICAL REFUSAL 1T 14 FEET			

Figure A-14,
Log of Boring LB 14, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 15** ELEV. (MSL.) **507'** DATE COMPLETED **01-14-2010** EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**COLLUVIUM/ALLUVIUM (Qc/Qal)** Loose to medium dense, moist, dark brown, Clayey, fine to coarse SAND, 10-20% with gravel, cobble and boulders up to 14 inches; slow difficult drilling; rippers used			
2								
4								
					REFUSAL AT 5 FEET			

Figure A-15,
Log of Boring LB 15, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING LB 16

ELEV. (MSL.) **546'** DATE COMPLETED **01-14-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**COLLUVIUM (Qc)** Stiff, moist, brown to dark brown, Silty CLAY with some sand; trace gravel			
2					-Gradational contact			
4				CL	Very stiff, moist, pale olive green to olive brown, Silty CLAY/CLAYSTONE with sand grit, trace gravel and gypsum			
6	LB16-1					1	110.5	17.4
8				SM/SC	**OTAY FORMATION (To)** Dense, damp, orange brown and pale green, Gravelly/Clayey, fine to coarse SAND with 20-40% gravel, cobble and boulders up to 14 inches			
					REFUSAL AT 9 FEET ON BOULDER			

Figure A-16,
Log of Boring LB 16, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING LB 17

ELEV. (MSL.) **509'** DATE COMPLETED **01-14-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**COLLUVIUM (Qc)** Stiff, moist, dark brown, Sandy CLAY with 5-10% gravel and cobble up to 6 inches			
2					-Becomes very stiff, pale gray to pale green			
4				CL/SC	**OTAY FORMATION (To)** Dense, damp, light brown to pale green, fine to coarse, Sandy CLAYSTONE/Clayey, fine to coarse SANDSTONE			
6					-Scoured contact			
				CL	Dense, damp, pale green and orange, Gravelly/fine to coarse, Sandy CLAYSTONE with 30% gravel, cobble and boulders up to 12 inches			
8					-Heavily scoured contact			
				CL	Hard, moist, pale green, Silty CLAYSTONE with fine to coarse, sandy grit; waxy but very competent			
10	LB17-1				-Gravel in shoe; blow counts not accurate	5/8"	113.2	15.3
				SM/SC	Very dense, damp, pale green and orange brown, Gravelly/Clayey, fine to coarse SANDSTONE with 20-40% gravel, cobble and boulders up 14 inches with random pale green discontinuous claystone beds			
12								
14								
16								
					-Gradational contact			
				CL	Very stiff to hard, pale gray-green, Silty CLAYSTONE with fine to coarse sandy grit and trace gravel; waxy but competent			
18	LB17-2					2	112.6	18.0
20					-Gravel content increases below 21 feet			
22					-Gradational contact			
				SM/SC	Very dense, damp, pale green and orange brown, Gravelly/Clayey, fine to coarse SANDSTONE with 20-40% gravel, cobble and boulders up 14 inches with random pale green discontinuous claystone beds			
24								

Figure A-17,
Log of Boring LB 17, Page 1 of 2

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 17** ELEV. (MSL.) **509'** DATE COMPLETED **01-14-2010** EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
26	LB17-3					5/8"	126.8	9.1
28								
30								
					-Gravel, cobble and boulder content increases below 30 feet PRACTICAL REFUSAL AT 31 FEET			

Figure A-17,
Log of Boring LB 17, Page 2 of 2

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 1 ELEV. (MSL.) 652' DATE COMPLETED 08-18-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: J. PAGNILLO	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, damp, brown, Clayey, fine to coarse SAND			
2					**METAVOLCANIC ROCK (KJmv)** Highly weathered, brown, moderately strong, METAVOLCANIC ROCK -Becomes moderately weathered and very strong; angular fragments up to 12" in maximum dimension			
					REFUSAL AT 3 FEET No groundwater encountered			

Figure A-18,
Log of Trench ET 1, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 2 ELEV. (MSL.) 700' DATE COMPLETED 08-18-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: J. PAGNILLO	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Loose, damp, brown, fine to medium Sandy CLAY			
2					**METAVOLCANIC ROCK (KJmv)** Slightly weathered, grayish brown, very strong to extremely strong, METAVOLCANIC ROCK; angular fragments up to 18" in max dimension REFUSAL AT 2½ FEET No groundwater encountered			

Figure A-19,
Log of Trench ET 2, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 3 ELEV. (MSL.) 674' DATE COMPLETED 08-18-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: J. PAGNILLO MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Loose, damp, brown, fine to medium, Sandy CLAY			
2								
4					**METAVOLCANIC ROCK (KJmv)** Soil, brownish- to olive gray, weak METAVOLCANIC ROCK (saprolite)			
6					-Becomes highly weathered			
8					-Becomes moderately weathered and moderately weak			
10					-Becomes moderately strong to strong; some angular fragments to 8" in max dimension			
12					-Very strong			
					REFUSAL AT 13 FEET No groundwater encountered			

Figure A-20,
Log of Trench ET 3, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 4 ELEV. (MSL.) **540'** DATE COMPLETED **08-18-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **J. PAGNILLO**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**COLLUVIUM (Qc)** Loose, damp, brown to dark brown, Clayey, fine to coarse SAND			
2					-Becomes medium dense			
4								
6					**METAVOLCANIC ROCK (KJmv)** Highly weathered, grayish brown, moderately weak, METAVOLCANIC ROCK			
8					-Becomes moderately strong			
10					-Becomes strong to very strong and moderately weathered -Some angular fragments up to 12" in max dimension			
12								
14					REFUSAL AT 14 FEET No groundwater encountered			

Figure A-21,
Log of Trench ET 4, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 5 ELEV. (MSL.) 505' DATE COMPLETED 08-18-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: J. PAGNILLO	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, damp, brown, Clayey, fine to coarse SAND			
2					**METAVOLCANIC ROCK (KJmv)** Highly weathered, grayish brown, weak, METAVOLCANIC ROCK with red oxidation			
4					-Becomes moderately weathered and moderately weak			
6					-Becomes strong to very strong; angular fragments up to 12" in max dimension			
8					REFUSAL AT 9 FEET No groundwater encountered			

Figure A-22,
Log of Trench ET 5, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 6 ELEV. (MSL.) 506' DATE COMPLETED 08-18-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: J. PAGNILLO	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**ALLUVIUM (Qal)** Medium dense, damp to moist, brown to dark brown, Clayey, fine to coarse SAND with trace sub-angular metavolcanic rock up to 6" in maximum dimension			
2	ET6-1							
4				CL/CH	**OTAY FORMATION (To)** Stiff, moist, light olive gray, fine to coarse, Sandy CLAYSTONE; waxy lustre, local polished surfaces			
6								
8								
10	ET6-2				-Becomes stiff to very stiff			
12								
14								
16								
18								
					TRENCH TERMINATED AT 19 FEET No groundwater encountered			

Figure A-23,
Log of Trench ET 6, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 7

ELEV. (MSL.) **550'** DATE COMPLETED **08-18-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **J. PAGNILLO**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**TOPSOIL** Loose to medium dense, damp, Clayey, fine to coarse SAND			
2				SM+GW	**FANGLOMERATE DEPOSITS (Tof)** Dense, damp, light brown to tan, Silty, fine to coarse SANDSTONE with 20-30% gravel and cobble up to 10 inches			
14					-Gravel percentage decreases (5-10%)			
18				CL-CH	**OTAY FORMATION (To)** Very stiff, damp, green/brown, Sandy CLAYSTONE			
24					TRENCH TERMINATED AT 24 FEET No groundwater encountered			

Figure A-24,
Log of Trench ET 7, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 8

ELEV. (MSL.) **646'** DATE COMPLETED **08-18-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **J. PAGNILLO**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**TOPSOIL**			
				SM	Loose, damp, reddish brown, Clayey, fine to coarse SAND			
2	ET8-1				**FANGLOMERATE DEPOSITS (Tof)** Very dense, damp, brown and gray, Silty/Gravelly, fine to coarse SANDSTONE with 30-40% gravel and cobble up to 6 inches			
4								
6								
8					-Boulders up to 18 inches present			
10								
12					REFUSAL AT 12 FEET No groundwater encountered			

Figure A-25,
Log of Trench ET 8, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 9 ELEV. (MSL.) 596' DATE COMPLETED 08-18-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: J. PAGNILLO	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	ET9-1			CL	**TOPSOIL** Medium dense, damp, brown to dark brown, fine to medium Sandy CLAY			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, moist, light brown, Silty, fine- to coarse-grained SANDSTONE with cobbles and some boulders up to 24" in maximum dimension approx. 10% greater than 12-inch minus			
4								
6								
8	ET9-2							
10								
12								
14								
16								
18								
					TRENCH TERMINATED AT 19 FEET No groundwater encountered			

Figure A-26,
Log of Trench ET 9, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH ET 10** ELEV. (MSL.) **504'** DATE COMPLETED **08-21-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Medium dense, dry, brown, Sandy CLAY; some rootlets			
2					-Becomes dense with some nested gravels and boulders up to 2 feet in maximum dimension			
4				SC	**OTAY FORMATION (To)** Dense, moist, light grayish to yellowish brown, Clayey, medium- to coarse-grained SANDSTONE with 20% gravel and occasional cobble			
6								
8								
10								
12					-Massive; becomes very dense and cemented			
14					REFUSAL AT 14 FEET No groundwater encountered			

Figure A-27,
Log of Trench ET 10, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 11 ELEV. (MSL.) 545' DATE COMPLETED 08-18-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: J. PAGNILLO	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, dark brown, fine to medium, Sandy CLAY with trace cobble up to 6" in maximum dimension			
2								
4								
6				SM	**OTAY FORMATION (To)** Dense, moist, light brown, Silty, fine- to coarse-grained SANDSTONE with 10-20% gravel and cobble up to 12-inch minus			
8								
10								
12					-Amount of cobble decreases			
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered			

Figure A-28,
Log of Trench ET 11, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 12 ELEV. (MSL.) 612' DATE COMPLETED 08-18-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: J. PAGNILLO MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Soft, damp, brown, fine to medium Sandy CLAY			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, moist, light brown, Silty, fine- to coarse-grained SANDSTONE with 15% gravel, cobble and boulders up to 18 inches			
4								
6					-Amount of cobble and boulder decreases			
8								
10								
12								
14								
16								
18								
					TRENCH TERMINATED AT 19 FEET No groundwater encountered			

Figure A-29,
Log of Trench ET 12, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 13

ELEV. (MSL.) **516'** DATE COMPLETED **08-22-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**TOPSOIL** Loose, dry, grayish brown, Silty to Clayey SAND			
2				CL	Stiff to hard, brown, Sandy CLAY			
4				SM	**OTAY FORMATION (To)** Dense, moist, light yellowish to grayish brown, Silty, fine- to coarse-grained SANDSTONE; few gravels -Becomes very dense with approx. 10-20% gravels and cobbles			
6								
8	ET13-1							
10								
12					-Massive			
14								
16					-Becomes strongly cemented and conglomeratic REFUSAL AT 16 FEET No groundwater encountered			

Figure A-30,
Log of Trench ET 13, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 14 ELEV. (MSL.) 616' DATE COMPLETED 08-22-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**TOPSOIL** Medium dense, moist, grayish brown, Silty SAND; some gravels and cobbles			
2				SC	**FANGLOMERATE DEPOSITS (Tof)** Dense, slightly moist, reddish brown, Clayey/Gravelly, fine to medium SANDSTONE with 20-30% gravel and cobble up to 12-inch minus			
4	ET14-1							
6								
8								
10					-Becomes very dense with abundant boulders greater than 2-feet in maximum dimension REFUSAL AT 10 FEET No groundwater encountered			

Figure A-31,
Log of Trench ET 14, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 15

ELEV. (MSL.) **510'** DATE COMPLETED **08-22-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC-SM	**ALLUVIUM (Qal)** Medium dense, dry, brown, Clayey to Silty SAND			
2				SM	**OTAY FORMATION (To)** Dense, moist, olive gray to light reddish brown, Silty to Clayey, fine- to medium-grained SANDSTONE			
4								
6	ET15-1							
8					-Becomes fine- to coarse-grained with 20-30% cobbles and boulders up to 2-foot minus			
10								
12								
14					-Massive			
16					REFUSAL AT 16 FEET No groundwater encountered			

Figure A-32,
Log of Trench ET 15, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 16 ELEV. (MSL.) **644'** DATE COMPLETED **08-21-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	ET16-1			SC	**TOPSOIL**			
				SM	Loose, damp, brown, Clayey SAND			
2					**FANGLOMERATE DEPOSITS (Tof)** Dense, dry, light brown, Silty/Gravelly, fine to medium SANDSTONE; angular gravels			
4								
6	ET16-2				-Becomes dense, moist, light grayish brown and moderately cemented			
8								
10								
12	ET16-3			SM	**OTAY FORMATION (To)** Dense, damp, light brown, Silty, fine to medium SANDSTONE with some gravel			
14								
16								
18					TRENCH TERMINATED AT 18 FEET No groundwater encountered			

Figure A-33,
Log of Trench ET 16, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 17

ELEV. (MSL.) **614'** DATE COMPLETED **08-18-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **J. PAGNILLO**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**ALLUVIUM (Qal)** Loose, moist to wet, dark brown, fine to coarse, Sandy CLAY with trace cobble (~10%) up to 6" size			
2								
4								
6				SM	**OTAY FORMATION (To)** Dense, moist to wet, light brown, Silty, fine to coarse SANDSTONE with cobble (~10-15%) sub-rounded, up to 12" in maximum dimension			
8				CL	Hard, moist to wet, yellow, fine to medium, Sandy CLAYSTONE			
10	ET17-1							
12								
14								
16								
18								
20					TRENCH TERMINATED AT 20 FEET No groundwater encountered			

Figure A-34,
Log of Trench ET 17, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 18

ELEV. (MSL.) **585'** DATE COMPLETED **08-21-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**ALLUVIUM (Qal)** Stiff, moist, brown, Sandy CLAY with some gravels			
2	ET18-1							
4								
6				SM	**OTAY FORMATION (To)** Dense, slightly moist, grayish brown, Silty, fine to medium, SANDSTONE; excavates blocky in texture			
8	ET18-2							
10								
12								
14					-Massive			
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered			

Figure A-35,
Log of Trench ET 18, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH ET 19** ELEV. (MSL.) **777'** DATE COMPLETED **08-21-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	ET19-1				**METAVOLCANIC ROCK (KJmv)** Slightly weathered, gray to reddish brown, strong METAVOLCANIC ROCK; excavates to 2-6" minus			
2								
					REFUSAL AT 3 FEET No groundwater encountered			

Figure A-36,
Log of Trench ET 19, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 20 ELEV. (MSL.) 638' DATE COMPLETED 08-21-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	B20-1			SM	**ALLUVIUM (Qal)** Loose, dry, grayish brown, Silty, fine to medium SAND with some clay and gravels			
2								
4								
6	B20-2			CL	**OTAY FORMATION (To)** Hard, light grayish brown, Silty CLAYSTONE			
8								
10								
12					-Massive			
14					**METAVOLCANIC ROCK (KJmv)** Highly weathered, blue-gray, strong METAVOLCANIC ROCK			
16					REFUSAL AT 16 FEET No groundwater encountered			

Figure A-37,
Log of Trench ET 20, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 21

ELEV. (MSL.) **660'** DATE COMPLETED **08-18-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	ET21-1			CL	**TOPSOIL** Loose to medium dense, moist, dark brown, fine to medium Sandy CLAY with cobble (~10%) up to 6" size			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, moist, light brown, Silty, fine to coarse SANDSTONE with 15% gravel, cobble and boulders up to 18 inches			
4								
6								
8					-Amount of cobble decreases (5-10%)			
	ET21-2			SM	**OTAY FORMATION (To)** Dense, damp, light brown, Silty, fine to coarse SANDSTONE with some gravel			
10								
12								
14								
16								
18								
20					TRENCH TERMINATED AT 20 FEET No groundwater encountered			

Figure A-38,
Log of Trench ET 21, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 22 ELEV. (MSL.) 766' DATE COMPLETED 08-21-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**METAVOLCANIC ROCK (KJmv)** Moderately weathered, grayish brown, strong METAVOLCANIC ROCK; joint orientations range between N70ºE, 3ºS to horizontal			
2	ET22-1							
4								
6					-Becomes moderately strong and highly weathered			
8								
10								
12					REFUSAL AT 12 FEET No groundwater encountered			

Figure A-39,
Log of Trench ET 22, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 23 ELEV. (MSL.) 766' DATE COMPLETED 08-21-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**ALLUVIUM (Qal)** Medium dense, dry, reddish brown, Clayey SAND; some gravels and occasional cobbles; approx 10% greater than 6" minus			
2								
4								
6					-30-40% greater than 6" minus			
8								
10					**METAVOLCANIC ROCK (KJmv)** Highly weathered, gray-brown, moderately strong METAVOLCANIC ROCK			
12								
14					REFUSAL AT 14 FEET No groundwater encountered			

Figure A-40,
Log of Trench ET 23, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 24

ELEV. (MSL.) **681'** DATE COMPLETED **08-21-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, dark olive brown, Sandy CLAY			
2								
4				SM	**OTAY FORMATION (To)** Dense, moist, gray brown to reddish brown, medium-grained, Silty SANDSTONE			
6								
8					-20-30% gravel and cobble present			
10								
12								
14					-Massive			
16								
18					TRENCH TERMINATED AT 18 FEET No groundwater encountered			

Figure A-41,
Log of Trench ET 24, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 25

ELEV. (MSL.) **642'** DATE COMPLETED **08-21-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, dry, light brown, Silty, fine SAND			
2				SC	**OTAY FORMATION (To)** Dense, dry, light reddish brown, Clayey, fine- to coarse-grained SANDSTONE with coarse gravels			
6	ET25-1			SM/SC	Dense, moist, light olive brown, Silty to Clayey, fine-grained SANDSTONE			
12					-Some claystone lenses present			
18					TRENCH TERMINATED AT 18 FEET No groundwater encountered			

Figure A-42,
Log of Trench ET 25, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 26 ELEV. (MSL.) 619' DATE COMPLETED 08-21-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**TOPSOIL** Loose, dry, dark brown, Silty SAND			
2				SM/SC	**FANGLOMERATE DEPOSITS (Tof)** Very dense, moist, grayish brown, Gravelly/Clayey, medium- to coarse-grained SANDSTONE with 30-40% gravel, cobble and boulders up to 3-feet in diameter			
4								
6	ET26-1							
8								
10								
12					-Becomes yellowish to reddish brown with increase in boulders -Very difficult excavation TRENCH TERMINATED AT 12 FEET No groundwater encountered			

Figure A-43,
Log of Trench ET 26, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 27 ELEV. (MSL.) 576' DATE COMPLETED 08-21-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, dry, olive brown, Clayey SAND			
2								
4				SM	**OTAY FORMATION (To)** Dense, moist, tan to olive brown, Silty/Gravelly, fine to medium SANDSTONE with 20-30% gravel and cobble			
6								
8					-Gravel and cobble content decreases			
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered			

Figure A-44,
Log of Trench ET 27, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH ET 28** ELEV. (MSL.) **562'** DATE COMPLETED **08-21-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Stiff, moist, dark brown, Sandy CLAY			
2				SM/SC	**OTAY FORMATION (To)** Dense, moist, light grayish brown, Silty/Clayey, fine to coarse SANDSTONE; some angular gravels			
4								
6								
8	ET28-1				-2"-4" thick waxy claystone lense present; competent; not remolded			
10								
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered			

Figure A-45,
Log of Trench ET 28, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 29 ELEV. (MSL.) 564' DATE COMPLETED 08-21-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CL	**ALLUVIUM (Qal)** Stiff, dry, dark olive brown, Sandy CLAY			
2	ET29-1							
				SM/SC	**OTAY FORMATION (To)** Dense, moist, light grayish brown, Silty/Clayey, fine to coarse SANDSTONE; some gravels; weakly to moderately cemented			
4								
6								
8								
10								
12					-Massive			
14					TRENCH TERMINATED AT 14 FEET No groundwater encountered			

Figure A-46,
Log of Trench ET 29, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 30 ELEV. (MSL.) **680'** DATE COMPLETED **08-21-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Stiff, dry, dark brown, Sandy CLAY			
2				SM	**OTAY FORMATION (To)** Dense, moist, light brown, Silty, fine- to medium-grained SANDSTONE; some gravels and cobble			
20					TRENCH TERMINATED AT 20 FEET No groundwater encountered			

Figure A-47,
Log of Trench ET 30, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 31 ELEV. (MSL.) **514'** DATE COMPLETED **08-19-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**ALLUVIUM (Qal)** Stiff, moist, brown, Clayey SAND; some boulders			
2								
4				SM/SC	**OTAY FORMATION (To)** Dense, moist, light grayish brown, Silty/Clayey, fine- to medium-grained SANDSTONE; occasional gravels			
6								
8								
10								
12								
					TRENCH TERMINATED AT 12½ FEET No groundwater encountered			

Figure A-48,
Log of Trench ET 31, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 32

ELEV. (MSL.) **558'** DATE COMPLETED **08-19-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	ET32-1			SC	**TOPSOIL** Medium dense, dry, dark reddish brown, Clayey SAND; some gravels and cobbles			
2				SM	**OTAY FORMATION (To)** Dense, moist, light grayish brown, Silty, medium- to coarse-grained SANDSTONE; some gravels			
4								
6	ET32-2							
8								
10								
12								
14					TRENCH TERMINATED AT 14 FEET No groundwater encountered			

Figure A-49,
Log of Trench ET 32, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 33 ELEV. (MSL.) 633' DATE COMPLETED 08-19-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, dry, brown, Clayey SAND			
2	ET33-1			SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, dry, reddish brown, Silty, medium- to coarse-grained SANDSTONE with 20-30% gravel, cobble and boulders up to 24 inches			
4					REFUSAL AT 5 FEET No groundwater encountered			

Figure A-50,
Log of Trench ET 33, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 34

ELEV. (MSL.) **535'** DATE COMPLETED **08-20-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, dry, light reddish brown, Silty SAND; trace gravels			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, moist, reddish brown, Silty/Gravelly SANDSTONE with 30-40% gravel, cobble and boulders up to 24 inches			
4	ET34-1							
6								
8					-Becomes less cemented and rippable			
10				SC	**OTAY FORMATION (To)** Dense, damp, light reddish to yellowish brown, Clayey, fine to coarse SANDSTONE with some gravel and occasional boulder			
12								
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered			

Figure A-51,
Log of Trench ET 34, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 35

ELEV. (MSL.) **612'** DATE COMPLETED **08-19-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Loose, dry, brown, Sandy CLAY			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, moist, light reddish to light brown, Silty/Gravelly, medium- to coarse-grained SANDSTONE with 30-40% gravel			
4	ET35-1							
6								
8								
10				SM	**OTAY FORMATION (To)** Dense, damp, light brown, Silty, fine to coarse SANDSTONE with some gravel			
12								
14								
					TRENCH TERMINATED AT 15 FEET No groundwater encountered			

Figure A-52,
Log of Trench ET 35, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 36 ELEV. (MSL.) 633' DATE COMPLETED 08-19-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, dry, reddish brown, Silty, medium- to coarse-grained SANDSTONE with 20-30% gravel, cobble and boulders up to 24 inches			
2								
4								
	ET36-1			SM	**OTAY FORMATION (To)** Very dense, light olive brown, Gravelly, fine to coarse SANDSTONE with approx. 20% gravel and cobble less than 6" minus			
6								
8					-Gravel increases with depth			
10								
12								
14								
16					-Occasional boulders within matrix approx 2' in maximum dimension			
18								
20					TRENCH TERMINATED AT 20 FEET No groundwater encountered			

Figure A-53,
Log of Trench ET 36, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 37 ELEV. (MSL.) 536' DATE COMPLETED 08-19-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				SM	**TOPSOIL** Loose, dry, Silty, fine to medium SAND with abundant gravels and 2' boulders			
2	ET37-1							
4				SM	**FANGLOMERATE DEPOSITS (Tof)** Very dense, light grayish brown, Silty/Gravelly, medium- to coarse-grained SANDSTONE with 30-40% gravel and cobble			
6								
8								
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered			

Figure A-54,
Log of Trench ET 37, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH ET 38** ELEV. (MSL.) **573'** DATE COMPLETED **08-19-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**TOPSOIL** Loose, dry, dark reddish brown, Silty SAND			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Very dense, dry, light reddish brown, Silty/Gravelly medium- to coarse-grained SANDSTONE with 30-40% gravel and cobble less than 12 inches			
4								
6								
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered			

Figure A-55,
Log of Trench ET 38, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 39 ELEV. (MSL.) 508' DATE COMPLETED 08-19-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	ET39-1			SM/SC	**ALLUVIUM (Qal)** Medium dense, dry, reddish brown, Silty/Clayey SAND with 10-20% gravel, cobble and boulders up to 24 inches			
2								
4				SM/SC	**OTAY FORMATION (To)** Very dense, moist, light grayish brown, Silty/Clayey, medium- to coarse-grained SANDSTONE			
6					**METAVOLCANIC ROCK (KJmv)** Slightly weathered, strong, grayish brown, METAVOLCANIC ROCK REFUSAL AT 6 FEET No groundwater encountered			

Figure A-56,
Log of Trench ET 39, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH ET 40** ELEV. (MSL.) **520'** DATE COMPLETED **08-19-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Loose, dry, dark brown, Silty, fine to medium SAND with 10-20% gravel and cobble up to 6 inches			
2								
4								
6				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, moist, light grayish brown, Silty/Gravelly medium- to coarse-grained SANDSTONE with 30-40% gravel and cobble up to 6 inches			
8								
10								
12								
14					-Difficult excavation			
					REFUSAL AT 15 FEET No groundwater encountered			

Figure A-57,
Log of Trench ET 40, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 41 ELEV. (MSL.) 650' DATE COMPLETED 08-20-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**COLLUVIUM (Qc)** Loose, dry, brown, Clayey SAND; occasional boulders in excess of 2 feet			
2								
4					**METAVOLCANIC ROCK (KJmv)** Highly weathered, light yellowish brown, medium strong METAVOLCANIC ROCK			
6	ET41-1							
8								
10								
12					-Becomes strong REFUSAL AT 12 FEET No groundwater encountered			

Figure A-58,
Log of Trench ET 41, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH ET 42** ELEV. (MSL.) **622'** DATE COMPLETED **08-20-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, damp, light reddish brown, Silty, fine- to medium-grained SANDSTONE with 15-25% gravel and cobble up to 12-inch minus			
2								
4								
6				SM	Dense, moist, light yellowish brown, Silty/Gravelly, medium- to coarse-grained SANDSTONE with 30-40% gravel and cobble up to 12-inch minus			
8								
10								
12								
14								
16								
18					REFUSAL AT 18 FEET No groundwater encountered			

Figure A-59,
Log of Trench ET 42, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH ET 43

ELEV. (MSL.) **586'** DATE COMPLETED **08-20-2008**

EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	ET43-1			SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, dry, light reddish brown, Silty/Gravelly SANDSTONE with 20% gravel and cobble less than 12-inch minus			
2								
4				SM	Very dense, moist, light yellowish brown, Silty/Gravelly, medium- to coarse-grained SANDSTONE with 20-30% gravel, cobble and boulders up to 12 inches			
6								
8								
10								
12					REFUSAL AT 12 FEET No groundwater encountered			

Figure A-60,
Log of Trench ET 43, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 44 ELEV. (MSL.) 626' DATE COMPLETED 08-20-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	ET44-1				**METAVOLCANIC ROCK (KJmv)** Highly weathered, reddish brown, moderately strong, METAVOLCANIC ROCK			
2								
4					-Becomes gray brown and slightly weathered			
					REFUSAL AT 5 FEET No groundwater encountered			

Figure A-61,
Log of Trench ET 44, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 45 ELEV. (MSL.) **679'** DATE COMPLETED **08-20-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Loose, dry, reddish brown, Silty/Sandy CLAY with 10-20% gravel and cobble up to 6 inches			
2								
4					**METAVOLCANIC ROCK (KJmv)** Moderately weathered, gray-brown, strong, METAVOLCANIC ROCK			
					REFUSAL AT 5 FEET No groundwater encountered			

Figure A-62,
Log of Trench ET 45, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 46 ELEV. (MSL.) 621' DATE COMPLETED 08-20-2008 EQUIPMENT PC 400LC-EXCAVATOR W/36" BUCKET BY: M. ERTWINE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**TOPSOIL** Highly weathered, loose, dry, reddish brown, Silty SAND with some gravel and cobble			
2								
4					**METAVOLCANIC ROCK (KJmv)** Soil, mottled reddish brown and gray, weak, METAVOLCANIC ROCK (saprolite); with gypsum crystals throughout			
6	ET46-1							
8								
10					-Becomes moderately weathered, gray-brown and moderately strong			
12					REFUSAL AT 12 FEET No groundwater encountered			

Figure A-63,
Log of Trench ET 46, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH ET 47** ELEV. (MSL.) **593'** DATE COMPLETED **08-20-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM/SC	**FANGLOMERATE DEPOSITS (Tof)** Highly weathered, dense, slightly moist, reddish mottled yellowish brown, Gravelly/Clayey, medium- to coarse-grained SANDSTONE with 30-40% gravel, cobble and boulders up to 14 inches			
2								
4								
6								
8					-Gravel, cobble and boulders increases with depth			
10					-Occasional boulder greater than 1 to 2-foot minus			
12								
14								
16					REFUSAL AT 16 FEET No groundwater encountered			

Figure A-64,
Log of Trench ET 47, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH ET 48** ELEV. (MSL.) **520'** DATE COMPLETED **08-20-2008** EQUIPMENT **PC 400LC-EXCAVATOR W/36" BUCKET** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**TOPSOIL** Loose, dry, dark brown, Gravelly, fine to coarse SAND			
2								
4				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, dry, reddish brown, Gravelly/Silty SANDSTONE with gravel, cobble and boulders up to 14 inches			
6								
8					-Becomes grayish brown			
10								
					REFUSAL AT 11 FEET No groundwater encountered			

Figure A-65,
Log of Trench ET 48, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 1 ELEV. (MSL.) 546' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**COLLUVIUM (Qc)** Medium dense, moist, reddish brown to mottled gray, pale green and brown, fine to coarse, Sandy CLAY (weathered)			
2				SM/SC	**OTAY FORMATION (To)** Very dense, damp, pale green and light brown, Silty/Clayey, fine to coarse SANDSTONE with trace gravel			
4								
6					TRENCH TERMINATED AT 7 FEET			

Figure A-66,
Log of Trench T 1, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 2 ELEV. (MSL.) 560' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Stiff, moist to wet, dark brown, fine to coarse, Sandy CLAY with trace gravel and cobble up to 8 inches			
2				SM/SC	**FANGLOMERATE DEPOSITS (Tof)** Dense, damp to moist, mottled light brown and pale green, Silty/Clayey, fine to coarse SANDSTONE with 20% gravel and cobble up to 9 inches; claystone and sandstone rip-up clasts up to 5 inches			
4								
					TRENCH TERMINATED AT 5 FEET			

Figure A-67,
Log of Trench T 2, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 3 ELEV. (MSL.) 574' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Soft to stiff, moist to wet, dark brown to reddish brown, Sandy CLAY with trace gravel and cobble			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Very dense to dense, mottled light brown and brown, Silty/Gravelly, fine to coarse SANDSTONE with 20-30% gravel and cobble up to 6 inches -Boulders observed at bottom of trench			
					PRACTICAL REFUSAL AT 3.5 FEET			

Figure A-68,
Log of Trench T 3, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH T 4

ELEV. (MSL.) **556'** DATE COMPLETED **01-29-2010**

EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Soft, moist to wet, dark brown to reddish brown, Sandy CLAY with trace gravel and cobble			
2				SC	**FANGLOMERATE DEPOSITS (Tof)** Medium dense, moist, reddish brown and brown, Clayey, fine to coarse SAND with gravel and cobble up to 6 inches; (weathered)			
				SC/SM	**OTAY FORMATION (To)** Very dense, damp, pale green, Clayey/Silty, fine to coarse SANDSTONE with trace gravel			
4								
6					TRENCH TERMINATED AT 6 FEET			

Figure A-69,
Log of Trench T 4, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 5 ELEV. (MSL.) 645' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Soft, moist to wet, dark brown, Sandy CLAY			
2				SC	**FANGLOMERATE DEPOSITS (Tof)** Dense, moist, mottled light brown, pale green and brown, Clayey SANDSTONE with 10-20% gravel and cobble up to 8 inches			
4					-Increase in gravel and cobble above contact			
6				SM	**OTAY FORMATION (To)** Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with trace gravel			
					TRENCH TERMINATED AT 7 FEET			

Figure A-70,
Log of Trench T 5, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 6 ELEV. (MSL.) 712' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**ALLUVIUM (Qal)** Loose, moist to wet, dark brown, Clayey SAND with 15-20% boulders up to 24 inches			
2			▽		-Minor seepage at 3 feet			
4					**METAVOLCANIC ROCK (KJmv)** Soil, blue green, weak, METAVOLCANIC ROCK (saprolite); excavates as stiff clay			
6								
8					Highly weathered, blue/green, weak, METAVOLCANIC ROCK (saprolite) with remnant rock fabric			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-71,
Log of Trench T 6, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 7 ELEV. (MSL.) 688' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**ALLUVIUM (Qal)** Stiff, moist to wet, dark brown to gray, Sandy CLAY with 15-20% gravel, cobble and boulders up to 20 inches			
2								
4								
6								
8					**METAVOLCANIC ROCK (KJmv)** Soil, light brown, weak, METAVOLCANIC ROCK (saprolite); rock fabric observed below 8 feet -Becomes highly weathered with rock fragments below 9 feet			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-72,
Log of Trench T 7, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 8 ELEV. (MSL.) 773' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**COLLUVIUM (Qc)** Stiff, moist, brown to reddish brown, Silty CLAY with sandy gravel and cobble up to 10 inches			
2								
4								
6					**METAVOLCANIC ROCK (KJmv)** Highly weathered to soil, green gray, weak, METAVOLCANIC ROCK (saprolite); remnant rock fabric observed			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-73,
Log of Trench T 8, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 9 ELEV. (MSL.) 696' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**COLLUVIUM (Qc)** Stiff to soft, wet, dark brown, Sandy/Silty CLAY with trace gravel and cobble			
2					-Becomes brown below 3 feet			
4				SM	**OTAY FORMATION (To)** Dense, damp, light brown, Silty, fine to coarse SANDSTONE with trace gravel			
6								
8					-Becomes gray and fine to medium below 8 feet with no gravel			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-74,
Log of Trench T 9, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 10 ELEV. (MSL.) 636' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**COLLUVIUM (Qc)** Stiff, moist, dark brown to reddish brown, Sandy CLAY with 10% gravel, cobble and boulders up to 14 inches			
2								
4				SC	**OTAY FORMATION (To)** Dense, moist, mottled gray, orange and light brown, Clayey, fine to coarse SANDSTONE with gravel, cobble and boulders up to 14 inches			
6					-Becomes very dense below 6 feet			
					TRENCH TERMINATED AT 7 FEET			

Figure A-75,
Log of Trench T 10, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 11** ELEV. (MSL.) **592'** DATE COMPLETED **01-29-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**COLLUVIUM (Qc)** Stiff to soft, transitions from dark brown to reddish brown, Silty/Sandy CLAY with trace gravel and cobble			
2								
4								
				SM	**OTAY FORMATION (To)** Dense, damp, light brown, Silty, fine to coarse SANDSTONE with 10% gravel			
6								
8					TRENCH TERMINATED AT 8 FEET			

Figure A-76,
Log of Trench T 11, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 12 ELEV. (MSL.) 608' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**COLLUVIUM (Qc)** Stiff, moist to wet, transitions from dark brown to reddish brown, Silty/Sandy CLAY with trace gravel and cobble			
2								
4				SC	**OTAY FORMATION (To)** Dense, damp, pale green, Clayey, fine to coarse SANDSTONE			
				SM	Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with trace gravel			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-77,
Log of Trench T 12, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 13 ELEV. (MSL.) **670'** DATE COMPLETED **01-29-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, wet, reddish brown, Clayey, fine to coarse SAND			
					METAVOLCANIC ROCK (KJmv) Slightly weathered, gray and reddish brown, very strong METAVOLCANIC ROCK			
					REFUSAL AT 1 FOOT			

Figure A-78,
Log of Trench T 13, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 14 ELEV. (MSL.) 694' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Stiff to soft, moist to wet, transitions from dark brown to reddish brown, Sandy CLAY with 10% gravel and cobble up to 6 inches			
2								
				SC	**FANGLOMERATE DEPOSITS (Tof)** Dense, damp to moist, mottled light brown and brown, Clayey, fine to coarse SANDSTONE with 10-20% gravel, cobble and boulders up to 14 inches			
4								
6								
8					-Difficult trenching below 9 feet			
10					PRACTICAL REFUSAL AT 10 FEET			

Figure A-79,
Log of Trench T 14, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 15 ELEV. (MSL.) 727' DATE COMPLETED 01-29-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Stiff, moist to wet, transitions from dark brown to reddish brown, Sandy CLAY with trace gravel and cobble			
2				SC	**FANGLOMERATE DEPOSITS (Tof)** Dense, damp, mottled light brown and brown, Clayey, fine to coarse SANDSTONE with 10-20% gravel, cobble and boulders up to 18 inches			
4					-Increase in boulders below 5.5 feet			
6					PRACTICAL REFUSAL AT 6 FEET			

Figure A-80,
Log of Trench T 15, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 16** ELEV. (MSL.) **496'** DATE COMPLETED **02-01-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Soft, wet, dark brown, fine to coarse Sandy CLAY with 10% gravel, cobble and boulders up to 14 inches			
2			▽		-Heavy seepage with minor caving			
4								
6								
8				SM/SC	**OTAY FORMATION (To)** Dense, moist, light brown and orange, Silty/Clayey, fine to coarse SANDSTONE			
					TRENCH TERMINATED AT 8.5 FEET			

Figure A-81,
Log of Trench T 16, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 17 ELEV. (MSL.) 532' DATE COMPLETED 02-01-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose to medium dense, moist, dark brown, Clayey, fine to medium SAND with 10-15% gravel and cobble up to 10 inches			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, damp to moist, mottled brown, light brown and pale green, Gravelly, fine to coarse SAND with clay, gravel and cobble up to 8 inches			
4					-Scoured contact			
				SM	**OTAY FORMATION (To)** Very dense, damp, light brown, Silty, fine to coarse SANDSTONE			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-82,
Log of Trench T 17, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 18** ELEV. (MSL.) **540'** DATE COMPLETED **02-01-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Stiff, very moist, dark brown to reddish brown, Sandy CLAY with gravel and cobble up to 8 inches			
2								
4					-Gravel, cobble and boulders at contact			
				SM	**OTAY FORMATION (To)** Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with 10-20% gravel			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-83,
Log of Trench T 18, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 19 ELEV. (MSL.) 577' DATE COMPLETED 02-01-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Stiff, very moist, dark brown to reddish brown, Sandy CLAY			
				SC	**FANGLOMERATE DEPOSITS (Tof)** Very dense, damp, reddish brown, Clayey, fine to coarse SANDSTONE with 10-20% gravel and cobble up 6 inches			
2					REFUSAL AT 2.5 FEET			

Figure A-84,
Log of Trench T 19, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 20 ELEV. (MSL.) 488' DATE COMPLETED 02-01-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**ALLUVIUM (Qal)** Loose, wet, dark brown to brown, Clayey, fine to coarse SAND with 10-30% gravel, cobble and boulders up to 20 inches; minor to moderate caving			
2								
4					-Heavy seepage at 4 feet			
					-36-inch boulder present at 5 feet			
6								
8								
10				SC	**OTAY FORMATION (To)** Dense, moist, mottled pale green, orange and brown, Clayey, fine to coarse SANDSTONE with gravel and cobble; difficult to see below 10 feet due to caving and heavy seepage; sidewall collapsed soon after formation was exposed			
					TRENCH TERMINATED AT 10 FEET DUE TO CAVING			

Figure A-85,
Log of Trench T 20, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 21** ELEV. (MSL.) **525'** DATE COMPLETED **02-01-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**ALLUVIUM (Qal)** Loose, moist, dark brown, Clayey, fine to coarse SAND with gravel, cobble and boulders up to 14 inches			
2								
4					-Heavy seepage			
				SM	Loose, wet, dark brown, Gravelly, fine to coarse SAND with 20-40% gravel, cobble and boulders up to 14 inches; moderate caving			
6								
8								
				SM/SC	**FANGLOMERATE DEPOSITS (Tof)** Dense, moist, mottled pale green and orange, Gravelly/Clayey, fine to coarse SANDSTONE with 30-40% gravel, cobble and boulders up to 14 inches			
10					TRENCH TERMINATED AT 10 FEET DUE TO CAVING			

Figure A-86,
Log of Trench T 21, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 22 ELEV. (MSL.) **534'** DATE COMPLETED **02-01-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Medium dense, moist, reddish brown, Clayey, fine to medium SAND with 10% gravel and cobble up to 5 inches			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Very dense, damp, reddish brown, Gravelly, fine to coarse SANDSTONE with gravel and cobble up to 14 inches			
					REFUSAL AT 2.5 FEET			

Figure A-87,
Log of Trench T 22, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 23 ELEV. (MSL.) **558'** DATE COMPLETED **02-01-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**COLLUVIUM (Qc)** Medium dense, moist, reddish brown, Clayey, fine to medium SAND with gravel and cobble up to 8 inches			
2								
4				SM/SC	**FANGLOMERATE DEPOSITS (Tof)** Very dense, damp, transitions from reddish brown to mottled light brown and pale green, Gravelly/Clayey, fine to coarse SANDSTONE with 30-40% gravel, cobble and boulders up to 14 inches			
6					PRACTICAL REFUSAL AT 6 FEET			

Figure A-88,
Log of Trench T 23, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 24 ELEV. (MSL.) **596'** DATE COMPLETED **02-01-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**COLLUVIUM (Qc)** Stiff, moist, transitions from dark brown to brown, Silty CLAY with trace gravel and cobble			
2								
4					**METAVOLCANIC ROCK (KJmv)** Soil, pale gray-green, weak METAVOLCANIC ROCK (saprolite); no distinguishable rock fabric; abundant gypsum present			
	T24-1							
6					-Remnant rock fragments present below 6 feet			
8								
					REFUSAL AT 9 FEET ON FRESH ROCK			

Figure A-89,
Log of Trench T 24, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 25 ELEV. (MSL.) **528'** DATE COMPLETED **02-01-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Soft, wet, dark brown to brown, Silty CLAY with trace gravel and cobble			
2								
4								
				SM/SC	**OTAY FORMATION (To)** Dense, damp, reddish brown with pale green mottling, Silty/Clayey, fine to coarse SANDSTONE			
6								
8					TRENCH TERMINATED AT 8 FEET			

Figure A-90,
Log of Trench T 25, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH T 26

ELEV. (MSL.) **510'** DATE COMPLETED **02-01-2010**

EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**ALLUVIUM (Qal)** Soft, wet, dark brown to brown, Sandy CLAY with 10% gravel and cobble up to 6 inches			
2			▽		-Estimated 5-foot diameter boulder in sidewall at 3 feet; moderate seepage with minor/moderate caving below 3 feet			
4								
				SC	Medium dense, moist, mottled light brown and pale green, Clayey, fine to medium SAND with minor pinholes			
6								
8								
				SM/SC	**OTAY FORMATION (To)** Very dense, damp, reddish brown with pale green mottling, Silty/Clayey, fine to coarse SANDSTONE			
10					TRENCH TERMINATED AT 10 FEET DUE TO CAVING OF SIDEWALL			

Figure A-91,
Log of Trench T 26, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 27 ELEV. (MSL.)_____ DATE COMPLETED **02-02-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Soft, wet, transitions from dark brown to reddish brown, Sandy CLAY with 10-20% gravel, cobble and boulders up to 24 inches			
2								
4					**METAVOLCANIC ROCK (KJmv)** Soil, pale green-gray, weak, METAVOLCANIC ROCK (saprolite) with moderate amounts of gypsum			
6					-Remnant rock fragments present below 6 feet			
8								
					TRENCH TERMINATED AT 9 FEET			

Figure A-92,
Log of Trench T 27, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 28 ELEV. (MSL.) **561'** DATE COMPLETED **02-02-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Stiff, moist to wet, dark brown, Sandy CLAY with 10% gravel, cobble and boulders up to 14 inches			
2								
4				CL	**FANGLOMERATE DEPOSITS (Tof)** Very stiff, damp, white to pale green, fine to coarse, Sandy CLAY with 10-15% gravel and cobble size rock fragments up to 8 inches (appears to be reworked saprolite with abundant caliche)			
6								
8					-Gravel and cobble size fragment increase below 8 feet			
					TRENCH TERMINATED AT 9 FEET			

Figure A-93,
Log of Trench T 28, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 29 ELEV. (MSL.)_____ DATE COMPLETED **02-02-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, damp to moist, reddish brown, Clayey, fine to coarse SAND with 10% gravel, cobble and boulders up to 16 inches; possible metavolcanic rock contact			
					REFUSAL ON ROCK AT 1 FOOT			

Figure A-94,
Log of Trench T 29, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 30** ELEV. (MSL.) **522'** DATE COMPLETED **02-02-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**ALLUVIUM (Qal)** Loose, moist to wet, dark brown, very Clayey, fine to coarse SAND with 20-30% gravel, cobble and boulders up to 16 inches			
2								
4								
6					-Increase in gravel, cobble and boulders at contact			
8				SM/SC	**OTAY FORMATION (To)** Dense, damp, light brown to brown, Clayey/Silty, fine to medium SANDSTONE; weathered in upper few feet			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-95,
Log of Trench T 30, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 31 ELEV. (MSL.) 508' DATE COMPLETED 02-02-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**ALLUVIUM (Qal)** Loose, moist to wet, reddish brown and dark brown, Clayey, fine to coarse SAND with 10-20% gravel, cobble and boulders up to 18 inches			
2								
4								
6								
8				SC/SM	**OTAY FORMATION (To)** Dense, damp, light brown and pale green, Clayey/Silty, fine to coarse SANDSTONE; weathered in upper foot			
					TRENCH TERMINATED AT 9 FEET			

Figure A-96,
Log of Trench T 31, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 32** ELEV. (MSL.) **620'** DATE COMPLETED **02-02-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Stiff, moist, dark brown, Sandy CLAY with 10% gravel and cobble up to 8 inches			
2								
				SC	**FANGLOMERATE DEPOSITS (Tof)** Very dense, damp, light brown and brown, Clayey, fine to coarse SAND with 20-30% gravel, cobble and boulders up to 18 inches			
4								
6								
8								
10					TRENCH TERMINATED AT 10 FEET			

Figure A-97,
Log of Trench T 32, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 33 ELEV. (MSL.) 730' DATE COMPLETED 02-02-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**ALLUVIUM (Qal)** Soft, wet, dark reddish brown, Sandy CLAY with gravel and cobble size rock fragments up to 10 inches			
2					-Becomes gray brown below 2 feet			
					METAVOLCANIC ROCK (KJmv) Moderately weathered, gray and brown, moderately strong, METAVOLCANIC ROCK			
					PRACTICAL REFUSAL AT 3.5 FEET			

Figure A-98,
Log of Trench T 33, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 34 ELEV. (MSL.) 634' DATE COMPLETED 02-02-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Soft, wet, reddish brown, Sandy CLAY with 10% gravel and cobble size rock fragments up to 10 inches			
2					**METAVOLCANIC ROCK (KJmv)** Highly to moderately weathered, orange and gray, moderately weak, METAVOLCANIC ROCK			
					PRACTICAL REFUSAL AT 3.5 FEET			

Figure A-99,
Log of Trench T 34, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 35 ELEV. (MSL.) **615'** DATE COMPLETED **02-02-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC/SM	**TOPSOIL** Medium dense, moist, reddish brown, Clayey/Silty, fine to coarse SAND with 10% gravel, cobble and boulders up to 14 inches			
2				SC	**FANGLOMERATE DEPOSITS** Dense, damp, light brown and dark brown, Clayey, fine to coarse SANDSTONE with 20-30% gravel, cobble and boulders up to 12 inches			
4					TRENCH TERMINATED AT 5 FEET			

Figure A-100,
Log of Trench T 35, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 36 ELEV. (MSL.) 586' DATE COMPLETED 02-02-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Medium dense, moist to damp, Clayey, fine to coarse SAND with 10% gravel, cobble and boulders up to 12 inches			
2								
				SM	**FANGLOMERATE DEPOSITS (Tof)** Very dense, damp, reddish brown, Silty, fine to coarse, SANDSTONE with 30% gravel, cobble and boulders up to 18 inches			
4								
6								
8					-Difficult trenching below 8 feet			
10					PRACTICAL REFUSAL AT 10 FEET			

Figure A-101,
Log of Trench T 36, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 37 ELEV. (MSL.) **580'** DATE COMPLETED **02-02-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, moist, dark brown, Clayey, fine to coarse SAND with several boulders up to 30 inches			
2				SM	**OTAY FORMATION (To)** Dense, damp, light brown, Clayey/Silty, fine to coarse SANDSTONE			
4					TRENCH TERMINATED AT 5 FEET			

Figure A-102,
Log of Trench T 37, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH T 38

ELEV. (MSL.) **480'** DATE COMPLETED **02-03-2010**

EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**ALLUVIUM (Qal)** Soft, wet, dark brown, Sandy CLAY with trace cobble			
2			▽		-Slight seepage at contact			
				SC	**OTAY FORMATION (To)** (Weathered) Loose to medium dense, moist, light brown, very Clayey, fine to coarse SAND with trace gravel and cobble			
4								
6								
8								
10								
12				SC/SM	**OTAY FORMATION (To)** Dense, damp to moist, white and orange brown, Clayey/Silty, fine to coarse SANDSTONE with trace gravel and cobble up to 8 inches			
					TRENCH TERMINATED AT 13 FEET			

Figure A-103,
Log of Trench T 38, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 39** ELEV. (MSL.) **544'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Soft, wet, dark brown, Silty/Sandy CLAY with several boulders from 12-30 inches			
2								
4				SM	**OTAY FORMATION (To)** Dense, damp, light brown, Silty/Gravelly, fine to coarse SANDSTONE with 20-30% gravel			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-104,
Log of Trench T 39, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 40 ELEV. (MSL.) **605'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, moist to wet, dark brown, Clayey SAND with 10% cobble and boulders up to 12 inches			
2				SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, damp, light yellow brown, Silty, fine to coarse SANDSTONE with 20-30% gravel, cobble and boulders up to 16 inches			
4					TRENCH TERMINATED AT 4.5 FEET			

Figure A-105,
Log of Trench T 40, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 41 ELEV. (MSL.) 537' DATE COMPLETED 02-03-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**ALLUVIUM (Qal)** Loose, wet, dark brown, very Clayey SAND with 20-30% cobble and boulders up to 24 inches			
2				SM	**OTAY FORMATION (To)** Very dense, damp, white to very light brown, Silty, fine to coarse SANDSTONE			
4								
6					TRENCH TERMINATED AT 6 FEET			

Figure A-106,
Log of Trench T 41, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 42** ELEV. (MSL.) **583'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC/SM	**TOPSOIL** Loose, moist, dark brown, Silty/Clayey, fine to coarse SAND with trace gravel			
2				SM	**OTAY FORMATION (To)** Dense to very dense, damp, light brown, Silty, fine to coarse SANDSTONE			
4								
6								
8					TRENCH TERMINATED AT 8 FEET			

Figure A-107,
Log of Trench T 42, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 43 ELEV. (MSL.) 565' DATE COMPLETED 02-03-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, moist, dark brown, Silty CLAY with trace gravel			
2				SM	**OTAY FORMATION (To)** Dense, damp, light brown with pale green mottling, Silty, fine to medium SANDSTONE with some clay			
4								
6								
8					TRENCH TERMINATED AT 9 FEET			

Figure A-108,
Log of Trench T 43, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 44 ELEV. (MSL.) 540' DATE COMPLETED 02-03-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, moist, dark brown, Sandy CLAY; several boulders 2 to 5 feet in diameter			
2				SM/SC	**OTAY FORMATION (To)** Dense, damp, mottled light brown to orange, Silty/Clayey, fine to coarse SANDSTONE with gravel and cobble up to 10 inches			
4				CL	Hard, moist, pale green, Silty CLAYSTONE; waxy and weathered -Becomes mottled brown and pale green with conchoidal fracturing and much more competent			
6								
8								
10					TRENCH TERMINATED AT 11 FEET			

Figure A-109,
Log of Trench T 44, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 45** ELEV. (MSL.) **541'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, wet, dark brown, very Clayey SAND			
2				SM	**OTAY FORMATION (To)** Dense, damp, reddish brown, Silty/Gravelly, fine to coarse SANDSTONE with 15-25% gravel and occasional cobble up to 4 inches			
4								
6								
8					-Large 3-foot boulder present at 8 feet			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-110,
Log of Trench T 45, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 46 ELEV. (MSL.) **567'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Stiff, moist, dark brown, Sandy CLAY with some gravel			
2				SM	**OTAY FORMATION (To)** Dense to very dense, light brown, Silty/Gravelly, fine to coarse SANDSTONE with 15-25% gravel			
4								
6								
8					-Cobble size fragments present below 8 feet			
					TRENCH TERMINATED AT 9 FEET			

Figure A-111,
Log of Trench T 46, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH T 47

ELEV. (MSL.) **526'** DATE COMPLETED **02-03-2010**

EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**ALLUVIUM ((Qal)** Soft, wet, dark brown, Sandy CLAY			
2			▽		-Moderate seepage at contact			
				SM	**OTAY FORMATION (To)** Dense, damp, light brown, Silty, fine to coarse SANDSTONE with 10-20% gravel and cobble up to 10 inches			
4								
6					-Random 16-inch boulders present below 6 feet			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-112,
Log of Trench T 47, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 48 ELEV. (MSL.) 550' DATE COMPLETED 02-03-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Soft, wet, dark brown, Sandy CLAY with trace gravel and cobble			
2								
4				SM	**OTAY FORMATION (To)** Dense, damp, light brown, Silty/Gravelly, fine to coarse SANDSTONE with 15-25% gravel and cobble up to 10 inches; occasional boulder up to 14 inches also present			
6								
8								
10					TRENCH TERMINATED AT 10 FEET			

Figure A-113,
Log of Trench T 48, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 49** ELEV. (MSL.) **496'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Loose, wet, dark brown, Silty, fine to coarse SAND			
2					-Heavy seepage at 3 feet with moderate caving below			
4								
6				SM	**OTAY FORMATION (To)** Very dense, damp, light brown, Silty/Gravelly, fine to medium SANDSTONE with 20-30% gravel, cobble and boulders up to 14 inches			
					TRENCH TERMINATED AT 7 FEET DUE TO CAVING			

Figure A-114,
Log of Trench T 49, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 50 ELEV. (MSL.) **525'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Loose, wet, dark brown, Sandy CLAY			
2				SM	**OTAY FORMATION (To)** Dense, damp, light brown, Silty/Gravelly, fine to coarse SANDSTONE with 10-25% gravel, cobble and boulders up to 14 inches			
4								
6					TRENCH TERMINATED AT 6 FEET			

Figure A-115,
Log of Trench T 50, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 51 ELEV. (MSL.) **559'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, moist, dark brown, Clayey, fine to coarse SAND with trace gravel and cobble			
2								
				SM	**OTAY FORMATION (To)** Very dense, damp, light brown, Silty/Gravelly, fine to coarse SANDSTONE with 20-30% gravel			
4								
					TRENCH TERMINATED AT 5 FEET			

Figure A-116,
Log of Trench T 51, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

TRENCH T 52

ELEV. (MSL.) **562'** DATE COMPLETED **02-03-2010**

EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**ALLUVIUM (Qal)** Loose, wet, dark brown, Clayey, fine to coarse SAND			
2			▽		-Heavy seepage at 3 feet			
4								
6				SM/SC	**OTAY FORMATION (To)** Dense, damp, light brown with orange, Silty/Clayey, fine to coarse SANDSTONE			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-117,
Log of Trench T 52, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 53 ELEV. (MSL.) 531' DATE COMPLETED 02-03-2010 EQUIPMENT JD 555 TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**ALLUVIUM (Qal)** Stiff, moist to wet, dark brown, Sandy CLAY with trace gravel and cobble			
2								
4								
				SM	**OTAY FORMATION (To)** Very dense, damp, light brown with orange mottling, Silty/Gravelly, fine to coarse SANDSTONE with 20-30% gravel			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-118,
Log of Trench T 53, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 54 ELEV. (MSL.) **515'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**ALLUVIUM (Qal)** Loose, wet, dark brown, very Clayey, fine to coarse SAND			
2								
				SM	**OTAY FORMATION (To)** Dense to very dense, damp, light brown, Silty/Gravelly, fine to coarse SANDSTONE with 15-25% gravel and trace cobble			
4								
					TRENCH TERMINATED AT 5.5 FEET			

Figure A-119,
Log of Trench T 54, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 55 ELEV. (MSL.) **504'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC/SM	**ALLUVIUM (Qal)** Loose, wet, dark brown, Clayey/Silty, fine to coarse SAND with 10-20% gravel and cobble up to 8 inches; moderate caving below 3 feet			
2			▽		-Moderate seepage at 3 feet			
4								
6					-Boulders up to 30 inches present at contact			
				SC/SM	**OTAY FORMATION (To)** Dense, damp, light brown and orange, Silty/Clayey, fine to coarse SANDSTONE with 10-20% gravel, cobble and boulders up to 14 inches			
8					TRENCH TERMINATED AT 8 FEET DUE TO CAVING			

Figure A-120,
Log of Trench T 55, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 56** ELEV. (MSL.) **520'** DATE COMPLETED **02-03-2010** EQUIPMENT **JD 555 TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**OTAY FORMATION (To)** Dense, moist, light brown, Clayey, fine to coarse SANDSTONE			
2								
4								
6								
8								
10					LOGGED ROAD HIGH CUT SLOPE *Picked through approx. 2 to 3 feet of colluvium to expose formational material			

Figure A-121,
Log of Trench T 56, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 57 ELEV. (MSL.) 555' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Loose to medium dense, dry to damp, brown, Silty, fine to medium SAND			
2								
4				SM	**FANGLOMERATE DEPOSITS (Tof)** Very dense, damp, light brown, Gravelly, fine to coarse SANDSTONE with 30-40% gravel and cobble up to 12-inches			
					PRACTICAL REFUSAL AT 4.5 FEET No groundwater encountered			

Figure A-122,
Log of Trench T 57, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 58** ELEV. (MSL.) **567'** DATE COMPLETED **10-15-2010** EQUIPMENT **JD TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				GM	**ALLUVIUM (Qal)** Loose, dry, light brown, fine to coarse, Sandy GRAVEL, with gravel and cobble up to 24-inches			
2				CL	**FANGLOMERATE DEPOSITS (Tof)** Dense, moist, pale green, Gravelly CLAY, with sand, and 30-40% gravel, cobble, and boulders up to 18-inch; matrix saprolitic			
4					PRACTICAL REFUSAL AT 4.5 FEET No groundwater encountered			

Figure A-123,
Log of Trench T 58, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 59 ELEV. (MSL.) 603' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				GM	**ALLUVIUM (Qal)** Loose, damp, brown, fine to coarse, Sandy GRAVEL, with gravel, cobble, and boulders up to 18-inch			
2								
					METAVOLCANIC ROCK (KJmv) Soil, pale green, weak METAVOLCANIC ROCK (saprolite); with remnant strong rock fragments floating in matrix			
4								
					PRACTICAL REFUSAL AT 5 FEET No groundwater encountered			

Figure A-124,
Log of Trench T 59, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 60 ELEV. (MSL.) 653' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				GM	**ALLUVIUM (Qal)** Loose, damp, brown, fine to coarse, Sandy GRAVEL; with gravel, cobble, and boulders up to 20-inch			
2					**METAVOLCANIC ROCK (KJmv)** Soil, pale green with maroon oxidation, weak METAVOLCANIC ROCK (saprolite); with remnant rock fragments floating in matrix			
4					TRENCH TERMINATE AT 5 FEET No groundwater encountered			

Figure A-125,
Log of Trench T 60, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 61 ELEV. (MSL.) 680' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Gravelly, fine to coarse SAND, with gravel, cobble, and boulders up to 18-inch			
2					**METAVOLCANIC ROCK (KJmv)** Moderately weathered, light brown, strong METAVOLCANIC ROCK			
4					REFUSAL AT 4 FEET No groundwater encountered			

Figure A-126,
Log of Trench T 61, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 62** ELEV. (MSL.) **738'** DATE COMPLETED **10-15-2010** EQUIPMENT **JD TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Gravelly, fine to coarse SAND, with gravel, cobble, and boulders up to 14-inch			
2					**METAVOLCANIC ROCK (KJmv)** Moderately weathered, orange brown, strong METAVOLCANIC ROCK			
					REFUSAL AT 2.5 FEET No groundwater encountered			

Figure A-127,
Log of Trench T 62, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 63 ELEV. (MSL.) 738' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Gravelly, fine to coarse SAND, with gravel, cobble, and boulders up to 24-inch			
2					**METAVOLCANIC ROCK (KJmv)** Moderately weathered, dark gray, strong METAVOLCANIC ROCK			
					REFUSAL AT 3 FEET No groundwater encountered			

Figure A-128,
Log of Trench T 63, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 64 ELEV. (MSL.) 572' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Gravelly, fine to coarse SAND, with gravel, cobble, and boulders up to 18-inch			
2					**METAVOLCANIC ROCK (KJmv)** Slightly weathered, gray, very strong METAVOLCANIC ROCK REFUSAL AT 2 FEET No groundwater encountered			

Figure A-129,
Log of Trench T 64, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 65 ELEV. (MSL.) 530' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Gravelly, fine to coarse SAND, with gravel, cobble, and boulders up to 14-inch			
2								
4					**METAVOLCANIC ROCK (KJmv)** Soil, mottled pale green and brown, weak METAVOLCANIC ROCK (saprolite); with relic rock floating in matrix			
6					TRENCH TERMINATE AT 6 FEET No groundwater encountered			

Figure A-130,
Log of Trench T 65, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 66 ELEV. (MSL.) 490' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Silty, fine to coarse SAND			
2					-12-inch gravel lense present below 2 feet			
4								
6					-Minor caving below 6 feet			
					METAVOLCANIC ROCK (KJmv) Moderately weathered, light brown and brown, strong METAVOLCANIC ROCK			
8					REFUSAL AT 8 FEET No groundwater encountered			

Figure A-131,
Log of Trench T 66, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 67 ELEV. (MSL.) 580' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Gravelly, fine to coarse SAND, with gravel, cobble, and boulders up to 16-inch			
2					**METAVOLCANIC ROCK (KJmv)** Moderately weathered, dark gray, strong METAVOLCANIC ROCK			
					REFUSAL AT 2.5 FEET No groundwater encountered			

Figure A-132,
Log of Trench T 67, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 68** ELEV. (MSL.) **650'** DATE COMPLETED **10-15-2010** EQUIPMENT **JD TRACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Gravelly, fine to coarse SAND, with gravel, cobble, and boulders up to 16-inch			
2					**METAVOLCANIC ROCK (KJmv)** Moderately weathered, dark gray, strong METAVOLCANIC ROCK			
					REFUSAL AT 2.5 FEET No groundwater encountered			

Figure A-133,
Log of Trench T 68, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 69 ELEV. (MSL.) 670' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**TOPSOIL** Loose, dry, brown, Gravelly, fine to coarse SAND, with gravel, cobble, and boulders up to 16-inch			
					METAVOLCANIC ROCK (KJmv) Slightly weathered, dark gray, very strong METAVOLCANIC ROCK			
					REFUSAL AT 1.5 FEET No groundwater encountered			

Figure A-134,
Log of Trench T 69, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 70 ELEV. (MSL.) 496' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Gravelly, fine to coarse SAND, with gravel, cobble, and boulders up to 14-inch			
2								
					METAVOLCANIC ROCK (KJmv) Highly weathered, pale green and light brown, weak and strong METAVOLCANIC ROCK (saprolite); with relic rock fragments floating in matrix			
4					PRACTICAL REFUSAL AT 4 FEET No groundwater encountered			

Figure A-135,
Log of Trench T 70, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 71 ELEV. (MSL.) 495' DATE COMPLETED 10-15-2010 EQUIPMENT JD TRACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Loose, damp, brown, Silty, fine to coarse SAND, with trace gravel			
2								
4								
6				GM	**FANGLOMERATE DEPOSITS (Tof)** Dense, damp, light brown, fine to coarse, Sandy, GRAVEL with 60-70% gravel, cobble, and boulders up to 16-inches			
					PRACTICAL REFUSAL AT 7 FEET No groundwater encountered			

Figure A-136,
Log of Trench T 71, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING SB 1

ELEV. (MSL.) **540'** DATE COMPLETED **01-19-2010**

EQUIPMENT **CME 75** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM & CL	3-Inches ASPHALT CONCRETE			
2	SB1-1				**UNDOCUMENTED FILL (Qudf)** Medium dense to stiff, moist, light brown to dark reddish, interlayered, Silty SAND and Sandy CLAY			
4	SB1-2					31	109.6	9.3
6	SB1-3			CL	Stiff, moist, dark brown to brown, Sandy CLAY; with few gravels	11	110.3	15.9
8								
10	SB1-4				-Gravel in sampler, blow counts likely not accurate	22	105.6	12.3
12								
14	SB1-5						---	14.8
16	SB1-6			CL	**ALLUVIUM (Qal)** Very stiff, reddish brown, Gravelly CLAY; with angular gravel; blow count not accurate due to gravels; poor recovery	33	108.5	11.2
18								
20	SB1-7			SC/SM	**FANGLOMERATE DEPOSITS (Tof)** Dense, damp, yellowish brown, mottled, reddish brown, Clayey/Gravelly SAND; moderately weathered	46	106.5	8.3
22								
24								
26	SB1-8			SM/SC	**OTAY FORMATION (To)** Very dense, moist, grayish brown, Silty/Clayey, fine-grained SANDSTONE; with trace subrounded to angular gravels			
					BORING TERMINATED AT 26.5 FEET No groundwater encountered Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye			

Figure A-137,
Log of Boring SB 1, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING SB 2** ELEV. (MSL.) **533'** DATE COMPLETED **01-19-2010** EQUIPMENT **CME 75** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				GC	3 Inch ASPHALT CONCRETE			
					FANGLOMERATE DEPOSITS (Tof) Very dense, dry, grayish brown, Clayey GRAVEL; -No recovery			
2	SB2-1							
4	SB2-2							
	SB2-3			ML	**OTAY FORMATION (To)** Becomes light yellowish brown, fine, Sandy SILTSTONE -No recovery, some gravels in clayey sand matrix	60/10"	---	5.5
					REFUSAL AT 5.5 FEET No groundwater encountered Backfilled with cement-mixed upper 3 ft. concrete seal with black dye			

Figure A-138,
Log of Boring SB 2, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING SB 3

ELEV. (MSL.) **505'** DATE COMPLETED **01-19-2010**

EQUIPMENT **CME 75** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC/SM	3-inches ASPHALT			
	SB3-1				**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, yellowish brown, Clayey/Gravelly SAND			
2	SB3-2					41	---	5.6
4								
6	SB3-3				-Some subrounded to angular gravels	39	111.2	7.8
8					-Gravel layer approximately 1-foot thick			
10	SB3-4				-Gravel layer, no recovery	44		
12								
14								
16	SB3-5			SC	**ALLUVIUM (Qal)** Medium dense, light brown to pale green, Clayey, fine to coarse grained SAND; with little gravel	38	114.5	14.4
18								
20	SB3-6			SC	**OTAY FORMATION (To)** Dense, moist, gray, mottled yellowish brown, Clayey, fine to coarse grained SANDSTONE; with some subrounded angular gravels	58	105.0	14.0
					BORING TERMINATED AT 21 FEET No groundwater encountered Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye			

Figure A-139,
Log of Boring SB 3, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING SB 4

ELEV. (MSL.) **504'** DATE COMPLETED **01-29-2010**

EQUIPMENT **CME 75** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	3-inches ASPHALT			
2	SB4-1				**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, brown mottled grayish brown, Clayey SAND; with fine gravels	18	104.5	10.6
4	SB4-2					18	110.6	14.4
6	SB4-3				-Becomes wet and strong brown			
8								
10	SB4-4				-Becomes moist to dry and brown to dark brown; blow counts not accurate due to gravels in shoe	45	98.4	9.7
12								
14								
16	SB4-5			CL	**ALLUVIUM (Qal)** Stiff, moist, grayish brown to brown, Sandy CLAY; trace small subrounded gravels	18	107.0	16.3
18								
20								
					BORING TERMINATED AT 21.5 FEET; after 10 minutes of effort by CME 75 No groundwater encountered Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye			

Figure A-140,
Log of Boring SB 4, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING SB 5

ELEV. (MSL.) **516'** DATE COMPLETED **01-26-2010**

EQUIPMENT **CME 75** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	3-inches ASPHALT CONCRETE			
2	SB5-1				**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, yellowish brown, Clayey, fine to medium SAND; trace gravels	16	---	5.8
4	SB5-2							
6	SB5-3			GC	**ALLUVIUM (Qal)** Medium dense, moist, yellowish to grayish brown, Clayey GRAVEL; sand and clay matrix	25	94.1	12.7
8								
10	SB5-4			CL	Stiff, moist, brown, Sandy CLAY; gravel in sample; blow counts not accurate	25	105.9	14.6
12								
14					-No recovery due to gravel or rock			

REFUSAL AT 15 FEET
No groundwater encountered
Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye

Figure A-141,
Log of Boring SB 5, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING SB 6

ELEV. (MSL.) **508'** DATE COMPLETED **01-25-2010**

EQUIPMENT **CME 75** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	3-inches ASPHALT CONCRETE			
					UNDOCUMENTED FILL (Qudf) Stiff, moist, brown, Sandy CLAY; trace small subrounded gravel			
2								
	SB6-1					15	115.2	14.2
4								
	SB6-2			SC	Medium dense, moist, brown to light brown, Clayey SAND	28	106.8	13.3
6	SB6-3							
8								
10	SB6-4				Becomes yellowish brown with few small angular gravels	26	110.7	12.8
12								
14					-Difficult drilling at 14-15 ft.			
				CL	**ALLUVIUM (Qal)**			
16	SB6-5				Medium dense, damp, light gray, fine, Sandy CLAY with siltstone clasts and gravelly sandstone lenses	50/9"	103.3	10.3
18								
20	SB6-6				-No recovery	50/2"		

BORING TERMINATED AT 20.2 FEET
No groundwater encountered
Backfilled with cement mixed soil,
upper 3 ft. concrete seal with black dye

Figure A-142,
Log of Boring SB 6, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING SB 7

ELEV. (MSL.) **505'** DATE COMPLETED **01-25-2010**

EQUIPMENT **CME 75** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	3-inches ASPHALT CONCRETE			
2	SB7-1				**UNDOCUMENTED FILL (Qudf)** Medium dense, dry, yellowish brown, Clayey SAND; with trace angular gravels; erroneous blow counts	23	---	8.9
4	SB7-2							
6	SB7-3			CL	Stiff, moist, reddish brown, Sandy CLAY; some small angular gravels	14	110.0	13.0
8								
10	SB7-4				-Granitic clasts present within fill matrix	15	102.8	15.4
12								
14								
16	SB7-5			SC	Medium dense, moist, yellowish brown with brown stringers within fill matrix, Clayey SAND; few angular gravel	26	99.3	13.1
18								
20	SB7-6			CL	**ALLUVIUM (Qal)** Firm, moist, dark grayish brown, Sandy CLAY; strong organic odor	16	116.3	11.6
22								
24	SB7-7				-Some gray and brown mottling	19	109.5	17.8
26								
28								

Figure A-143,
Log of Boring SB 7, Page 1 of 2

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING SB 7** ELEV. (MSL.) **505'** DATE COMPLETED **01-25-2010** EQUIPMENT **CME 75** BY: **M. ERTWINE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	SB7-8				-Trace angular gravels and pebbles	14	105.1	19.9
32	SB7-9				-Excavates to sandy clay			
34			▽		-Seepage at 35 feet			
36	SB7-10 SB7-11				**FANGLOMERATE DEPOSITS (Tof)** -No recovery with cal sampler, few brecciated metavolcanic rock retrieved from SPT sampler	51		
					REFUSAL AT 37.5 FEET Seepage at 35 feet Backfilled with cement mixed concrete, upper 3 ft. concrete seal with black dye			

Figure A-143,
Log of Boring SB 7, Page 2 of 2

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING SB 8

ELEV. (MSL.) **505'** DATE COMPLETED **01-25-2010**

EQUIPMENT **CME 75** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	3-inches ASPHALT CONCRETE			
2	SB8-1				**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, yellowish mottled grayish brown, Clayey SAND; trace gravel	21	---	12.0
4								
6	SB8-2				-Few gravel	17	98.4	16.8
	SB8-3							
8					-Gravel layer, difficult drilling			
10	SB8-4				-Becomes loose and reddish brown with few gravels; poor recovery	16	---	9.2
12								
14								
16	SB8-5			GM/GC	Medium dense, reddish brown, mottled, yellowish brown, Sandy/Clayey GRAVEL; poor recovery due to gravels	29	101.7	14.1
18								
20	SB8-6			CL	Stiff, moist, dark brown, Sandy CLAY; with some gravel	21	104.0	14.1
22								
24								
	SB8-7					70/7"	109.9	16.2
				SC & ML	**OTAY FORMATION (To)** Dense to very stiff, moist, light grayish brown, interbedded Clayey SANDSTONE and Sandy SILTSTONE			
					BORING TERMINATED AT 25.7 FEET No groundwater encountered Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye			

Figure A-144,
Log of Boring SB 8, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G1012-52-02

BORING SB 9

ELEV. (MSL.) **506'** DATE COMPLETED **01-26-2010**

EQUIPMENT **CME 75** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	3-inches ASPHALT CONCRETE			
2	SB9-1				**UNDOCUMENTED FILL (Qudf)** Firm, moist, reddish brown, Sandy CLAY; trace gravels			
4	SB9-2					22	103.1	13.5
6	SB9-3			SC	Medium dense to stiff, moist, reddish brown, Clayey, fine to medium SAND; with interlayered sandy clay lenses	25	98.9	14.0
8								
10	SB9-4				-Blow counts not accurate due to gravels; some grayish mottling present	42	88.5	12.9
12					-Difficult drilling due to gravels			
14	SB9-5			GC	Medium dense, moist, reddish brown, with grayish brown mottling, Clayey GRAVEL; poor recovery	39	103.6	14.4
16								
18					-Difficult drilling due to gravels			
20			▽		-Seepage encountered at 20 feet; no recovery due to gravels			
22				SM/SC	**ALLUVIUM (Qal)** Dense, moist, dark brown, Gravelly/Clayey, fine to coarse SANDSTONE with gravel and cobble	29		
24					-Cutting head advanced from 21-24 feet with relative ease			
26	SB9-6				-Poor recovery, brecciated meta volcanic rock obtained from california sampler; blow counts not accurate due to gravels	72	117.0	13.2
					REFUSAL AT 26 FEET Seepage at 20 feet Backfilled with cement mixed soil, upper 3 feet concrete ft. concrete seal with black dye			

Figure A-145,
Log of Boring SB 9, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO. G1012-52-02

BORING SB 10

ELEV. (MSL.) **518'** DATE COMPLETED **01-29-2010**

EQUIPMENT **CME 75** BY: **M. ERTWINE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	3-inches ASPHALT CONCRETE			
2	SB10-1 SB10-2				**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, reddish brown to gray brown, Clayey, fine to coarse SAND; few gravels with interlayered sandy clay lenses	20	117.1	8.8
4								
6	SB10-3			GC	Loose, dry to moist, Clayey GRAVEL; poor recovery	13	99.5	14.6
8								
10	SB10-4 SB10-5				**ALLUVIUM (Qal)** -Sampling unsuccessful, no recovery -Hard gravel layer; brecciated metavolcanic rock obtained in SPT sampler	50/6" 50/5"		
					REFUSAL AT 11 FEET No groundwater encountered Backfilled with cement mixed cuttings, upper 3 ft. concrete seal with black dye			

Figure A-146,
Log of Boring SB 10, Page 1 of 1

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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

GEOCON

APPENDIX B

APPENDIX B

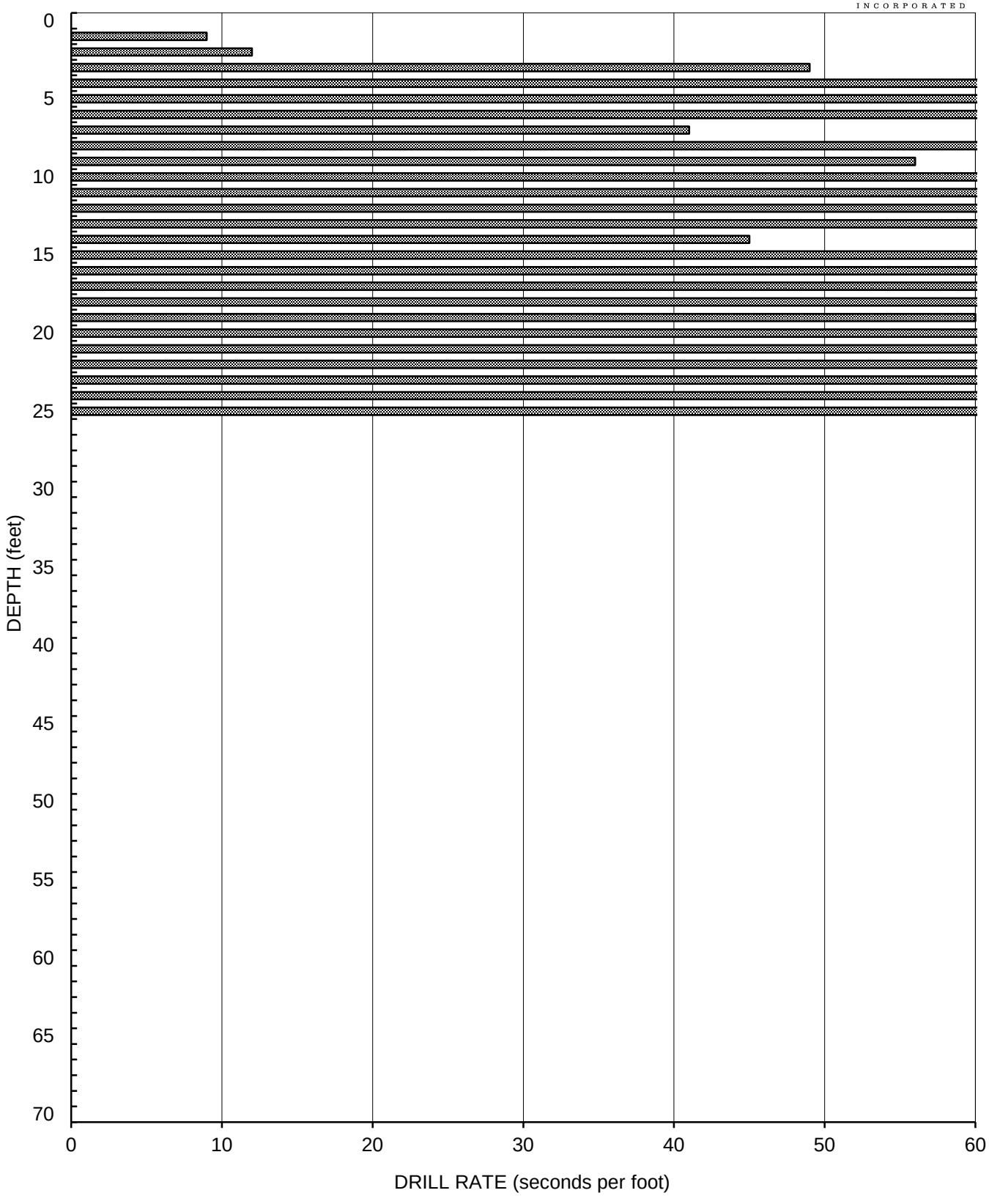
AIR TRACK BORINGS

Our subsurface investigation included excavating 22 air-track borings in the locations of proposed cuts to evaluate bedrock rippability. The air track borings were advanced to a maximum depth of approximately 67 feet using an ECM-370 drill rig equipped with a 4-inch diameter drill bit. The drill bit is advanced with an air percussion hammer and drill rods. As the drilling proceeded, Geocon Incorporated recorded the drill penetration rates in seconds per foot (seconds/foot) based on measured marks on the drill rig tower and a stopwatch. The approximate locations of the air track borings are shown on the Geologic Map, Figures 2 through 8. Logs of the air track borings are presented on Figures B-1 through B-22 in this appendix.

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-1
Elevation - 807 Feet (MSL)

GEOCON
INCORPORATED



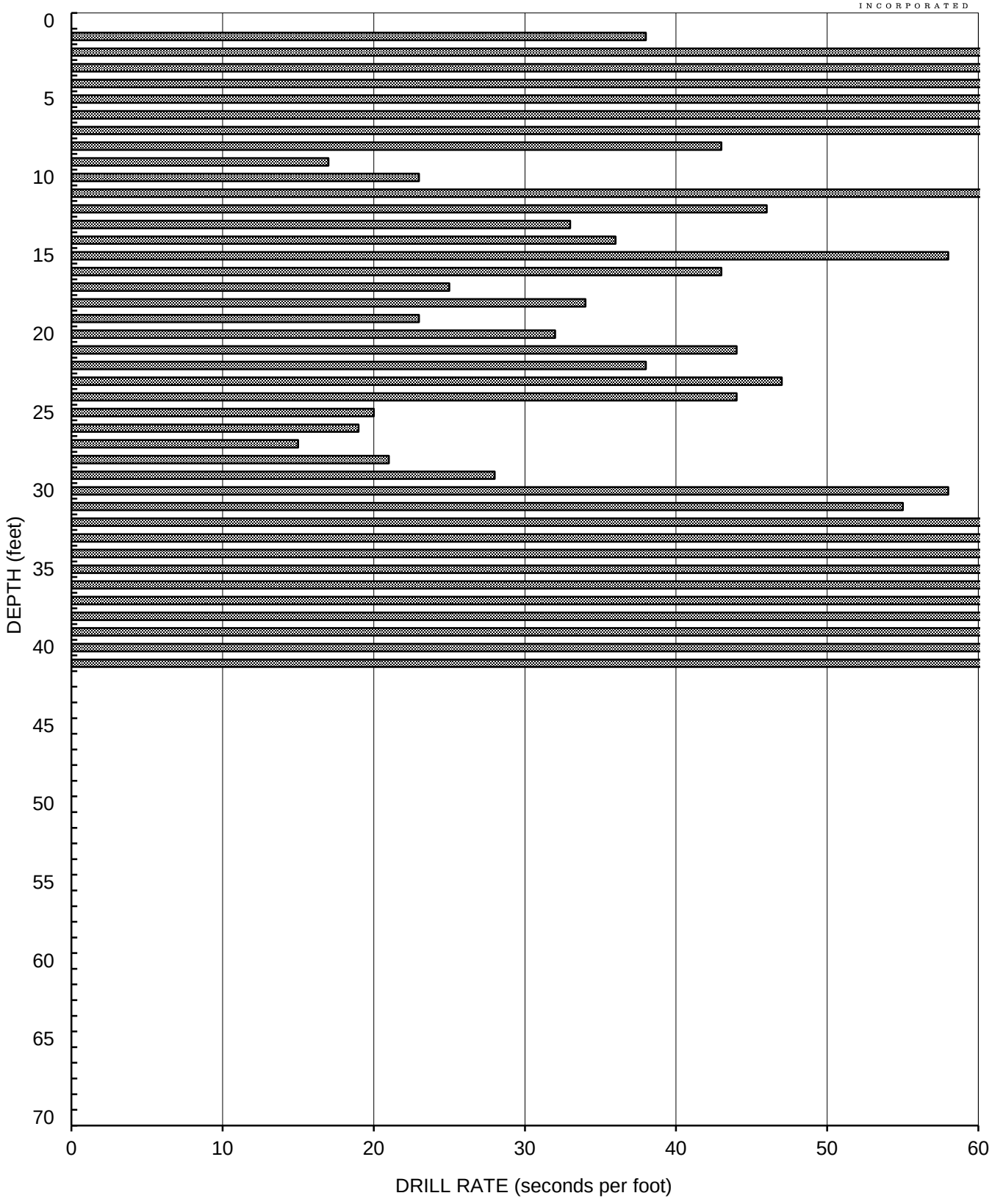
AT001.xls

FIGURE B-1

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-2
Elevation - 820 Feet (MSL)

GEOCON
INCORPORATED



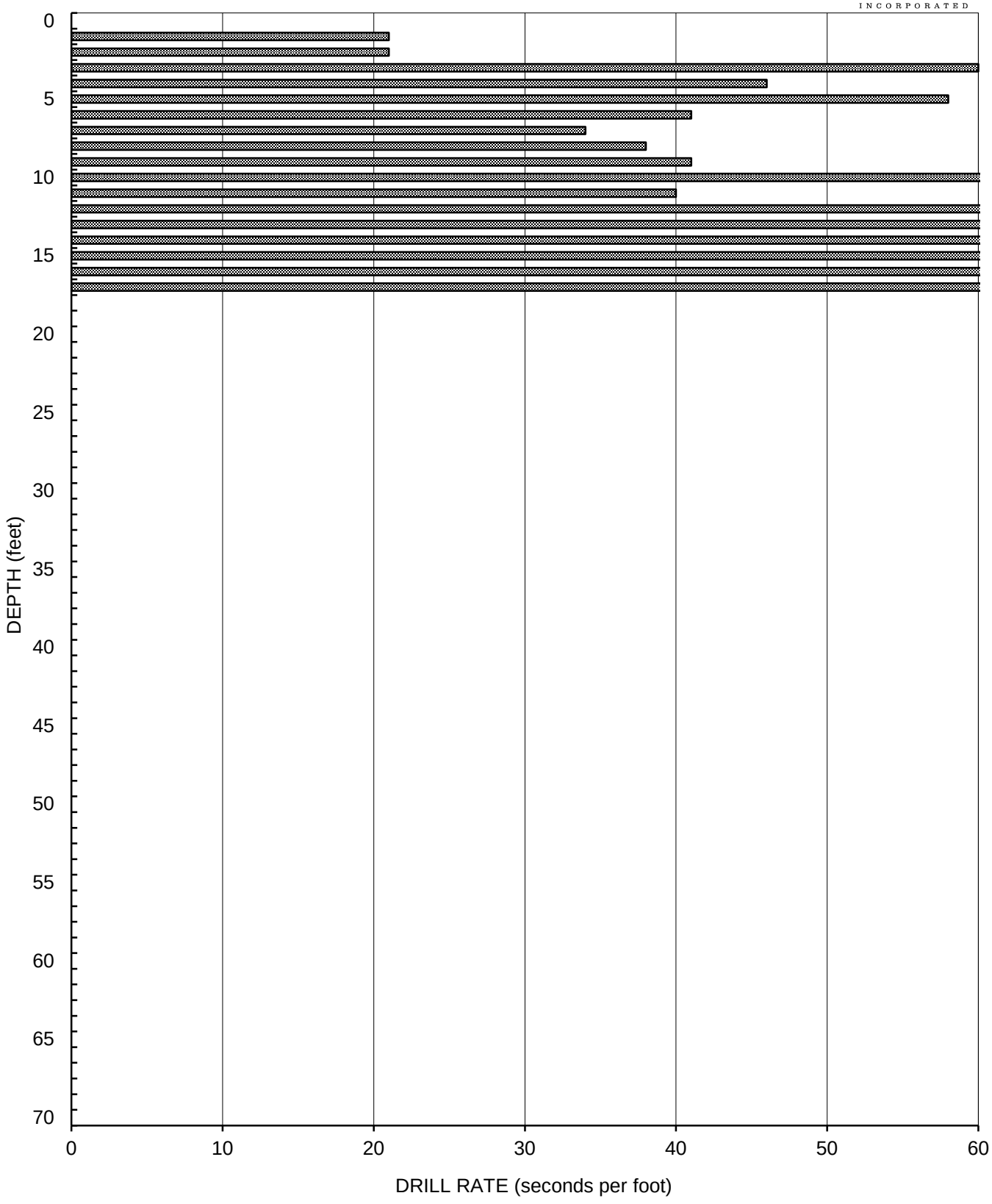
AT002.xls

FIGURE B-2

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-3
Elevation - 786 Feet (MSL)

GEOCON
INCORPORATED



AT003.xls

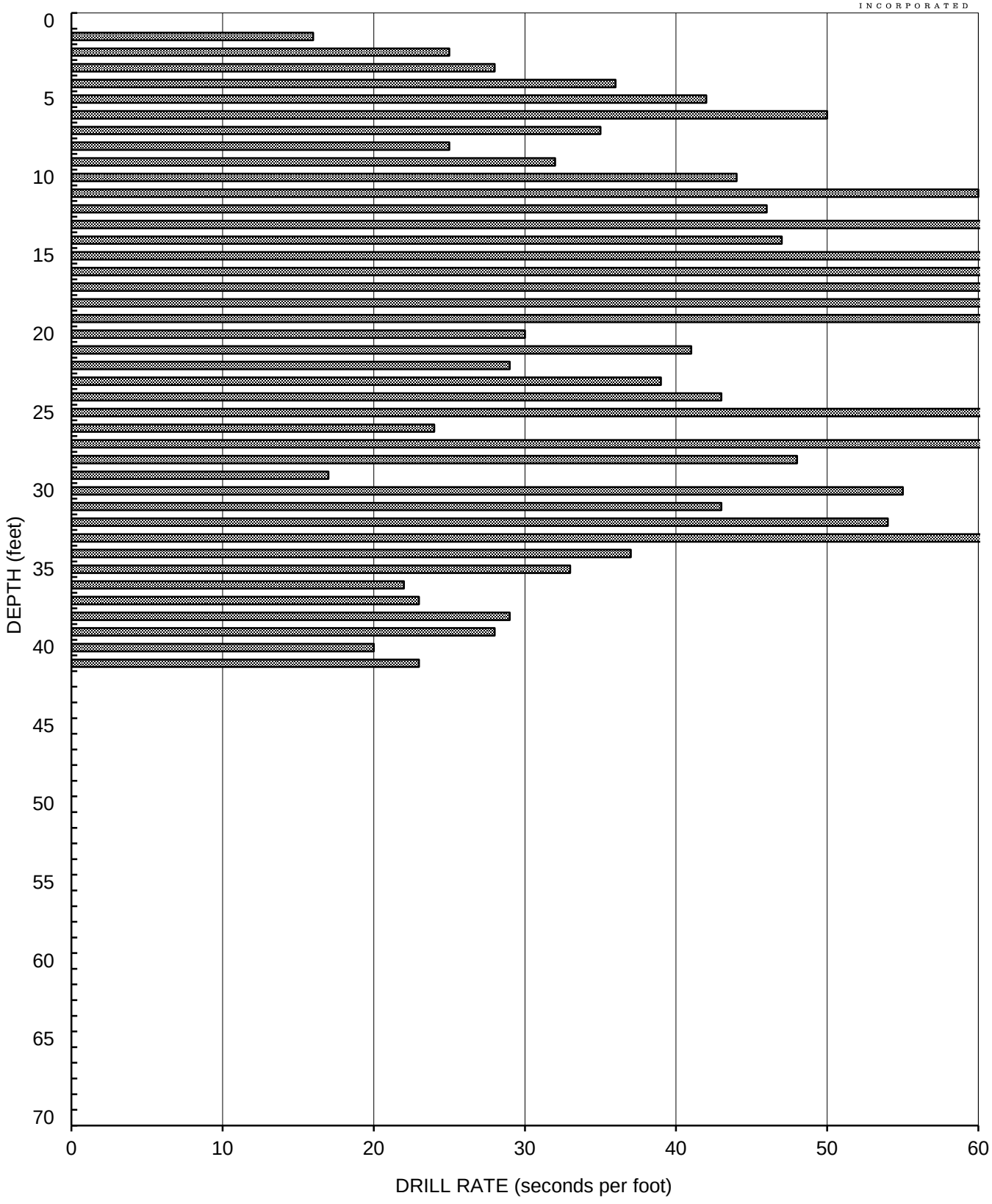
FIGURE B-3

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-4

Elevation - 663 Feet (MSL)

GEOCON INCORPORATED



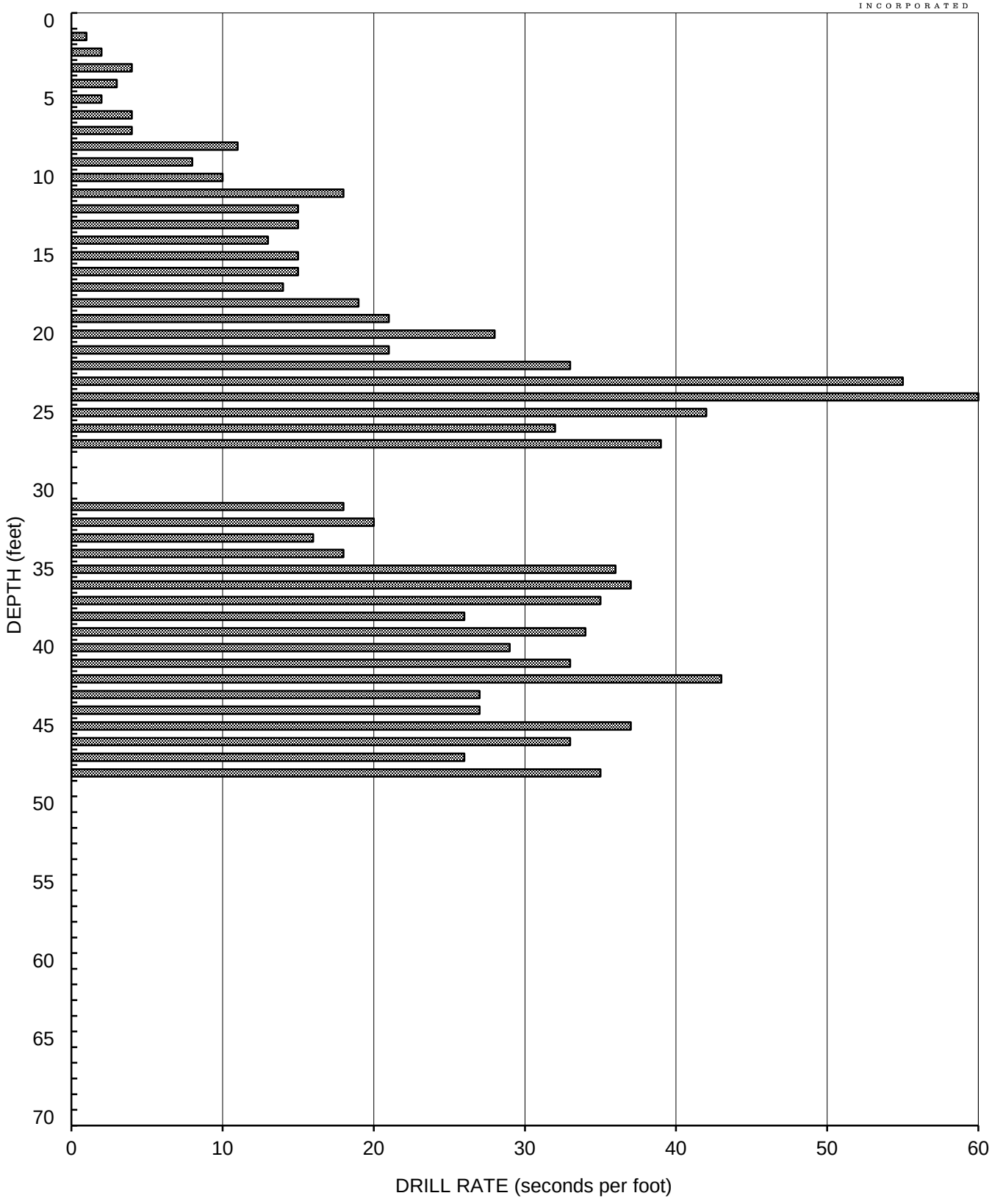
AT004.xls

FIGURE B-4

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-5
Elevation - 684 Feet (MSL)

GEOCON
INCORPORATED



AT005.xls

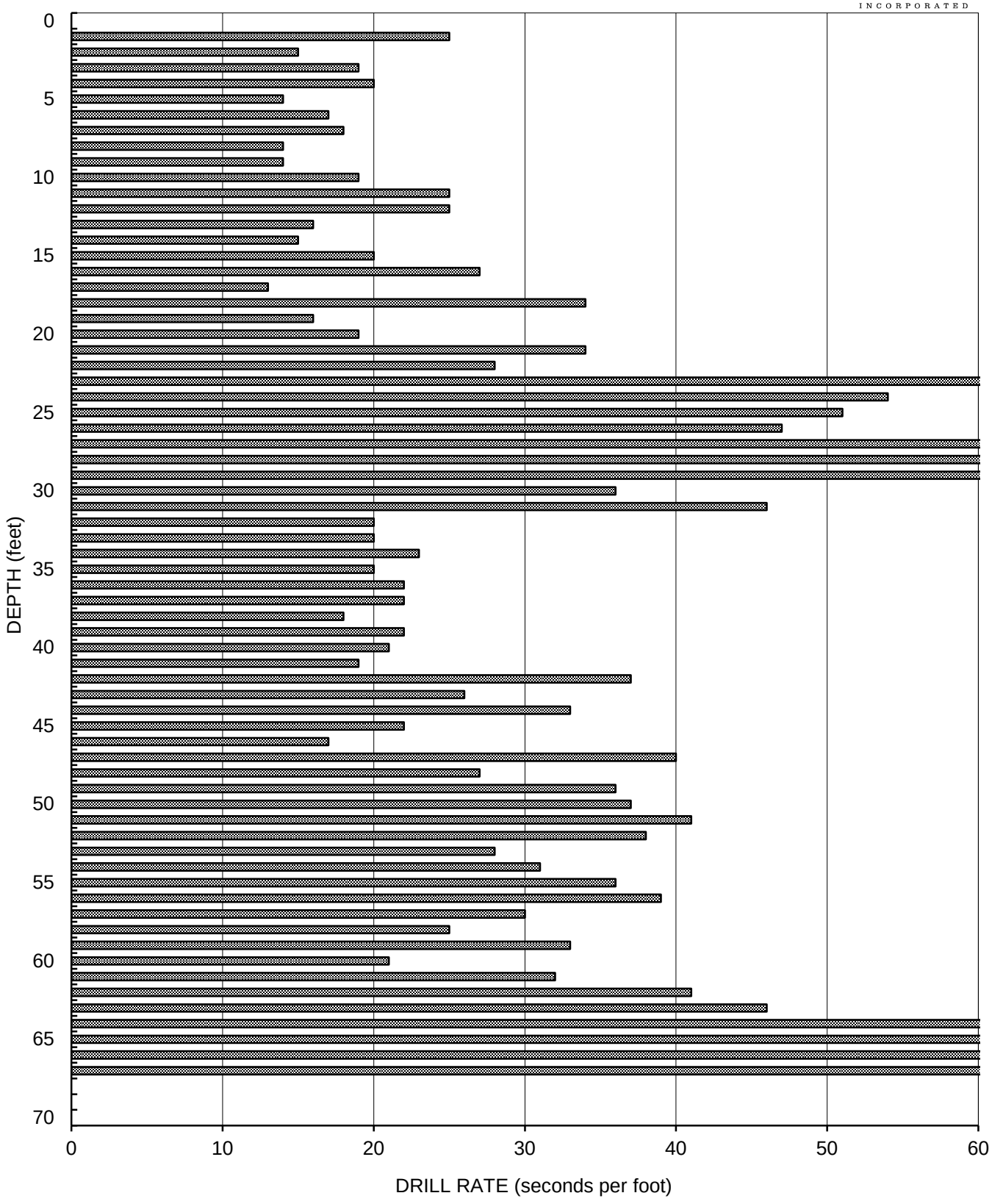
FIGURE B-5

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-6

Elevation - 645 Feet (MSL)

GEOCON INCORPORATED



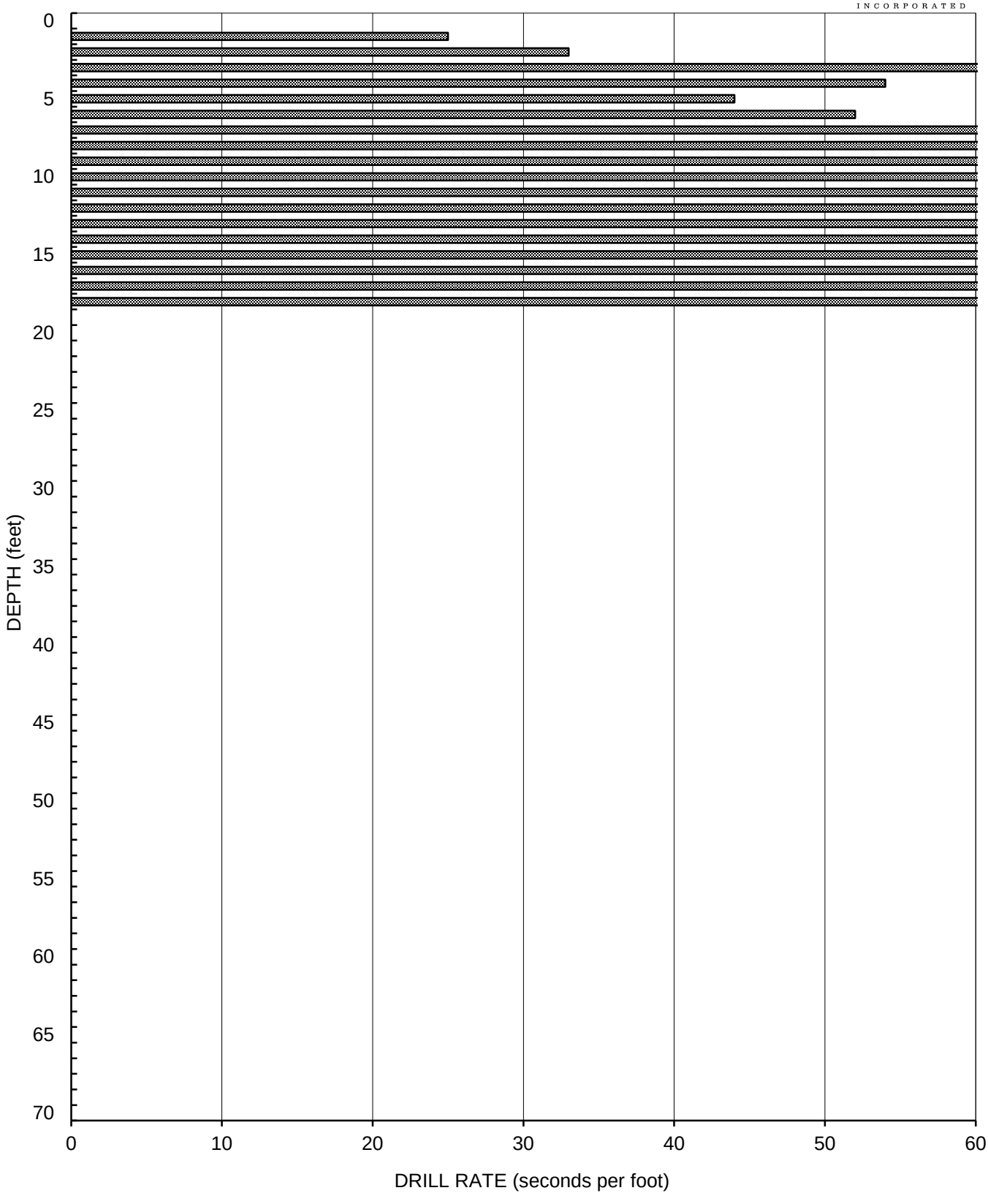
AT006.xls

FIGURE B-6

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-7
Elevation - 693 Feet (MSL)

GEOCON
INCORPORATED



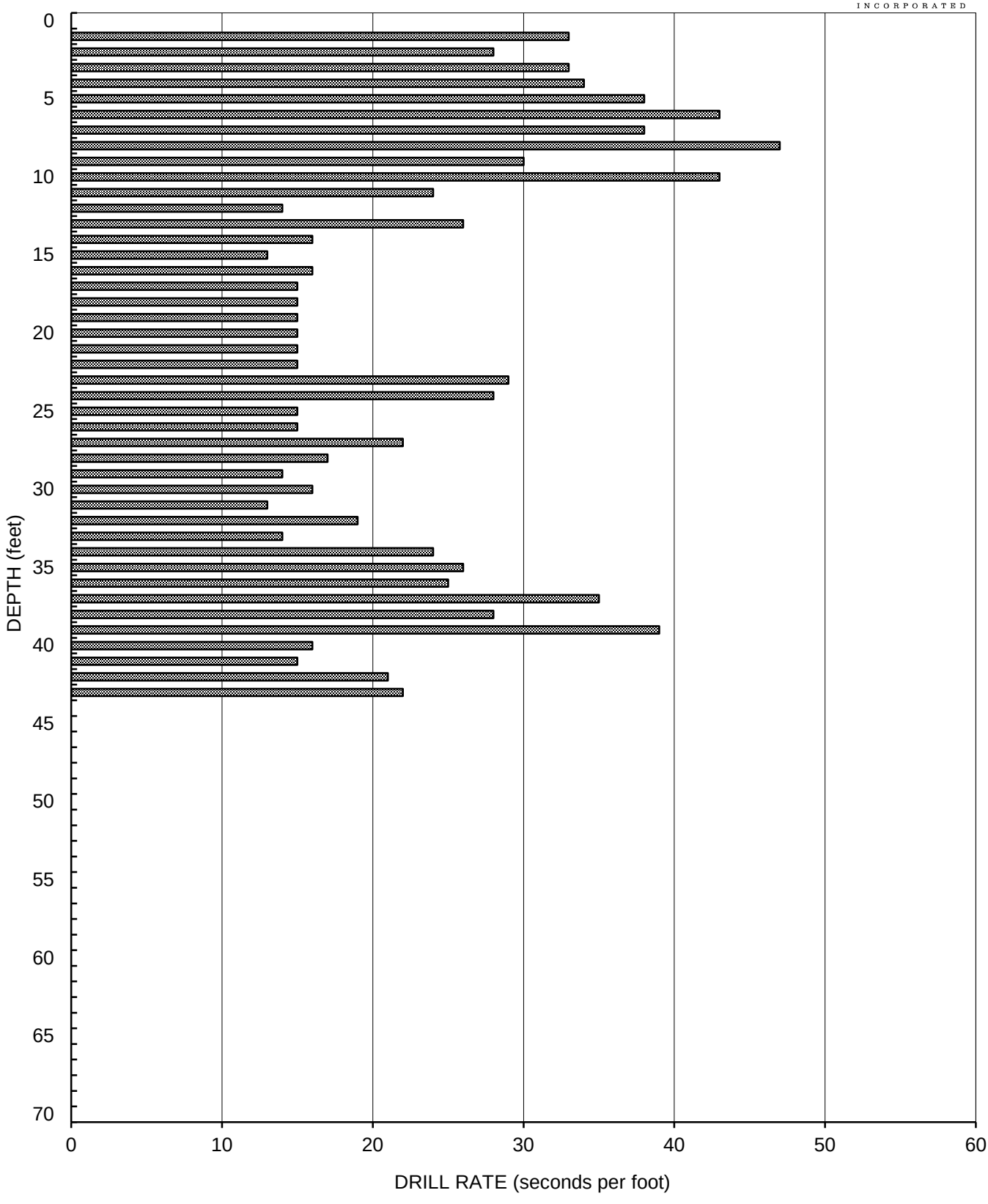
AT007.xls

FIGURE B-7

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-8
Elevation - 611 Feet (MSL)

GEOCON
INCORPORATED



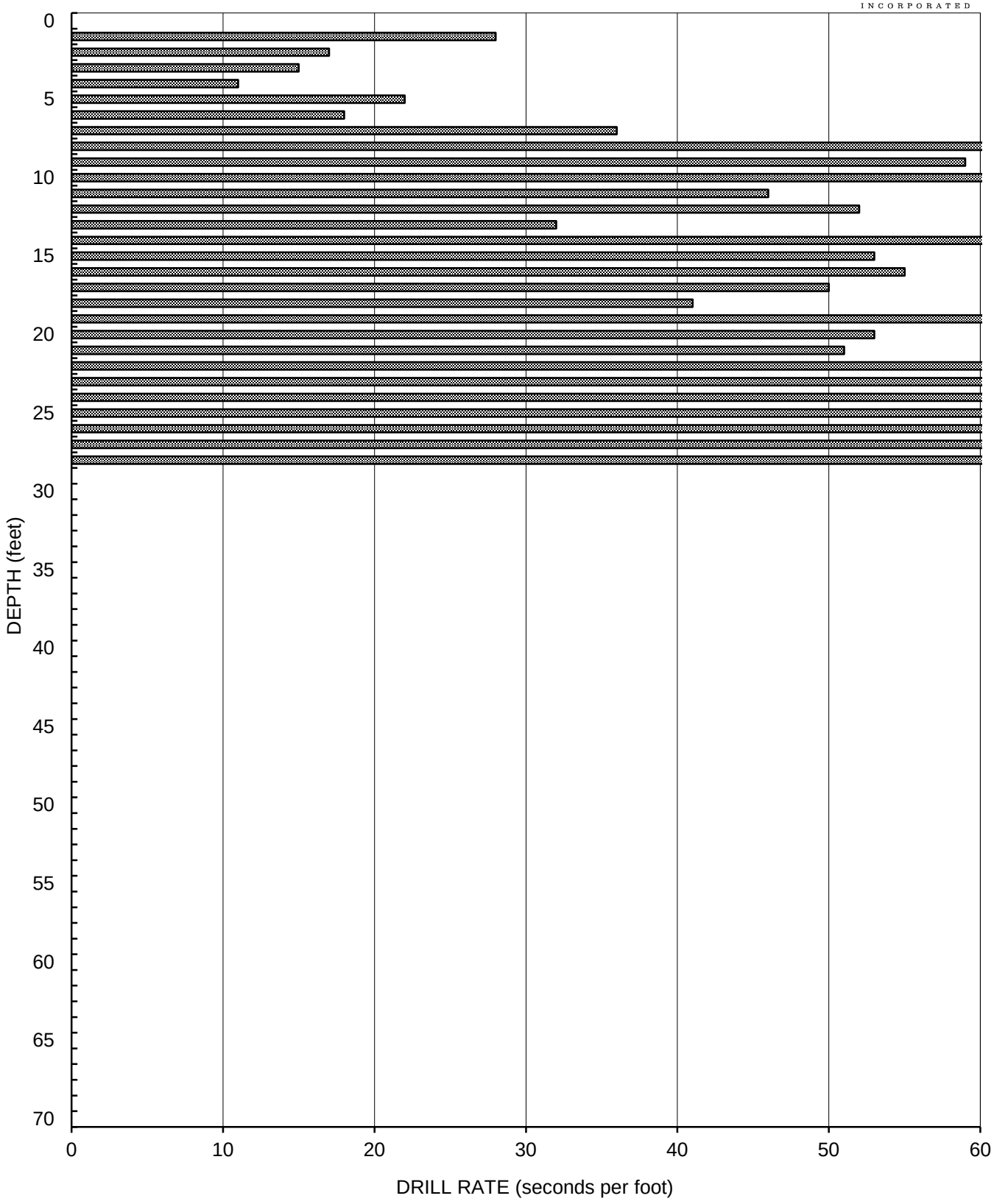
AT008.xls

FIGURE B-8

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-9
Elevation - 702 Feet (MSL)

GEOCON
INCORPORATED



AT009.xls

FIGURE B-9

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-10
Elevation - 800 Feet (MSL)

GEOCON
INCORPORATED

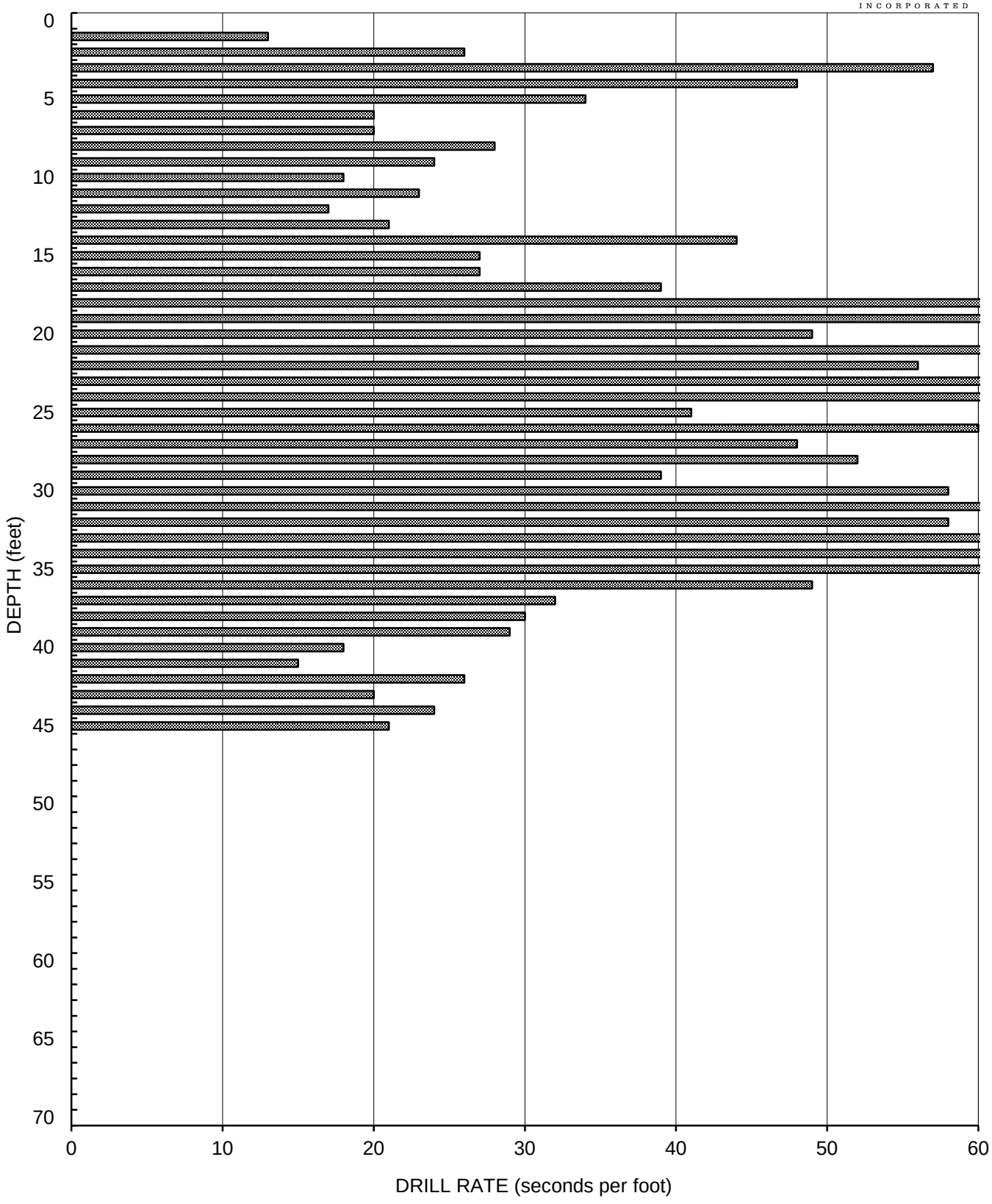


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FIGURE B-10

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-11
Elevation - 756 Feet (MSL)

GEOCON
INCORPORATED

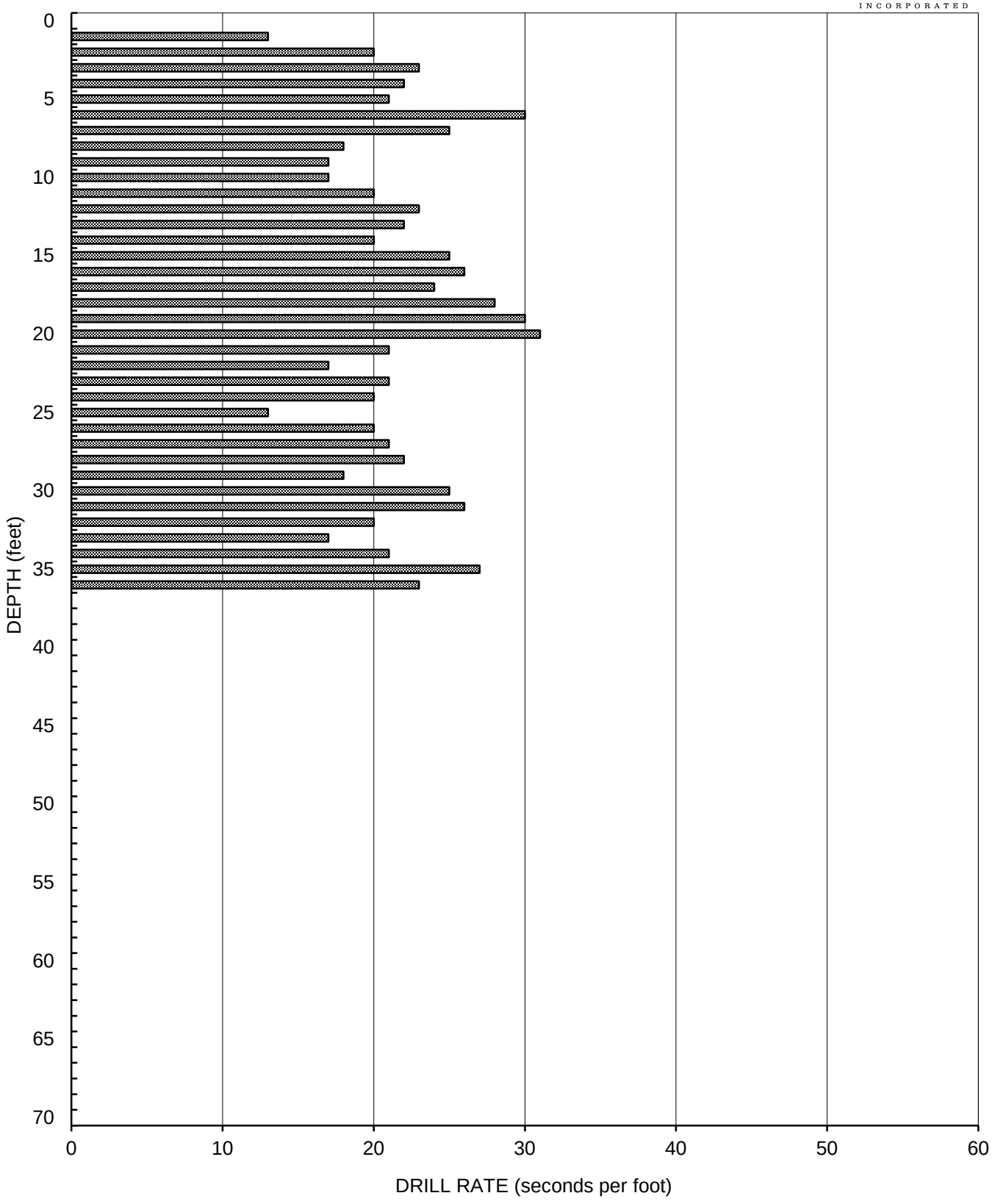

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FIGURE B-11

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-12
Elevation - 811 Feet (MSL)

GEOCON
INCORPORATED

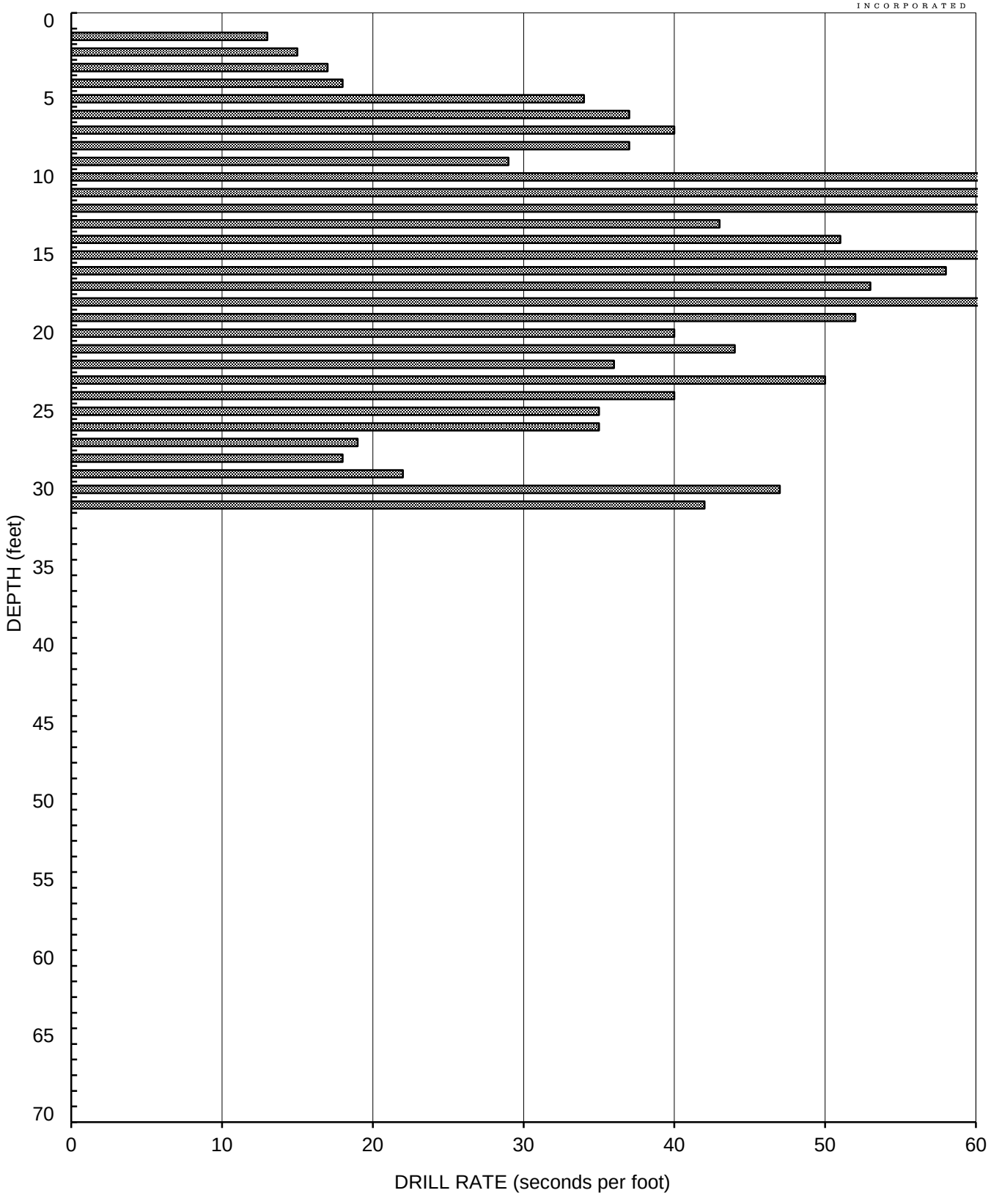

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FIGURE B-12

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-13

Elevation - 884 Feet (MSL)

GEOCON
INCORPORATED

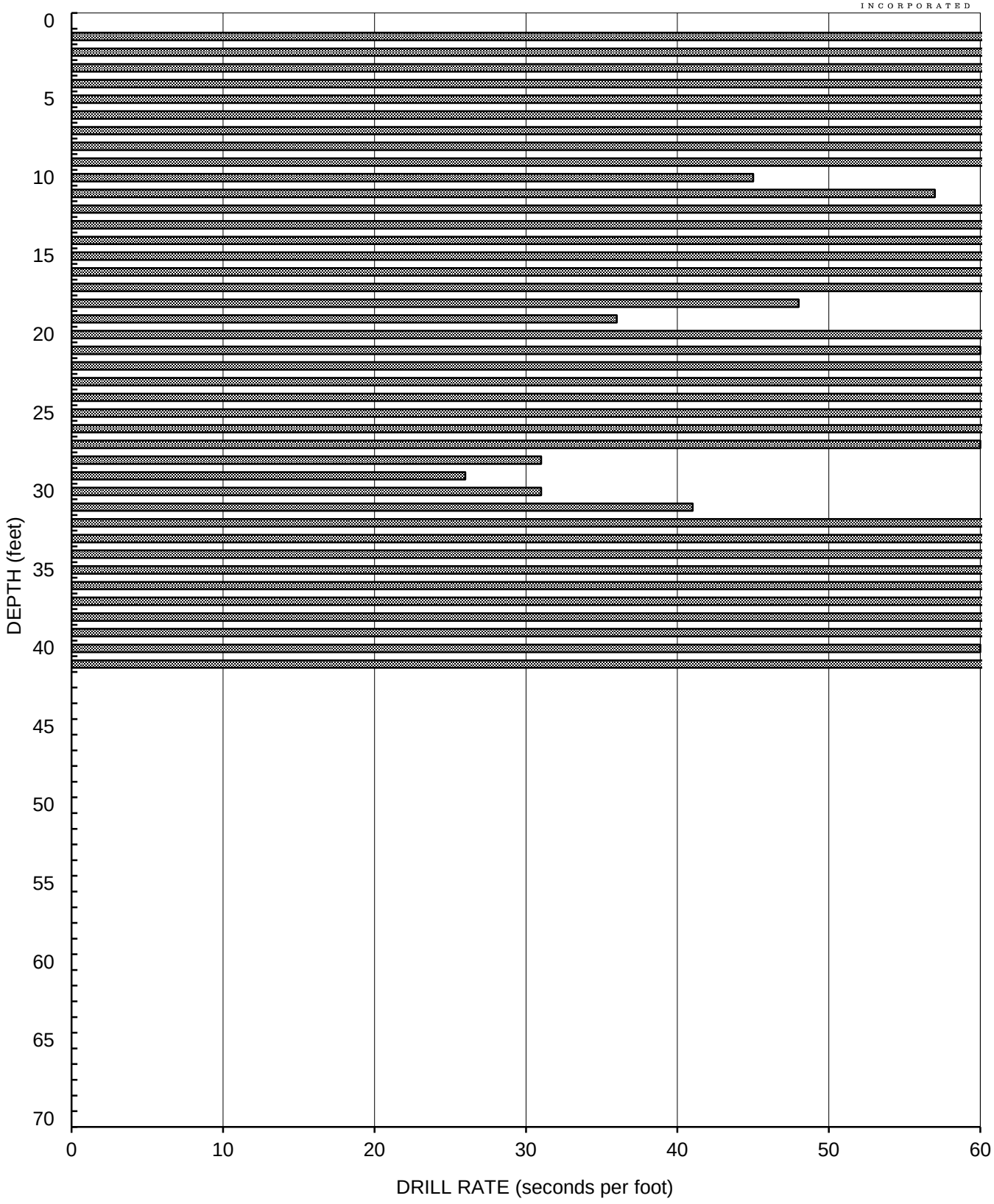

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FIGURE B-13

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-14
Elevation - 832 Feet (MSL)

GEOCON
INCORPORATED

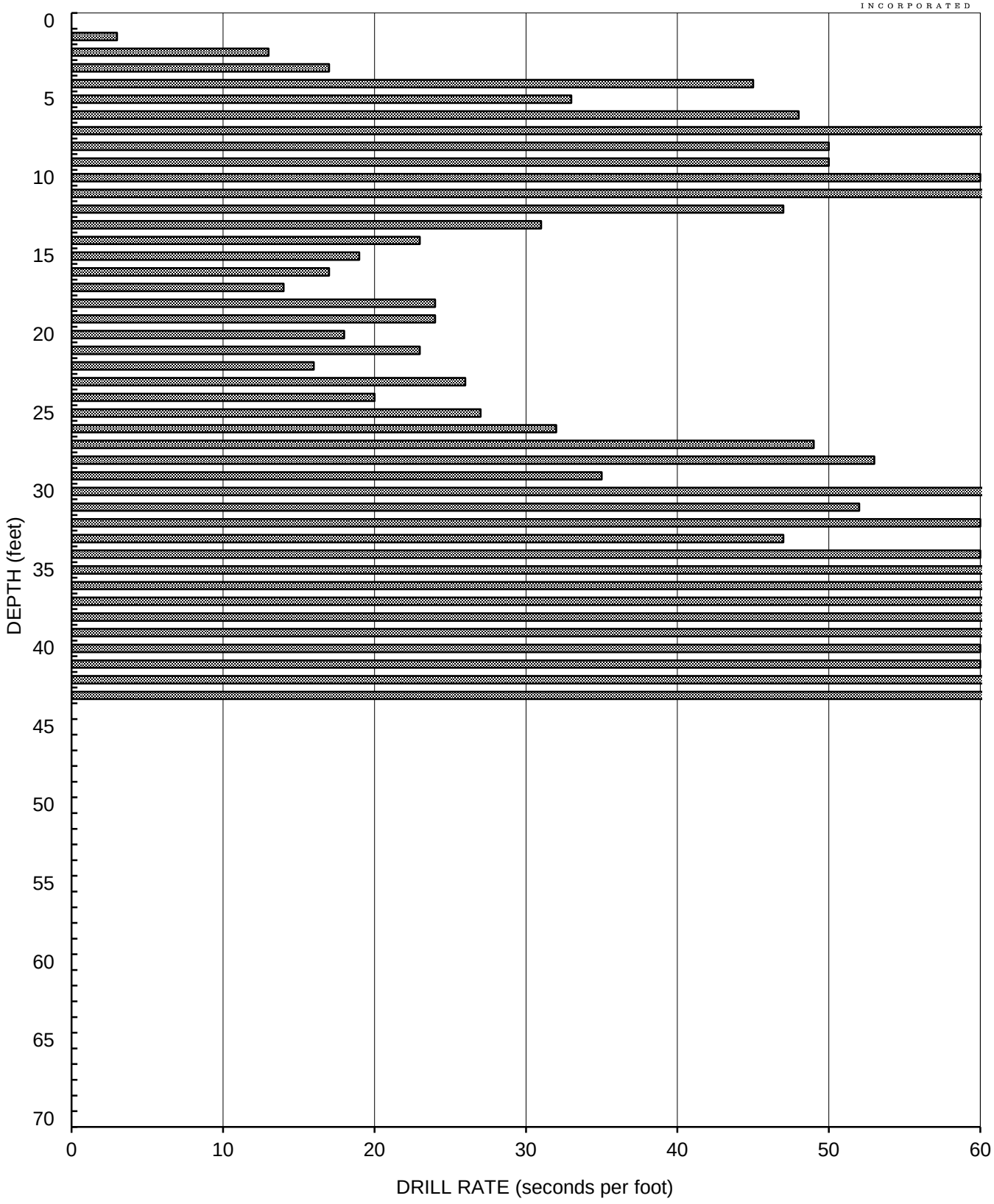

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FIGURE B-14

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-15
Elevation - 815 Feet (MSL)

GEOCON
INCORPORATED

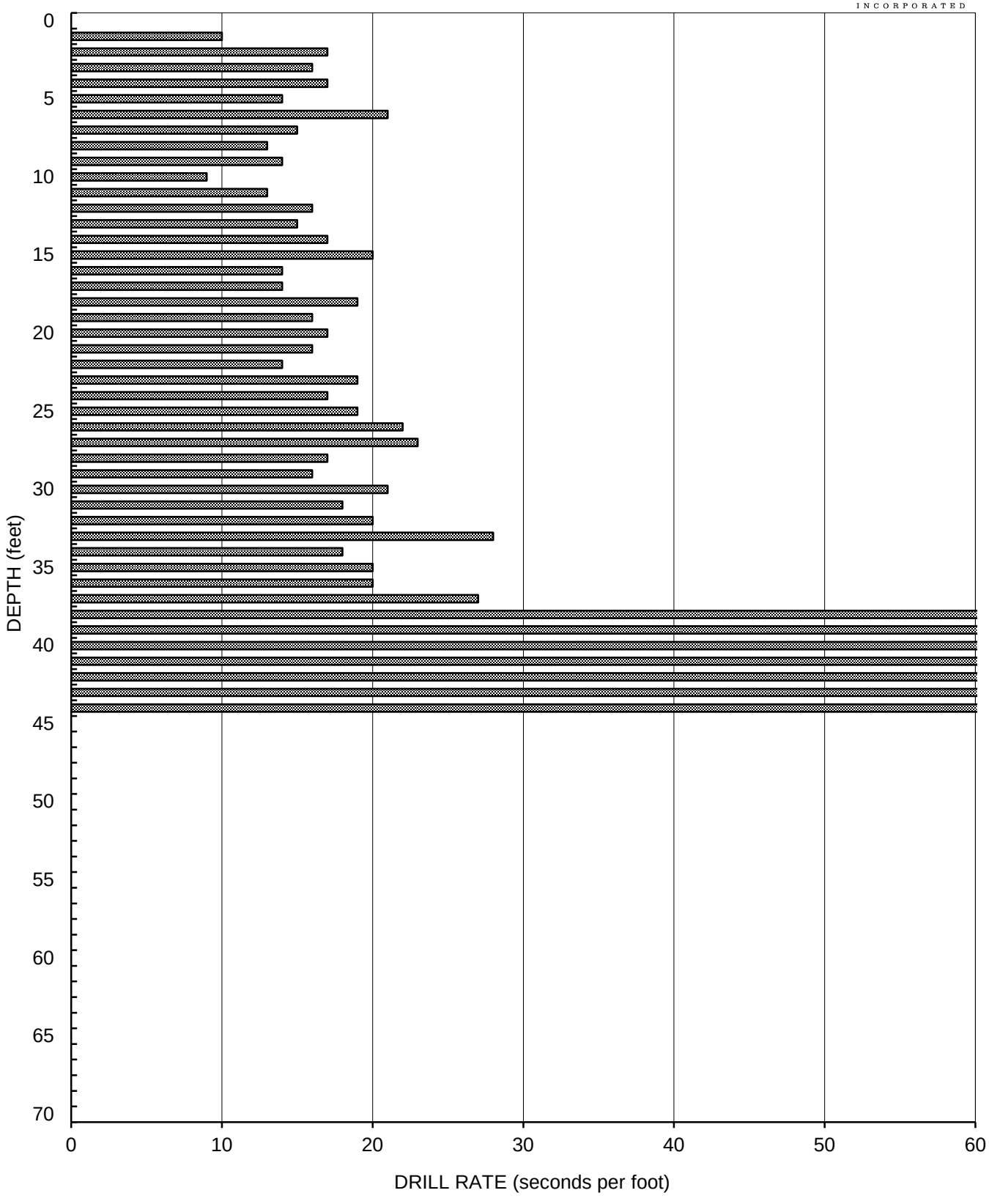

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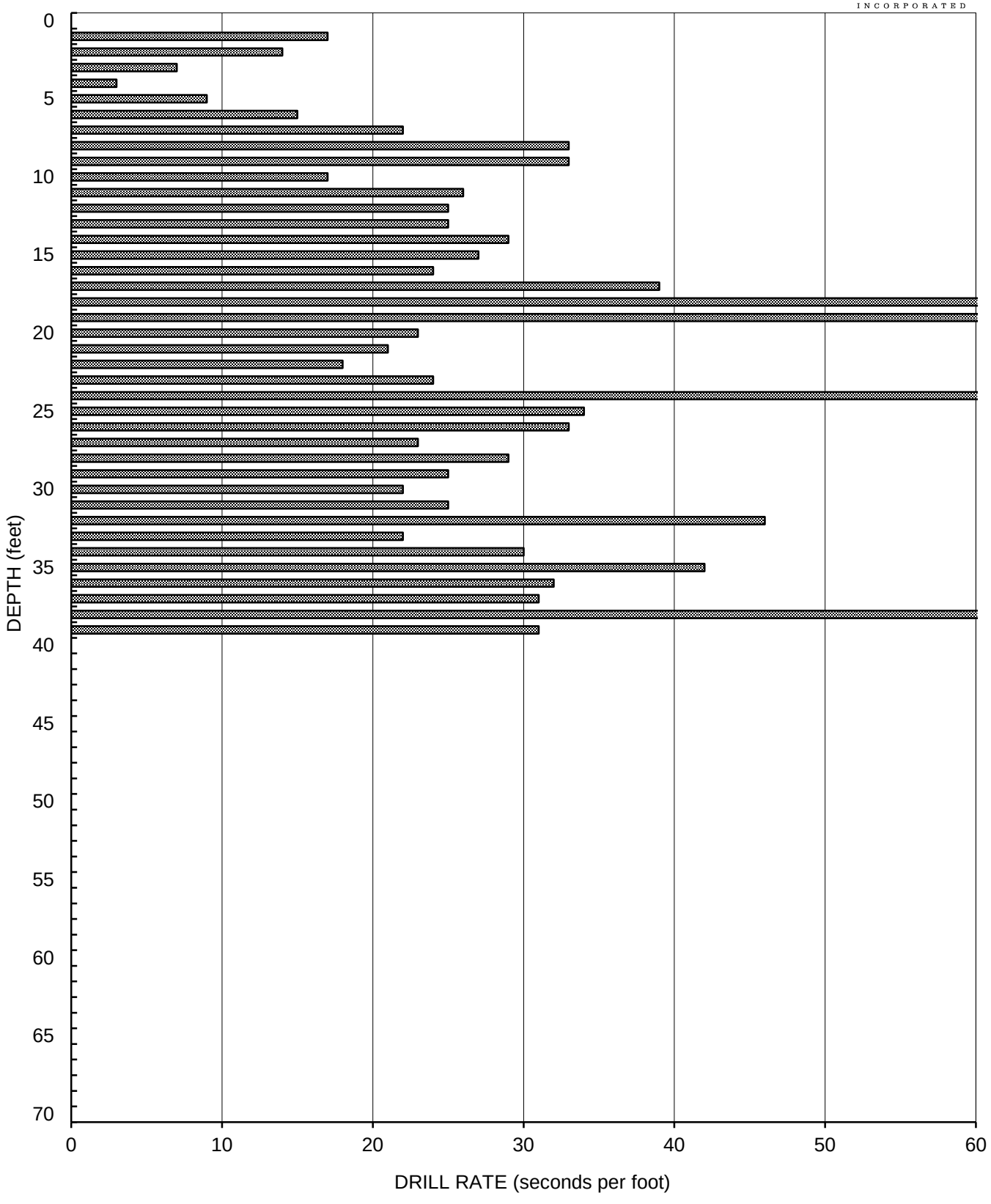
FIGURE B-15

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-16
Elevation - 698 Feet (MSL)

GEOCON
INCORPORATED



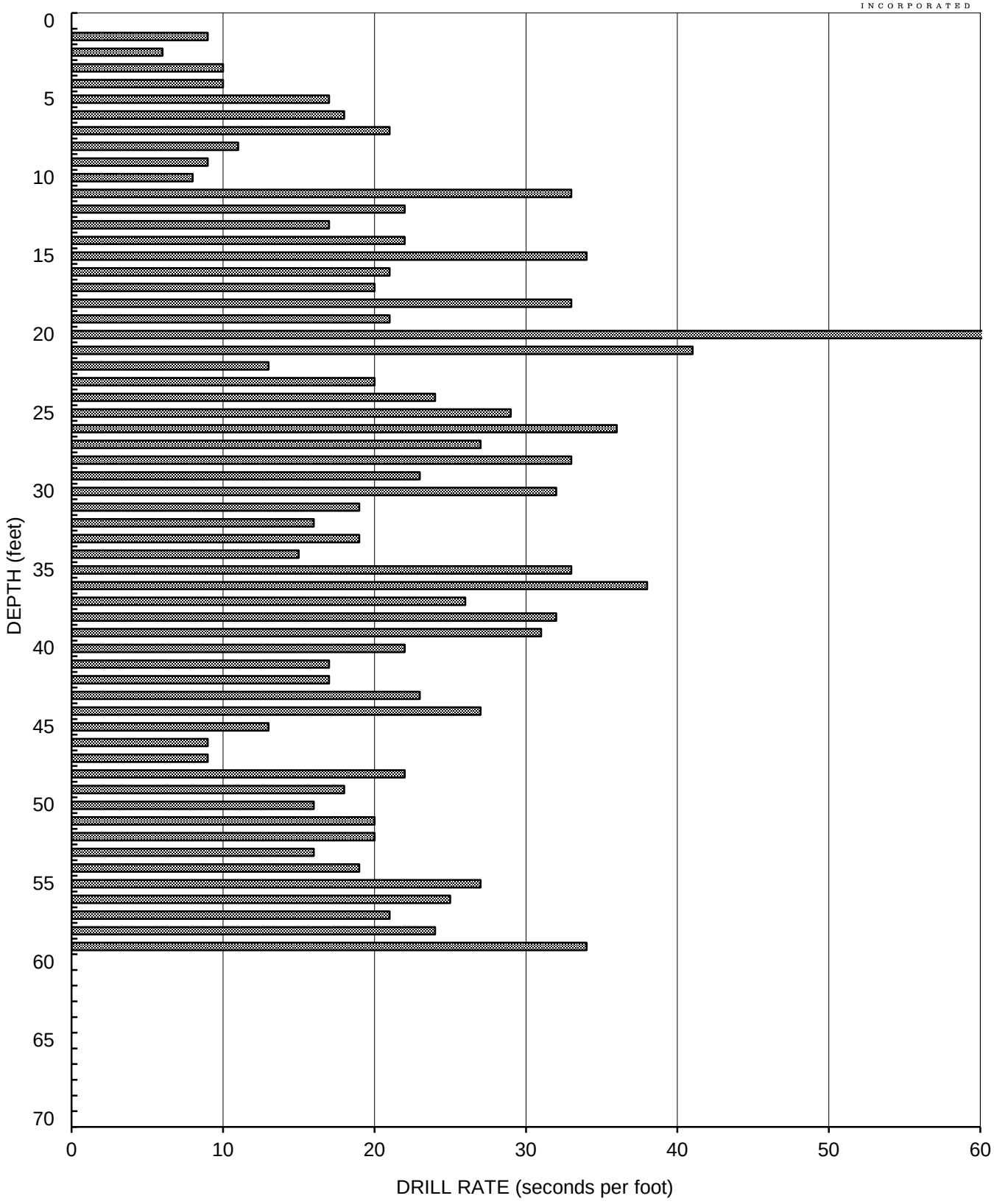
AT016.xls

FIGURE B-16

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-17
Elevation - 598 Feet (MSL)

GEOCON
INCORPORATED



AT017.xls

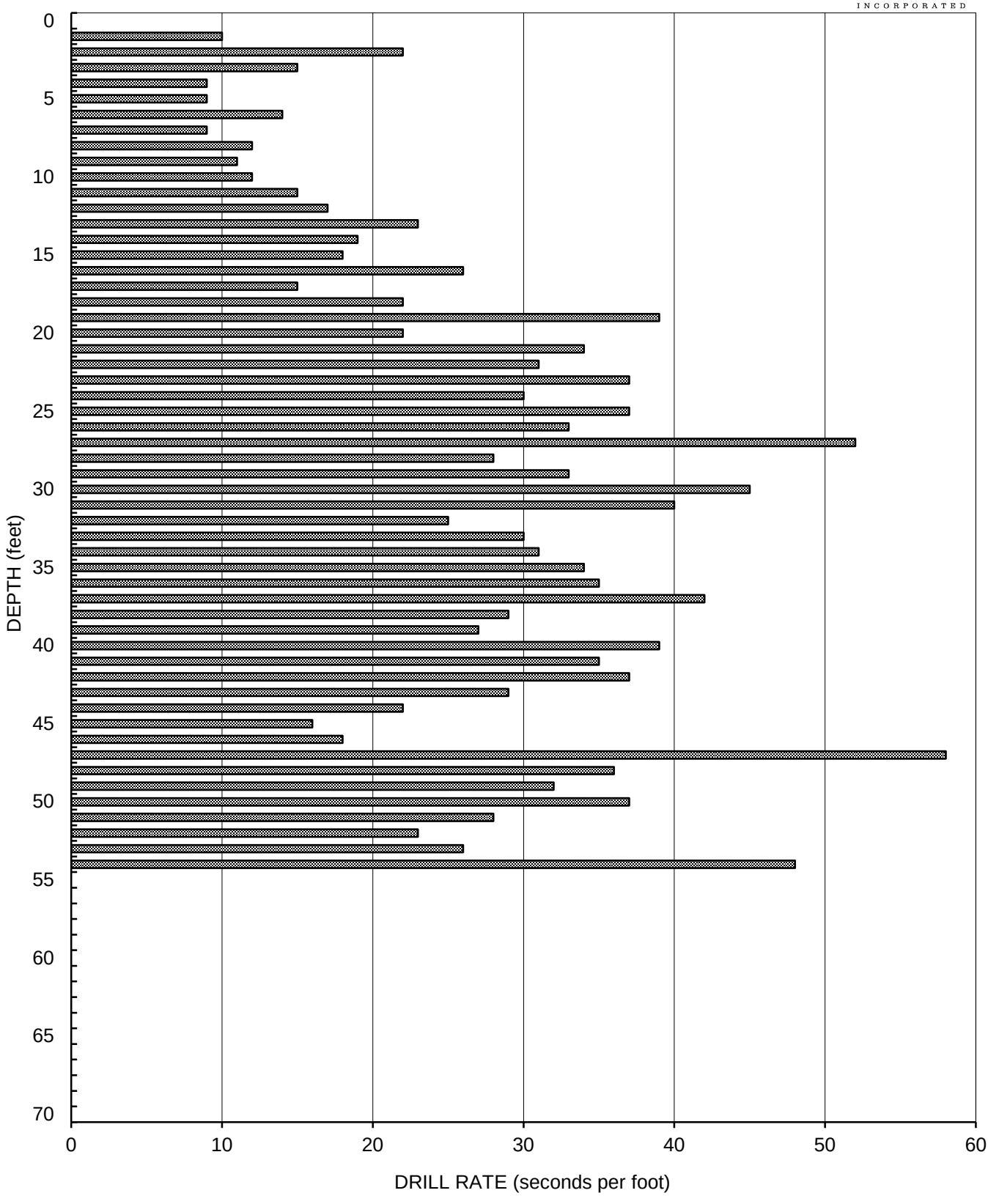
FIGURE B-17

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-18

Elevation - 596 Feet (MSL)

GEOCON INCORPORATED



AT018.xls

FIGURE B-18

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-19
Elevation - 563 Feet (MSL)

GEOCON
INCORPORATED

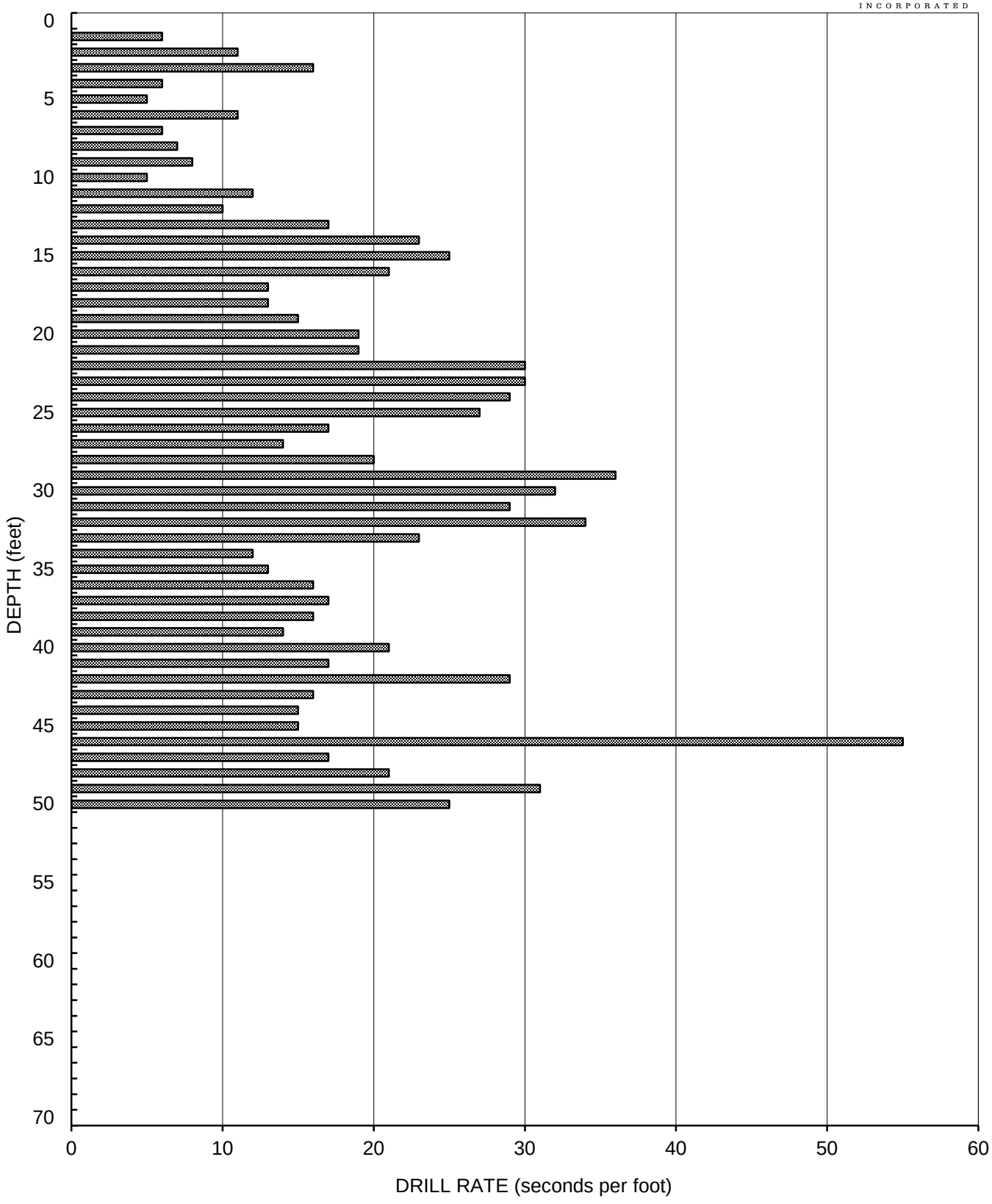


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FIGURE B-19

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-20
Elevation - 696 Feet (MSL)

GEOCON
INCORPORATED

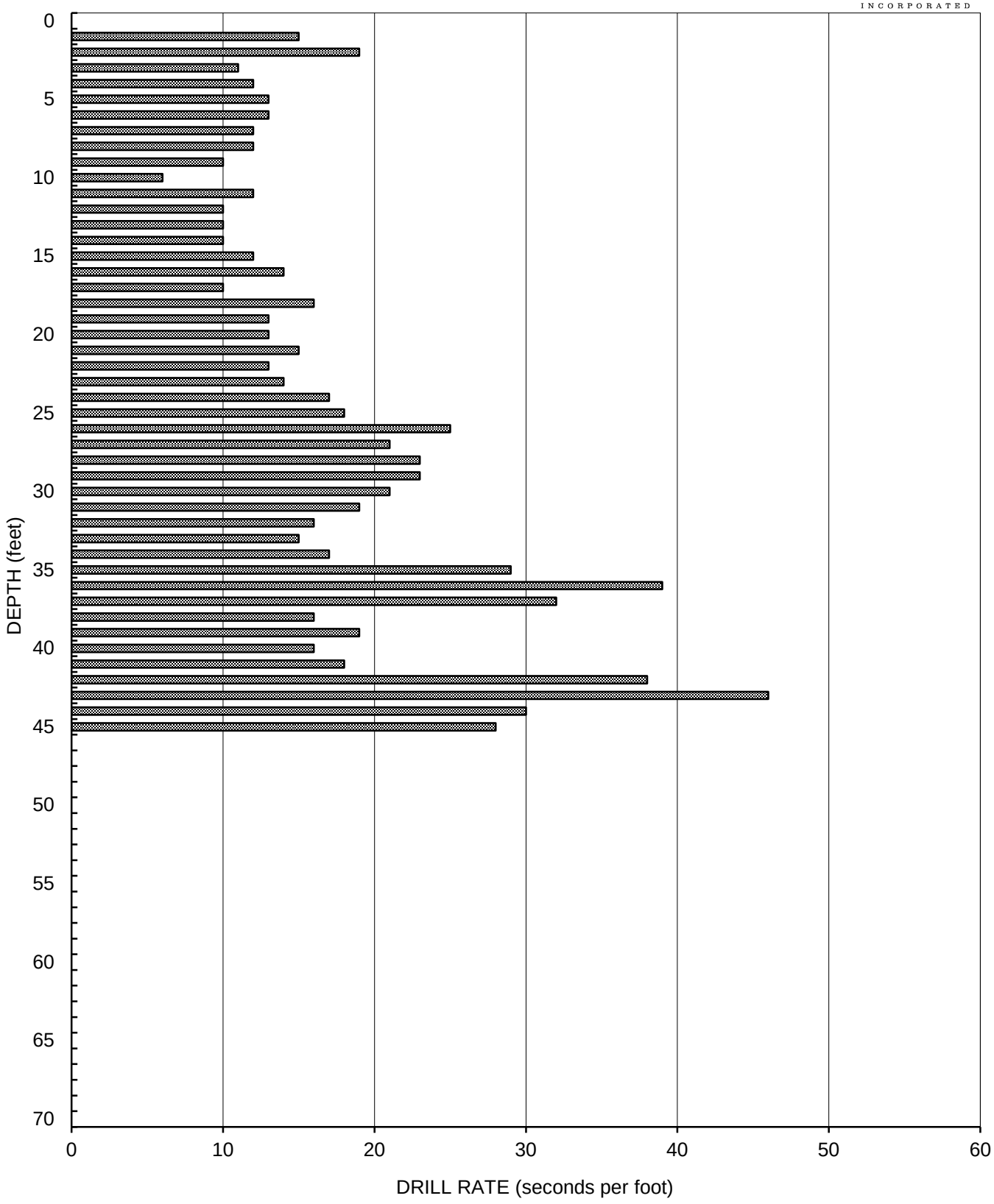

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FIGURE B-20

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-21
Elevation - 537 Feet (MSL)

GEOCON
INCORPORATED

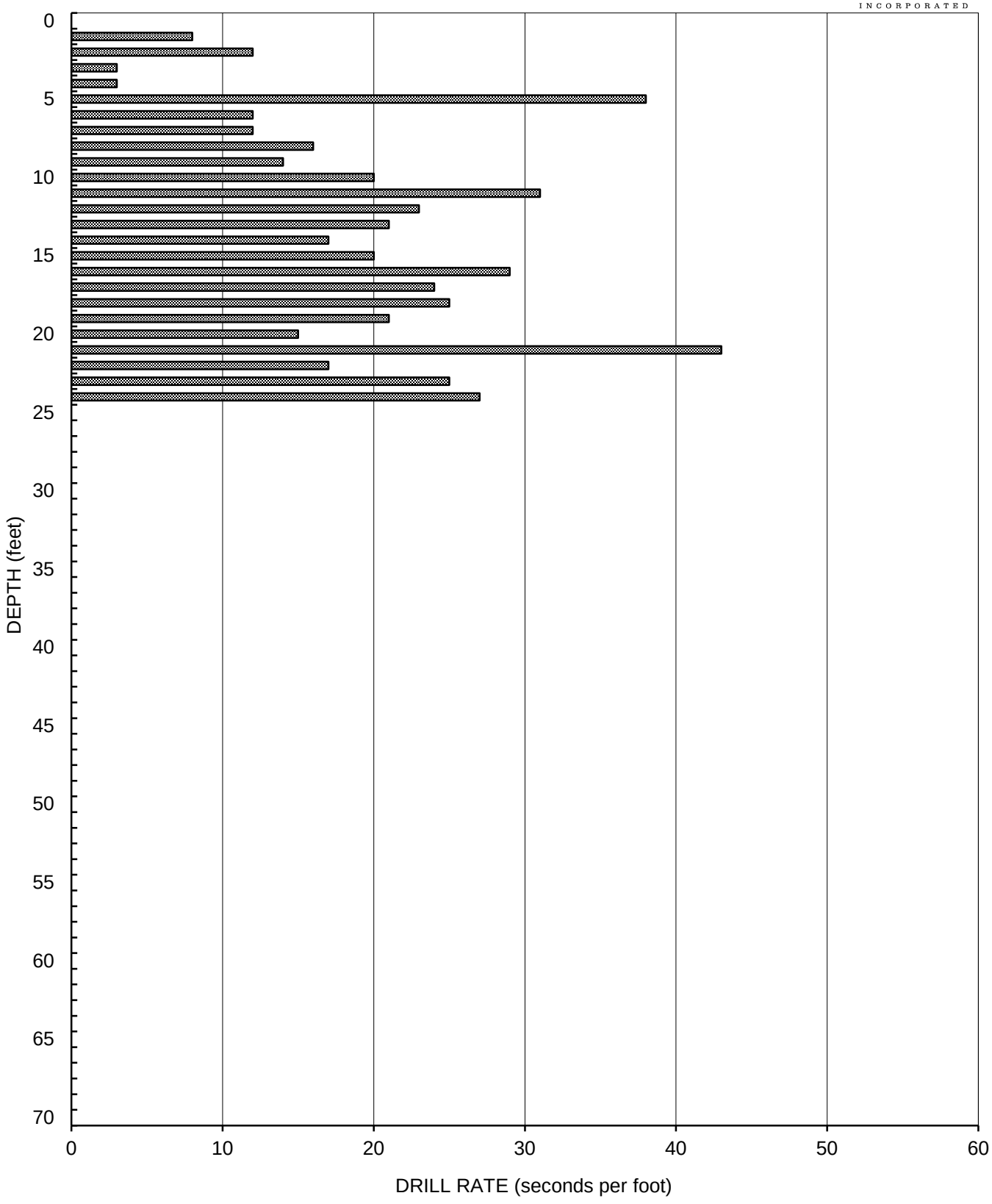

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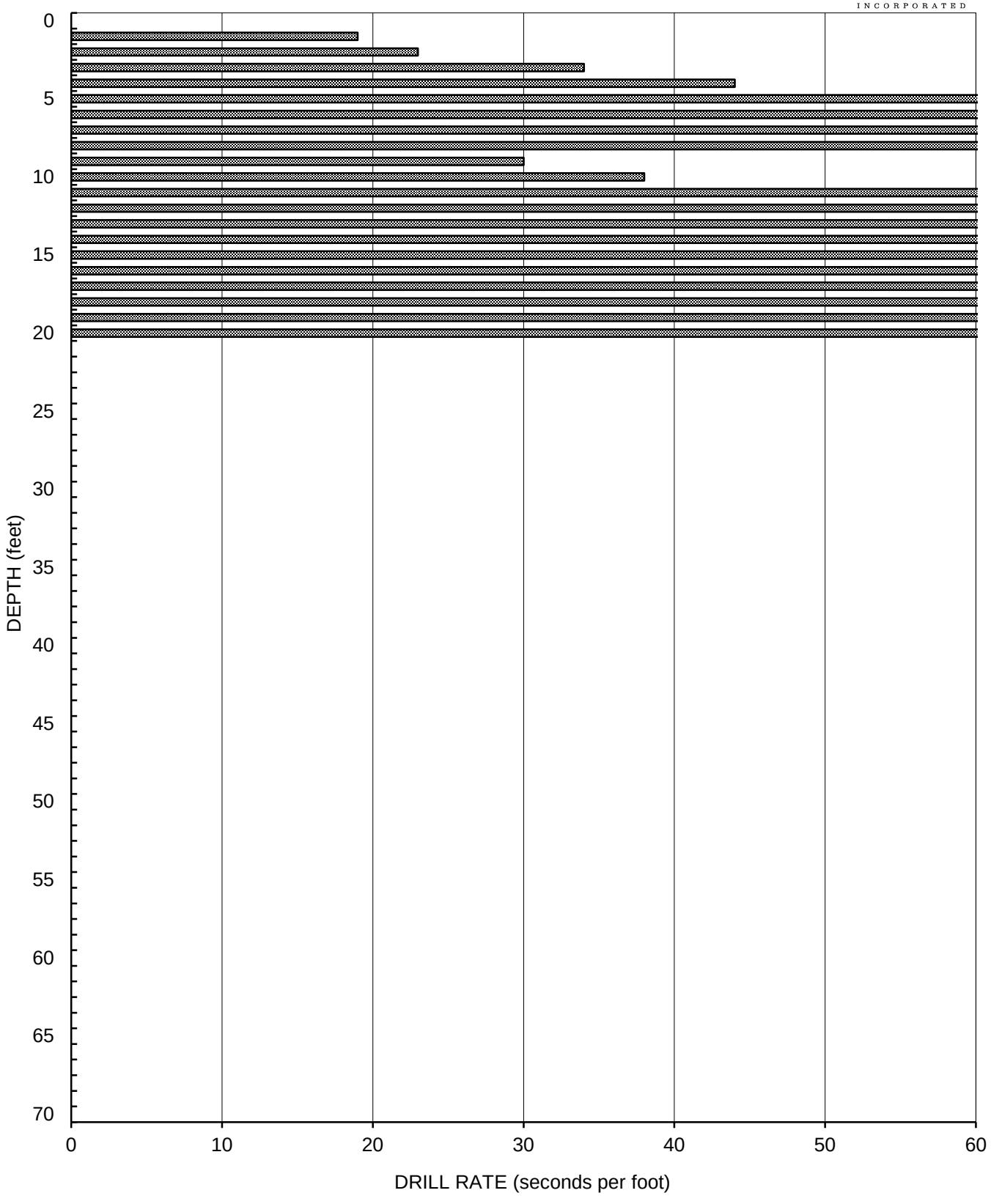
FIGURE B-21

OTAY RANCH RESORT VILLAGE

AIR TRACK BORING AT-22
Elevation - 728 Feet (MSL)

GEOCON
INCORPORATED



AT022.xls

FIGURE B-22

APPENDIX C

APPENDIX C

SEISMIC REFRACTION SURVEY REPORT

PREPARED BY **SOUTHWEST GEOPHYSICS, INC.**
DATED **OCTOBER 10, 2008 (PROJECT NO. 108226)**

FOR

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO. G1012-52-02

SEISMIC REFRACTION SURVEY
OTAY RANCH RESIDENTIAL DEVELOPMENT
SAN DIEGO, CALIFORNIA

PREPARED FOR:
Geocon Consultants, Inc.
6970 Flanders Drive
San Diego, CA 92121

PREPARED BY:
Southwest Geophysics, Inc.
7438 Trade Street
San Diego, CA 92121

October 10, 2008
Project No. 108226

SOUTHWEST
GEOPHYSICS, INC.
YOUR SUBSURFACE SOLUTION

October 10, 2008
Project No. 108226

Mr. Nathan Ash
Geocon Consultants, Inc.
6970 Flanders Drive
San Diego, CA 92121

Subject: Seismic Refraction Survey
Otay Ranch Residential Development
San Diego, California

Dear Mr. Ash:

In accordance with your authorization, we have performed a seismic refraction survey for the proposed Otay Ranch Residential Development to be located in an area of generally undeveloped land along the north side of Otay Lakes Road in San Diego, California. Specifically, our survey consisted of performing 18 seismic refraction lines at the subject site. The purpose of our study was to develop a subsurface velocity profile of the areas surveyed, and to assess the apparent rippability of near surface materials. This data report presents our survey methodology, equipment used, analysis, and results.

We appreciate the opportunity to be of service on this project. Should you have any questions related to this report, please contact the undersigned at your convenience.

Sincerely,
SOUTHWEST GEOPHYSICS, INC.

Patrick Lehrmann

Patrick Lehrmann, P.G., R.Gp.
Principal Geologist/Geophysicist

Hans van de Vrugt

Hans van de Vrugt, C.E.G., R.Gp.
Principal Geologist/Geophysicist

REGISTERED GEOPHYSICIST
Hans van de Vrugt
No 1012
Exp. 4/24/10
STATE OF CALIFORNIA

HV/PFL/hv

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Figure 4o – Seismic Profile, SL-15
Figure 4p – Seismic Profile, SL-16
Figure 4q – Seismic Profile, SL-17
Figure 4r – Seismic Profile, SL-18

1. INTRODUCTION

In accordance with your authorization, we have performed a seismic refraction survey for the proposed Otay Ranch Residential Development to be located in an area of generally undeveloped land along the north side of Otay Lakes Road in San Diego, California (Figure 1). Specifically, our survey consisted of performing 18 seismic refraction lines at the subject site. The purpose of our study was to develop a subsurface velocity profile of the areas surveyed, and to assess the apparent rippability of near surface materials. This data report presents our survey methodology, equipment used, analysis, and results.

2. SCOPE OF SERVICES

Our scope of services included:

- Performance of 18 seismic refraction lines at the project site.
- Compilation and analysis of the data collected.
- Preparation of this data report presenting our results and conclusions.

3. SITE AND PROJECT DESCRIPTION

The project site generally includes south facing slopes and low-lying terrain along the north side of Otay Lakes Road (Figure 1). The project area is situated just to the north of Lower Otay Reservoir. Figures 2a and 2b illustrate the study area and general site conditions. Terrain at the site varies from gentle to very steep slopes, flat low-lying areas, and relatively small drainages. Numerous crystalline rock outcrops and remnant boulders were observed in the study areas. Vegetation generally consists of dry grass and brush. Figure 3 provides a general view of the site conditions in the project area and along some seismic lines.

Based on our discussions with you, we understand that the study area is under consideration for grading and construction of new single family homes and associated roadways. Cuts up to roughly 125 feet deep are proposed.

4. SURVEY METHODOLOGY

A seismic P-wave (compression wave) refraction survey was conducted at the site to evaluate the depth to bedrock and apparent rippability characteristics of the subsurface materials, and to develop a subsurface velocity profile of the areas surveyed. The seismic refraction method uses first-arrival times of refracted seismic waves to estimate the thicknesses and seismic velocities of subsurface layers. Seismic P-waves generated at the surface, using a hammer and plate, are refracted at boundaries separating materials of contrasting velocities. These refracted seismic waves are then detected by a series of surface vertical component geophones and recorded with a 24-channel Geometrics StrataView seismograph. The travel times of the seismic P-waves are used in conjunction with the shot-to-geophone distances to obtain thickness and velocity information on the subsurface materials.

Eighteen seismic lines/profiles (SL-1 through SL-18) were conducted as part of our study. The general locations of the lines were selected by your office, and are depicted on Figures 2a and 2b. Shot points were conducted at the ends and midpoint of each line and in areas where relatively deep cuts were proposed 50-foot offend shots were performed in order to increase the exploration depth.

The refraction method requires that subsurface velocities increase with depth. A layer having a velocity lower than that of the layer above will not be detectable by the seismic refraction method and, therefore, could lead to errors in the depth calculations of subsequent layers. In addition, lateral variations in velocity, such as those caused by core stones or intrusions can also result in the misinterpretation of the subsurface conditions.

In general, seismic wave velocities can be correlated to material density and/or rock hardness. The relationship between rippability and seismic velocity is empirical and assumes a homogenous mass. Localized areas of differing composition, texture, and/or structure may affect both the measured data and the actual rippability of the mass. The rippability of a mass is also dependent on the excavation equipment used and the skill and experience of the equipment operator.

The rippability values presented in Table 1 are based on our experience with similar materials and assumes that a Caterpillar D-9 dozer ripping with a single shank is used. We emphasize that the cutoffs in this classification scheme are approximate and that rock characteristics, such as fracture spacing and orientation, play a significant role in determining rock rippability. These characteristics may also vary with location and depth.

For trenching operations, the rippability values should be scaled downward. For example, velocities as low as 3,500 feet/second may indicate difficult ripping during trenching operations. In addition, the presence of boulders, which can be troublesome in a narrow trench, should be anticipated.

Table 1 – Rippability Classification

Seismic P-wave Velocity	Rippability
0 to 2,000 feet/second	Easy
2,000 to 4,000 feet/second	Moderate
4,000 to 5,500 feet/second	Difficult, Possible Local Blasting
5,500 to 7,000 feet/second	Very Difficult, Probable Local to General Blasting
Greater than 7,000 feet/second	Blasting Generally Required

It should be noted that the rippability cutoffs presented in Table 1 are slightly more conservative than those published in the Caterpillar Performance Handbook (Caterpillar, 2004). Accordingly, the above classification scheme should be used with discretion, and contractors should not be relieved of making their own independent evaluation of the rippability of the on-site materials prior to submitting their bids.

5. RESULTS

As previously indicated, 18 seismic traverses were conducted as part of our study. The collected data were processed using SIPwin (Rimrock Geophysics, 2003) a seismic interpretation program and analyzed using both SIPwin and SeisOpt Pro (Optim, 2008). Both programs use first arrival picks and elevation data to produce subsurface velocity models. SIPwin uses layered based modeling techniques to produce layered velocity models, where changes in velocities are depicted as

discrete contacts. SeisOpt Pro uses a nonlinear optimization technique called adaptive simulated annealing. The resulting velocity models provide a tomographic image of the estimated geologic conditions. Both vertical and lateral velocity information is contained in the models. Changes in layer velocity are revealed as gradients rather than discrete contacts, which typically are more representative of actual conditions.

Table 2 lists the approximate P-wave velocities and depths calculated from the seismic refraction traverses conducted during the evaluation. The approximate locations of the seismic refraction traverses are shown on the Seismic Line Location Maps (Figures 2a and 2b). The layer velocity profiles are included in Figures 4a through 4r. It should also be noted that, as a general rule, the effective depth of evaluation for a seismic refraction traverse is approximately one-third to one-fifth the length of the refraction line.

Table 2 – Seismic Traverse Results[1]

Traverse No. And Length	P-wave Velocity feet/second	Approximate Depth to Bottom of Layer in feet	Apparent Rippability[3]
SL-1 240 feet[2]	V1 = 1,900 V2 > 10,000	2 – 7 ---	Easy Blasting Generally Required
SL-2 480 feet	V1 = 2,500 V2 = 8,450	1 – 8 ---	Moderate Blasting Generally Required
SL-3 240 feet[2]	V1 = 1,675 V2 = 7,550	2 – 10 ---	Easy Blasting Generally Required
SL-4 240 feet	V1 = 1,650 V2 = 8,725 V3 > 10,000	3 – 8 20 – 36 ---	Easy Blasting Generally Required Blasting Generally Required
SL-5 240 feet	V1 = 1,475 V2 = 9,175	2 – 5 ---	Easy Blasting Generally Required
SL-6 480 feet	V1 = 2,450 V2 > 10,000	3 – 8 ---	Moderate Blasting Generally Required
SL-7 240 feet	V1 = 3,025 V2 > 10,000	4 – 8 ---	Moderate Blasting Generally Required
SL-8 240 feet	V1 = 1,625 V2 = 5,575	4 – 9 ---	Easy Very Difficult, Probable Blasting
SL-9 240 feet[2]	V1 = 2,150 V2 > 10,000	4 – 11 ---	Moderate Blasting Generally Required
SL-10 240 feet	V1 = 1,600 V2 = 7,300	4 – 11 ---	Easy Blasting Generally Required
SL-11 240 feet	V1 = 1,575 V2 > 10,000	2 – 7 ---	Easy Blasting Generally Required

Table 2 – Seismic Traverse Results[1]			
Traverse No. And Length	**P-wave Velocity feet/second**	**Approximate Depth to Bottom of Layer in feet**	**Apparent Rippability[3]**
SL-12 240 feet	V1 = 1,525 V2 = 9,050	3 – 6 ---	Easy Blasting Generally Required
SL-13 310 feet	V1 = 1,850 V2 = 9,425	2 – 6 ---	Easy Blasting Generally Required
SL-14 240 feet	V1 = 1,400 V2 > 10,000	1 – 6 ---	Easy Blasting Generally Required
SL-15 240 feet[2]	V1 = 1,925 V2 = 5,600 V3 > 10,000	3 – 6 21 – 49 ---	Easy Very Difficult, Probable Blasting Blasting Generally Required
SL-16 240 feet	V1 = 1,775 V2 = 7,250 V3 > 10,000	6 – 8 58 – 77 ---	Easy Blasting Generally Required Blasting Generally Required
SL-17 240 feet	V1 = 1,450 V2 = 4,850 V3 = 8,475	3 – 6 26 – 44 ---	Easy Difficult, Possible Local Blasting Blasting Generally Required
SL-18 240 feet[2]	V1 = 2,075 V2 = 3,975 V3 > 10,000	2 – 6 56 – 66 ---	Moderate Moderate Blasting Generally Required

1 Results based on models generated using SIP, 2003
2 50-foot offend shots were also conducted at the ends of the line
3 Rippability criteria based on the use of a Caterpillar D-9 dozer ripping with a single shank

6. CONCLUSIONS

The results from our seismic survey revealed two to three distinct layers at the locations surveyed. Based on our site observations and discussions with you, the layers detected have been interpreted to be surficial soil (colluvium or topsoil) overlying crystalline bedrock with varying degrees of weathering along profiles SL-1 through SL-17, and topsoil overlying fanglomerate deposits and crystalline bedrock along profile SL-18. Figures 4a through 4r provide the velocity models for the areas calculated from both SIPwin and SeisOpt Pro. In general the two results agree well, with distinct lateral velocity variations evident in the tomographic profiles for some areas. Based on the results of our survey, significant variations in the subsurface materials are present in the study area. Accordingly, variability in the excavatability (including excavation depth) of the subsurface materials should be expected across the project area.

Based on our results, very difficult conditions where blasting may be required to obtain proposed excavation depths may be encountered depending on the location, excavation depth, and desired

rate of production. A contractor with excavation experience in similar difficult conditions should be consulted for expert advice on excavation methodology, equipment, production rate, and possibly oversized materials.

7. LIMITATIONS

The field evaluation and geophysical analyses presented in this report have been conducted in general accordance with current practice and the standard of care exercised by consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be present. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface surveying will be performed upon request.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Southwest Geophysics, Inc. should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document. This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

8. SELECTED REFERENCES

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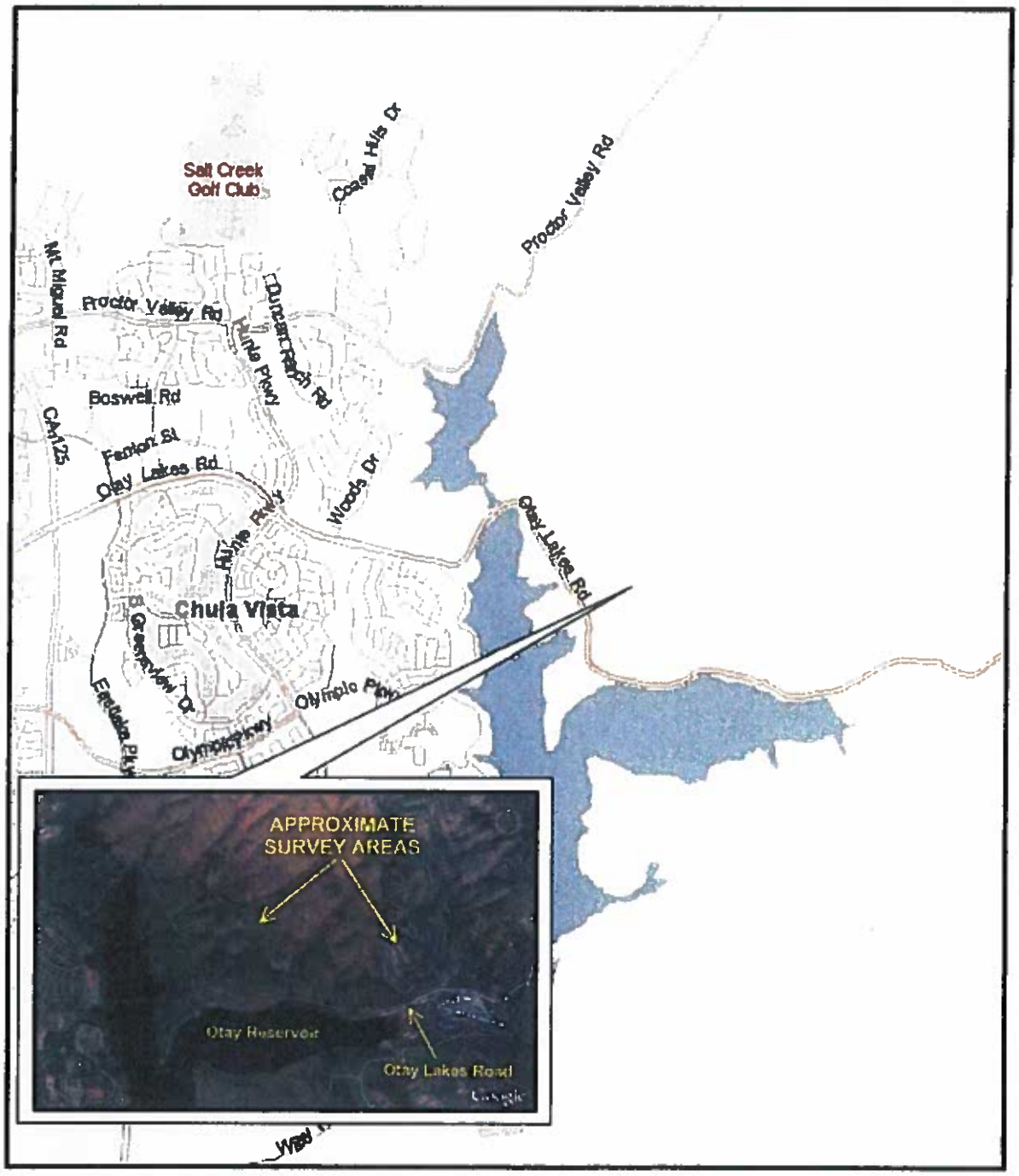
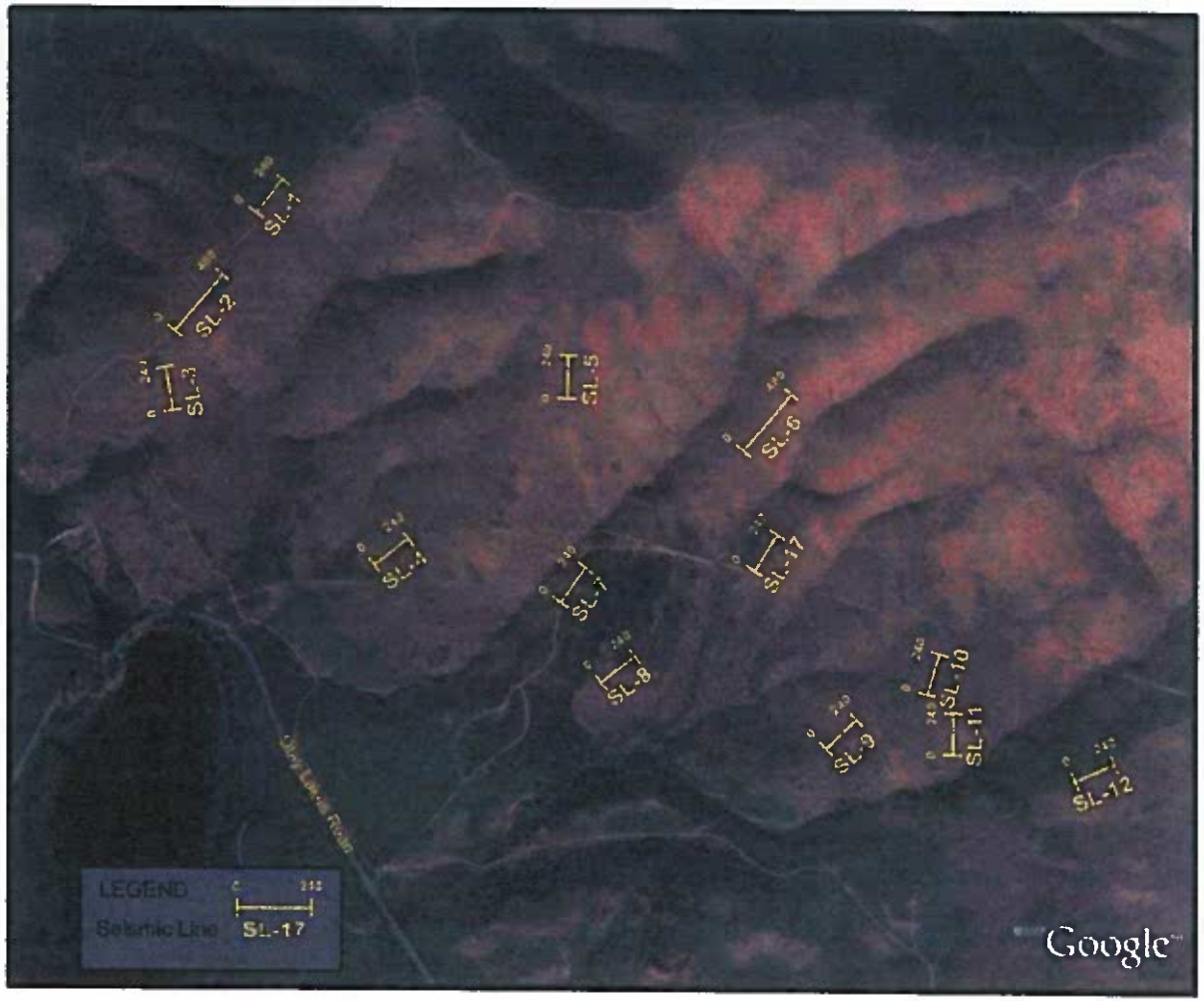


SITE LOCATION MAP	N	Otay Ranch Residential Development Chula Vista, California	SOUTHWEST GEOPHYSICS INC
		Project No.. 108226 | Date: 10/08	Figure 1



SEISMIC LINE LOCATION MAP

N

Otay Ranch Residential Development
San Diego, California

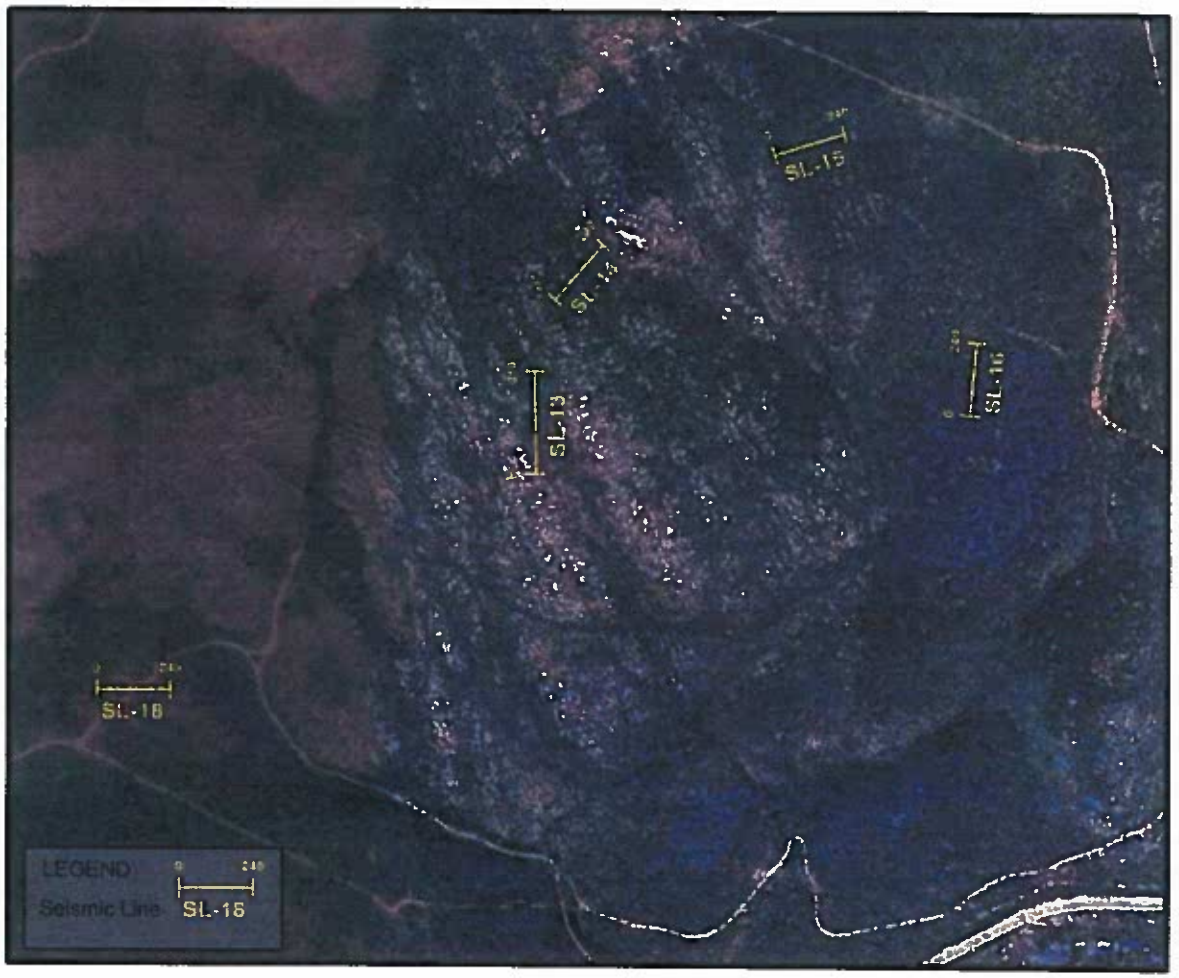
Project No.: 108226 | Date: 10/08

SOUTHWEST GEOPHYSICS INC

Figure 2a

0 960 1920

approximate scale in feet



SEISMIC LINE LOCATION MAP

N

Otay Ranch Residential Development
San Diego, California

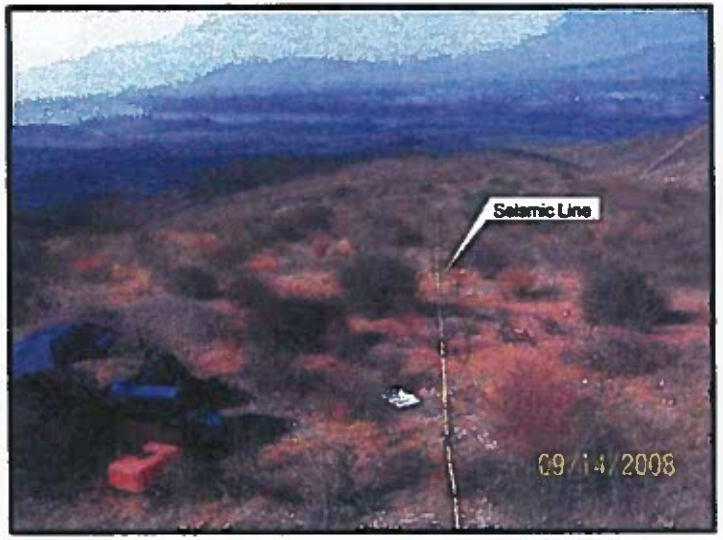
Project No.. 108228 | Date: 10/06

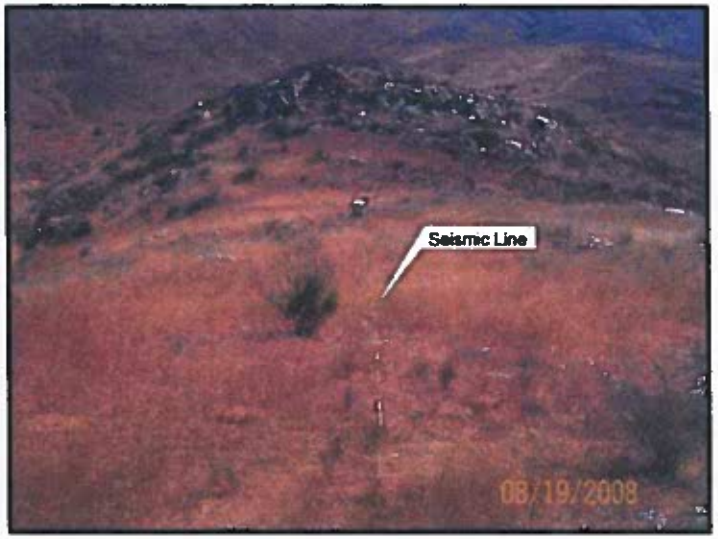
SOUTHWEST GEOPHYSICS INC.

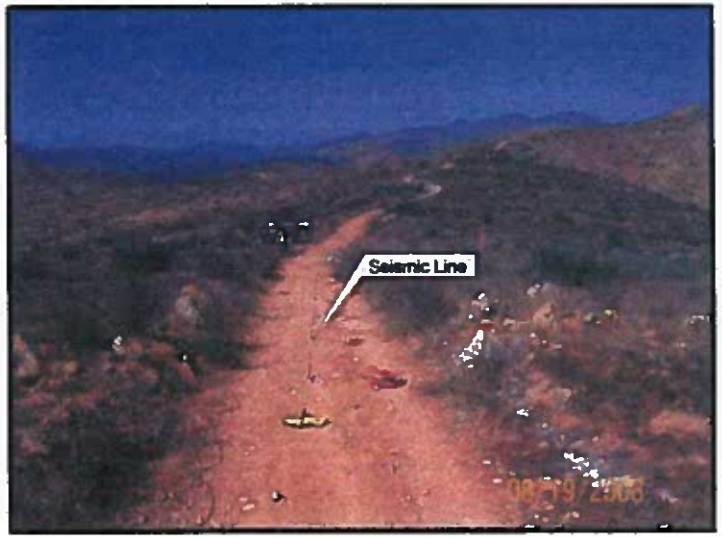
Figure 2b

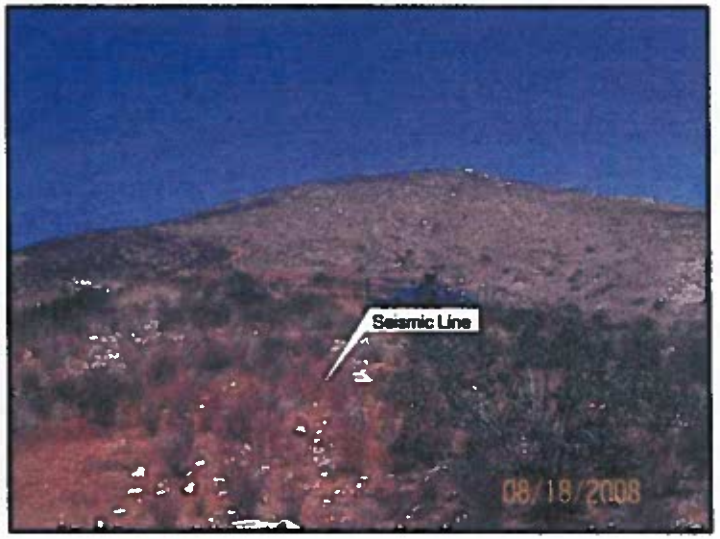
0 480 960

approximate scale in feet









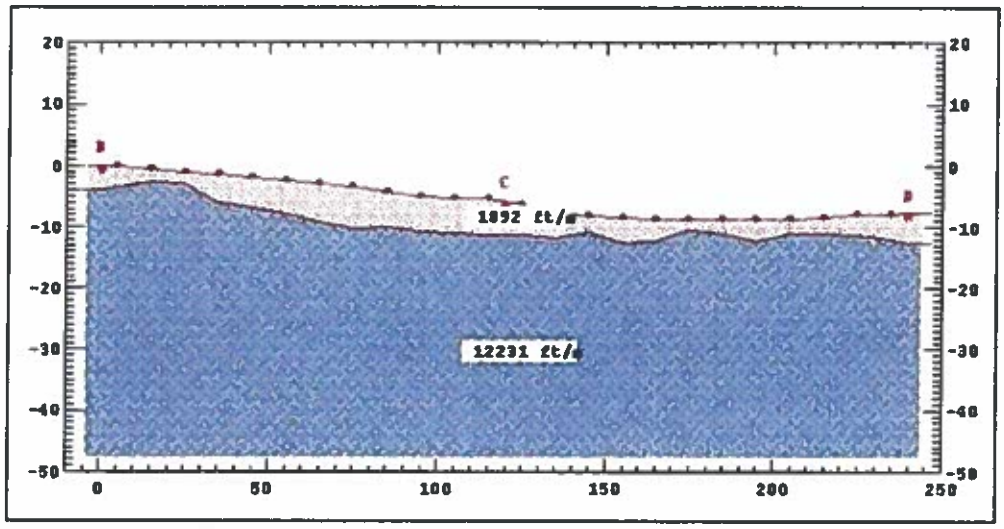
SITE PHOTOGRAPHS

Otay Ranch Residential Development
Chula Vista, California

Project No.. 108226 | Date: 10/06

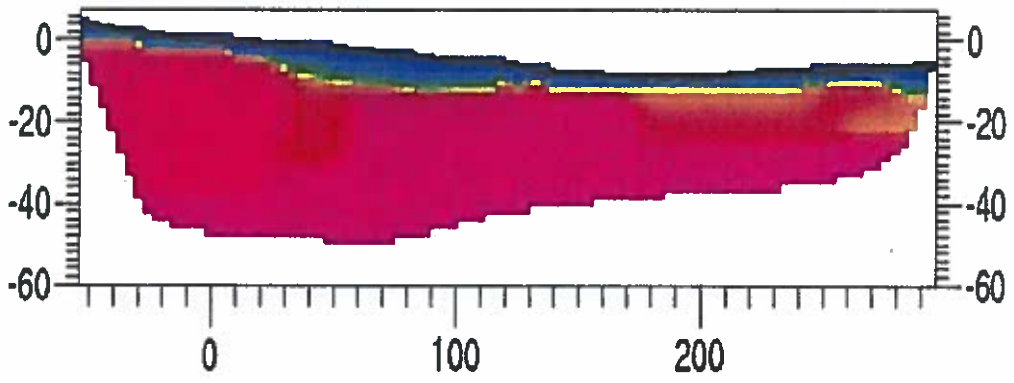
SOUTHWEST GEOPHYSICS INC

Figure 3



DEPTH IN FEET

DISTANCE IN FEET



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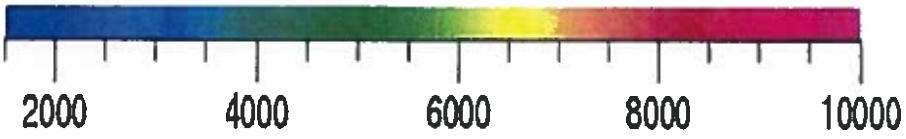
DISTANCE IN FEET



VELOCITY

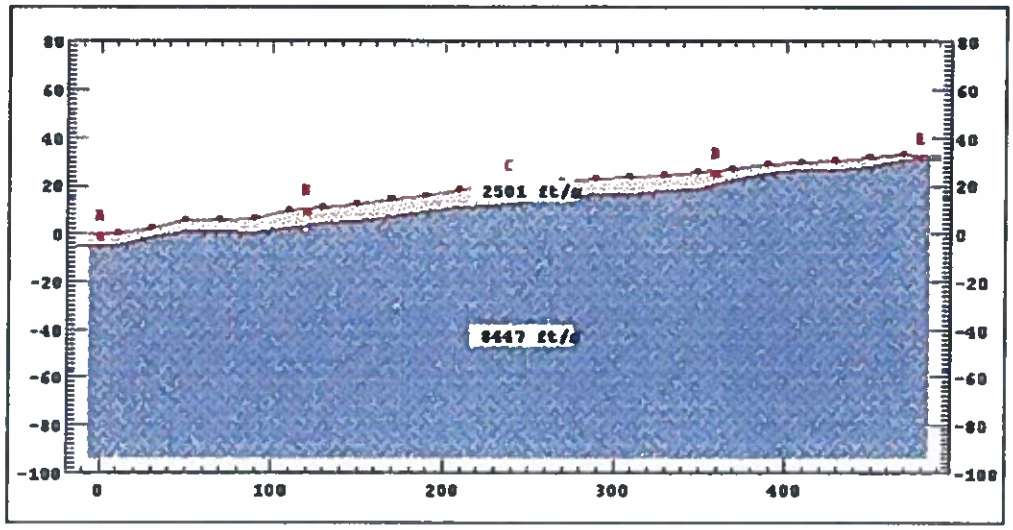
SEISMIC PROFILE
SL-1

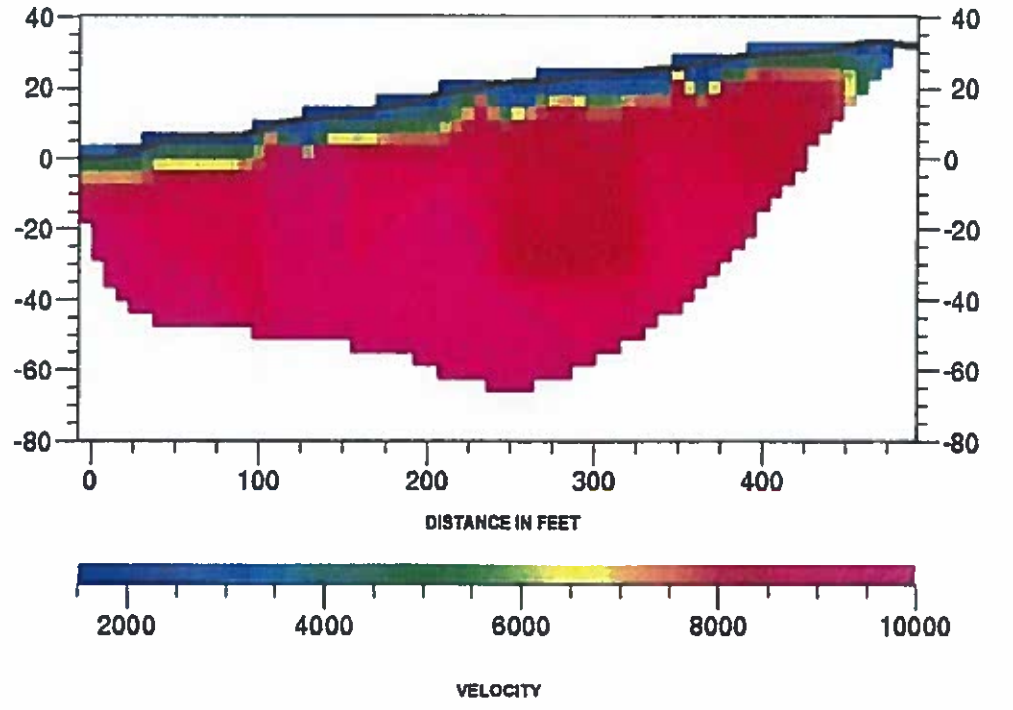
Otay Ranch Residential Development
San Diego, California

Project No.: 108226 | Date: 10/08

SOUTHWEST GEOPHYSICS INC

Figure 4a





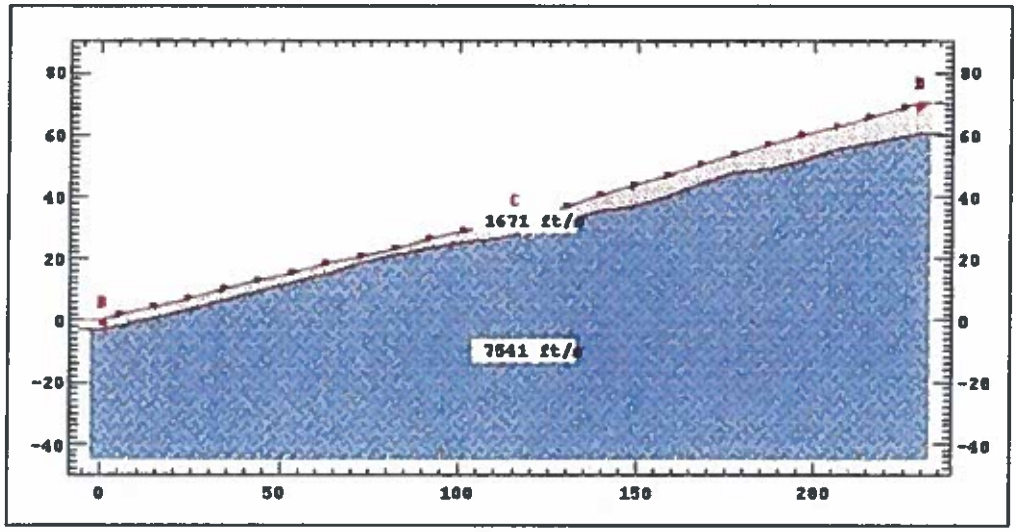
SEISMIC PROFILE SL-2

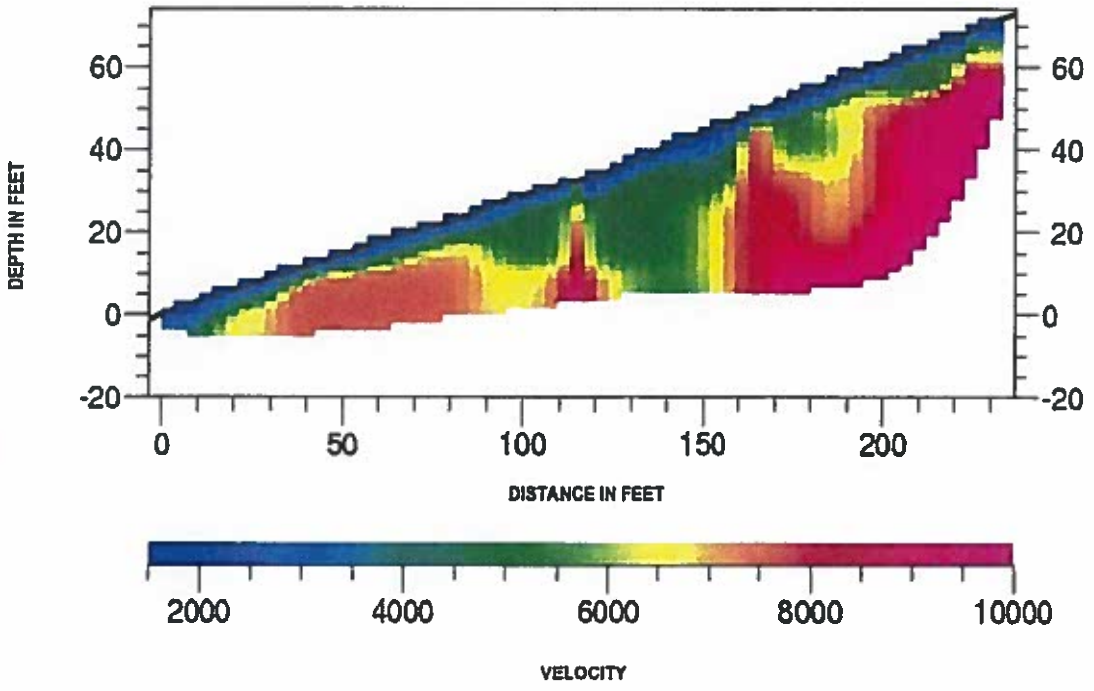
Otay Ranch Residential Development
San Diego, California

Project No.: 108226 | Date: 10/08

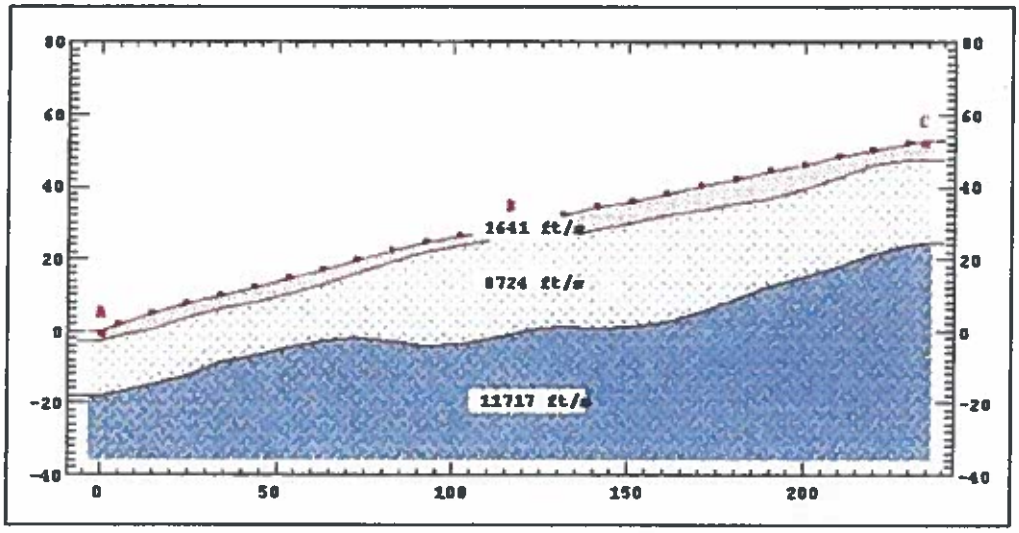
SOUTHWEST GEOPHYSICS INC

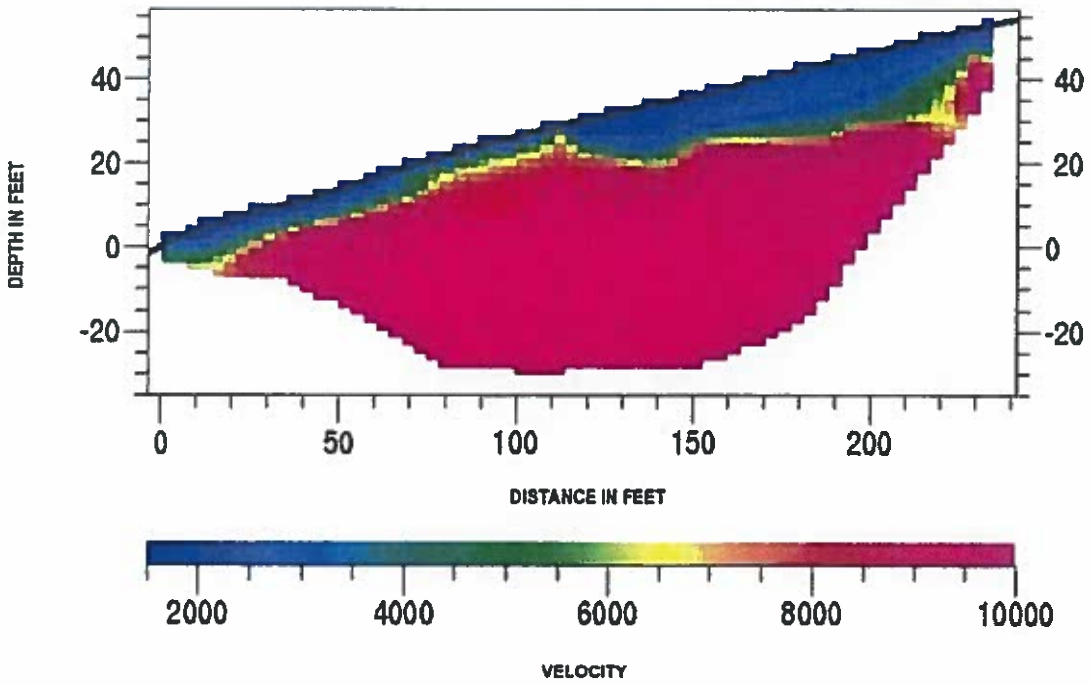
Figure 4b





SEISMIC PROFILE SL-3	Otay Ranch Residential Development San Diego, California	SOUTHWEST GEOPHYSICS INC.
	Project No.: 108226 Date: 10/08	Figure 4c





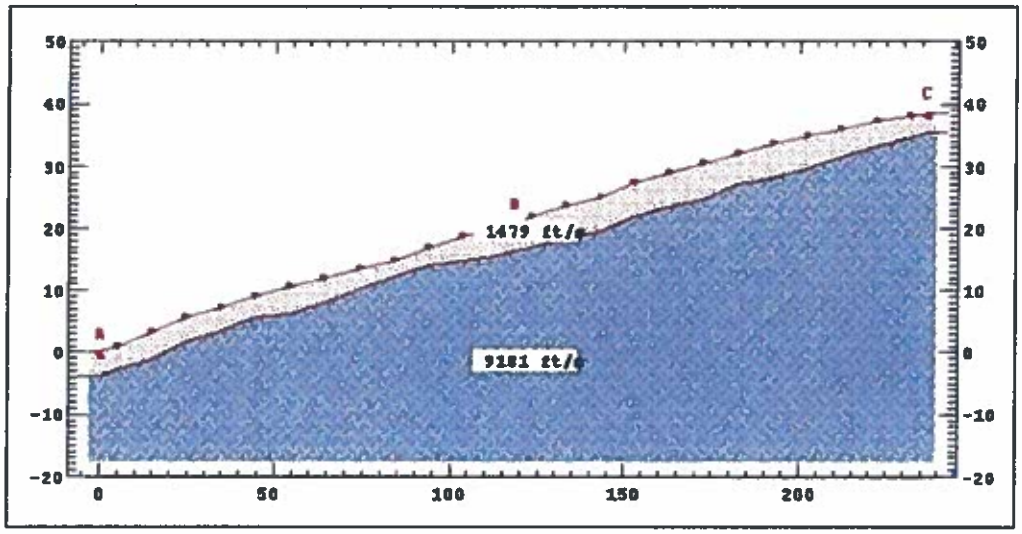
SEISMIC PROFILE
SL-4

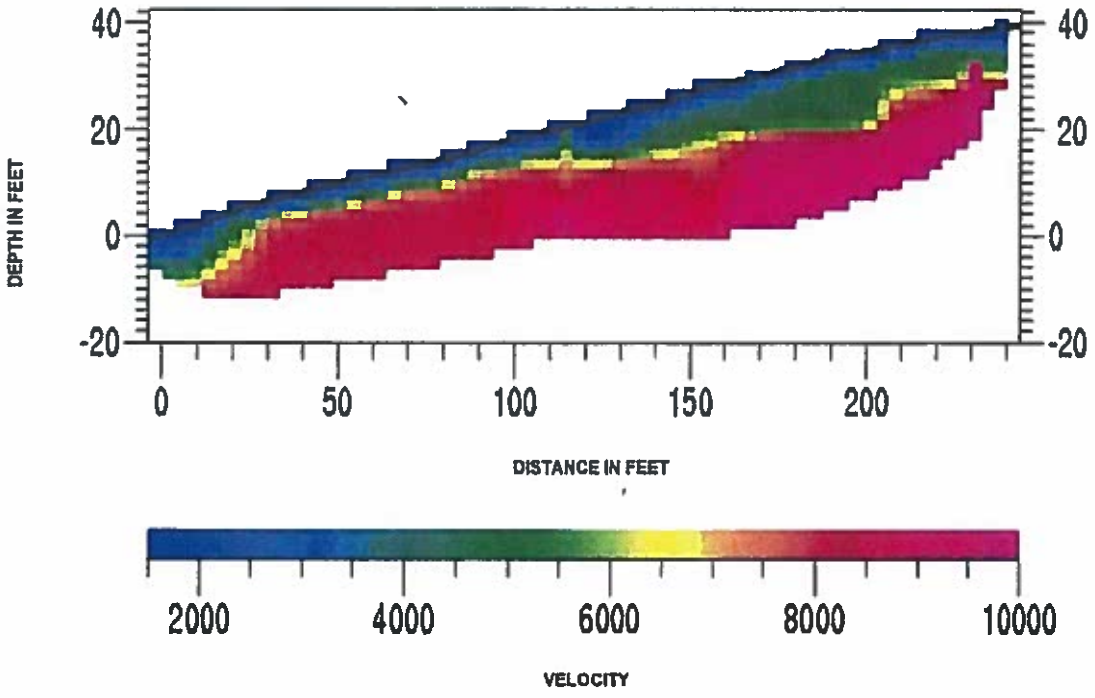
Otay Ranch Residential Development
San Diego, California

Project No.: 108226 | Date: 10/06

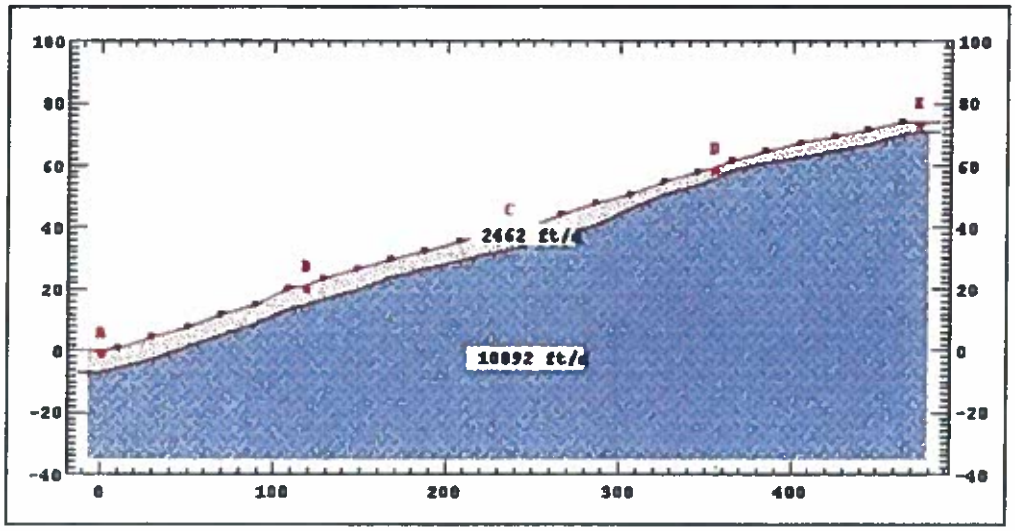
SOUTHWEST GEOPHYSICS INC

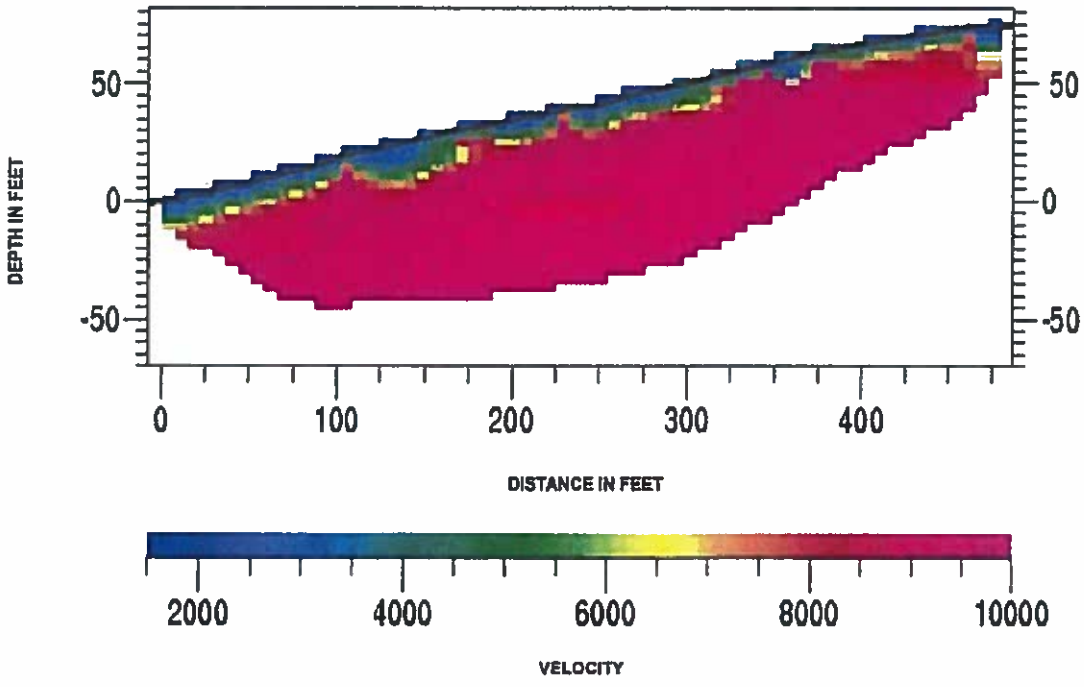
Figure 4d



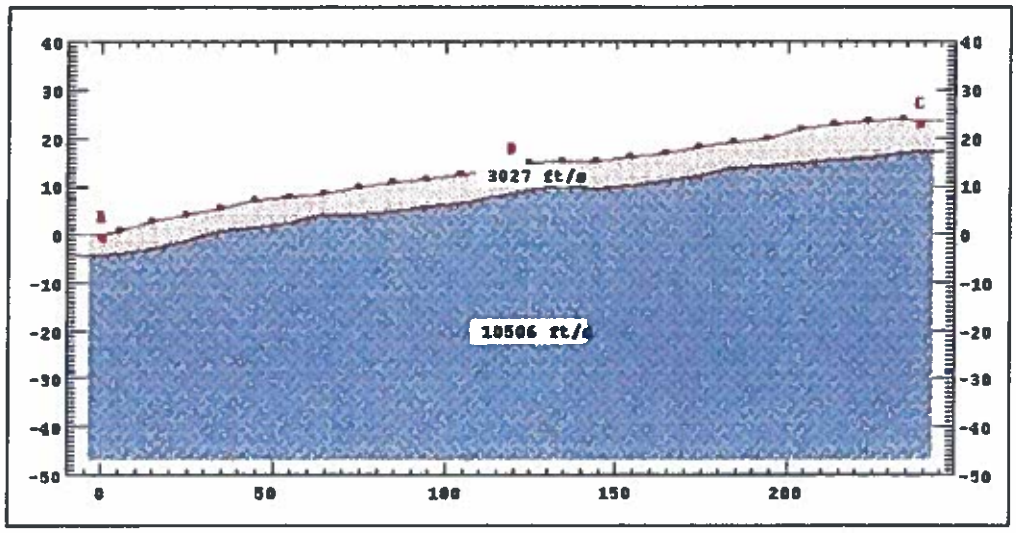


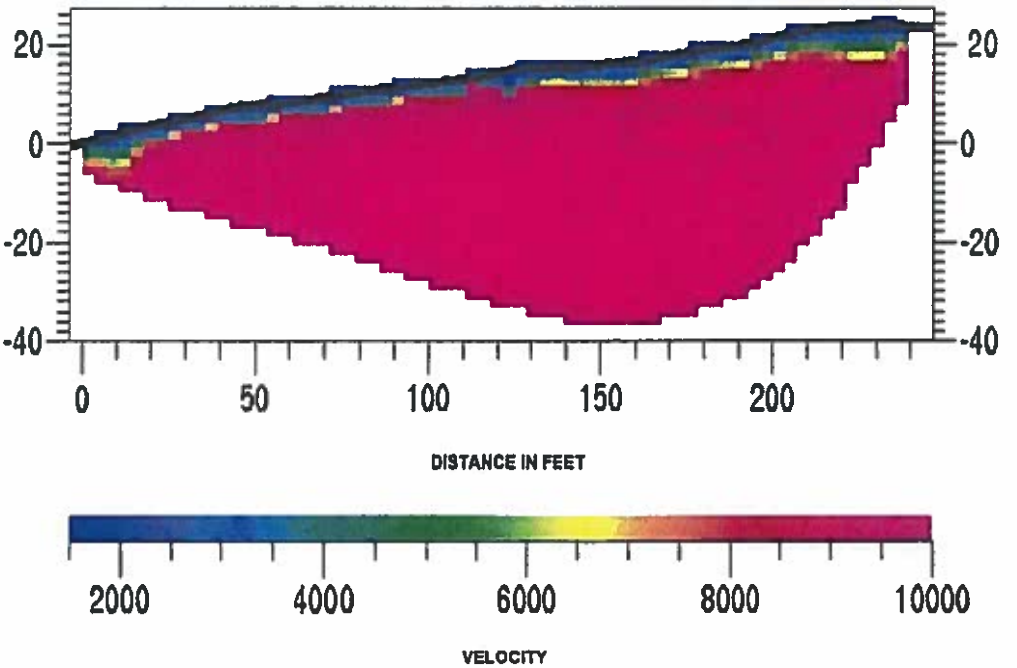
SEISMIC PROFILE SL-5	Otay Ranch Residential Development San Diego, California	SOUTHWEST GEOPHYSICS INC
	Project No.: 106226 / Date: 10/08	Figure 4e





SEISMIC PROFILE SL-6	Otay Ranch Residential Development San Diego, California	SOUTHWEST GEOPHYSICS INC
	Project No.: 108226 / Date: 10/08	Figure 4f





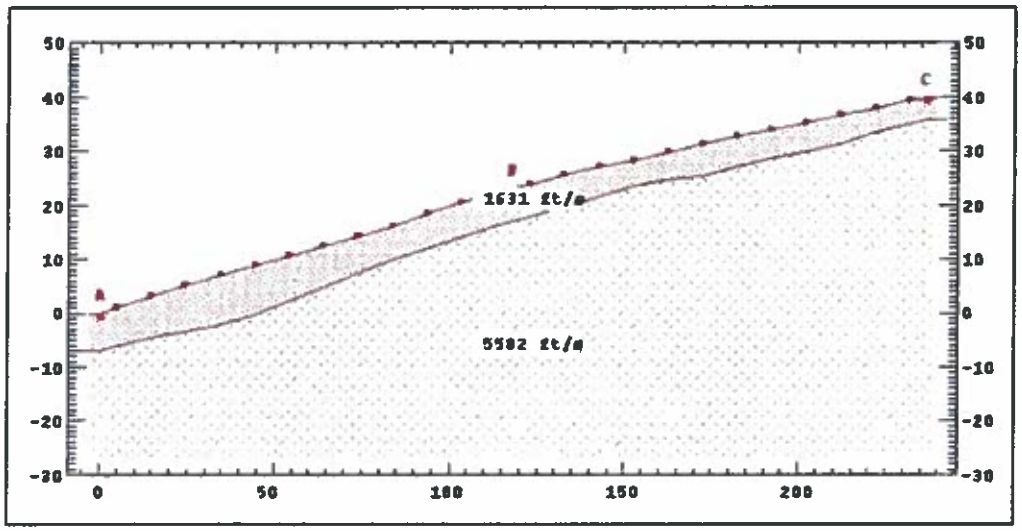
SEISMIC PROFILE
SL-7

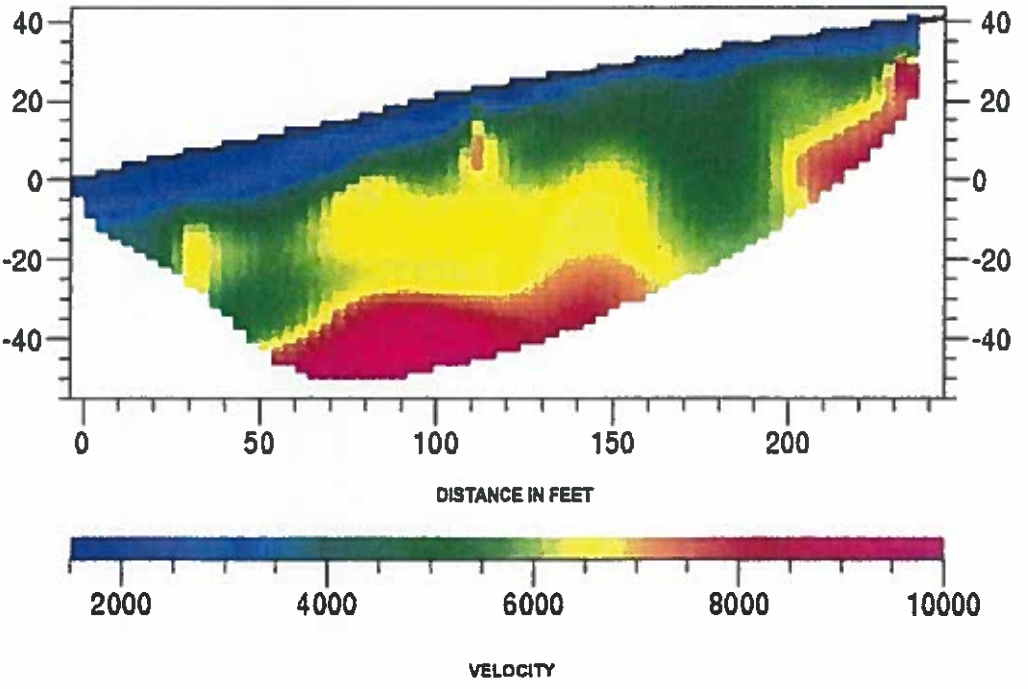
Otay Ranch Residential Development
San Diego, California

Project No.. 108226 | Date: 10/08

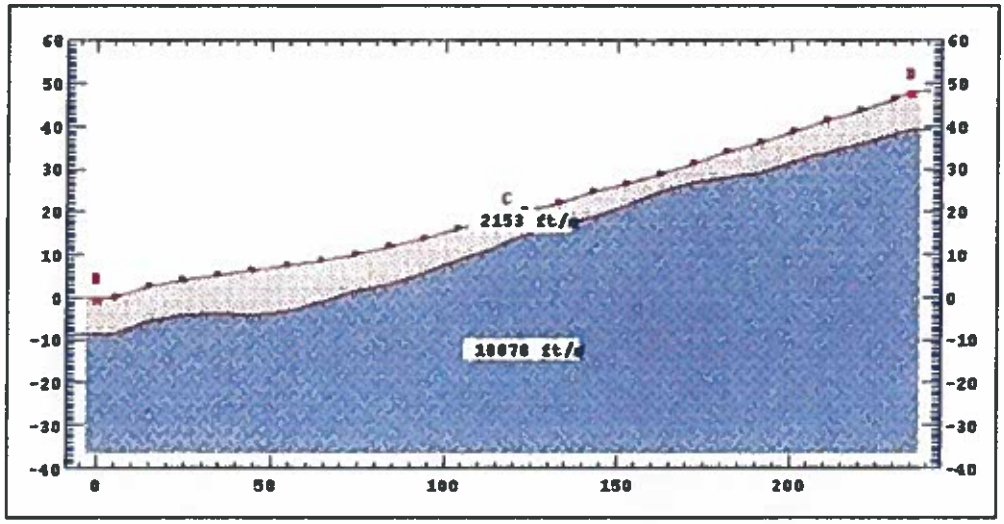
SOUTHWEST GEOPHYSICS INC

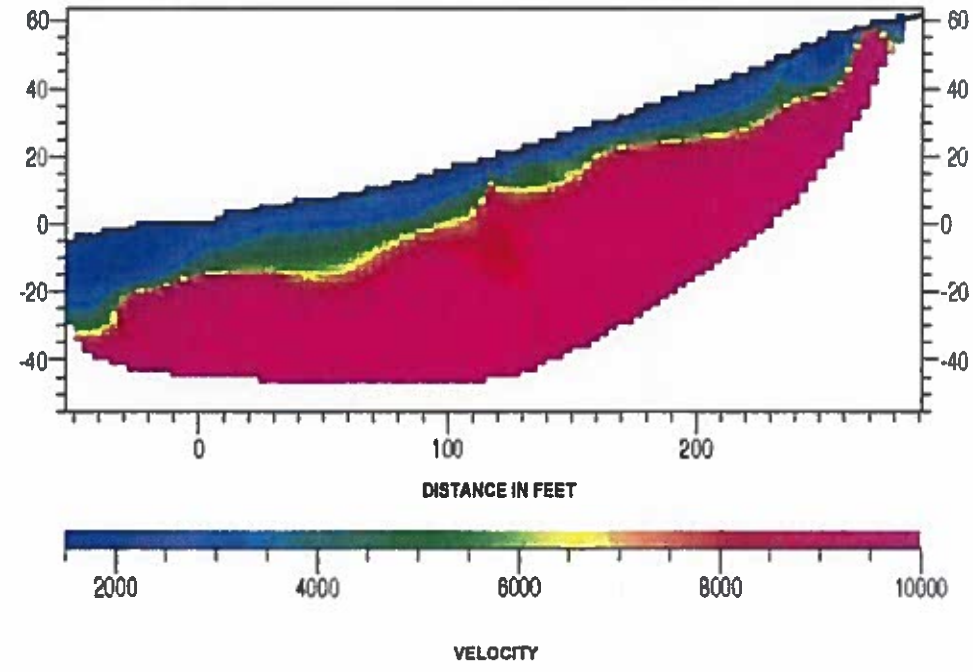
Figure 4g





SEISMIC PROFILE SL-8	Otay Ranch Residential Development San Diego, California	SOUTHWEST GEOPHYSICS INC
	Project No.: 108226 / Date: 10/08	Figure 4h





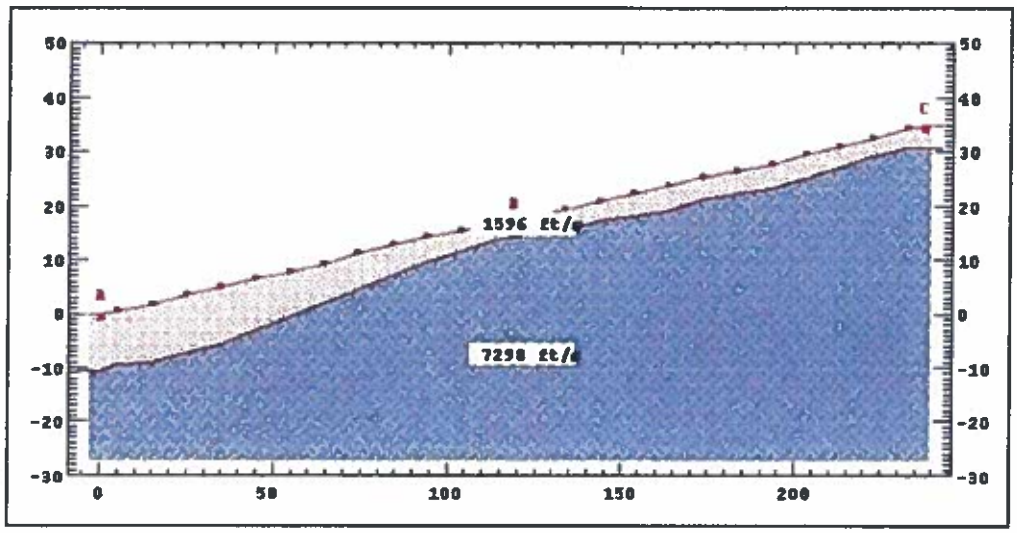
SEISMIC PROFILE
SL-9

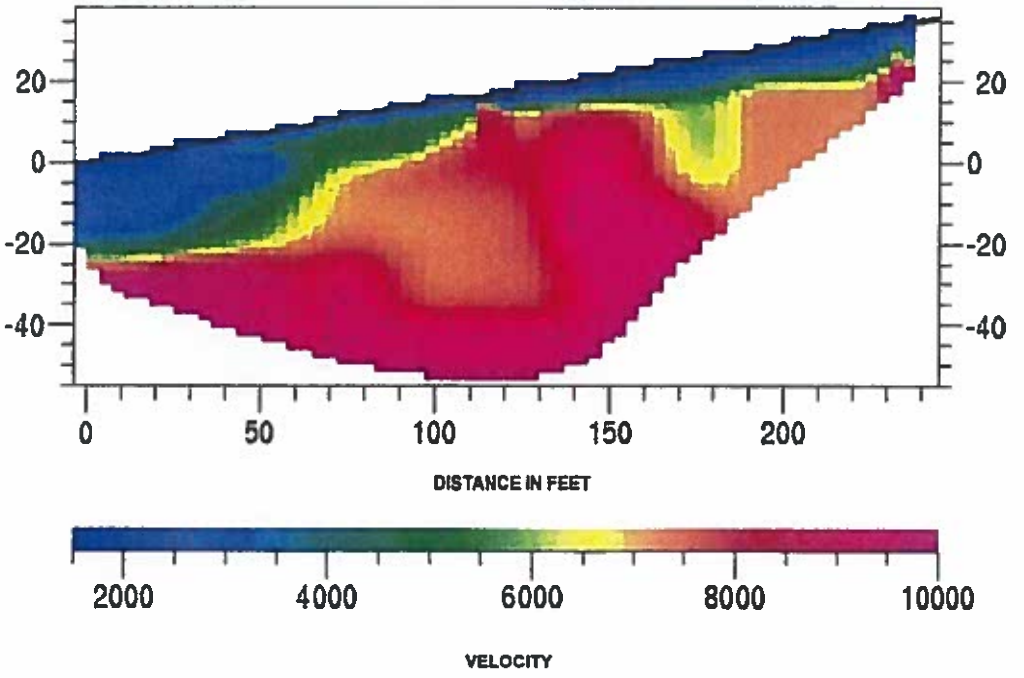
Otay Ranch Residential Development
San Diego, California

Project No.: 108226 | Date: 10/08

SOUTHWEST GEOPHYSICS INC

Figure 4i





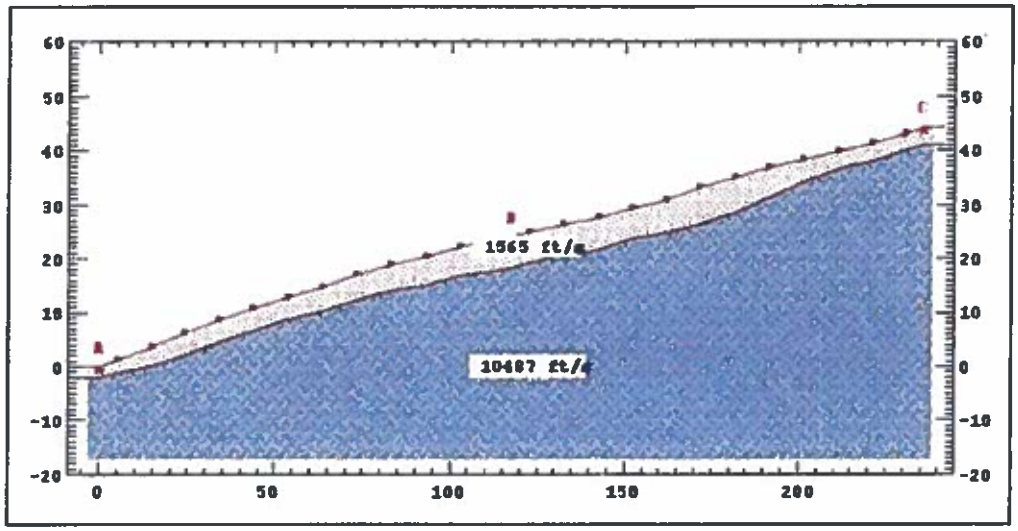
SEISMIC PROFILE
SL-10

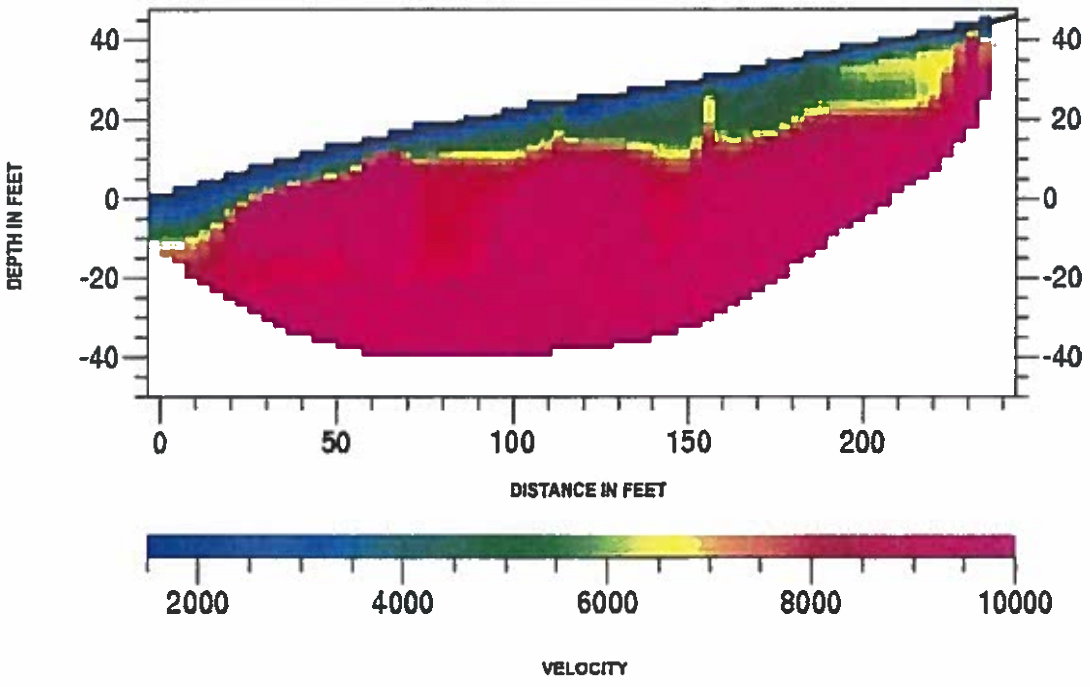
Otay Ranch Residential Development
San Diego, California

Project No.: 108226 | Date: 10/08

SOUTHWEST GEOPHYSICS INC

Figure 4j





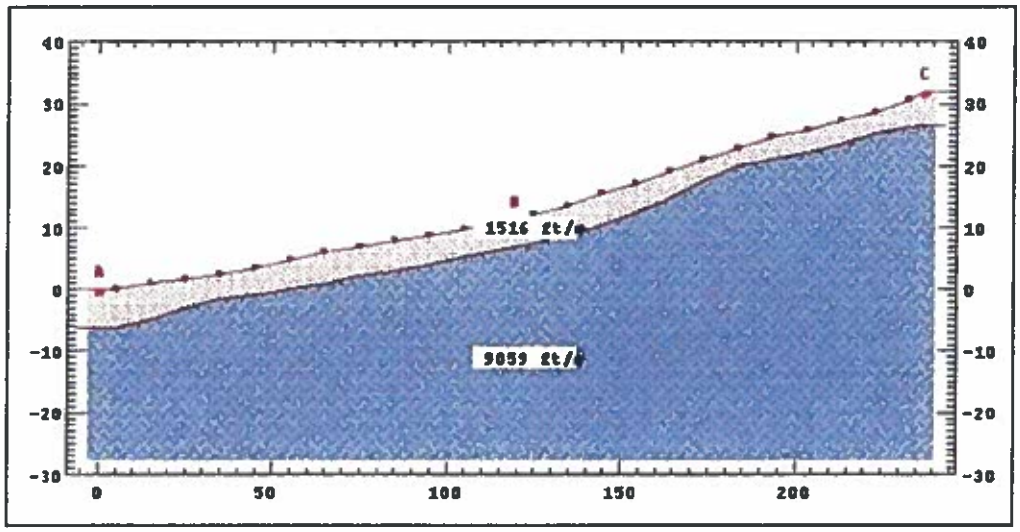
SEISMIC PROFILE
SL-11

Otay Ranch Residential Development
San Diego, California

Project No.: 108226 | Date: 10/08

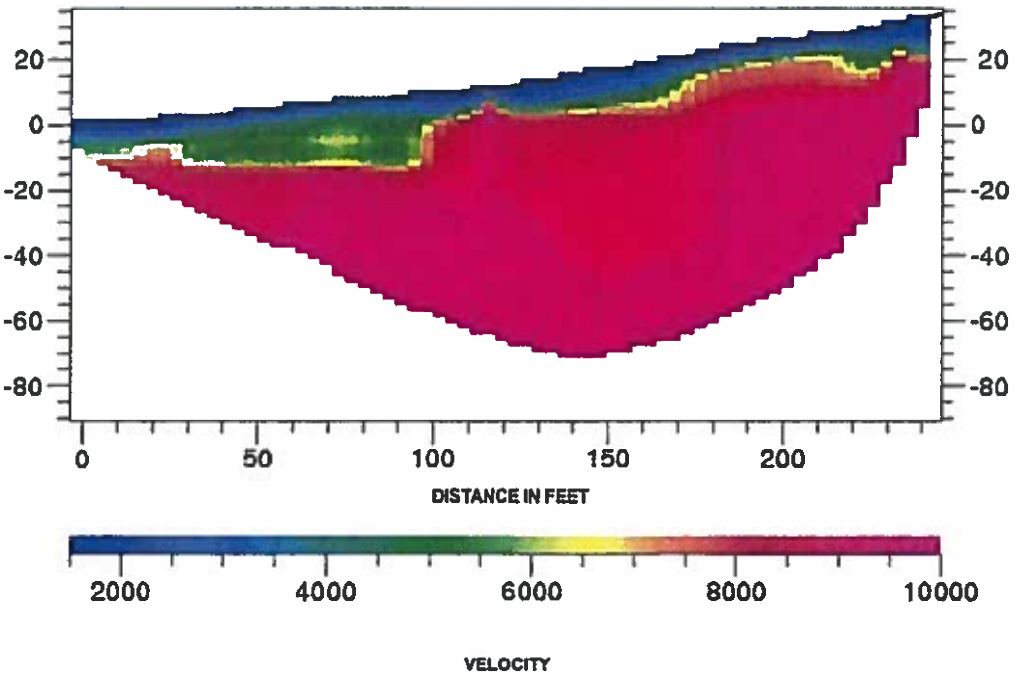
SOUTHWEST GEOPHYSICS INC

Figure 4k



DEPTH IN FEET

DISTANCE IN FEET

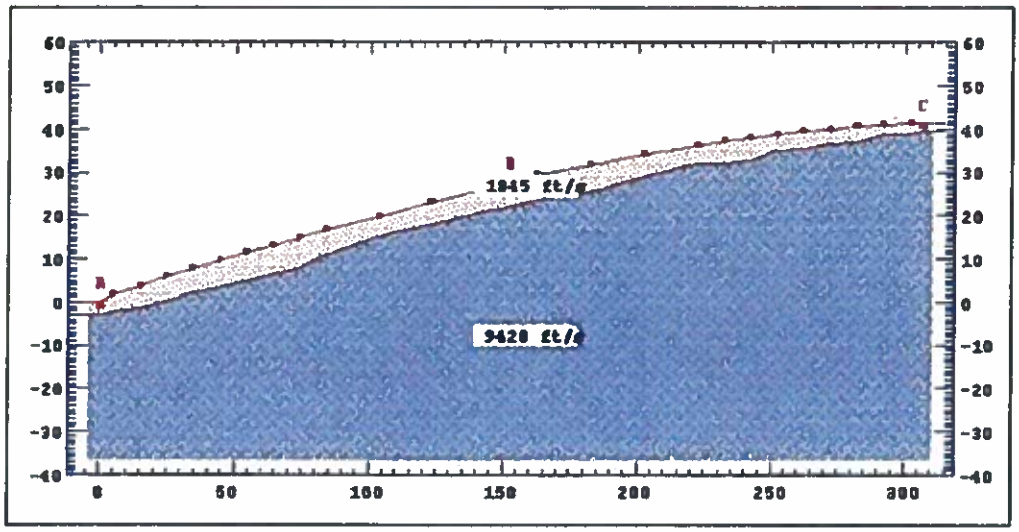


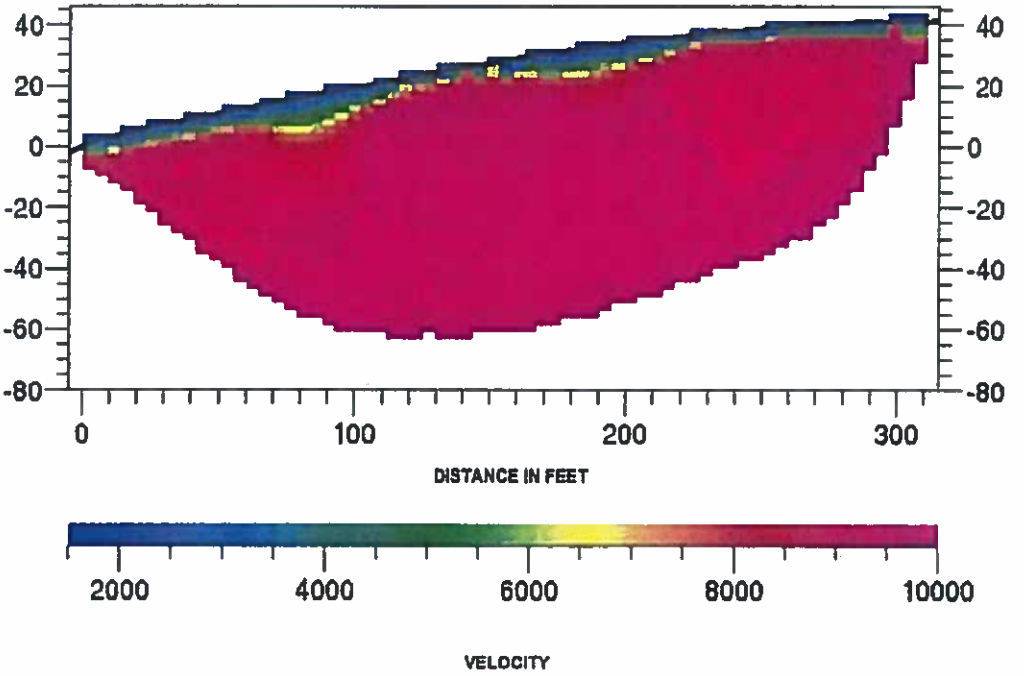
DEPTH IN FEET

DISTANCE IN FEET

VELOCITY

SEISMIC PROFILE SL-12	Otay Ranch Residential Development San Diego, California	SOUTHWEST GEOPHYSICS INC
	Project No.: 108226 | Date: 10/08	Figure 4l





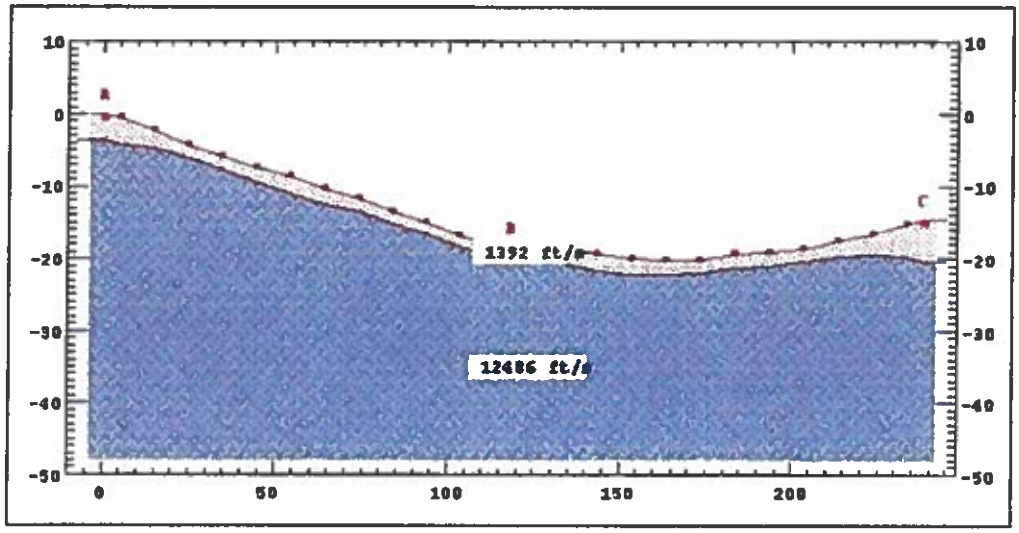
SEISMIC PROFILE
SL-13

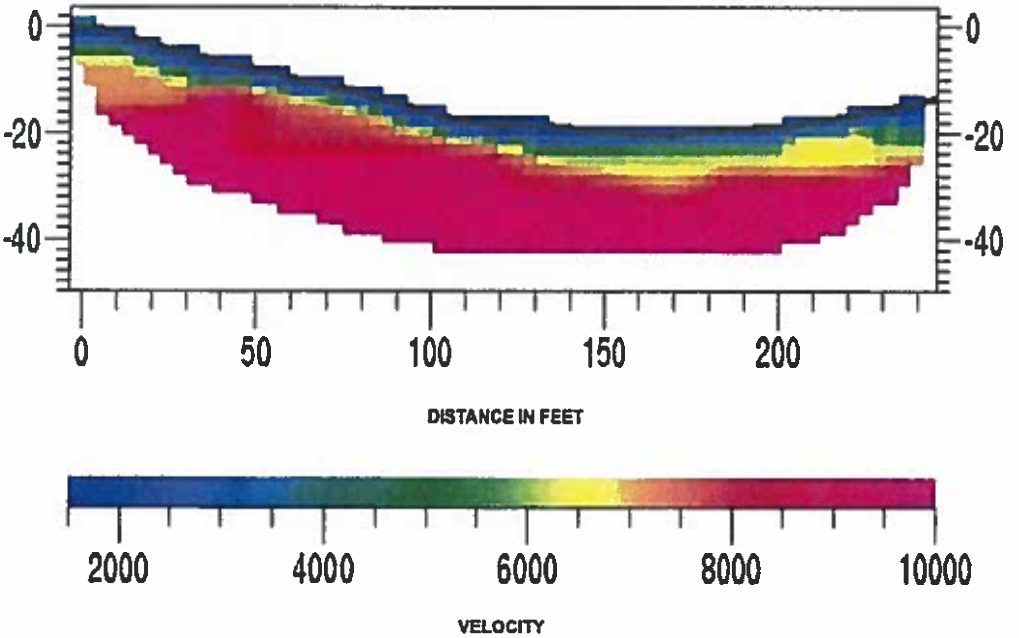
Otay Ranch Residential Development
San Diego, California

Project No.. 108226 | Date: 10/08

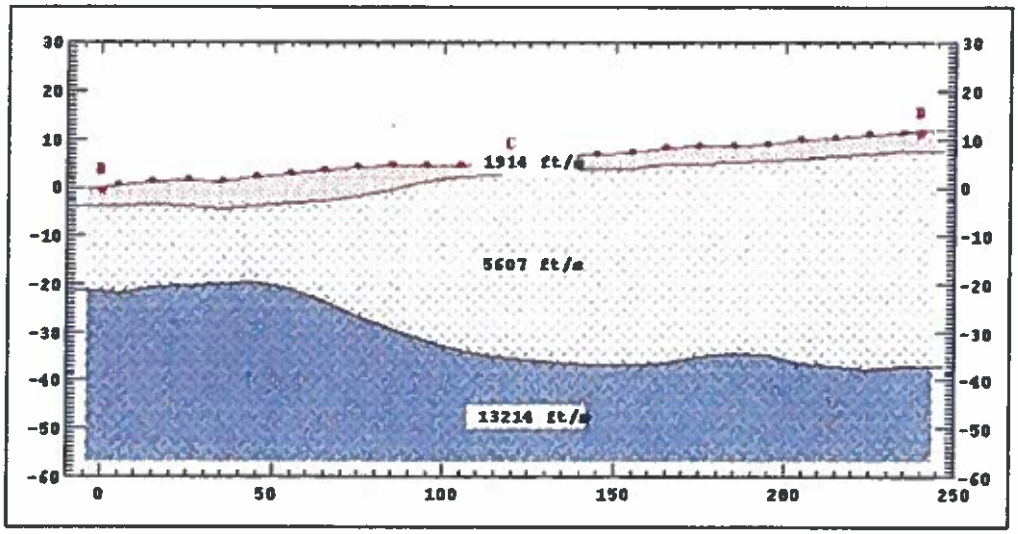
SOUTHWEST GEOPHYSICS INC

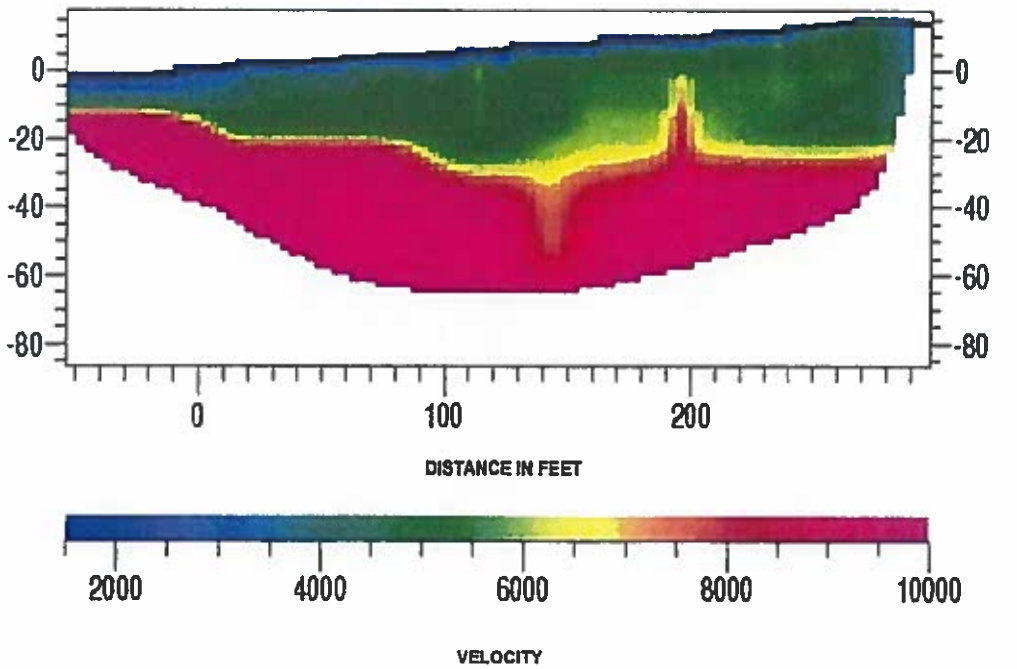
Figure 4m



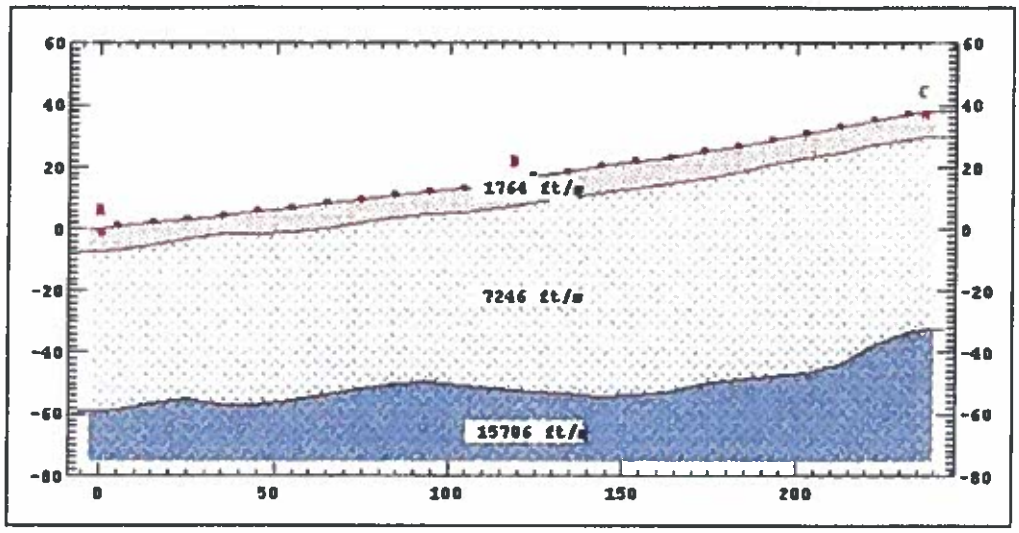


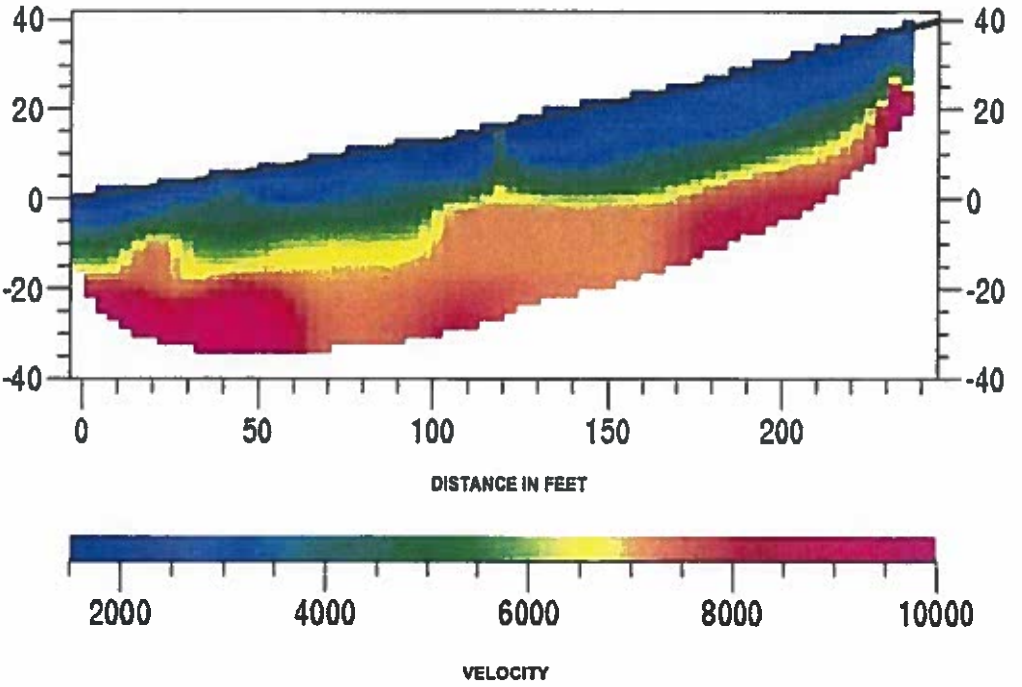
SEISMIC PROFILE SL-14	Otay Ranch Residential Development San Diego, California Project No.: 108226 Date: 10/08	SOUTHWEST GEOPHYSICS INC Figure 4n



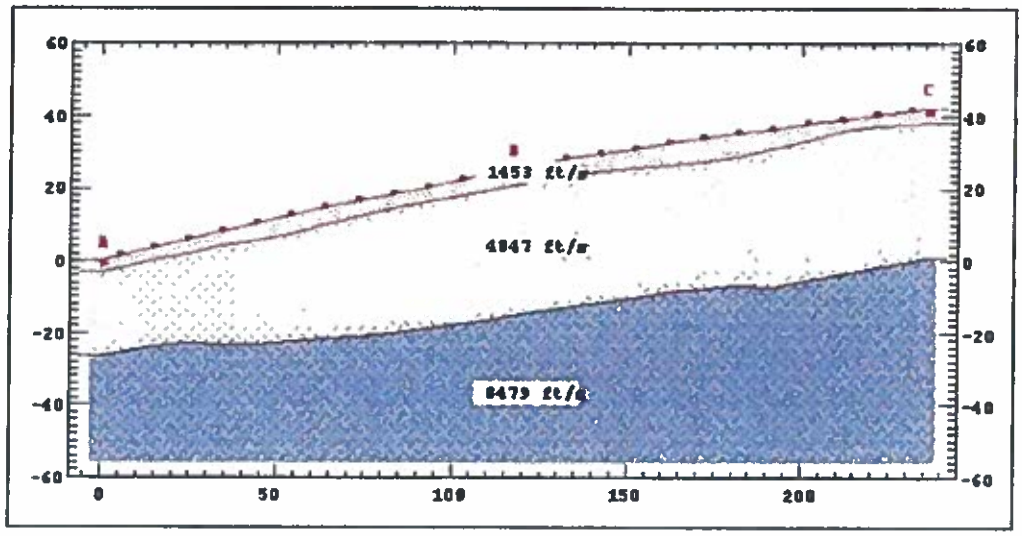


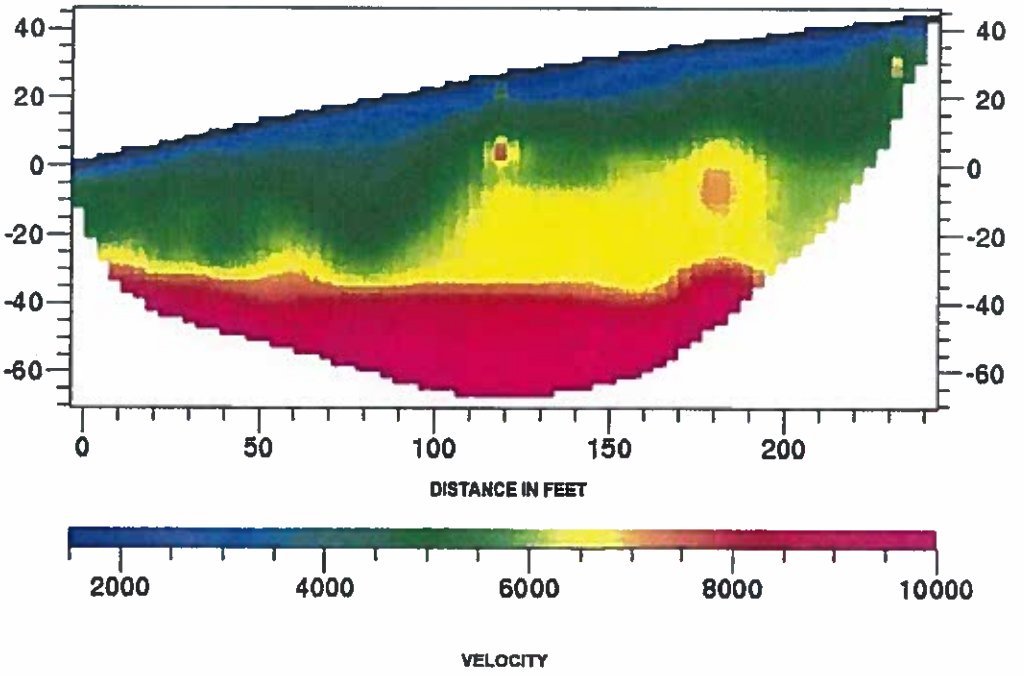
SEISMIC PROFILE SL-15	Otay Ranch Residential Development San Diego, California	SOUTHWEST GEOPHYSICS INC
	Project No.: 108226 | Date: 10/08	Figure 4o



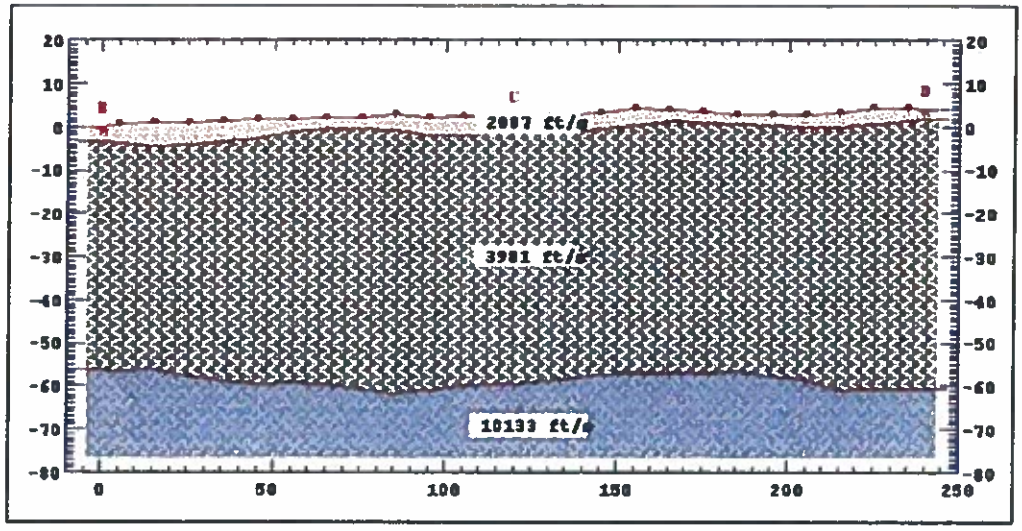


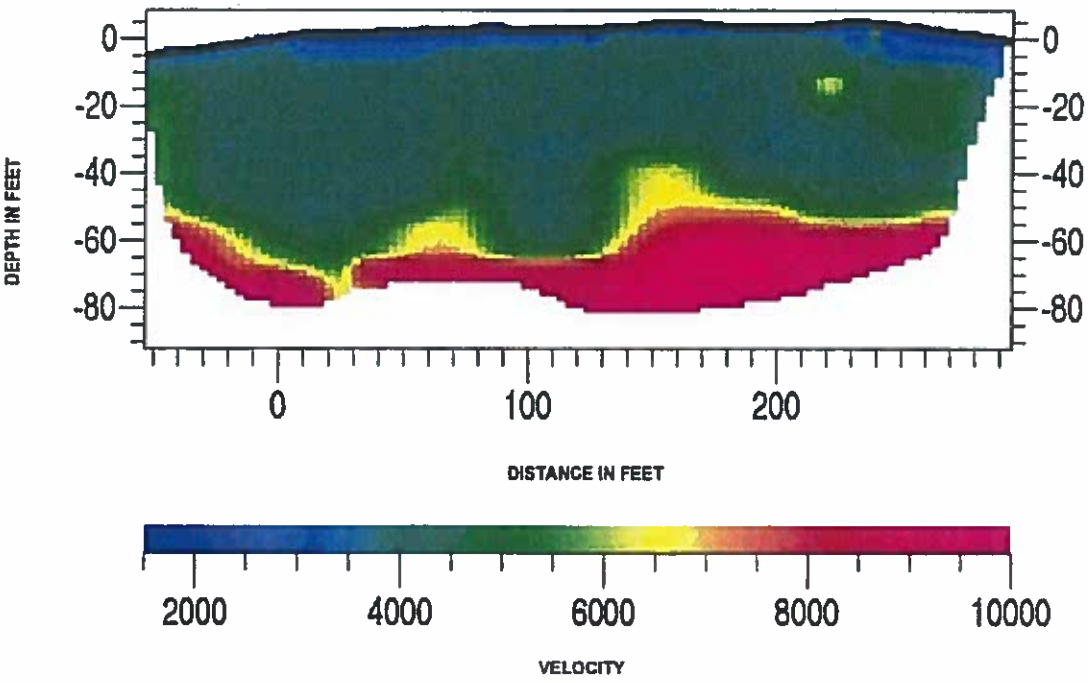
SEISMIC PROFILE SL-16	Otay Ranch Residential Development San Diego, California	SOUTHWEST GEOPHYSICS INC Figure 4p
	Project No.: 108226 | Date: 10/08	





SEISMIC PROFILE SL-17	Otay Ranch Residential Development San Diego, California	SOUTHWEST GEOPHYSICS INC
	Project No.: 108226 / Date: 10/08	Figure 4q





SEISMIC PROFILE
SL-18

Otay Ranch Residential Development
San Diego, California

Project No.: 108226 | Date: 10/08

SOUTHWEST GEOPHYSICS INC

Figure 4r

APPENDIX D

APPENDIX D

BORING LOGS AND SEISMIC REFRACTION SURVEYS

FROM ***PRELIMINARY GEOLOGIC/GEOTECHNICAL FEASIBILITY FOR ENVIRONMENTAL IMPACT REPORT, OTAY RANCH VILLAGE 13, CITY OF CHULA VISTA, COUNTY OF SAN DIEGO, CALIFORNIA***,

PREPARED BY **NEBLETT & ASSOCIATES,**
DATED **JANUARY 16, 2004 (PROJECT NO. 362-000-02)**

FOR

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO. G1012-52-02

GEOTECHNICAL BORING LOG

PROJECT NO. 362 000
DATE STARTED 6/18/01
DATE FINISHED 6/18/01
DRILLER
TYPE OF DRILL RIG Bucket Auger

PROJECT NAME OTAY RANCH
GROUND ELEV
GW DEPTH (FT)
DRIVE WT.
DROP

BORING DESIG. NB-1
LOGGED BY JSC
NOTE

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	Other Tests
						Alluvium (Qal): Silty sand with cobbles and boulders, brown, slightly moist, dense, subrounded clasts. @ 2' Difficult drilling - ripper utilized.				
5						@ 4' **Unnamed Fanglomerate Deposits (Tfg):** Cobble - boulder conglomerate in clayey sand matrix, pale greenish brown, moist, dense, subrounded clasts, difficult to excavate. @ 7' Refusal Total depth 7.0 feet. No groundwater, no caving.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
GS - Grain Size Analysis
EI - Expansion Index
CONS - Consolidation

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4911 WARNER AVENUE, SUITE 218
HUNTINGTON BEACH, CA 92649 714-840-8286

PLATE A-1

GEOTECHNICAL BORING LOG

PROJECT NO. 362 000
DATE STARTED 6/18/01
DATE FINISHED 6/18/01
DRILLER
TYPE OF DRILL RIG Bucket Auger

PROJECT NAME OTAY RANCH
GROUND ELEV.
GW DEPTH (FT)
DRIVE WT.
DROP

BORING DESIG NB-2
LOGGED BY JSC
NOTE

DEPTH (feet)	ELEV.	SAMPLE TYPE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT. (%)	DRY (pcf) DENSITY	SAT-URATION (%)	Other Tests
0						**Alluvium (Qal):** Sandy to gravelly clay, dark brown, slightly moist, stiff, coarse-grained, porous, rooted, sharp lower contact.				
5		B R	5			@ 5' **Unnamed Fanglomerate Deposits (Tfg):** Gravel/cobble conglomerate in clayey sand matrix, mottled, reddish brown and brown, moist, moderately hard, very clayey. @7' Sandstone with gravel, mottled, brown and reddish brown, moist, moderately hard, coarse-grained, some cobbles, gypsum crystals throughout.				
10						@ 10' No sample taken due to cobbles. @ 10' Sharp contact. Gravel/cobble conglomerate with clayey sand matrix, reddish brown, moist, moderately hard, coarse-grained sand.				
15						@ 15' No sample taken due to cobbles.				
20						@ 20' No sample taken due to cobbles.				
25						@ 25' No sample taken due to cobbles - difficult drilling @ 25' Cobble/boulder conglomerate with clayey sand matrix, reddish brown, moist, dense, coarse-grained sand.				
						@ 28' Difficult drilling - ripper utilized. @ 28' Refusal on boulder. Total depth 28.0 feet. No groundwater, no caving.				

SAMPLE TYPES:
[R] RING (DRIVE) SAMPLE
[S] SPT (SPLIT SPOON) SAMPLE
[B] BULK SAMPLE [T] TUBE SAMPLE

► Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
GS - Grain Size Analysis
EI - Expansion Index
CONS - Consolidation

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PLATE A-2

NT - 1

Date Excavated: 6-19-01
Logged by: JSC

Depth	Description
0.0' – 3.0'	**Alluvium (Qal):** silty sand with gravel, cobbles, and boulders, brown, slightly moist, moderately dense, rooted, clayey, porous, difficult to excavate, sharp lower contact.
3.0' – 6.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravel and cobble conglomerate with clayey sand matrix, mottled orangish brown and grayish brown, slightly moist, moderately dense, locally decomposed clay (bentonite) within matrix, difficult to excavate.

Total Depth 6.5'; no groundwater, no caving.

NT - 2

Date Excavated: 6-19-01
Logged by: JSC

Depth	Description
0.0' – 4.5'	**Colluvium (Qcol):** silty sand, brown, slightly moist, moderately dense, fine to coarse grained, porous, rooted, some gravel and cobbles, some boulders at 3 feet, sharp lower contact.
4.5' – 7.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravel-cobble conglomerate with coarse sand and clay matrix (bentonitic), mottled orangish brown, pale greenish brown and yellowish brown, slightly moist, massive, cobble amount increases with depth, few boulders.

Total Depth 7.5'; no groundwater, no caving.

NT - 3

Date Excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' – 3.5'	**Alluvium (Qal):** silty sand, brown, slightly moist, moderately dense, fine to coarse grained, boulders and cobbles, porous, sharp lower contact.
	BULK SAMPLE at 1.0'to 2.0'.
3.5' – 7.5'	**Unnamed Fanglomerate Deposits (Tfg):** sandy claystone (bentonitic), pale yellowish to greenish gray, moist, soft to moderately hard, massive, weathered.
	BULK SAMPLE at 6'.
	Total Depth 7.5'; no groundwater, no caving.

NT - 4

Date Excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' - 2.0'	**Colluvium (Qcol):** gravelly sand, brown, fine- to coarse-grained, moist, moderately dense, weakly bedded, heavily rooted in upper 1-2 feet.
2.0' – 6.0'	**Unnamed Fanglomerate Deposits (Tfg):** gravel and cobble conglomerate with clayey coarse sand matrix, mottled brown and pale brown, moist, moderately hard, massive.
	Total Depth 6.0'; no groundwater, no caving.

NT - 5

Date Excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' – 5.0'	**Alluvium (Qcol):** clayey sand and silty sand; dark brown; fine to medium grained; slightly moist; moderately dense; some gravel; weak angular blocky structure; sharp lower contact.
5.0' – 7.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravel and cobble conglomerate with clayey coarse sand matrix, mottled brown and pale brown, moist, moderately hard, massive.
	Total Depth 7.5'; no groundwater, no caving.

NT – 6

Date Excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' – 6.0'	**Alluvium (Qal):** silty sand and clayey sand, dark brown to very dark brown, moist, moderately dense, rooted, decomposed organics, sharp lower contact.
6.0' – 8.0'	**Unnamed Fanglomerate Deposits (Tfg):** sandy claystone, mottled brown and pale greenish gray, slightly moist, soft to moderately hard, fine to coarse grained.

Total Depth 8.0'; no groundwater, no caving.

NT – 7

Date Excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' – 3.5'	**Alluvium (Qal):** silty to clayey sand, brown, slightly moist, moderately dense, fine to coarse grained with gravel and cobbles, porous, rooted, sharp lower contact.
3.5' – 5.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravel and cobble conglomerate with clayey coarse sand matrix, medium brown to light brown and orangish brown, slightly moist, moderately hard, massive.

Total Depth 5.5'; no groundwater, no caving.

NT – 8

Date Excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' – 3.5'	**Alluvium (Qal):** silty to clayey sand, brown, slightly moist, moderately dense, fine to coarse grained with gravel and cobble, some boulders, porous, sharp lower contact.
3.5' – 5.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravel and cobble conglomerate with clayey coarse sand matrix, medium brown to light brown and orangish brown, slightly moist, moderately hard, massive.

Total Depth 5.5'; no groundwater, no caving.

NT – 9

Date Excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' – 2.0'	**Colluvium (Qcol):** clayey sand and silty sand with gravel and cobble, brown, moist, moderately dense, porous, rooted.
2.0' – 3.0'	**Unnamed Fanglomerate Deposits (Tfg):** gravelly sandstone with clay, brown, slightly moist, soft to moderately hard coarse-grained sand.
	Total Depth 3.0'; no groundwater, no caving.

NT – 10

Date Excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' – 4.0'	**Alluvium (Qal):** silty sand with gravel, cobble, and boulder, dark brown, slightly moist, moderately dense; porous, rooted, sharp lower contact.
4.0' – 7.0'	**Unnamed Fanglomerate Deposits (Tfg):** gravel and cobble conglomerate with clayey sand matrix, slightly moist, moderately hard, massive.
	Total Depth 7.0', no groundwater, no caving.

NT – 11

Date excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' – 4.0'	**Alluvium (Qal):** silty sand with gravel, cobble and boulders, brown, slightly moist, moderately dense, rooted, very difficult to excavate, sharp lower contact.
4.0' – 6.0'	**Unnamed Fanglomerate Deposits (Tfg):** sandstone with gravel and cobbles, pale brown and grayish brown, slightly moist, moderately hard, fine to coarse grained.
	Total Depth 6.0'; no groundwater, no caving.

NT – 12

Date Excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' – 3.5'	**Alluvium (Qal):** clayey sand with gravel and cobble, dark brown, slightly moist, dense, porous, sharp lower contact.
3.5' – 5.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravelly sandstone, pale brown and orangish brown, slightly moist, moderately hard, fine to coarse grained, massive.

Total Depth 5.5'; no groundwater, no caving

NT – 13

Date Excavated: 6-19-2001
Logged by: JSC

Depth	Description
0.0' – 1.5'	**Alluvium (Qal):** silty sand with gravel and cobble, grayish brown, slightly moist, moderately dense, porous.
1.5' – 3.0'	Cobbly to sandy clay, dark brown to reddish brown, moist, stiff, sharp lower contact.
3.0' – 5.5'	**Unnamed Fanglomerate Deposits (Tfg):** sandy to gravelly claystone, moist, soft to moderately hard.

Total Depth 5.5'; no groundwater, no caving.

NT – 14

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 3.0'	**Alluvium (Qal):** sandy clay, light grayish brown, slightly moist, stiff, some coarse sand, fine gravel (40%), trace cobble, small boulder (<5%).
3.0' – 9.0'	**Unnamed Fanglomerate Deposits (Tfg):** clayey sandstone, pale greenish yellow, moist, moderately hard, fine to coarse grained, moderately graded, subangular to angular, occasional small subrounded cobbles, cobble/boulder bed from 7' to 8'.

Total Depth 9.0'; no groundwater, no caving.

NT – 15

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 2.0'	**Alluvium (Qal):** sandy clay, medium brown, moist, stiff, porous, fine to coarse sand (15%), subangular to subrounded cobble/boulder (30%).
2.0' – 8.0'	**Unnamed Fanglomerate Deposits (Tfg):** gravelly sandstone, pale greenish yellow, moist, dense, moderately well to well graded, angular, fine to coarse sand, gravel (15%), some oxidation mottling.
	Total Depth 8.0'; no groundwater, no caving.

NT – 16

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 2.0'	**Colluvium (Qcol):** sandy clay, dark brown, moist, stiff, porous.
2.0' – 5.0'	**Unnamed Fanglomerate Deposits (Tfg):** gravelly sandstone, pale greenish yellow, moist, moderately dense, angular, fine to coarse sand, gravel (15%), some oxidation mottling.
	Total Depth 5.0'; no groundwater, no caving

NT – 17

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 2.0'	**Colluvium (Qcol):** sandy silt, gray brown, moist, stiff, fine to coarse grained, porous, roots, cobble/boulder layer from 2' to 3', orangish brown.
5.0' – 8.0'	**Unnamed Fanglomerate Deposits (Tfg):** sandy claystone, pale yellowish green, moist, moderately hard, plastic, bentonitic, coarse grained sand
	BULK SAMPLE at 7'.
	Total Depth 8.0'; no groundwater, no caving.

NT – 18

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 2.0'	**Alluvium (Qal):** sandy clay, pale reddish brown, moist, stiff, porous, fine to coarse grained, trace gravel, roots.
2.0' – 5.0'	**Unnamed Fanglomerate Deposits (Tfg):** clayey sandstone with gravel and cobbles, pale yellowish brown, moist, moderately hard, fine to coarse sand, gravel/cobbles (30-40%).

Total Depth 5.0'; no groundwater, no caving.

NT – 19

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 2.0'	**Colluvium (Qcol):** clayey sand, gray brown, moist, soft, fine to coarse sand, abundant cobbles at surface, angular.
2.0' – 6.0'	**Unnamed Fanglomerate Deposits (Tfg):** sandy claystone, pale olive gray, moist, soft, some medium to coarse sand.

Total Depth 6.0'; no groundwater, no caving.

NT – 20

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 4.0'	**Alluvium (Qal):** silty clay, gray brown, moist, hard, abundant boulders in clayey silt matrix, angular. Refusal on cobble/boulder bed.

Total Depth 4.0'; no groundwater, no caving.

NT – 21

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 2.5'	**Colluvium (Qcol):** sandy clay, pale reddish brown, slightly moist, stiff, fine to coarse sand (<15%), gravel (5%), subangular, cobble/boulder layer from 2' to 2.5'.
2.5' – 8.0'	**Unnamed Fanglomerate Deposits (Tfg):** clayey sandstone with gravel and cobbles, pale yellowish brown, moist, moderately hard, fine to coarse sand, gravel/cobbles (30-40%), angular boulder to 12" from 7' to 8'.

Total Depth 8.0'; no groundwater, no caving.

NT – 22

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 5.0'	**Alluvium (Qal):** gravelly clay, gray brown, moist, stiff.
5.0' – 8.0'	**Unnamed Fanglomerate Deposits (Tfg):** clayey sandstone with gravel and cobbles, pale yellowish brown, moist, moderately hard, fine to coarse sand, gravel/cobbles (30-40%), angular to subangular boulders from 5' to 7'.

Total Depth 8.0'; no groundwater, no caving.

NT – 23

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 2.0'	**Colluvium (Qcol):** sandy clay with cobbles and boulders, gray brown, moist, stiff, porous.
2.0' – 5.0'	**Unnamed Fanglomerate Deposits (Tfg):** silty claystone, pale yellowish green, moist, soft, scarce coarse sand.

Total Depth 5.0'; no groundwater, no caving

NT – 24

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' - 3.0'	**Alluvium (Qal):** clayey sand, reddish brown, moist, stiff, poorly sorted, fine to coarse grained, some fine angular gravel, small cobbles.
3.0' – 6.0'	**Unnamed Fanglomerate Deposits (Tfg):** silty claystone, pale yellowish green, moist, soft, some coarse sand, cobble/boulder bed at contact.
	Total Depth 6.0'; no groundwater, no caving.

NT – 25

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 2.0'	**Colluvium (Qcol):** sandy clay, reddish brown, moist, stiff, some fine to coarse sand, gravel/small cobbles (10–15%).
2.0' – 4.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravelly sandstone, yellowish gray, slightly moist, dense, fine to coarse grained.
	Total Depth 4.5'; no groundwater, no caving.

NT – 26

Date Excavated: 3-20-2001
Logged by: SMR

Depth	Description
0.0' – 2.0'	**Alluvium (Qal):** sandy clay, reddish brown, moist, stiff, some fine to coarse sand, gravel/small cobbles (10–15%).
2.0' – 6.0'	**Unnamed Fanglomerate Deposits (Tfg):** silty claystone, light gray brown, moist, soft, trace coarse sand.
	BULK SAMPLE at 6 feet.
	Total Depth 6.0'; no groundwater, no caving.

NT – 27

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 3.0'	**Alluvium (Qal):** sandy clay, reddish brown, moist, stiff, some fine to coarse sand, gravel/small cobbles (10–15%).
3.0' – 5.0'	**Unnamed Fanglomerate Deposits (Tfg):** gravelly sandstone, yellowish gray, slightly moist, moderately hard, fine to coarse grained, abundant cobbles.
	Total Depth 5.0', no groundwater, no caving.

NT – 28

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 1.5'	**Colluvium (Qcol):** sandy clay, reddish brown, moist, stiff, some fine to coarse sand, very few cobbles.
1.5' – 4.0'	**Unnamed Fanglomerate Deposits (Tfg):** clayey sandstone, pale yellowish green, moist, moderately hard, fine to coarse sand, abundant cobbles (30-40%), few small boulders (<5%).
	Total Depth 4.0'; no groundwater, no caving.

NT – 29

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 3.0'	**Alluvium (Qal):** sandy clay, reddish brown, moist, hard, roots,
3.0' – 7.0'	**Unnamed Fanglomerate Deposits (Tfg):** clayey sandstone, pale yellowish green, moist, moderately hard, fine to coarse sand, few cobbles.
	Total Depth 7.0'; no groundwater, no caving

NT – 30

Date Excavated: 6-20-2001
Logged by: SMR

Depth	Description
0.0' – 3.0'	**Alluvium (Qal):** clayey sand with cobbles, reddish brown, moist, dense, boulder/cobble at base, difficult to excavate, sharp lower contact.
3.0' – 7.0'	**Unnamed Fanglomerate Deposits (Tfg):** clayey sandstone, pale yellowish green, moist, moderately hard, fine to coarse sand, weathered.
5.0' – 7.0'	Gravelly sandstone, pale yellowish green, slightly moist, moderately hard, fine to coarse grained, abundant cobbles.
	Total Depth 7.0'; no groundwater, no caving.

NT – 31

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 3.5'	**Alluvium (Qal):** clayey sand with cobbles, reddish brown, moist, dense, fine to coarse sand, gravel/cobble (30-40%), few small boulders, porous, roots
3.5' – 7.0'	**Unnamed Fanglomerate Deposits (Tfg):** clayey sandstone, pale yellowish green, moist, moderately hard, fine to coarse sand, moderately graded, few cobbles.
	Total Depth 7.0'; no groundwater, no caving.

NT – 32

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 5.0'	**Alluvium (Qal):** gravel, cobble, and boulder in silty sand matrix, brown, slightly moist, moderately dense, fine to coarse grained, porous, difficult to excavate at 3', dense, sharp lower contact.
5.0' – 7.0'	**Unnamed Fanglomerate Deposits (Tfg):** coarse sandstone with gravel, clayey matrix, mottled greenish brown and orangish brown, moist, soft to moderately hard.
	Total Depth 7.0'; no groundwater, no caving.

NT – 33

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 4.0'	**Alluvium (Qal):** coarse-grained sand with gravel and cobbles, brown, moist, loose, interbedded with dark brown clayey sand.
	BULK SAMPLE at 2'.
4.0' – 4.5'	Cobble and boulders, pale yellowish green, very moist, dense. Groundwater at 4.0', Refusal due to caving. Total Depth 4.5'; groundwater at 4', caving to 4'.

NT – 34

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 4.0'	**Alluvium (Qal):** gravel, cobble, and boulders in silty sand matrix, brown, slightly moist to moist, dense, porous, roots, difficult to excavate, sharp lower contact.
4.0' – 8.0'	**Unnamed Fanglomerate Deposits (Tfg):** gravelly sandstone with cobbles, mottled orangish brown, greenish brown, and gray, moist, soft to moderately hard, weathered to 7'.
	Total Depth 8.0'; no groundwater, no caving.

NT – 35

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 2.5'	**Colluvium (Qcol):** gravelly to cobbly sand with clay, brown, slightly moist, moderately dense, fine to coarse grained, porous, rooted, sharp lower contact.
2.5' – 4.0'	**Unnamed Fanglomerate Deposits (Tfg):** gravelly sandstone with cobbles, pale brown, greenish brown, and orangish brown, slightly moist, moderately hard, massive.
	BULK SAMPLE at 3 feet.
	Total Depth 4.0'; no groundwater, no caving

NT – 36

Date Excavated: 3-20-2001
Logged by: JSC

Depth	Description
0.0' – 2.0'	**Alluvium (Qal):** silty sand with gravel, cobble, and boulder, brown, slightly moist, moderately dense, porous, rooted, sharp lower contact.
0.0' – 4.0'	**Unnamed Fanglomerate Deposits (Tfg):** gravel and cobble conglomerate with clayey sand matrix, mottled medium brown and orangish brown, slightly moist, moderately hard, some boulder.
	Total Depth 4.0'; no groundwater, no caving

NT – 37

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 2.0'	**Colluvium (Qcol):** silty sand with gravel, cobble, and boulder, brown, slightly moist, moderately dense, porous, rooted, sharp lower contact.
2.0' – 3.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravelly sandstone with clay, mottled brown, orange and greenish brown, slightly moist, moderately hard, difficult to excavate.
	Total Depth 3.5'; no groundwater, no caving.

NT – 38

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' - 4.0'	**Alluvium (Qal):** silty sand with gravel and cobble, medium to dark brown, slightly moist, loose to moderately dense, rooted.
2.0' - 4.0'	Silty sand with gravel, dark brown, moist, moderately dense.
4.0' 5.0'	**Unnamed Fanglomerate Deposits (Tfg):** gravel and cobble conglomerate with clayey sand matrix, mottled greenish gray, orangish brown, and brown, moist, moderately hard to soft.

Total Depth 5.0'; no groundwater, no caving.

NT - 39

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 2.5'	**Alluvium (Qal):** silty to clayey sand with gravel, cobble, and boulder, brown, slightly moist, loose to moderately dense, sharp lower contact.
2.5' – 4.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravelly sandstone, clayey (bentonitic), coarse-grained sand matrix, mottled pale brown and brown, greenish brown, moist, moderately hard, increase in cobble with depth.

Total Depth 4.5'; no groundwater, no caving.

NT – 40

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 2.5'	**Colluvium (Qcol):** clayey sand and gravel with cobble, brown to reddish brown, slightly moist, moderately dense to dense, porous, rooted, sharp lower contact.
2.5' - 4.0'	**Unnamed Fanglomerate Deposits (Tfg):** clayey sandstone, mottled greenish brown and brown, moist, moderately hard, fine to coarse grained.

Total Depth 4.0'; no groundwater, no caving.

NT – 41

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 4.0'	**Alluvium (Qal):** clayey sand and gravel with cobble, brown to reddish brown, slightly moist, moderately dense to dense, porous, rooted, sharp lower contact.
4.0' – 5.0'	**Unnamed Fanglomerate Deposits (Tfg):** sandy claystone, mottled greenish brown and brown, moist, moderately hard, massive.

Total Depth 5.0'; no groundwater, no caving.

NT – 42

Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 4.0'	**Alluvium (Qal):** gravel, cobble, and boulder in silty sand matrix, brown, slightly moist, moderately dense, rooted, difficult to excavate, sharp lower contact.
4.0' – 5.0'	**Unnamed Fanglomerate Deposits (Tfg):** coarse-grained sandstone, clayey , pale greenish brown, moist, moderately hard, massive, cobbly at 5'.

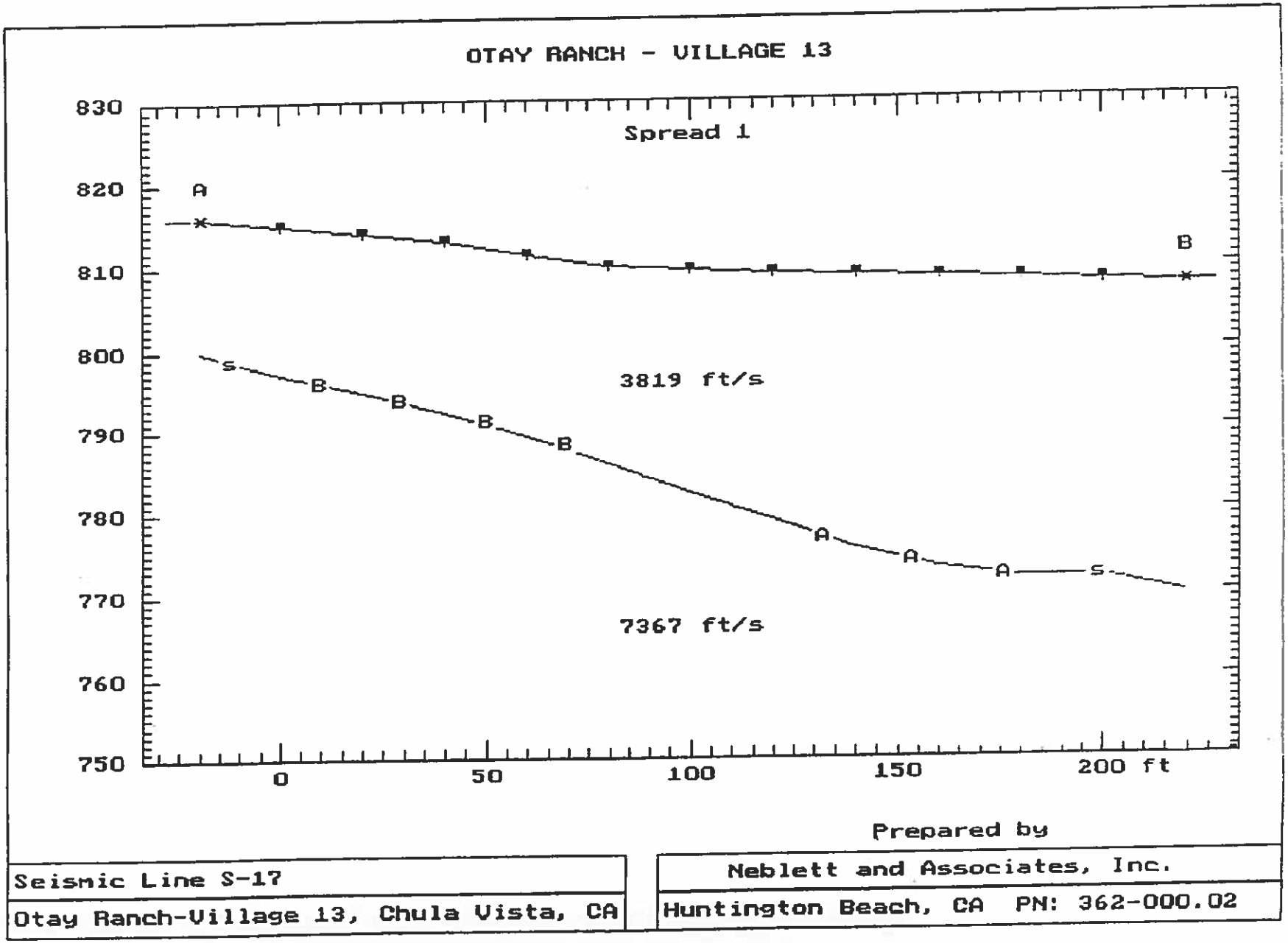
Total Depth 5.0'; no groundwater, no caving.

NT – 43

Date Excavated: 3-20-2001
Logged by: JSC

Depth	Description
0.0' – 3.0'	**Colluvium (Qcol):** clayey sand, dark reddish brown, moist, dense, fine to coarse grained, porous, rooted, sharp lower contact.
0.0' – 4.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravel and cobble conglomerate, brown, slightly moist, moderately hard, difficult to excavate, deep reddish brown with depth.

Total Depth 4.5'; no groundwater, no caving


OTAY RANCH - VILLAGE 13
Spread 1
830
820
810
800
790
780
770
760
750
A
B
S
B
B
B
B
A
A
A
S
3819 ft/s
7367 ft/s
0
50
100
150
200 ft
Prepared by
Neblett and Associates, Inc.
Huntington Beach, CA PN: 362-000.02
Seismic Line S-17
Otay Ranch-Village 13, Chula Vista, CA

NT – 44 **Date Excavated: 6-20-2001**
Logged by: JSC

Depth	Description
0.0' – 3.0'	**Alluvium (Qol):** clayey sand, dark reddish brown, moist, dense, fine to coarse grained, porous, rooted, sharp lower contact.
3.0' – 3.5'	**Unnamed Fanglomerate Deposits (Tfg):** gravel and cobble conglomerate, brown, slightly moist, moderately hard, difficult to excavate.
	Total Depth 3.5'; no groundwater, no caving.

NT – 45 **Date Excavated: 6-20-2001**
Logged by: JSC

Depth	Description
0.0' – 4.0'	**Alluvium (Qal):** cobble and boulder in silty sand matrix, brown, slightly moist, fine to coarse grained, porous, rooted.
4.0	REFUSAL at 4' at contact with Bedrock – Santiago Peak Volcanics (KJsp) Total Depth 4.0'; no groundwater, no caving.

NT – 46 **Date Excavated: 6-20-2001**

Depth	Description
0.0' – 4.0'	**Colluvium (Qcol):** clayey sand with gravel and cobble, slightly moist, moderately dense, porous, cobble and boulder near lower contact.
4.0' – 5.5'	**Unnamed Fanglomerate Deposits (Tfg):** sandy claystone, greenish brown, moist, moderately hard, some gravel.
	REFUSAL on large boulder at 5.5 feet.
	Total Depth 5.5'; no groundwater, no caving .

NT – 47

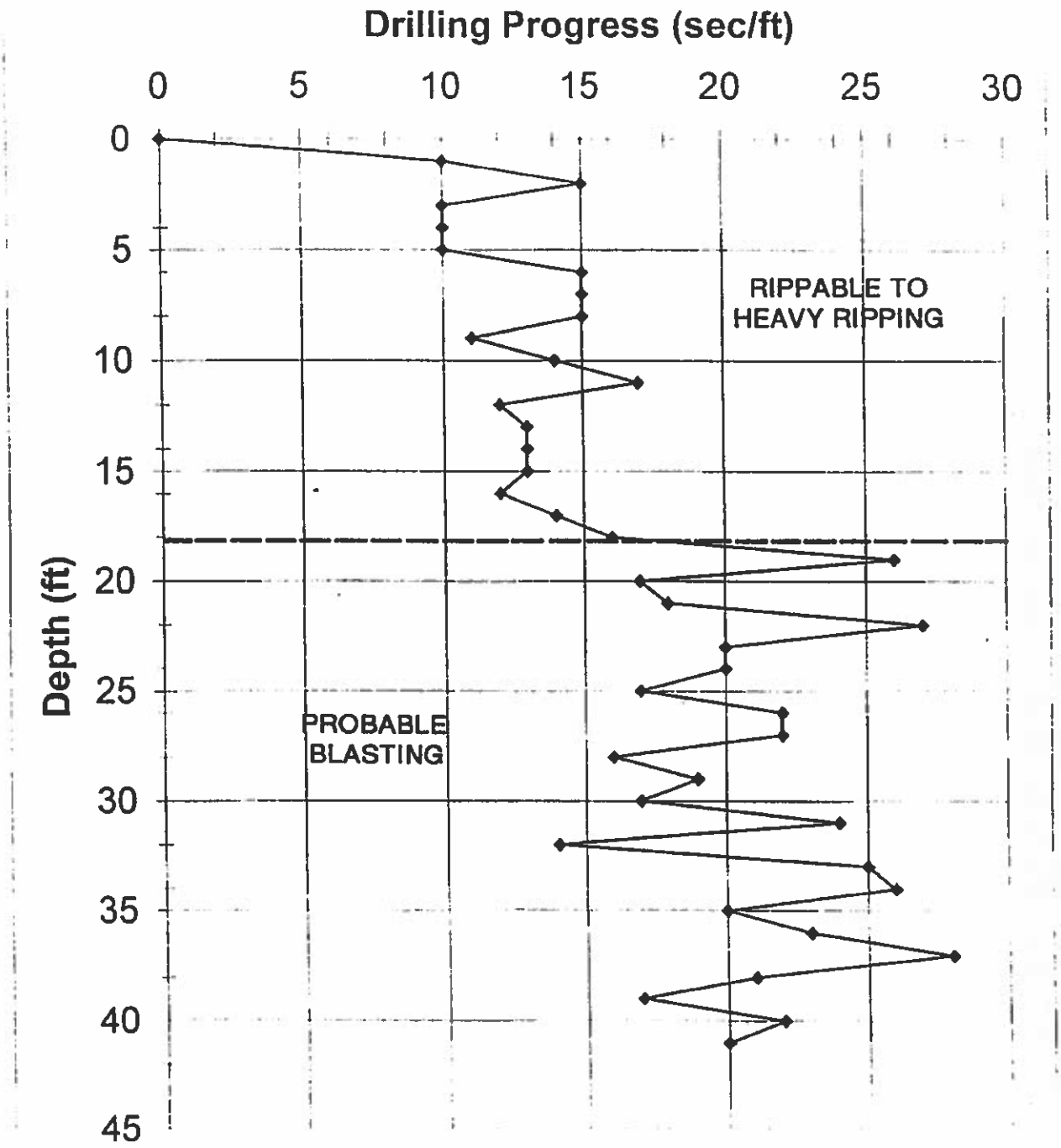
Date Excavated: 6-20-2001
Logged by: JSC

Depth	Description
0.0' – 3.0'	**Colluvium (Qcol):** gravelly to sandy clay, dark brown, moist, dense, some silty sand, moist, dense, sharp lower contact.
3.0' – 5.5'	**Unnamed Fanglomerate Deposits (Tfg):** sandy claystone, brown, slightly moist, moderately hard, greenish brown at 4.5'.
	Total Depth 5.5'; no groundwater, no caving.

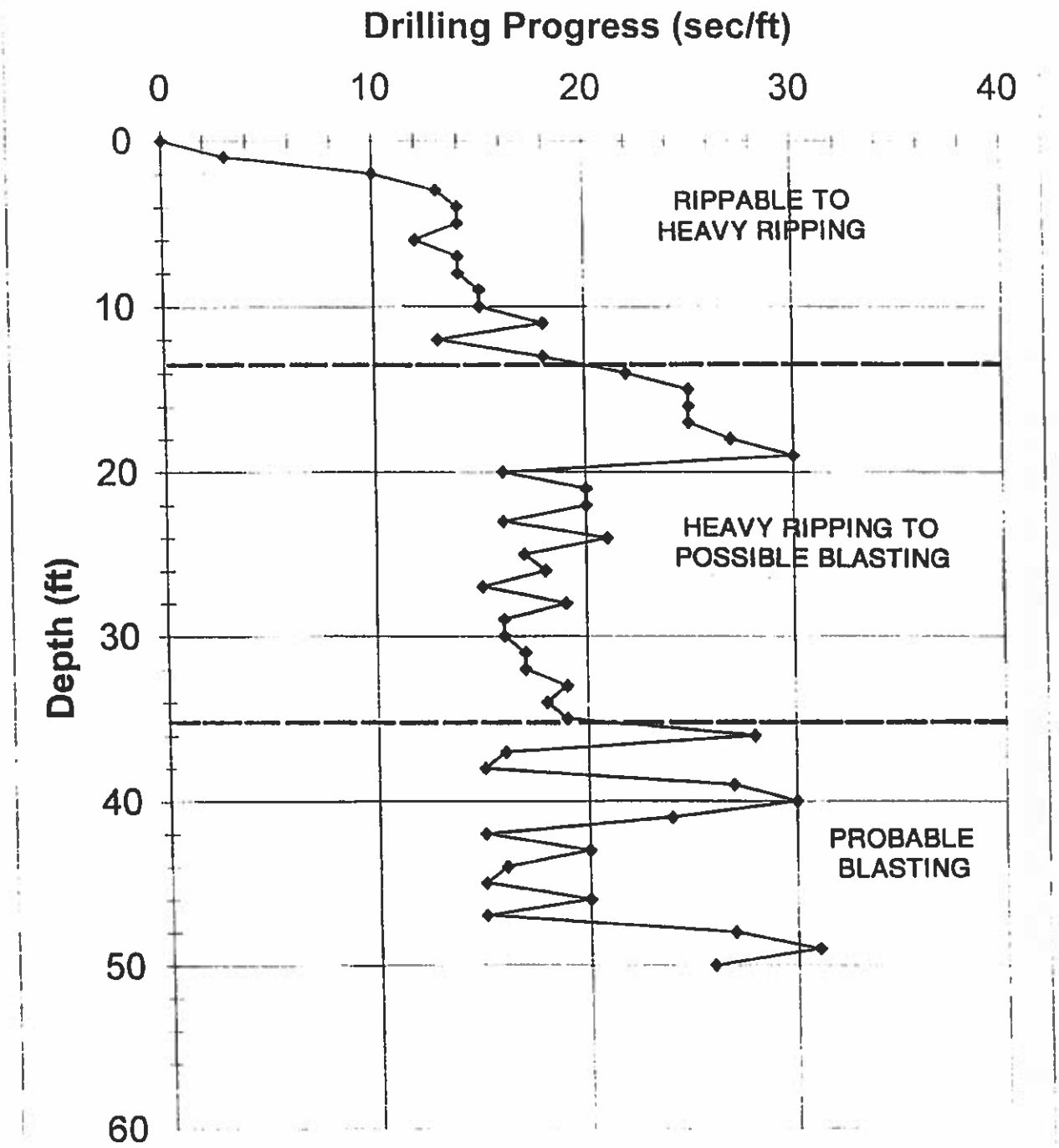
APPENDIX B

AIR HAMMER AND SEISMIC REFRACTION DATA

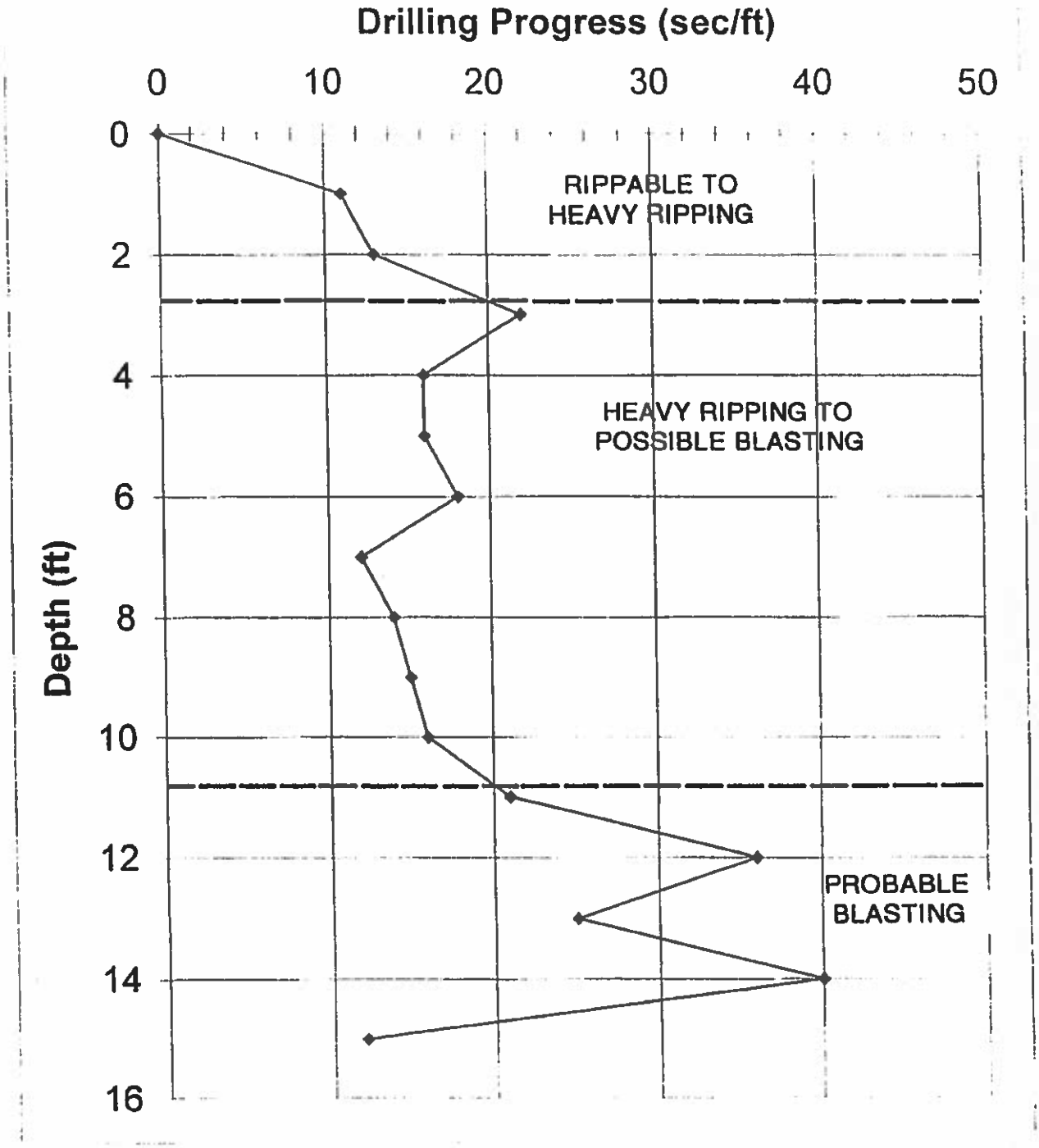
AH-1


Drilling Progress (sec/ft)
0
5
10
15
20
25
30
Depth (ft)
0
5
10
15
20
25
30
35
40
45
RIPPABLE TO
HEAVY RIPPING
PROBABLE
BLASTING

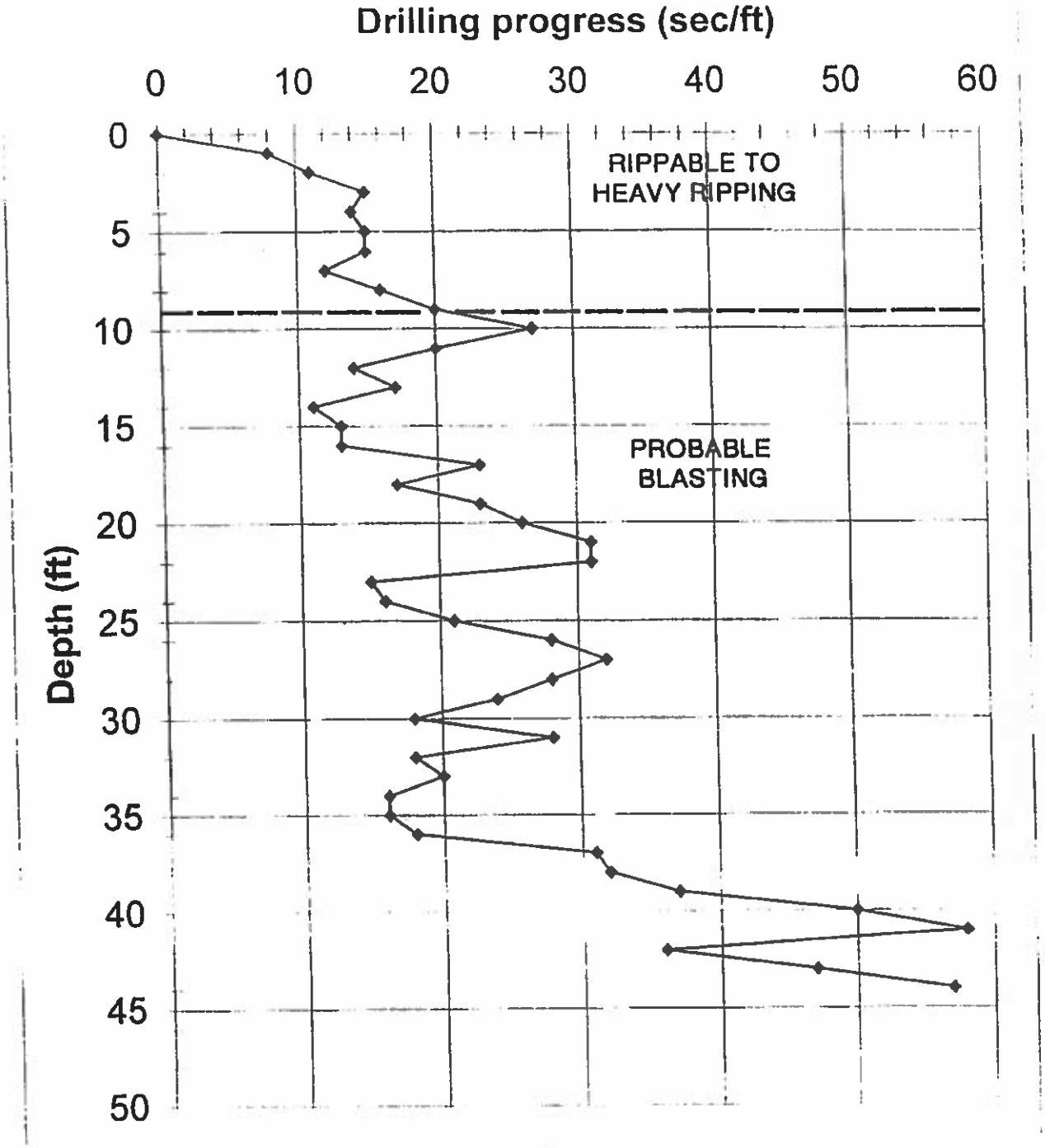
AH-2


Drilling Progress (sec/ft)
0
10
20
30
40
Depth (ft)
0
10
20
30
40
50
60
RIPPABLE TO
HEAVY RIPPING
HEAVY RIPPING TO
POSSIBLE BLASTING
PROBABLE
BLASTING

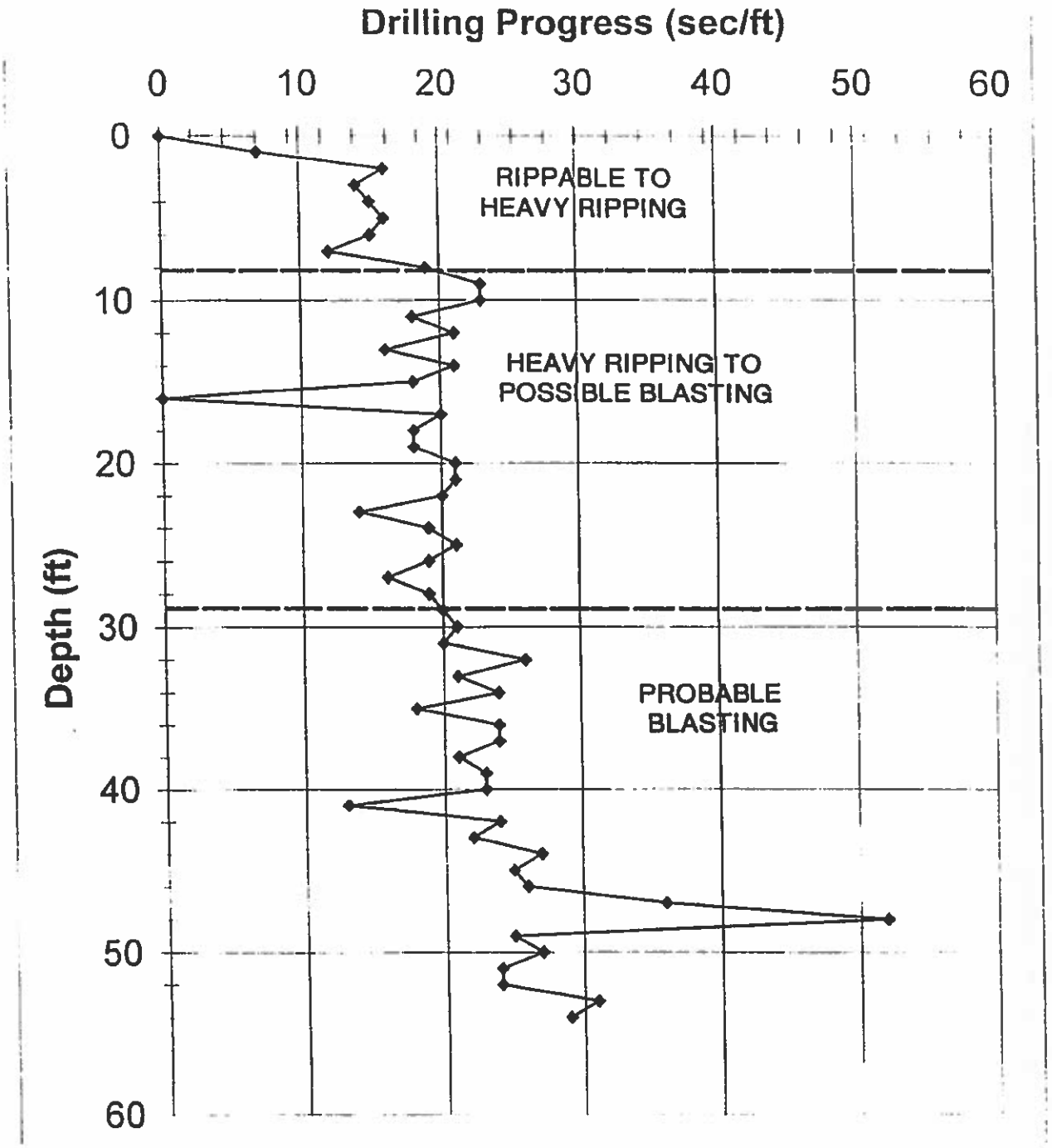
AH-3


Drilling Progress (sec/ft)
0
10
20
30
40
50
Depth (ft)
0
2
4
6
8
10
12
14
16
RIPPABLE TO
HEAVY RIPPING
HEAVY RIPPING TO
POSSIBLE BLASTING
PROBABLE
BLASTING

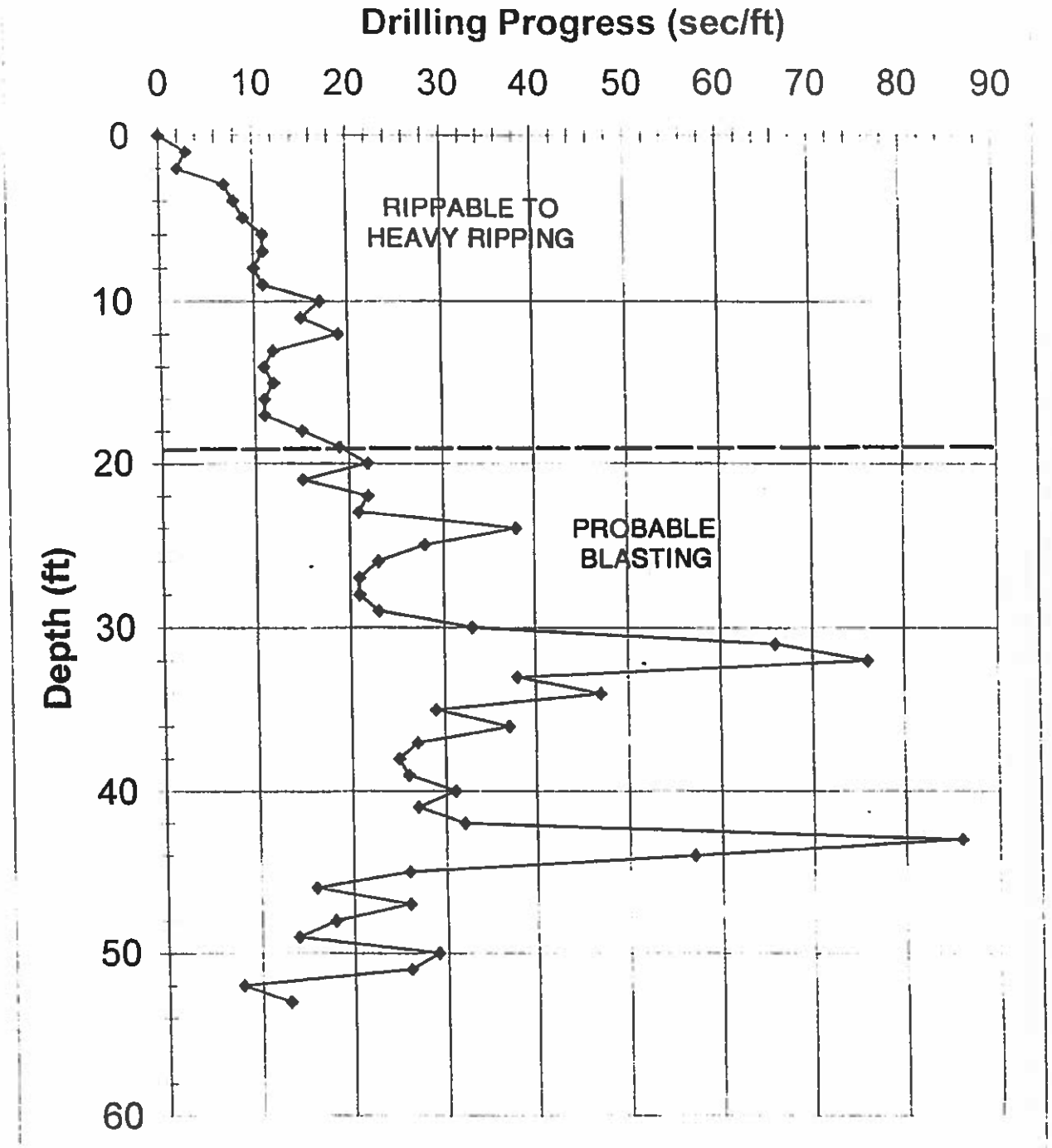
AH-4


Drilling progress (sec/ft)
0
10
20
30
40
50
60
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
RIPPABLE TO
HEAVY RIPPING
PROBABLE
BLASTING

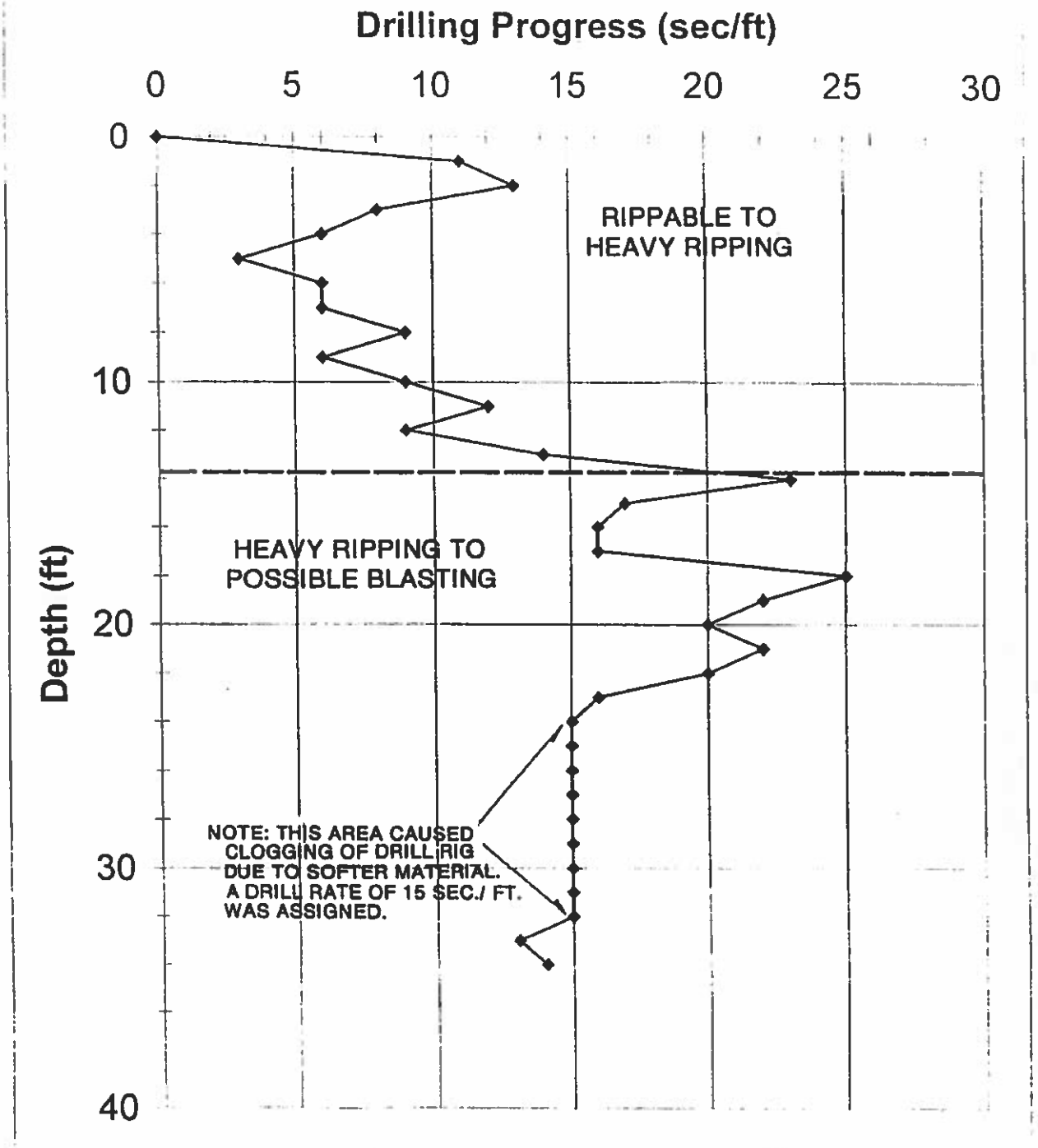
AH-5


Drilling Progress (sec/ft)
0
10
20
30
40
50
60
Depth (ft)
0
10
20
30
40
50
60
RIPPABLE TO
HEAVY RIPPING
HEAVY RIPPING TO
POSSIBLE BLASTING
PROBABLE
BLASTING

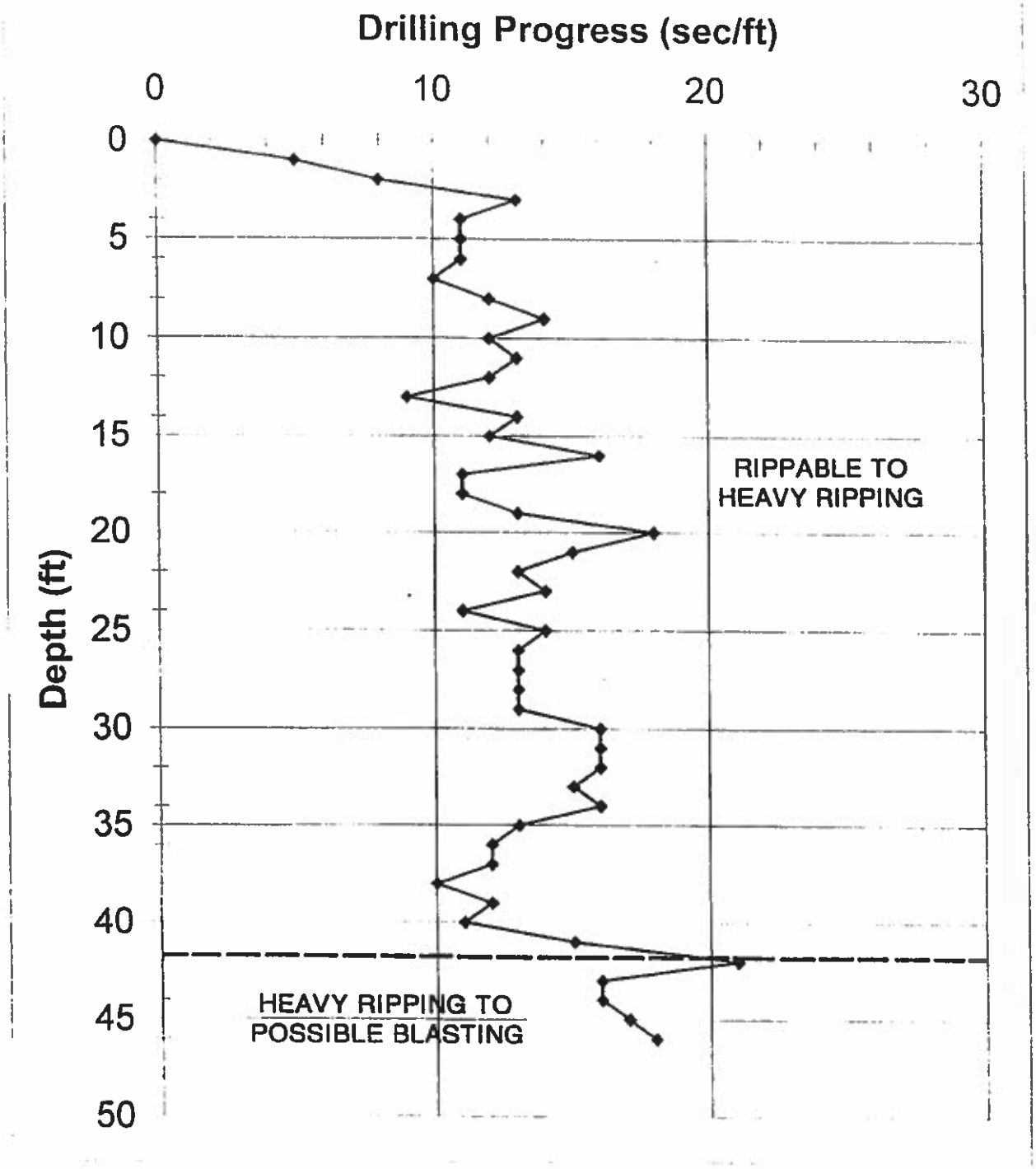
AH-6


Drilling Progress (sec/ft)
0
10
20
30
40
50
60
70
80
90
Depth (ft)
0
10
20
30
40
50
60
RIPPABLE TO
HEAVY RIPPING
PROBABLE
BLASTING

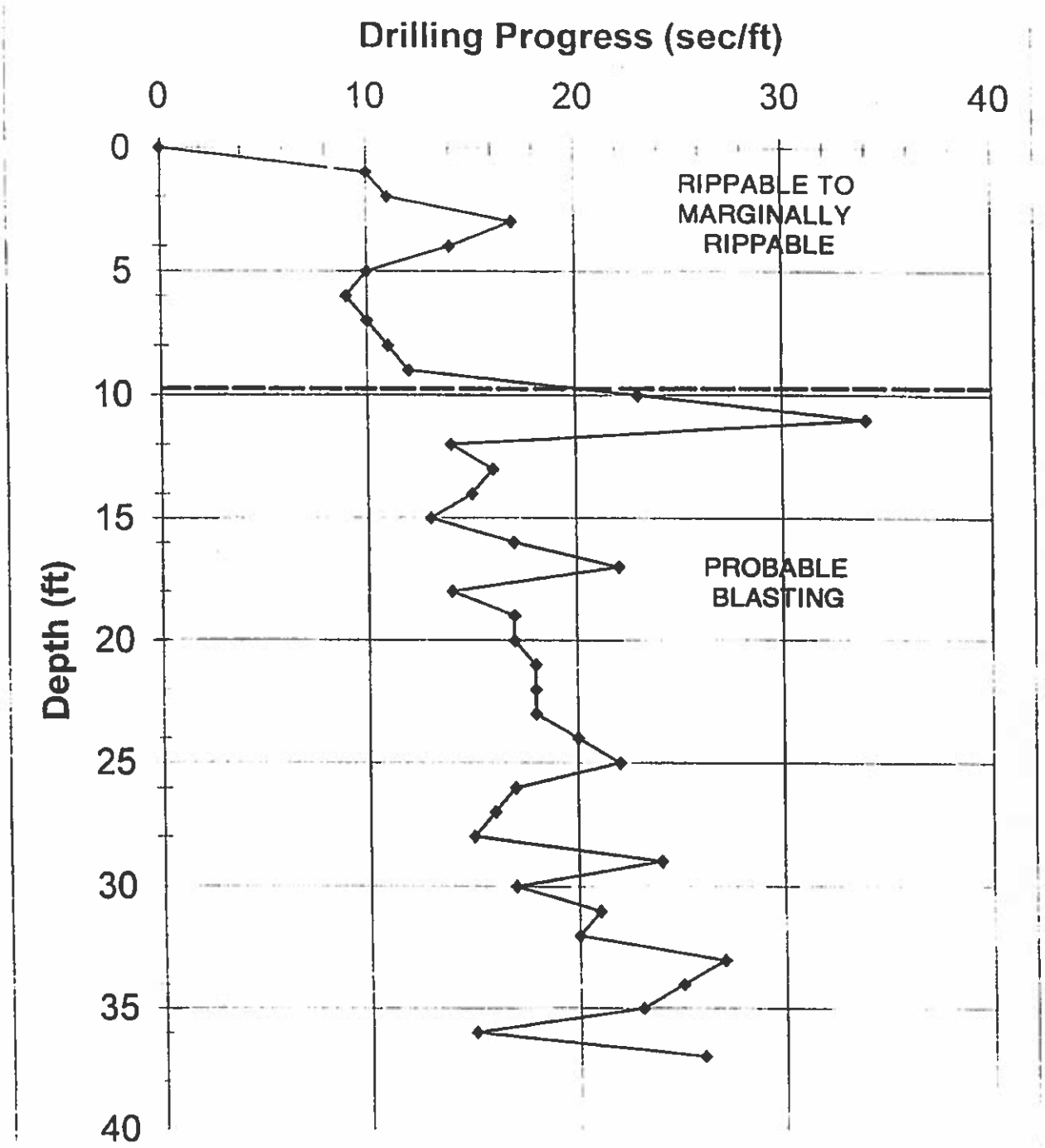
AH-7


Drilling Progress (sec/ft)
0
5
10
15
20
25
30
Depth (ft)
0
10
20
30
40
RIPPABLE TO
HEAVY RIPPING
HEAVY RIPPING TO
POSSIBLE BLASTING
NOTE: THIS AREA CAUSED
CLOGGING OF DRILL RIG
DUE TO SOFTER MATERIAL.
A DRILL RATE OF 15 SEC./ FT.
WAS ASSIGNED.

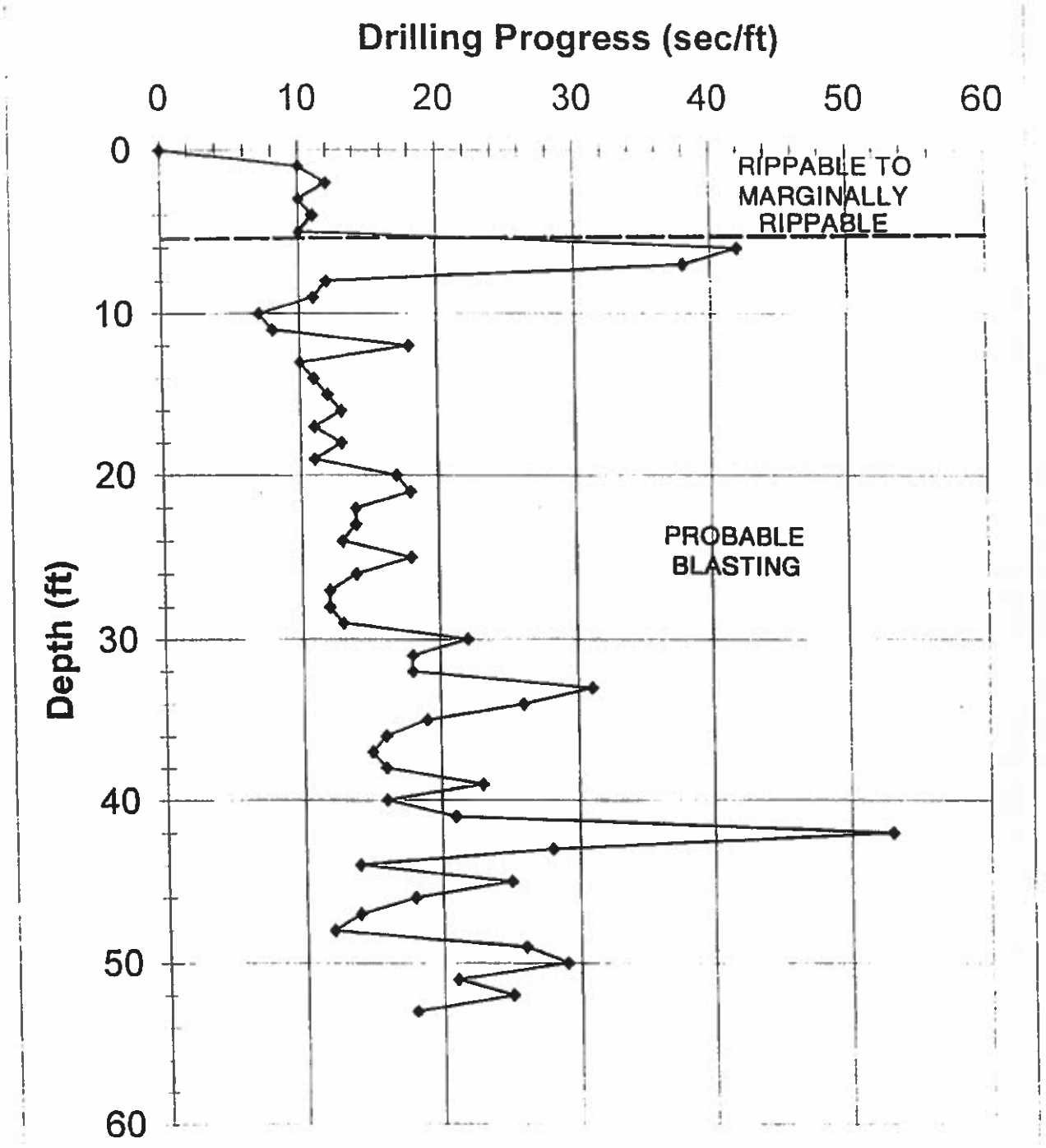
AH-8

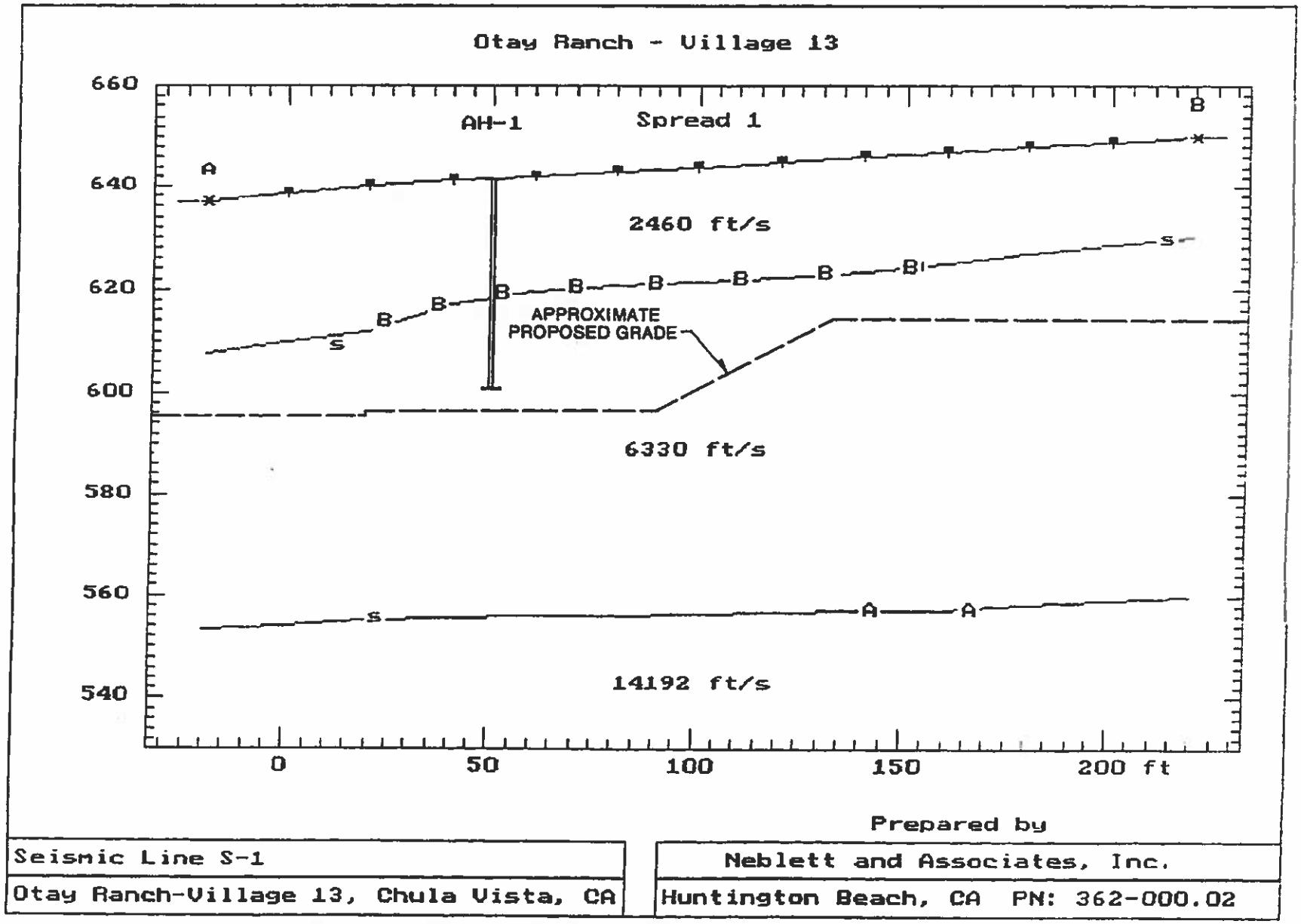

Drilling Progress (sec/ft)
0
10
20
30
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
RIPPABLE TO
HEAVY RIPPING
HEAVY RIPPING TO
POSSIBLE BLASTING

AH-9


Drilling Progress (sec/ft)
0
10
20
30
40
Depth (ft)
0
5
10
15
20
25
30
35
40
RIPPABLE TO MARGINALLY RIPPABLE
PROBABLE BLASTING

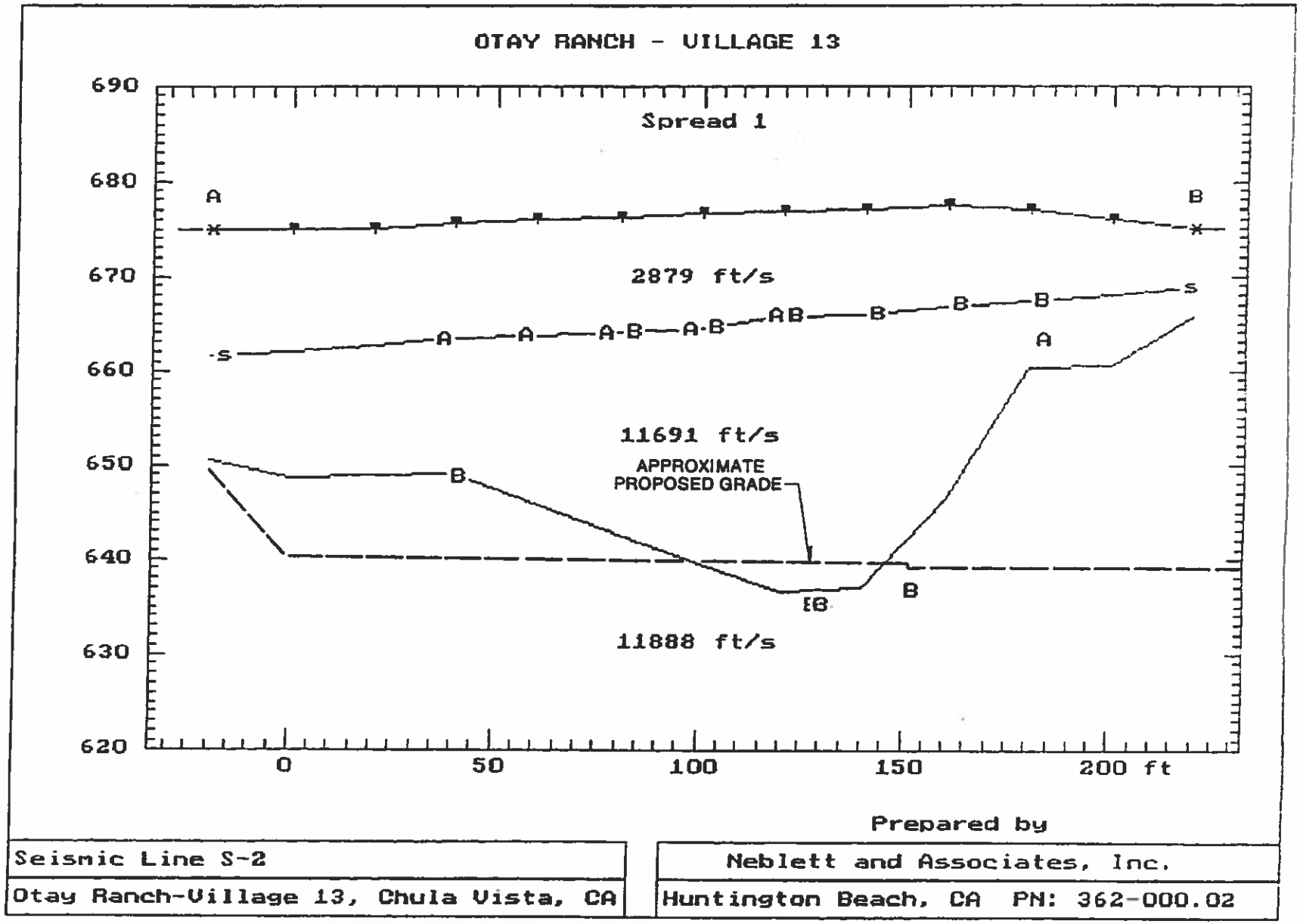
AH-10


Drilling Progress (sec/ft)
0
10
20
30
40
50
60
Depth (ft)
0
10
20
30
40
50
60
RIPPABLE TO MARGINALLY RIPPABLE
PROBABLE BLASTING



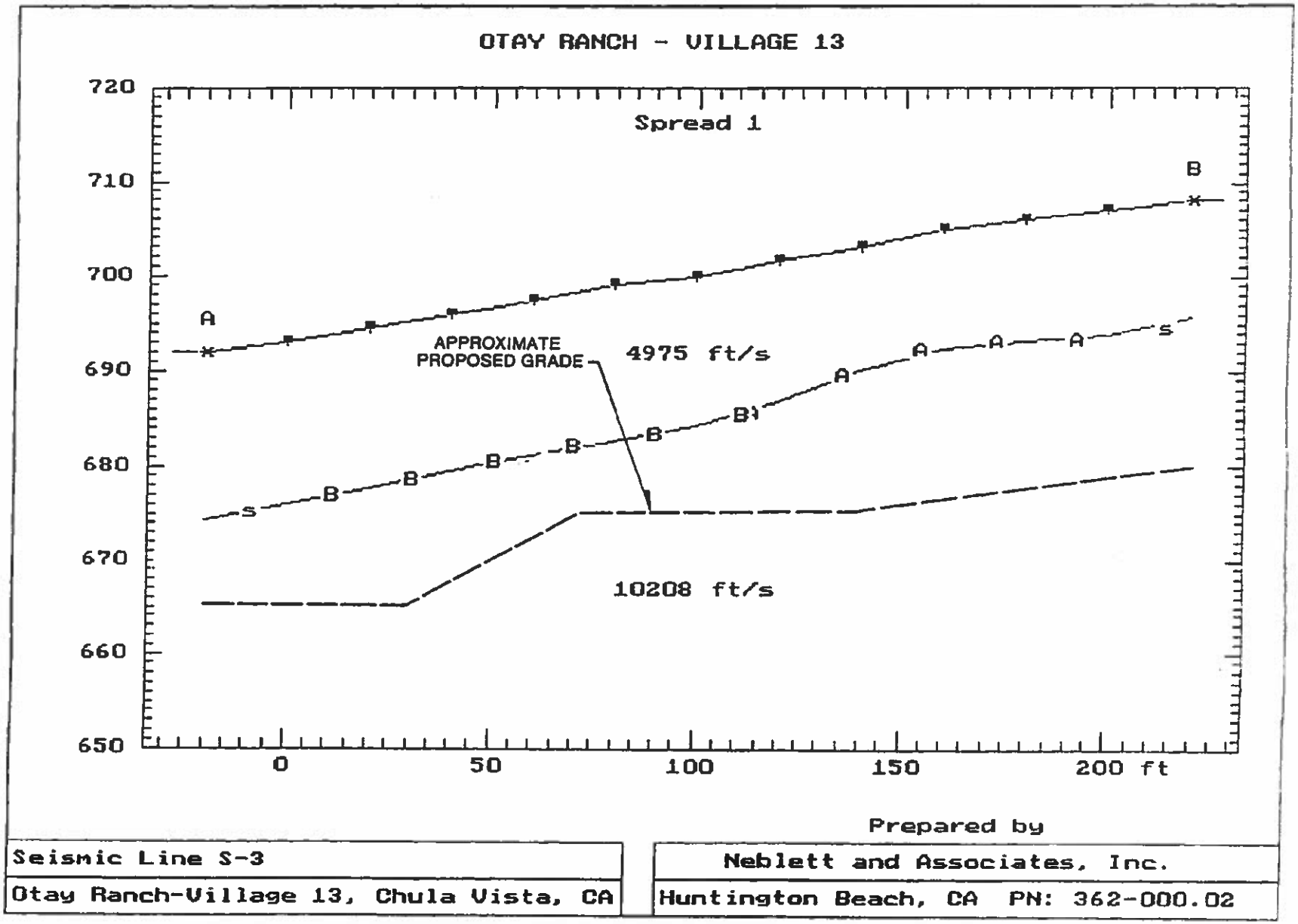
Prepared by

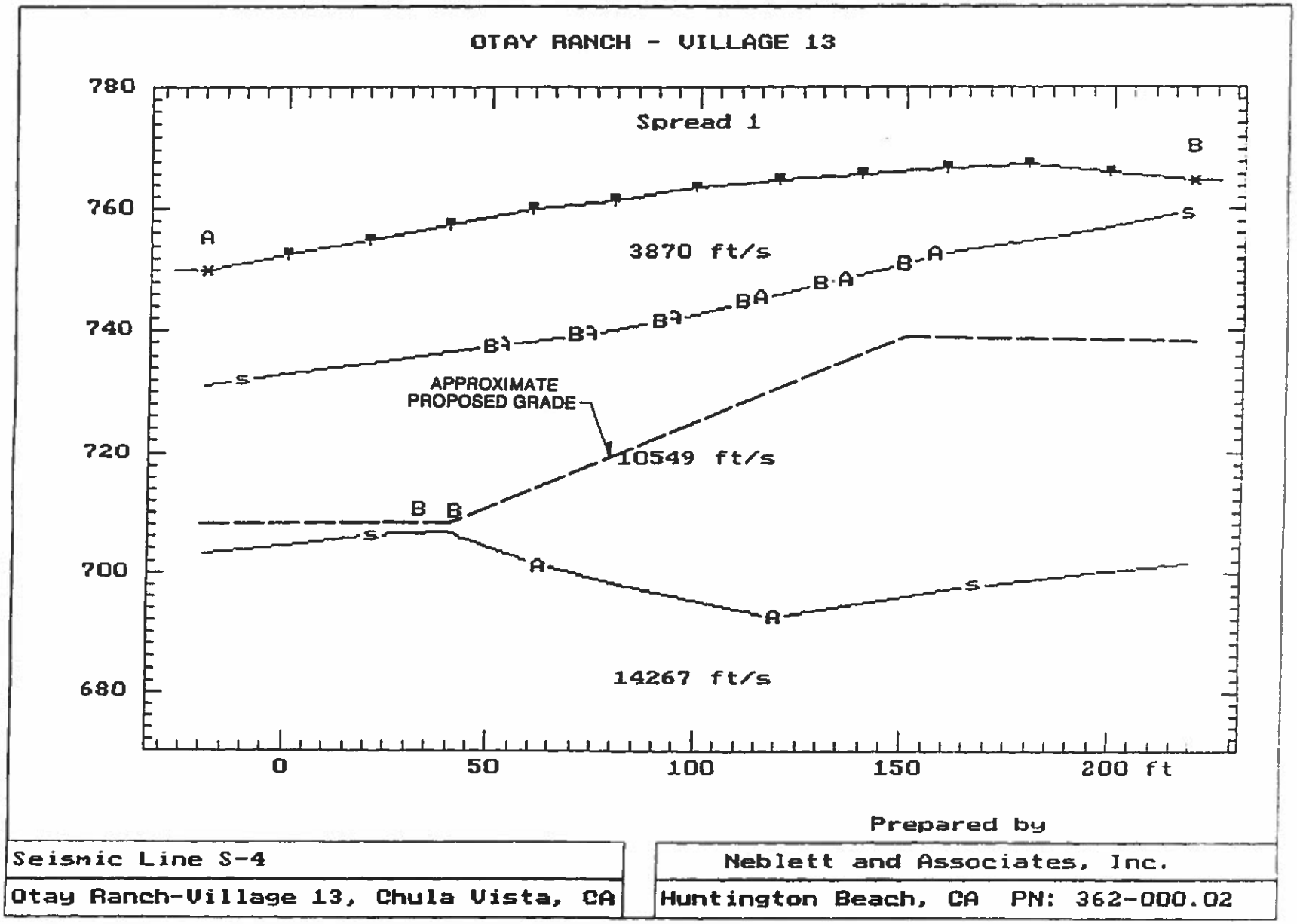
Seismic Line S-1	Neblett and Associates, Inc.
Otay Ranch-Village 13, Chula Vista, CA	Huntington Beach, CA PN: 362-000.02

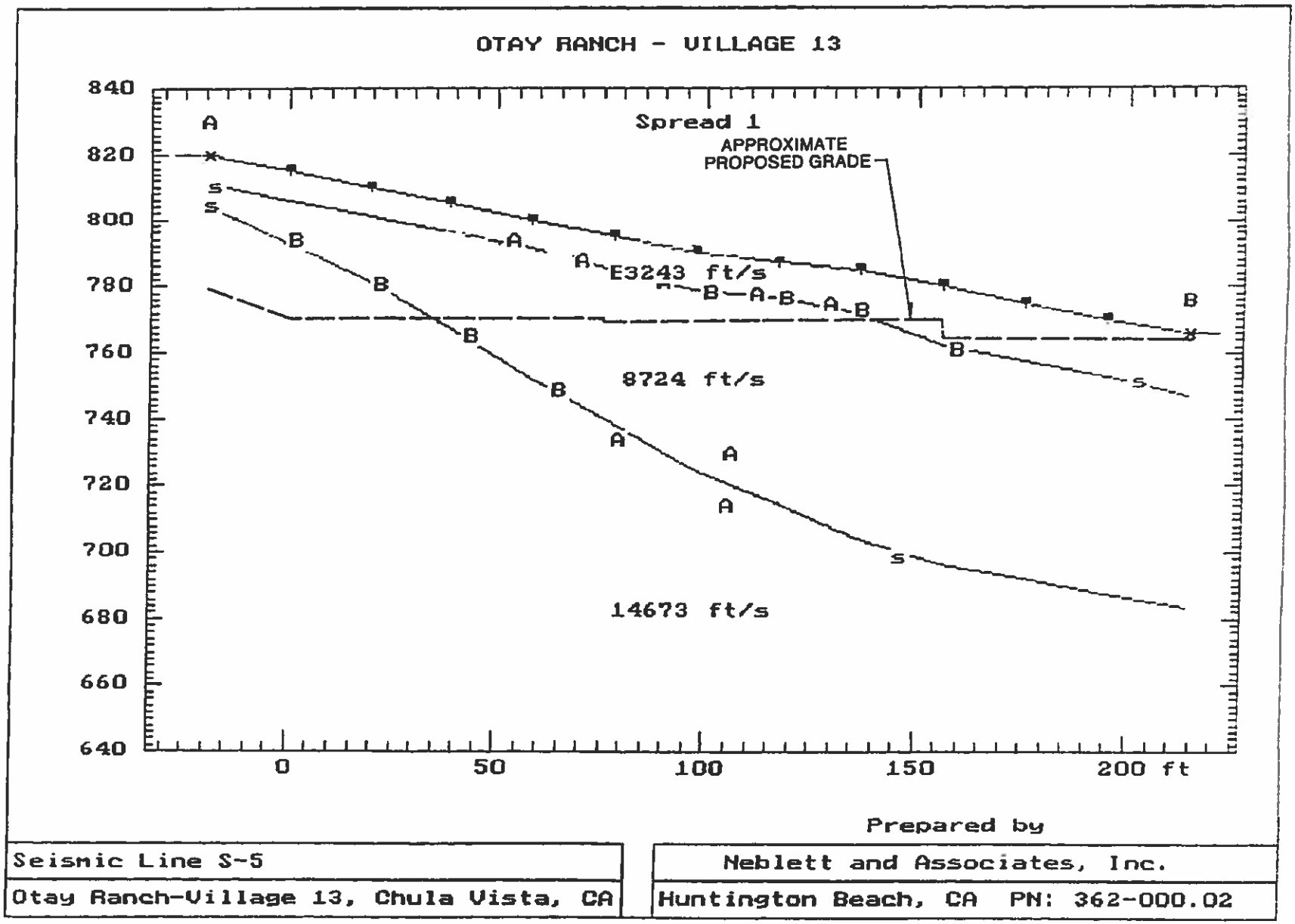


Prepared by

Seismic Line S-2	Neblett and Associates, Inc.
Otay Ranch-Village 13, Chula Vista, CA	Huntington Beach, CA PN: 362-000.02

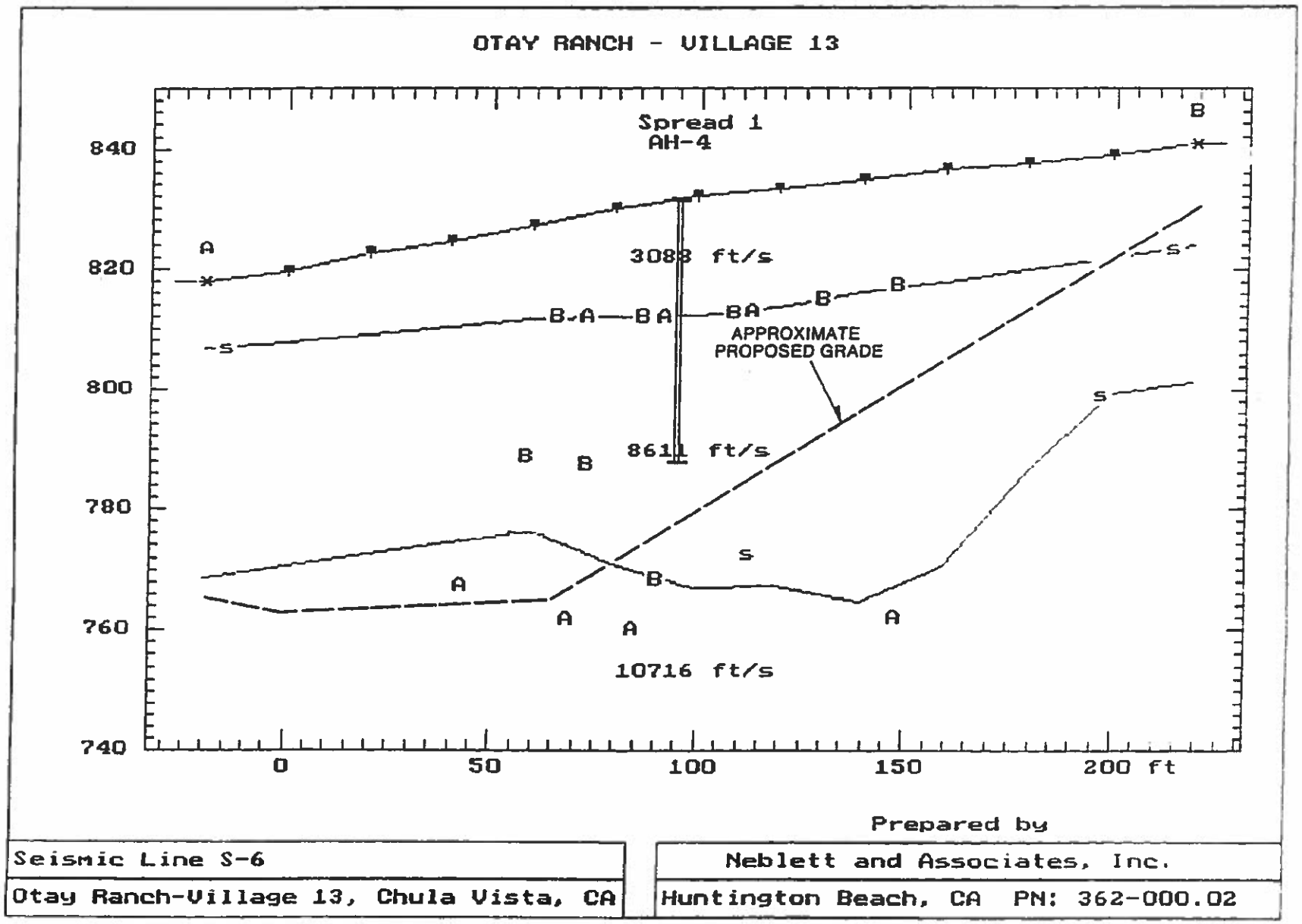

OTAY RANCH - VILLAGE 13
Spread 1
720
710
700
690
680
670
660
650
0
50
100
150
200 ft
A
B
APPROXIMATE
PROPOSED GRADE
4975 ft/s
10208 ft/s
Prepared by
Seismic Line S-3
Otay Ranch-Village 13, Chula Vista, CA
Neblett and Associates, Inc.
Huntington Beach, CA PN: 362-000.02

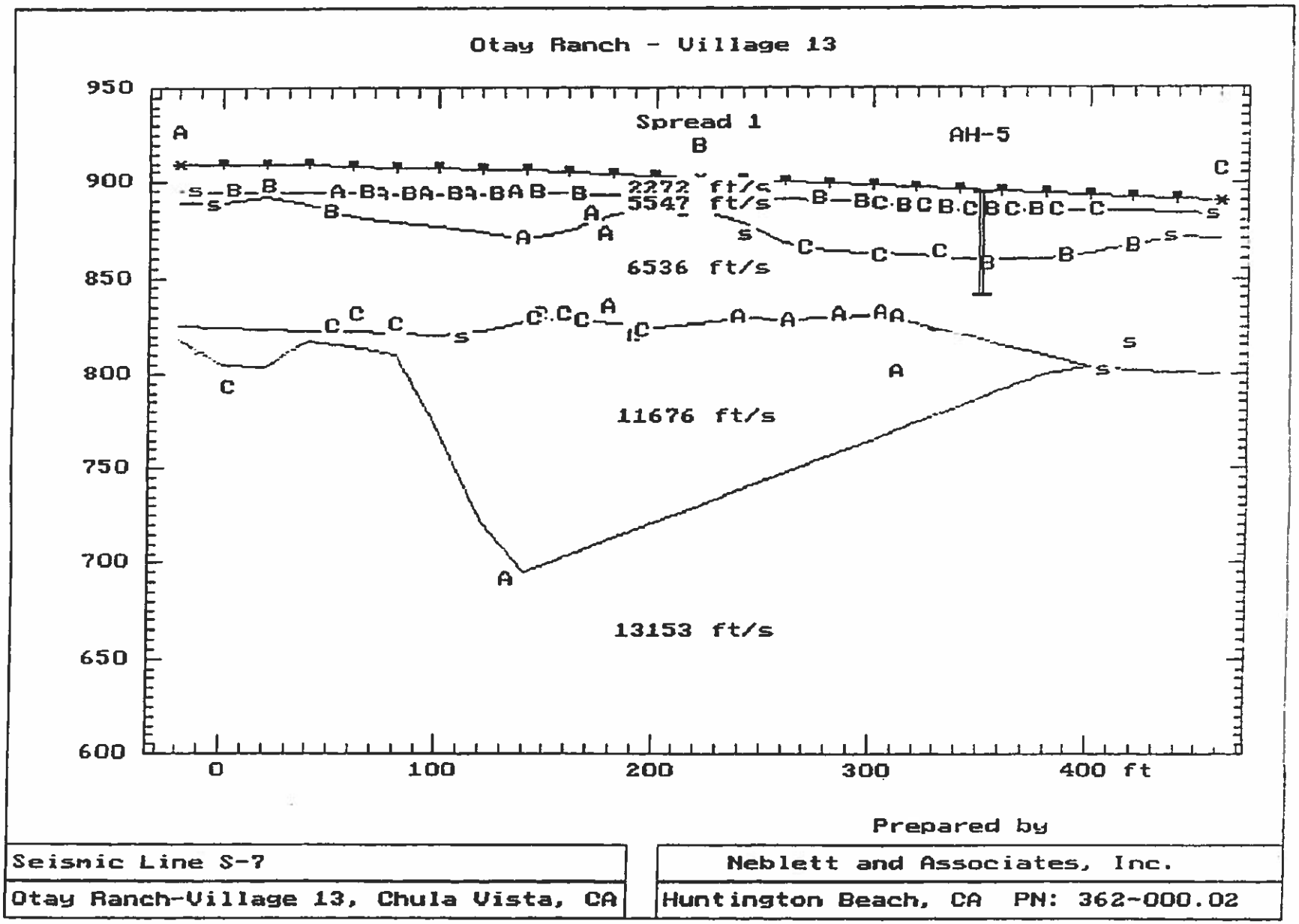

OTAY RANCH - VILLAGE 13
Spread 1
780
760
740
720
700
680
3870 ft/s
10549 ft/s
14267 ft/s
APPROXIMATE
PROPOSED GRADE
0
50
100
150
200 ft
Prepared by
Seismic Line S-4
Otay Ranch-Village 13, Chula Vista, CA
Neblett and Associates, Inc.
Huntington Beach, CA PN: 362-000.02



Prepared by

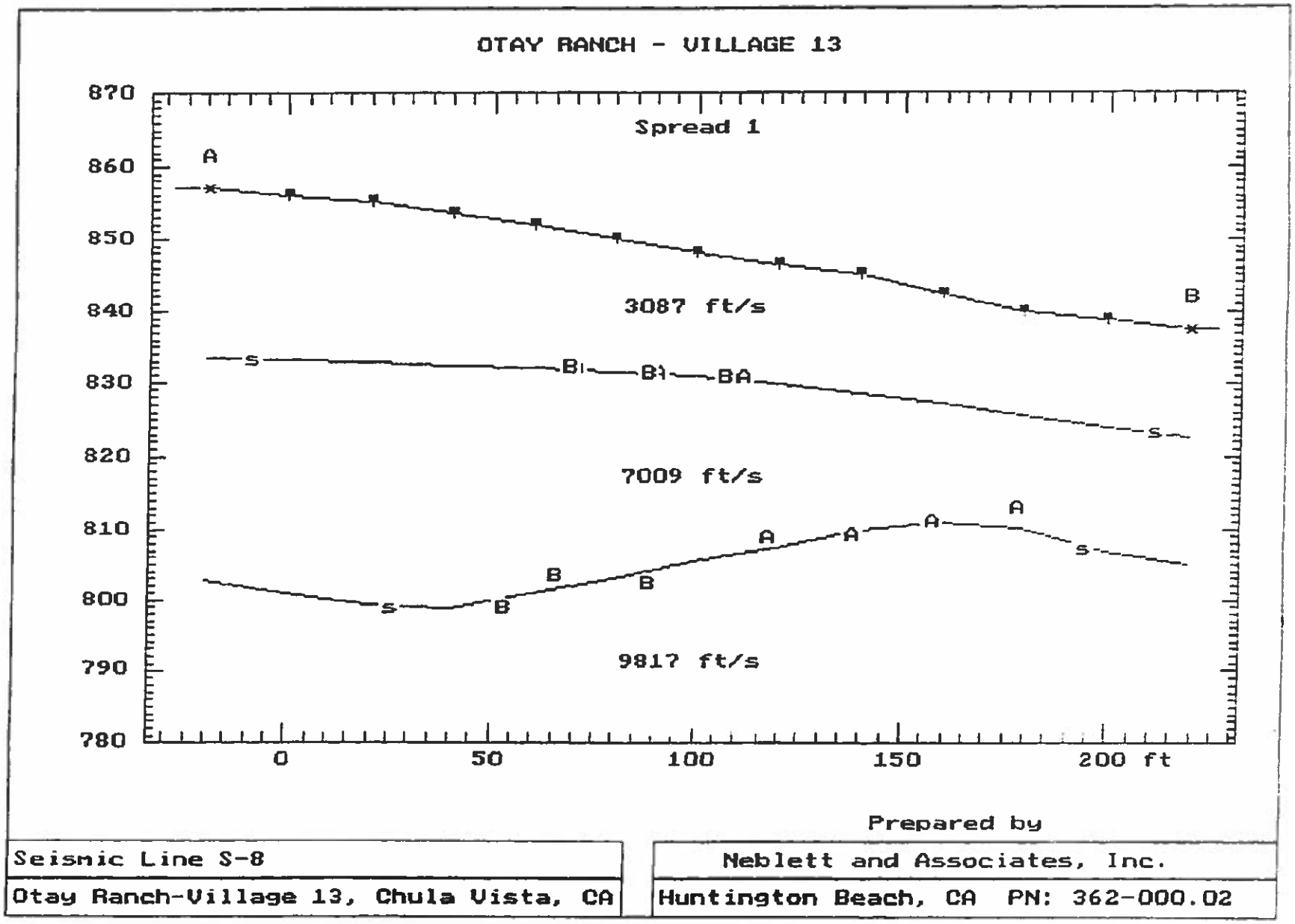
Seismic Line S-5	Neblett and Associates, Inc.
Otay Ranch-Village 13, Chula Vista, CA	Huntington Beach, CA PN: 362-000.02

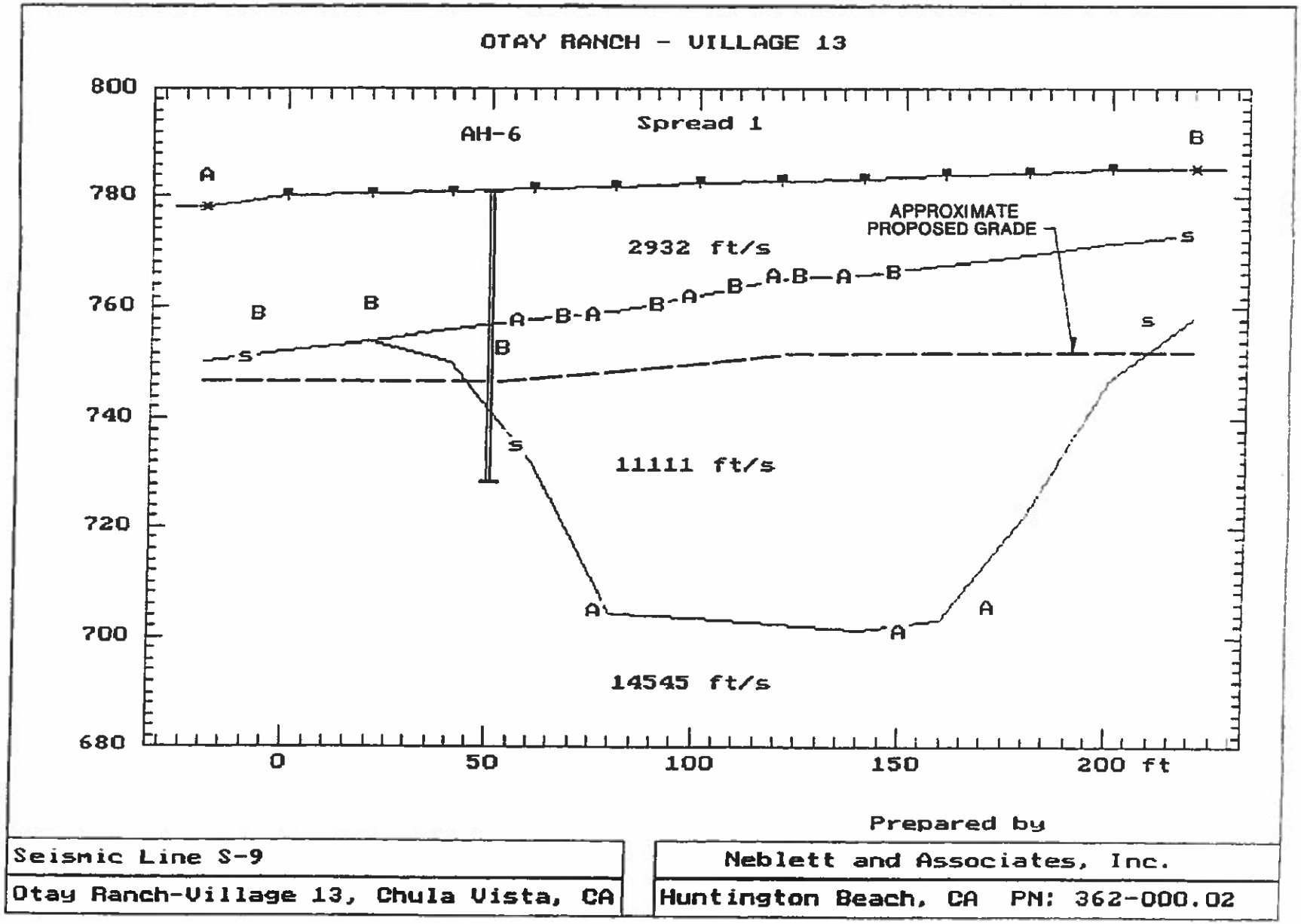

OTAY RANCH - VILLAGE 13
Spread 1
AH-4
840
820
800
780
760
740
0
50
100
150
200 ft
3088 ft/s
8611 ft/s
10716 ft/s
APPROXIMATE
PROPOSED GRADE
Prepared by
Seismic Line S-6
Otay Ranch-Village 13, Chula Vista, CA
Neblett and Associates, Inc.
Huntington Beach, CA PN: 362-000.02

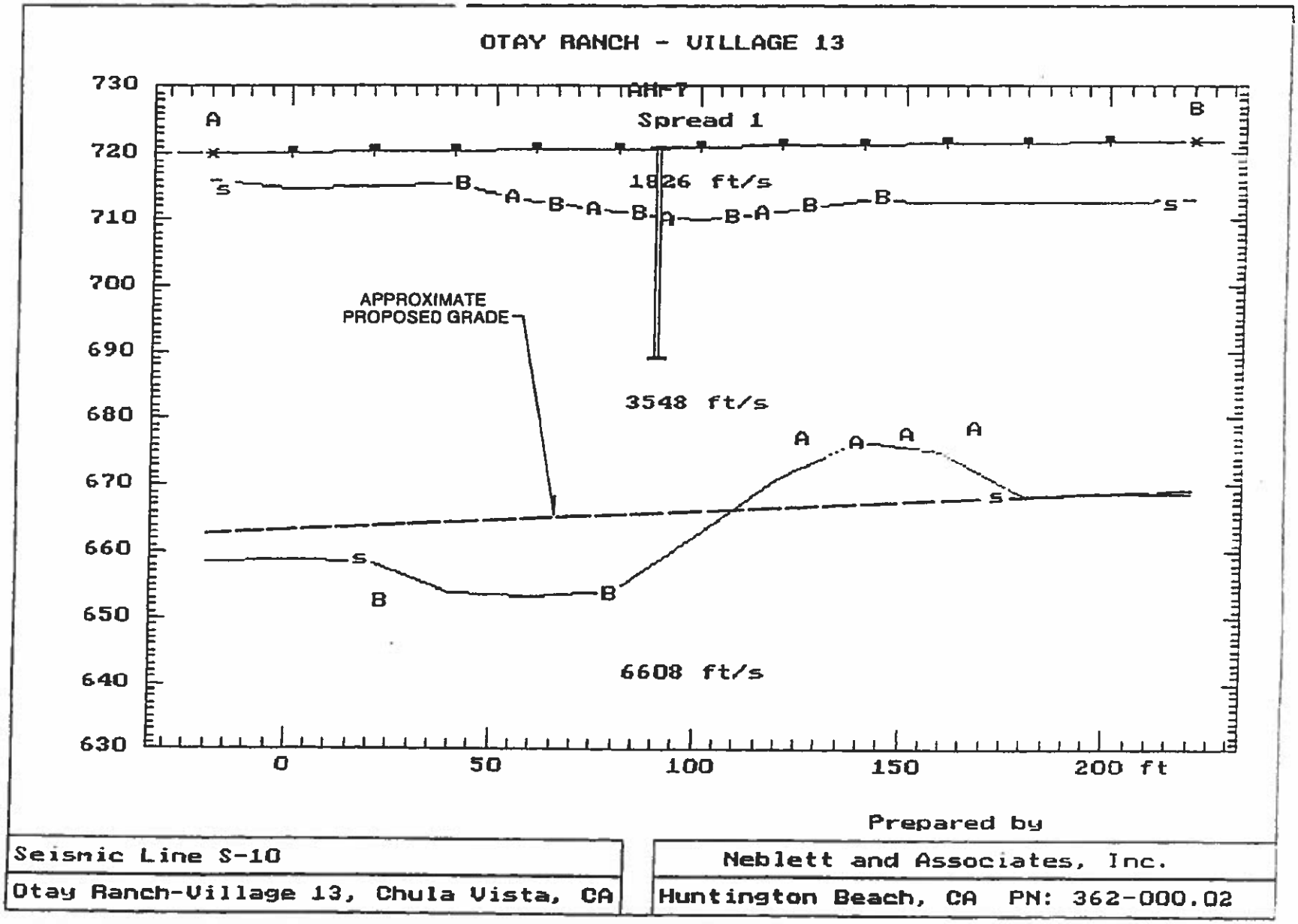


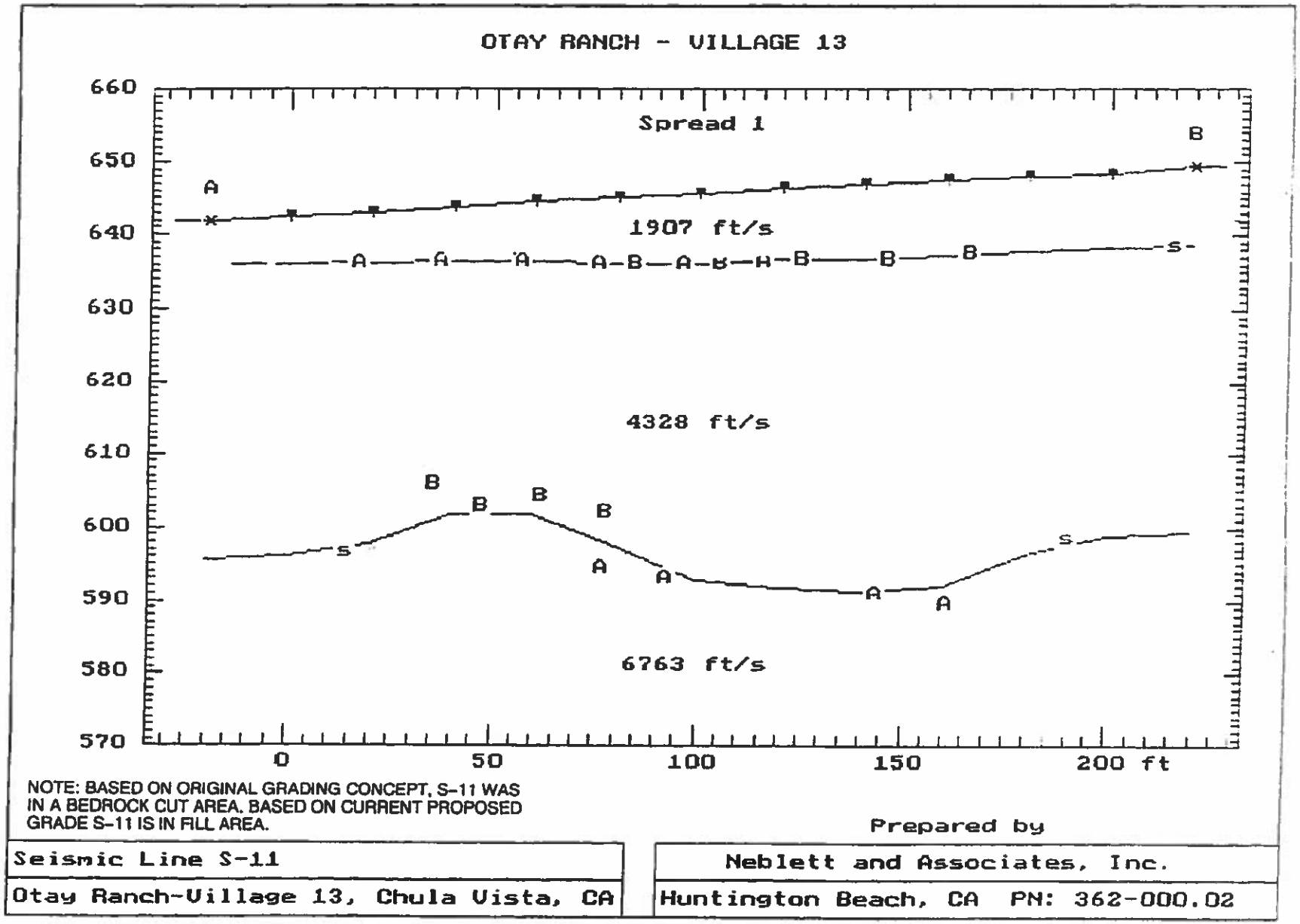
Prepared by

Seismic Line S-7	Neblett and Associates, Inc.
Otay Ranch-Village 13, Chula Vista, CA	Huntington Beach, CA PN: 362-000.02


OTAY RANCH - VILLAGE 13
Spread 1
870
860
850
840
830
820
810
800
790
780
0
50
100
150
200 ft
3087 ft/s
7009 ft/s
9817 ft/s
Prepared by
Seismic Line S-8
Otay Ranch-Village 13, Chula Vista, CA
Neblett and Associates, Inc.
Huntington Beach, CA PN: 362-000.02


OTAY RANCH - VILLAGE 13
800
780
760
740
720
700
680
AH-6
Spread 1
A
B
APPROXIMATE
PROPOSED GRADE
2932 ft/s
11111 ft/s
14545 ft/s
0
50
100
150
200 ft
Prepared by
Seismic Line S-9
Otay Ranch-Village 13, Chula Vista, CA
Neblett and Associates, Inc.
Huntington Beach, CA PN: 362-000.02

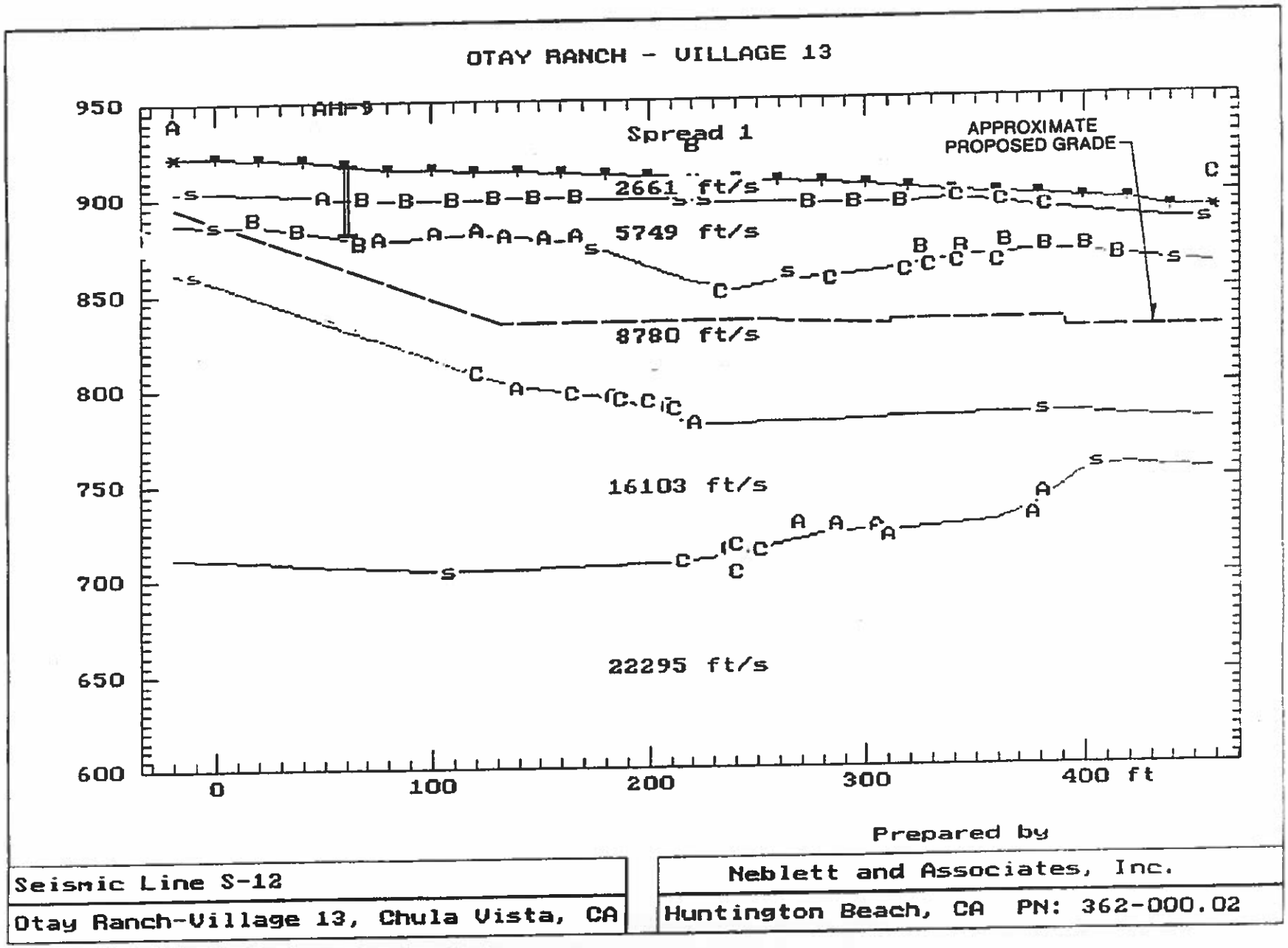

OTAY RANCH - VILLAGE 13
730
720
710
700
690
680
670
660
650
640
630
A
Spread 1
B
1826 ft/s
APPROXIMATE
PROPOSED GRADE
3548 ft/s
6608 ft/s
0
50
100
150
200 ft
Prepared by
Seismic Line S-10
Otay Ranch-Village 13, Chula Vista, CA
Neblett and Associates, Inc.
Huntington Beach, CA PN: 362-000.02

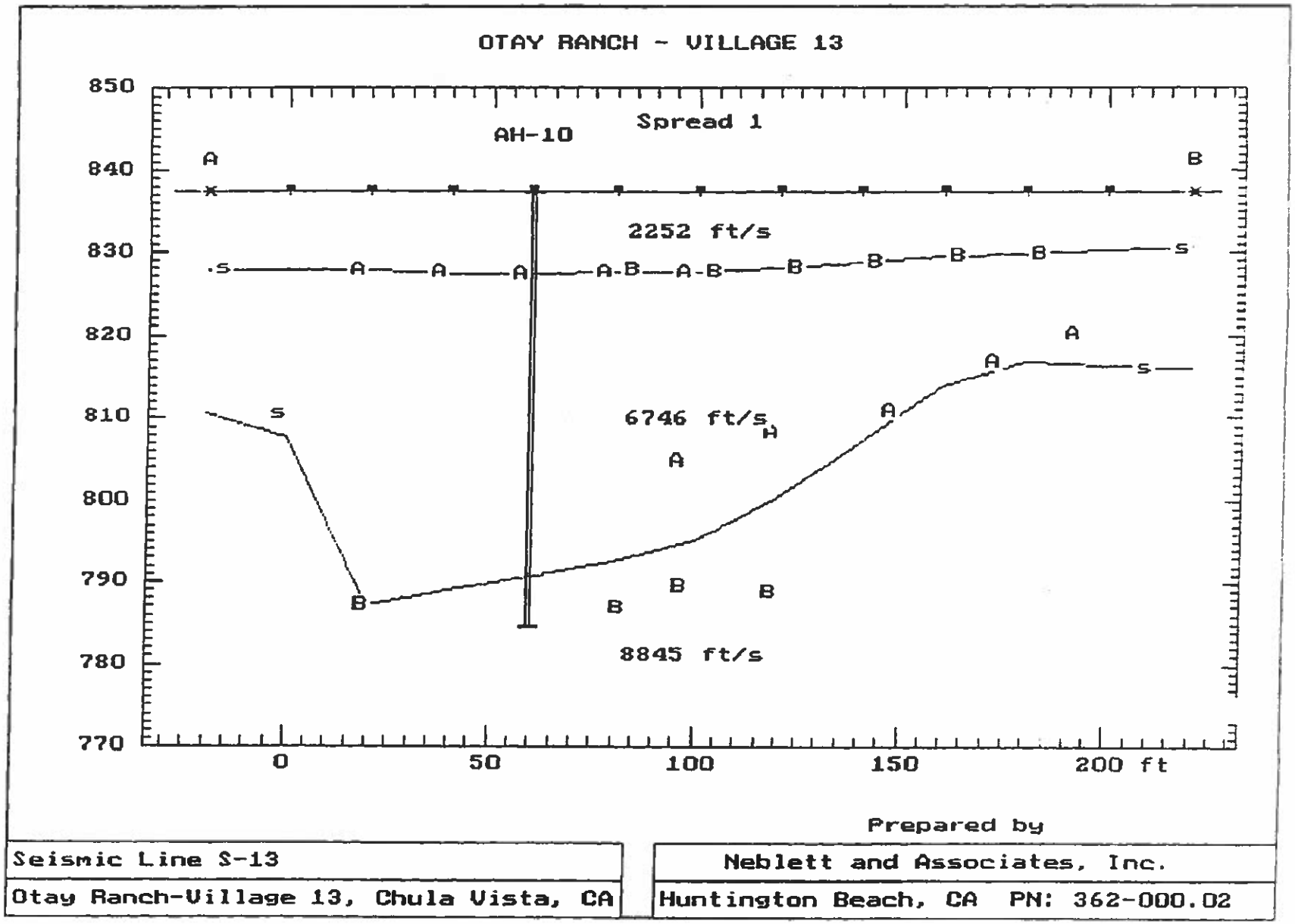


NOTE: BASED ON ORIGINAL GRADING CONCEPT, S-11 WAS IN A BEDROCK CUT AREA. BASED ON CURRENT PROPOSED GRADE S-11 IS IN FILL AREA.

Prepared by

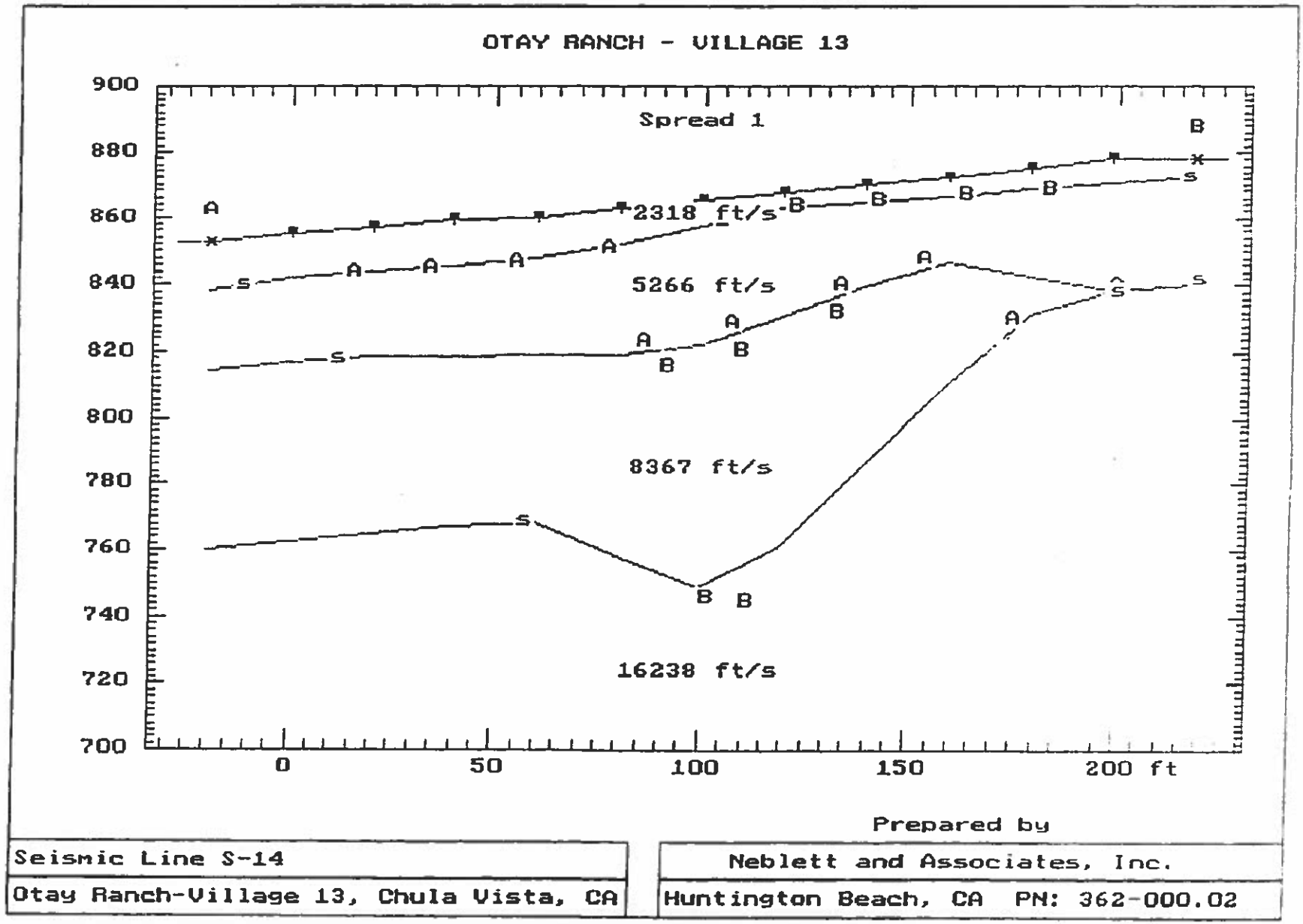
Seismic Line S-11	Neblett and Associates, Inc.
Otay Ranch-Village 13, Chula Vista, CA	Huntington Beach, CA PN: 362-000.02


OTAY RANCH - VILLAGE 13
Spread 1
APPROXIMATE
PROPOSED GRADE
2661 ft/s
5749 ft/s
8780 ft/s
16103 ft/s
22295 ft/s
950
900
850
800
750
700
650
600
0
100
200
300
400 ft
Prepared by
Seismic Line S-12
Otay Ranch-Village 13, Chula Vista, CA
Neblett and Associates, Inc.
Huntington Beach, CA PN: 362-000.02



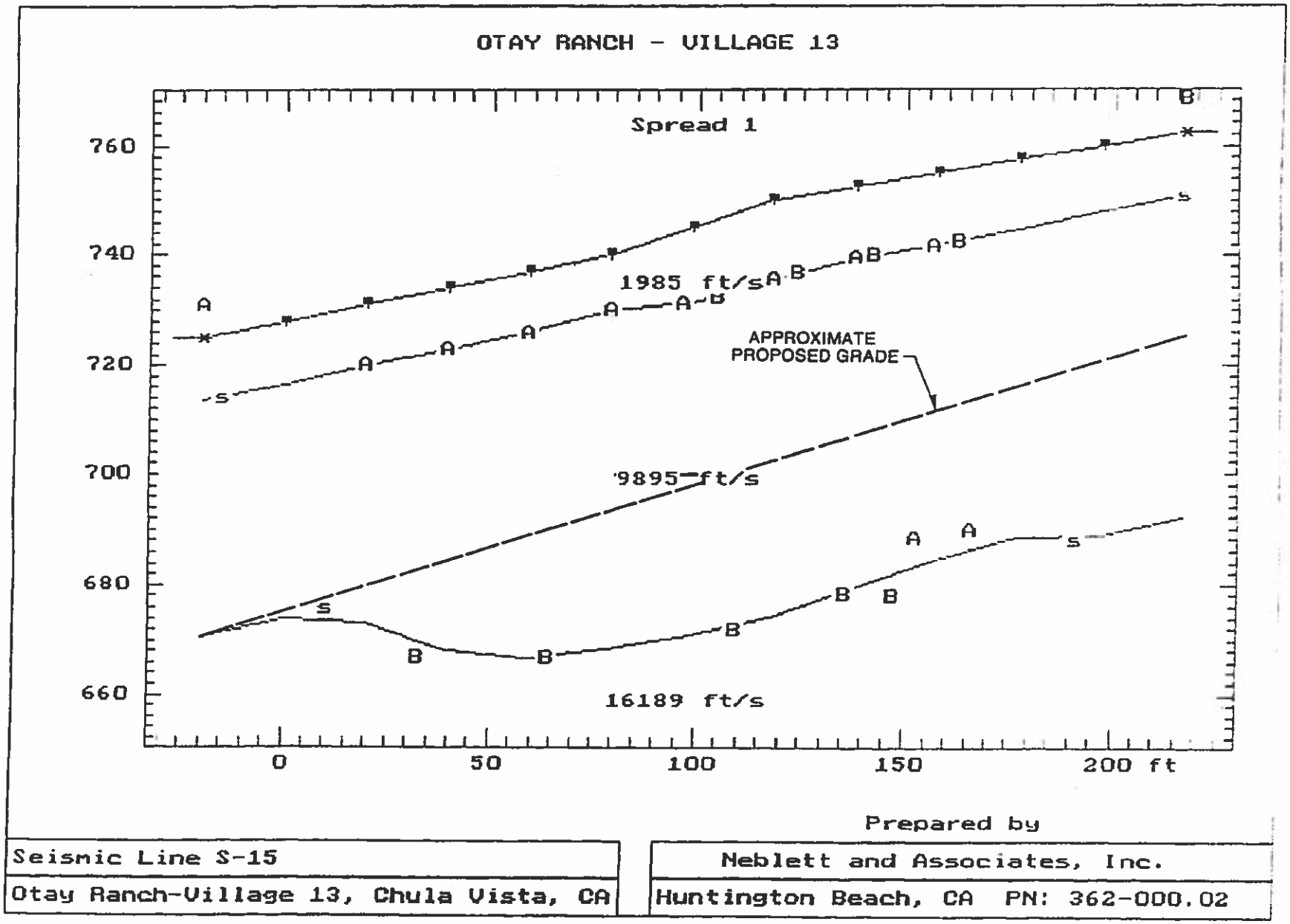
Prepared by

Seismic Line S-13	Neblett and Associates, Inc.
Otay Ranch-Village 13, Chula Vista, CA	Huntington Beach, CA PN: 362-000.02



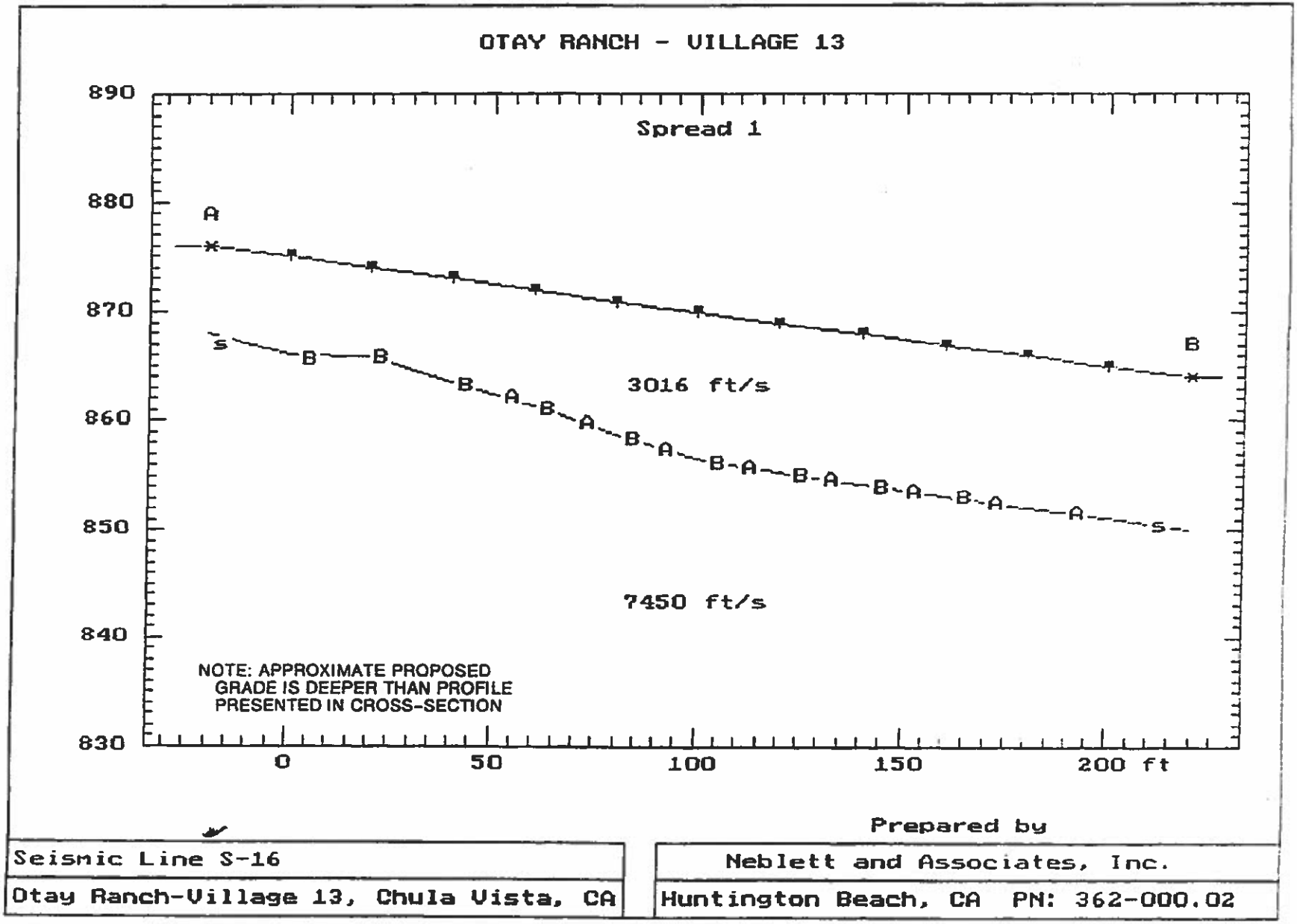
Prepared by

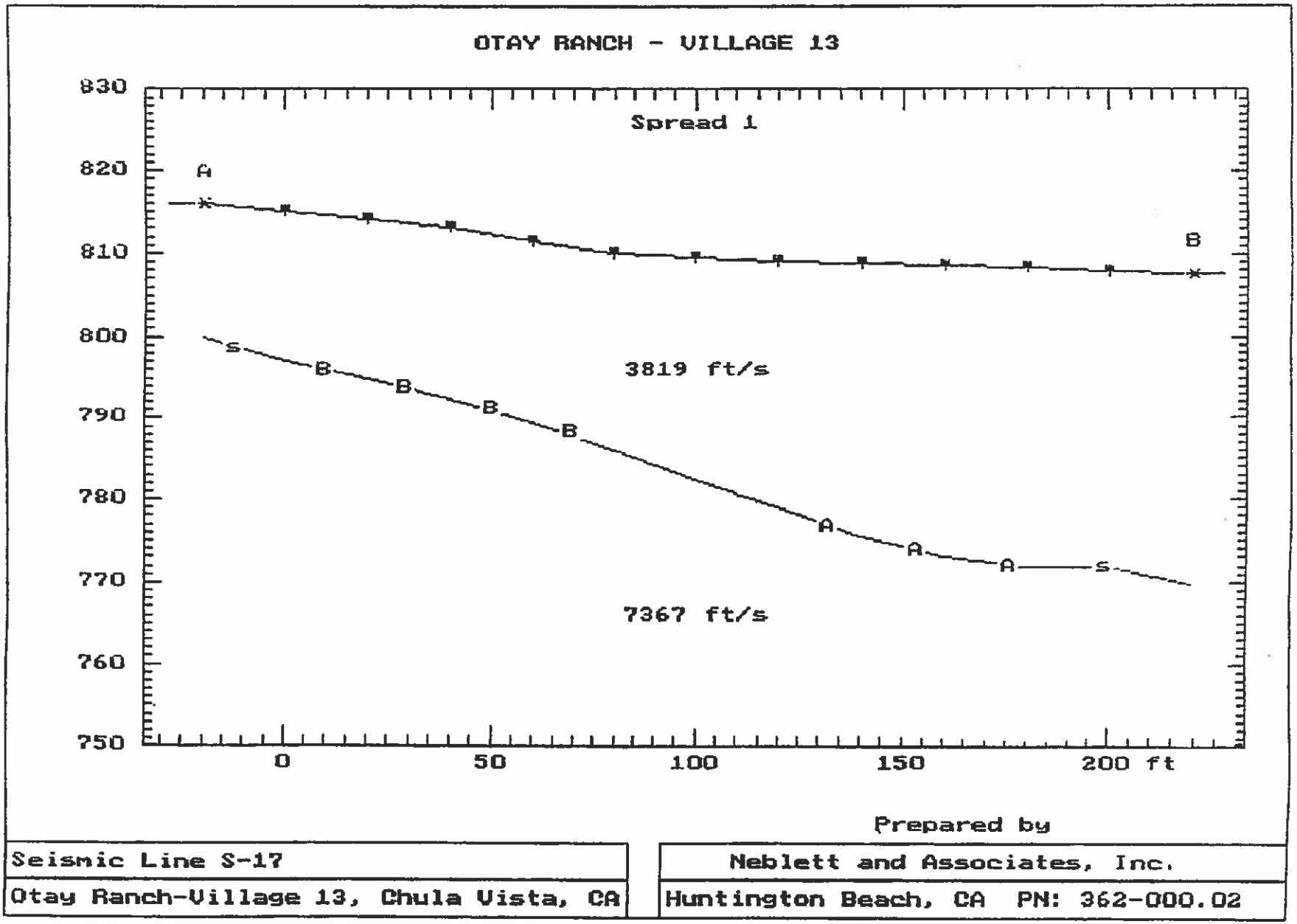
Seismic Line S-14	Neblett and Associates, Inc.
Otay Ranch-Village 13, Chula Vista, CA	Huntington Beach, CA PN: 362-000.02



Prepared by

Seismic Line S-15	Neblett and Associates, Inc.
Otay Ranch-Village 13, Chula Vista, CA	Huntington Beach, CA PN: 362-000.02


OTAY RANCH - VILLAGE 13
Spread 1
890
880
870
860
850
840
830
A
B
3016 ft/s
7450 ft/s
NOTE: APPROXIMATE PROPOSED GRADE IS DEEPER THAN PROFILE PRESENTED IN CROSS-SECTION
0
50
100
150
200 ft
Prepared by
Seismic Line S-16
Otay Ranch-Village 13, Chula Vista, CA
Neblett and Associates, Inc.
Huntington Beach, CA PN: 362-000.02


OTAY RANCH - VILLAGE 13
Spread 1
830
820
810
800
790
780
770
760
750
A
B
S
B
B
B
B
A
A
A
S
3819 ft/s
7367 ft/s
0
50
100
150
200 ft
Prepared by
Seismic Line S-17
Otay Ranch-Village 13, Chula Vista, CA
Neblett and Associates, Inc.
Huntington Beach, CA PN: 362-000.02

APPENDIX E

APPENDIX E

METAVOLCANIC ROCK RIPPABILITY SUMMARY

Our subsurface investigation included excavating 22 air-track borings, 18 seismic-refraction surveys, and 14 excavator trenches within the Metavolcanic Rock. We have also included subsurface exploration information consisting 7 air-track borings, 2 backhoe trenches, and 14 seismic-refraction surveys within the Metavolcanic Rock from a previous geotechnical report by Neblett & Associates (2004) in our analysis. We used information from our subsurface exploration and the previous exploration to estimate the approximate thickness of capping material and the depth to non-rippable rock summarized in Table E-I for each excavation location (if located within Metavolcanic Rock). The rippability information is also presented on the Geologic Map, Figures 2 through 8, at each excavation location within the rock unit. We provided an average value for the data on the geologic map when 2 or more methods were used in the same proximity.

TABLE E-I
METAVOLCANIC ROCK RIPPABILITY SUMMARY

Excavation No.	Geologic Formation	Estimated Thickness of Capping Material after Screening (feet)	Estimated Rippable Depth (feet)
AT-1	Metavolcanic Rock (KJmv)	2	3
AT-2	Metavolcanic Rock (KJmv)	1	1
AT-3	Metavolcanic Rock (KJmv)	0	1
AT-4	Metavolcanic Rock (KJmv)	1	2
AT-6	Fanglomerate Deposits (Tof)/Metavolcanic Rock (KJmv)	23	23
AT-7	Metavolcanic Rock (KJmv)	0	1
AT-8	Fanglomerate Deposits (Tof)/Metavolcanic Rock (KJmv)	34	34
AT-9	Metavolcanic Rock (KJmv)	1	5
AT-10	Metavolcanic Rock (KJmv)	0	2
AT-11	Metavolcanic Rock (KJmv)	0	2
AT-12	Metavolcanic Rock (KJmv))	0	5
AT-13	Metavolcanic Rock (KJmv)	0	0
AT-14	Metavolcanic Rock (KJmv))	1	3
AT-15	Metavolcanic Rock (KJmv)	1	26
AT-16	Metavolcanic Rock (KJmv)	4	7
AT-21	Metavolcanic Rock (KJmv)	5	16
AT-22	Metavolcanic Rock (KJmv)	0	2
AH-2	Metavolcanic Rock (KJmv)	1	13½
AH-3	Metavolcanic Rock (KJmv)	1	10½

TABLE E-I (Continued)
METAVOLCANIC ROCK RIPPABILITY SUMMARY

Excavation No.	Geologic Formation	Estimated Thickness of Capping Material after Screening (feet)	Estimated Rippable Depth (feet)
AH-4	Metavolcanic Rock (KJmv)	2	9
AH-5	Metavolcanic Rock (KJmv)	1	8
AH-6	Metavolcanic Rock (KJmv)	6	19
AH-9	Metavolcanic Rock (KJmv)	1	10
AH-10	Metavolcanic Rock (KJmv)	1	5½
SL-1	Metavolcanic Rock (KJmv)	2	4½
SL-2	Metavolcanic Rock (KJmv)	1	4½
SL-3	Metavolcanic Rock (KJmv)	2	6
SL-4	Metavolcanic Rock (KJmv)	3	5½
SL-5	Metavolcanic Rock (KJmv)	2	3½
SL-6	Metavolcanic Rock (KJmv)	3	5½
SL-7	Metavolcanic Rock (KJmv)	4	12
SL-8	Metavolcanic Rock (KJmv)	4	6½
SL-9	Metavolcanic Rock (KJmv)	4	7½
SL-10	Metavolcanic Rock (KJmv)	4	7½
SL-11	Metavolcanic Rock (KJmv)	2	3½
SL-12	Metavolcanic Rock (KJmv)	3	4½
SL-13	Metavolcanic Rock (KJmv)	2	4
SL-14	Metavolcanic Rock (KJmv)	1	3½
SL-15	Metavolcanic Rock (KJmv)	3	21
SL-16	Metavolcanic Rock (KJmv)	5	7
SL-17	Metavolcanic Rock (KJmv)	3	26
SL-18	Metavolcanic Rock (KJmv)	61	61
S-2	Metavolcanic Rock (KJmv)	1	22
S-3	Metavolcanic Rock (KJmv)	0	12
S-4	Metavolcanic Rock (KJmv)	1	17
S-5	Metavolcanic Rock (KJmv)	1	5
S-6	Metavolcanic Rock (KJmv)	0	18
S-7	Metavolcanic Rock (KJmv)	1	10
S-8	Metavolcanic Rock (KJmv)	1	17
S-9	Metavolcanic Rock (KJmv)	0	16
S-12	Metavolcanic Rock (KJmv)	1	10
S-13	Metavolcanic Rock (KJmv)	0	9
S-14	Metavolcanic Rock (KJmv)	0	7

TABLE E-I (Concluded)
METAVOLCANIC ROCK RIPPABILITY SUMMARY

Excavation No.	Geologic Formation	Estimated Thickness of Capping Material after Screening (feet)	Estimated Rippable Depth (feet)
S-15	Metavolcanic Rock (KJmv)	0	8
S-16	Metavolcanic Rock (KJmv)	1	10
S-17	Fanglomerate Deposits (Tof)/Metavolcanic Rock (KJmv)	20	20
ET-1	Metavolcanic Rock (KJmv)	1	>3
ET-2	Metavolcanic Rock (KJmv)	½	2½
ET-3	Metavolcanic Rock (KJmv)	3	>13
ET-4	Metavolcanic Rock (KJmv)	5	>14
ET-5	Metavolcanic Rock (KJmv)	2	>9
ET-8	Metavolcanic Rock (KJmv)	½	>12
ET-19	Metavolcanic Rock (KJmv)	0	>3
ET-22	Metavolcanic Rock (KJmv)	0	>12
ET-23	Alluvium (Qal)/ Metavolcanic Rock (KJmv)	10	>14
ET-39	Alluvium (Qal)/Otay Formation (To) Metavolcanic Rock (KJmv)	5½	>6
ET-41	Metavolcanic Rock (KJmv)	4	>12
ET-44	Metavolcanic Rock (KJmv)	0	>5
ET-45	Metavolcanic Rock (KJmv)	3	>5
ET-46	Metavolcanic Rock (KJmv)	4	>12
NT-45	Alluvium (Qal)/Metavolcanic Rock (KJmv)	>4	--
NT-46	Metavolcanic Rock (KJmv)	>5½	--

APPENDIX F

APPENDIX F

LABORATORY TESTING

We performed laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were analyzed for in-situ dry density and moisture content, maximum dry density and optimum moisture content, direct shear strength, expansion potential, Atterberg limits, water-soluble sulfate, water-soluble chloride ion, pH and resistivity, R-Value, aggregate quality, and gradation. The results of the laboratory tests are presented on Tables F-I through F-IX and Figures F-1 through F-4. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A.

TABLE F-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
ET6-1	Dark brown, Clayey SAND	128.9	8.6
ET6-2	Light olive brown, Silty CLAY	117.7	14.2
ET8-1	Reddish brown, Clayey SAND	126.3	10.3
ET14-1	Reddish brown, Clayey SAND	131.9	7.7
ET16-2	Yellowish brown, Clayey SAND	117.8	14.3
ET21-2	Yellowish brown, Silty SAND	124.2	10.9
ET35-1	Light yellowish brown, Clayey SAND	125.5	11.0
ET41-1	Brown, Clayey SAND (Weathered KJmv)	117.6	13.9

TABLE F-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Dry Density (pcf)	Moisture Content (%)		Peak [Ultimate] Cohesion (psf)	Peak [Ultimate] Angle of Shear Resistance (degrees)
		Initial	After Test		
LB1-5	115.0	17.0	22.9	525[475]	29[25]
LB1-6	101.9	23.4	29.1	525[375]	21[19]
LB1-7**	n/a	n/a	n/a	430	22
LB1-9	102.2	25.0	31.9	350[600]	20[20]
LB1-12	104.1	23.0	29.8	450[425]	32[16]
LB3-3	118.1	15.5	21.7	750[125]	32[29]
LB3-4	122.2	9.6	14.0	700[225]	40[40]
LB3-7	108.8	18.2	26.8	525[300]	31[30]
LB4-4	121.6	13.1	18.9	700[500]	33[29]
LB4-5	120.7	13.3	18.5	775[850]	34[30]
LB10-3	121.6	8.6	14.5	625[725]	45[43]
LB11-1	111.1	15.7	21.6	875[1000]	32[27]
LB12-1	108.2	17.7	21.8	300[500]	26[26]
LB17-1	113.2	15.3	20.5	500[725]	31[19]
LB17-2	112.6	18.0	23.4	300[375]	30[20]
ET6-1*	115.5	8.9	20.5	190 [140]	32 [32]
ET6-2*	107.1	12.8	22.9	380 [295]	16 [15]
ET8-1*	112.9	10.9	20.4	235	35
ET16-2*	104.7	15.5	24.7	390	24
ET35-1*	112.0	11.3	21.6	255 [215]	33 [33]
ET41-1*	105.5	14.1	21.0	240 [120]	32 [35]

*Sample remolded to a dry density of approximately 90 percent of the laboratory maximum dry density near optimum moisture content.
**Fully softened remolded sample.

TABLE F-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification
	Before Test	After Test			
ET6-2	12.5	29.5	98.5	63	Medium
ET9-1	9.3	19.1	112.4	40	Low
ET16-2	11.7	27.2	104.6	95	High
ET18-1	11.6	28.4	103.0	103	High
ET18-2	8.6	18.9	113.1	33	Low
ET37-1	10.9	25.3	105.2	66	Medium
ET41-1	11.3	26.6	102.2	57	Medium
ET46-1	13.9	34.8	93.0	90	Medium

TABLE F-IV
SUMMARY OF LABORATORY ATTERBERG LIMITS TEST RESULTS
ASTM D 4318

Sample No.	Liquid Limit	Plastic Limit	Plasticity Index
LB1-9	72	29	43
LB1-10	74	28	46
ET6-2	61	18	43

TABLE F-V
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Water-Soluble Sulfate (%)	Water-Soluble Sulfate (ppm)	ACI 318 Sulfate Exposure
ET6-2	0.050	500	S0
ET9-1	0.002	20	S0
ET16-2	0.201	2,010	S2
ET18-1	0.118	1,180	S1
ET18-2	0.008	80	S0
ET37-1	0.172	1,720	S1
ET46-1	0.975	9,750	S2

TABLE F-VI
SUMMARY OF LABORATORY WATER-SOLUBLE CHLORIDE ION CONTENT TEST RESULTS
AASHTO TEST NO. T 291

Sample No.	Chloride Ion Content (%)	Chloride Ion Content (ppm)
ET17-1	0.188	1,882

TABLE F-VII
SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (PH) AND RESISTIVITY TEST RESULTS
CALIFORNIA TEST METHOD 643

Sample No.	pH	Minimum Resistivity (ohm-centimeters)
ET17-1	7.8	180

TABLE F-VIII
SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
ASTM D 2844

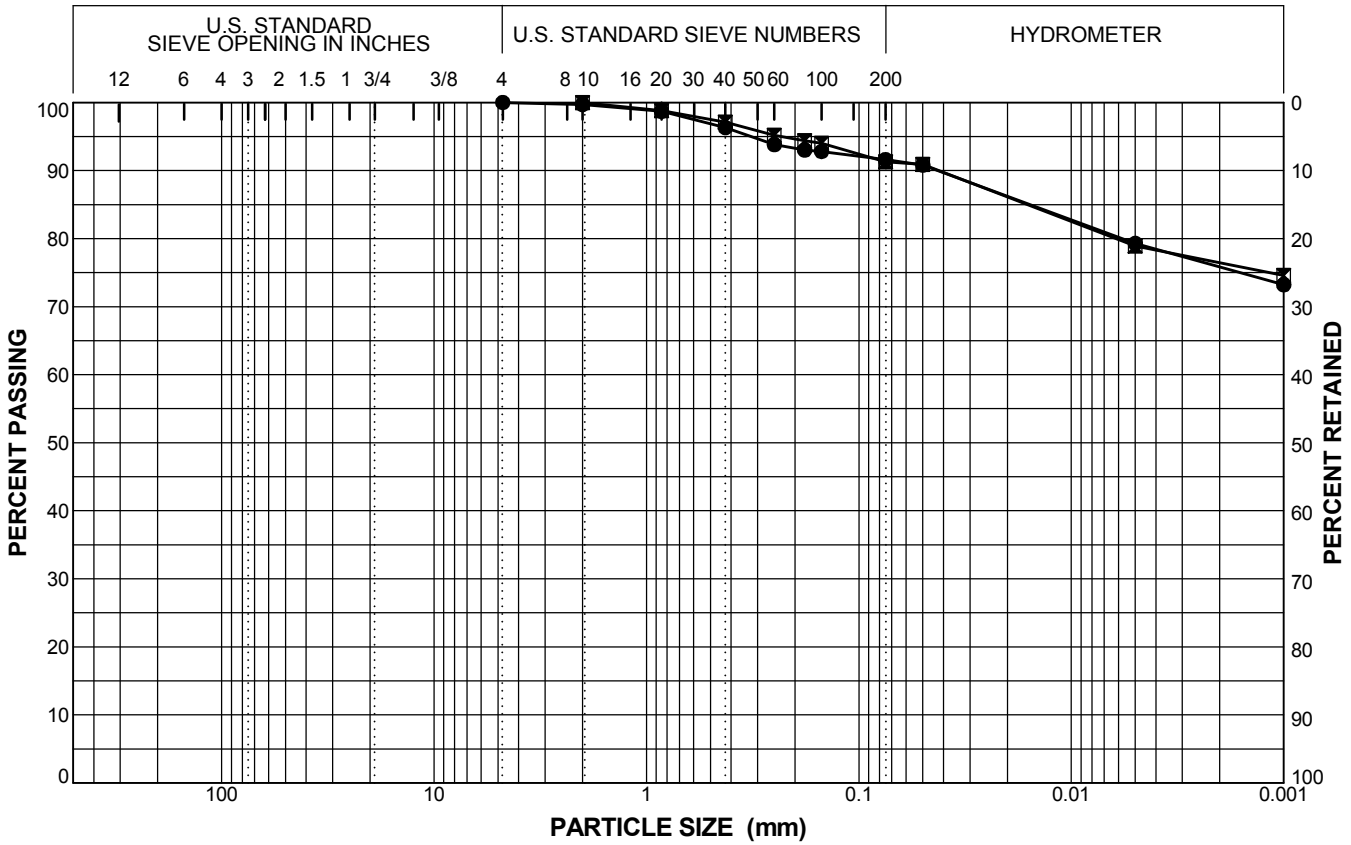
Sample No.	R-Value
ET28-1	23

TABLE F-IX
SUMMARY OF LABORATORY AGGREGATE QUALITY TEST RESULTS

Test Type	Sample Number				Specified Value
	ET19-1	ET22-1	ET26-1	ET44-1	
Apparent Specific Gravity ASTM C128	2.6	2.6	2.7	2.7	2.5 Minimum (Greenbook)
Absorption ASTM C128 (%)	0.5	0.1	1.0	1.5	4.2 Maximum (Greenbook)
Density ASTM C128 (pcf)	162.3	164.4	164.6	159.2	--
Durability Index California Test 229	87	93	82	73	35 Minimum (Caltrans)
L.A. Abrasion ASTM C131 (%Wear, 200 Revolutions)	6	6	10	10	15 Maximum (Greenbook)
L.A. Abrasion ASTM C131 (% Wear, 500 Revolutions)	14	13	18	20	52 Maximum (Greenbook)
Geologic Unit	Metavolcanic Rock (KJmv)	Metavolcanic Rock (KJmv)	Fanglomerate Deposits Cobble (Tof)	Metavolcanic Rock (KJmv)	--

PROJECT NO. G1012-52-01A

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



	SAMPLE	DEPTH (ft)	CLASSIFICATION	% Gravel	% Sand	% Fines
●	LB1-9	35.0	(CH) Silty CLAY	0	8	92
⊠	LB1-10	39.5	(CH) Silty CLAY	0	9	91
▲						

GRADATION CURVE

OTAY RANCH RESORT VILLAGE

SAN DIEGO COUNTY, CALIFORNIA

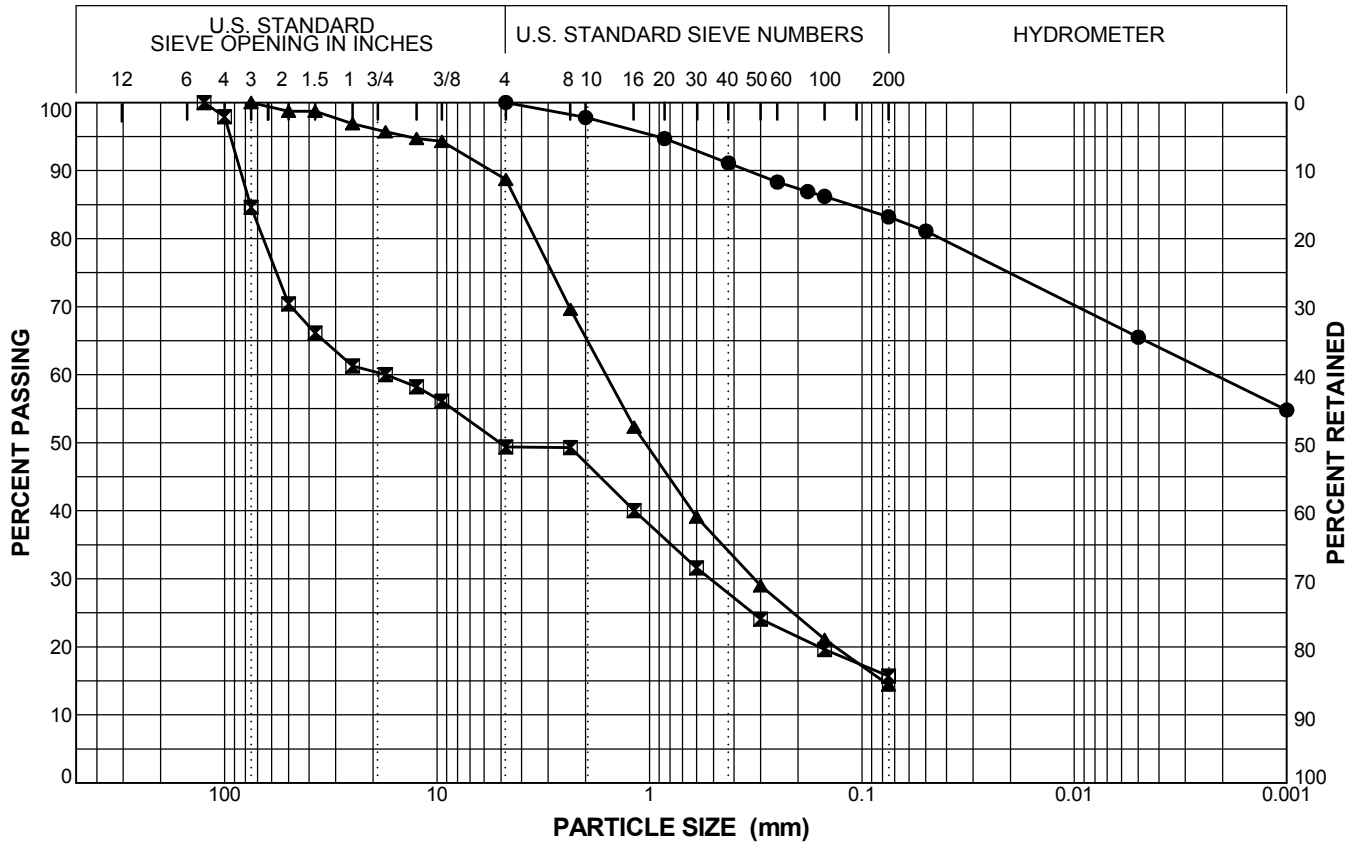
G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

Figure F-1

GEOCON

PROJECT NO. G1012-52-01A

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



	SAMPLE	DEPTH (ft)	CLASSIFICATION	% Gravel	% Sand	% Fines
●	ET6-2	10.5	(CH) CLAY with sand	0	17	83
⊠	ET9-2	8.5	(GC) Clayey GRAVEL with sand	35	34	16
▲	ET13-1	7.0	(SC) Clayey SAND	11	74	14

GRADATION CURVE

OTAY RANCH RESORT VILLAGE

SAN DIEGO COUNTY, CALIFORNIA

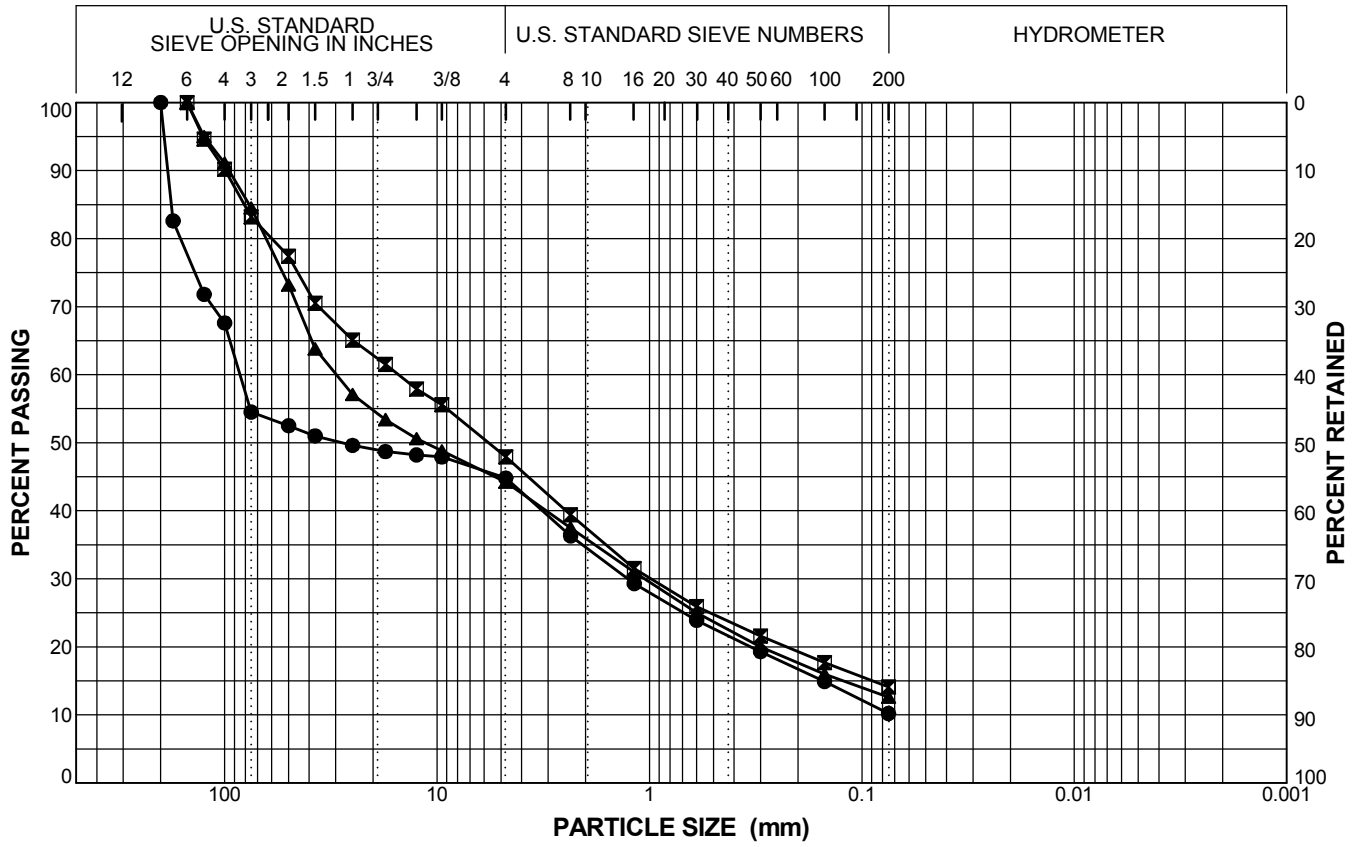
G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

Figure F-2

GEOCON

PROJECT NO. G1012-52-01A

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



	SAMPLE	DEPTH (ft)	CLASSIFICATION	% Gravel	% Sand	% Fines
●	ET15-1	6.0	(GP-GM) GRAVEL with silt or clay and sand	10	35	10
⊠	ET33-1	1.0	(GM) Silty GRAVEL with sand	35	34	14
▲	ET36-1	5.0	(GM) Silty GRAVEL with sand	40	32	13

GRADATION CURVE

OTAY RANCH RESORT VILLAGE

SAN DIEGO COUNTY, CALIFORNIA

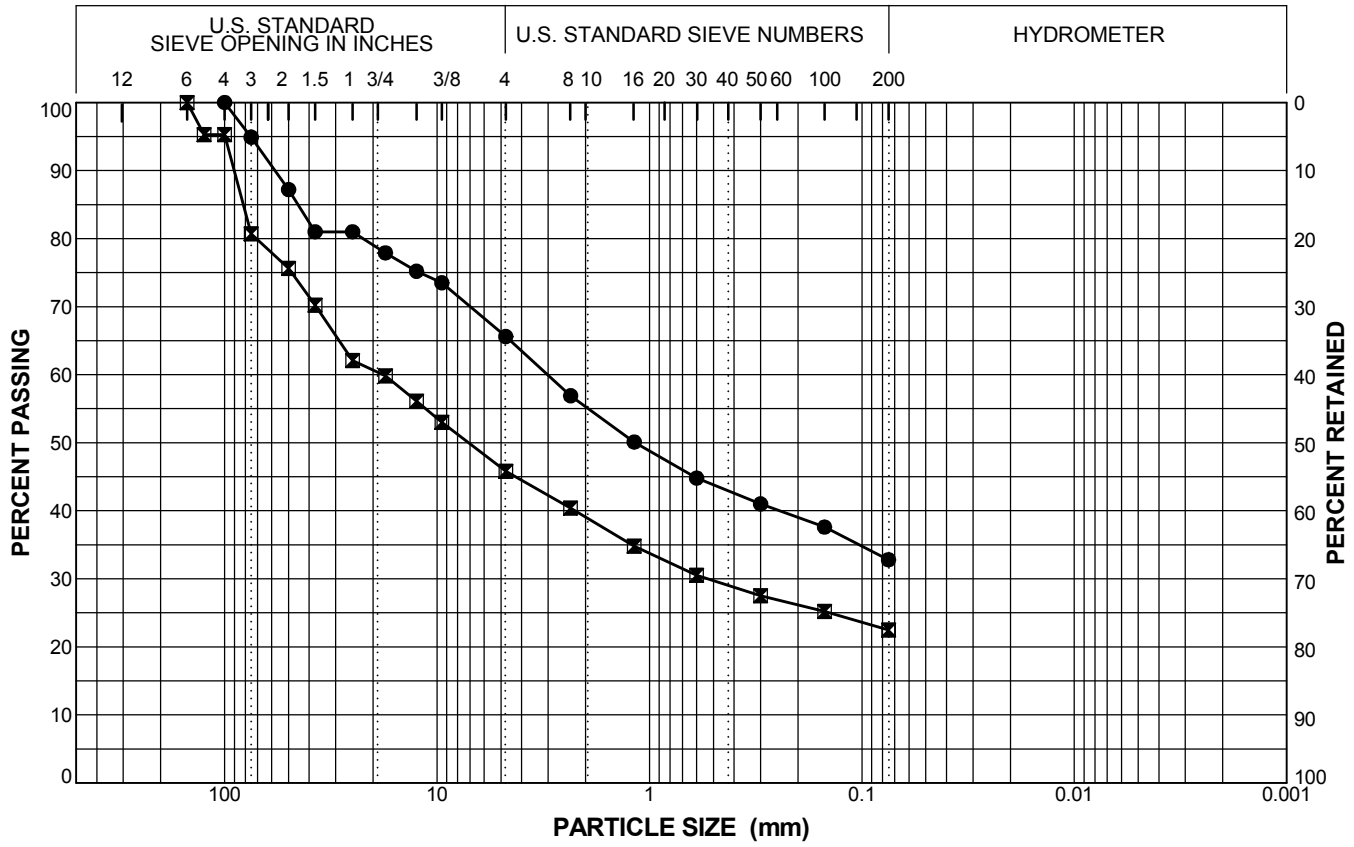
G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

Figure F-3

GEOCON

PROJECT NO. G1012-52-01A

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



	SAMPLE	DEPTH (ft)	CLASSIFICATION	% Gravel	% Sand	% Fines
●	ET41-1	6.0	(GC) Clayey GRAVEL with sand	29	33	33
⊠	ET43-1	1.0	(GC) Clayey GRAVEL with sand	35	23	23
▲						

GRADATION CURVE

OTAY RANCH RESORT VILLAGE

SAN DIEGO COUNTY, CALIFORNIA

G1012-52-01A (OTAY RANCH RESORT VILLAGE).GPJ

Figure F-4

GEOCON

APPENDIX G

APPENDIX G

SLOPE STABILITY ANALYSIS

We performed slope stability analyses using a two-dimensional computer software *GeoStudio2004* developed by Geo-Slope International Ltd. We analyzed the critical modes of potential slip surfaces including rotational-mode and block-mode based on Spencer's method. The soil parameters used, case conditions, and the calculated factors of safety were presented herein. Plots of analyses' results, including the soil stratigraphy, potential failure surfaces, and calculated Factors of Safety, are included in this appendix.

Shear strength characters of the existing geologic units were estimated based on laboratory direct shear tests on samples obtained during our field investigation in accordance with ASTM D 3080 (see Appendix F), and based on empirical data obtained from the referenced geotechnical literature. The soil parameters used for the stability analyses are presented on Table G-I.

TABLE G-I
SUMMARY OF SOIL PROPERTIES USED FOR SLOPE STABILITY ANALYSES

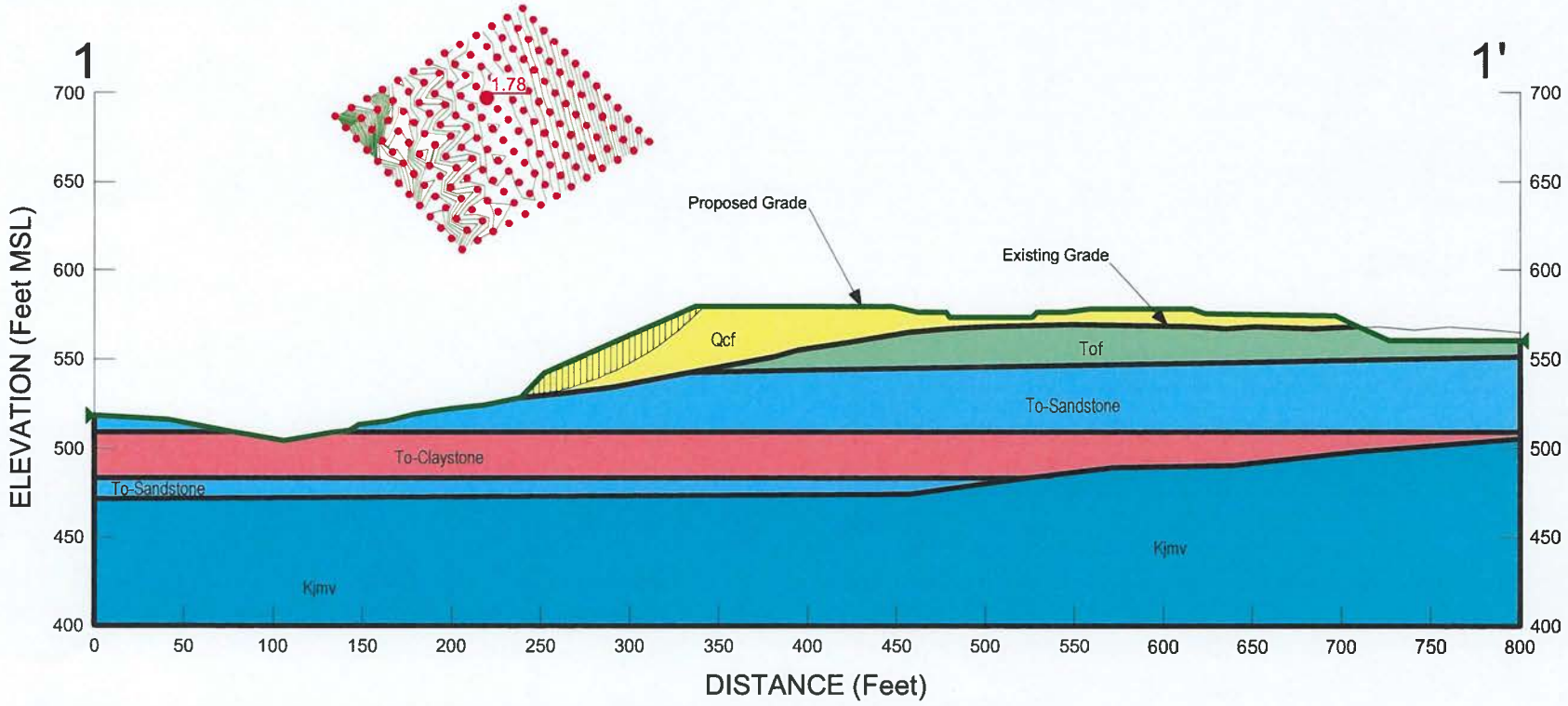
Geologic Unit/Material	Density (pcf)	Cohesion (psf)	Friction Angle (degrees)
Compacted Fill (Qcf)	125	250	30
Surficial Deposits	120	300	16
Fanglomerate Deposits (Tof)	130	200	31
Otay Formation (To) - Sandstone	130	700	34
Otay Formation (To) – Sandstone (Clayey)	130	700	30
Otay Formation (To) – Claystone	130	300	22
Otay Formation (To) – Claystone (WEAK)	130	300	20
Metavolcanic Rock (KJmv)	130	1,000	35

We selected Cross Sections 1-1′, 10-10' and 11-11' to perform the slope stability analyses. Table G-II provides a summary of cases analyzed and calculated Factors of Safety. A minimum Factor of Safety of 1.5 under static conditions is currently required by the County of San Diego for slope stability. Results of slope stability analyses are plotted on the following figures. As discussed herein, we encountered discontinuous claystone layers in some of the exploratory borings and trenches within the Otay Formation (To) and Fanglomerate Deposits (Tof). The claystone possesses relatively low shear strengths and may be prone to slope instability if exposed in cut slopes. This geologic claystone layer is shown on cross sections 1-1′ and 3-3". Surficial slope stability calculations are presented herein.

TABLE G-II
SUMMARY OF SLOPE STABILITY ANALYSES

Cross Section	Case Name	Condition of Slope Stability Analyses	Calculated Factor of Safety
1-1'	1-1'_Case1	Minimum Rotational-Mode Factor of Safety of Fill Slope – Static	1.78
	1-1'_Case1	Minimum Block-Mode Factor of Safety of Fill Slope – Static	2.02
10-10'	10-10'_Case1	Minimum Rotational-Mode Factor of Safety of Fill Slope – Static	1.70
11-11'	11-11'_Case1	Minimum Rotational-Mode Factor of Safety of Rock Slope – Static	2.53
N/A	--	Surficial Slope Stability Analysis	2.2

Otay Ranch Resort Village
Project No. G1012-52-02
Cross Section 1-1'
Name: 1-1'_Case 1.gsz
Date: 1/30/2018 Time: 8:55:28 AM
Name: Qcf Unit Weight: 125 pcf Cohesion: 250 psf Phi: 30 °
Name: Kjmv Unit Weight: 130 pcf Cohesion: 1000 psf Phi: 35 °
Name: To-Claystone Unit Weight: 130 pcf Cohesion: 300 psf Phi: 22 °
Name: Tof Unit Weight: 130 pcf Cohesion: 200 psf Phi: 31 °
Name: To-Sandstone Unit Weight: 130 pcf Cohesion: 700 psf Phi: 34 °



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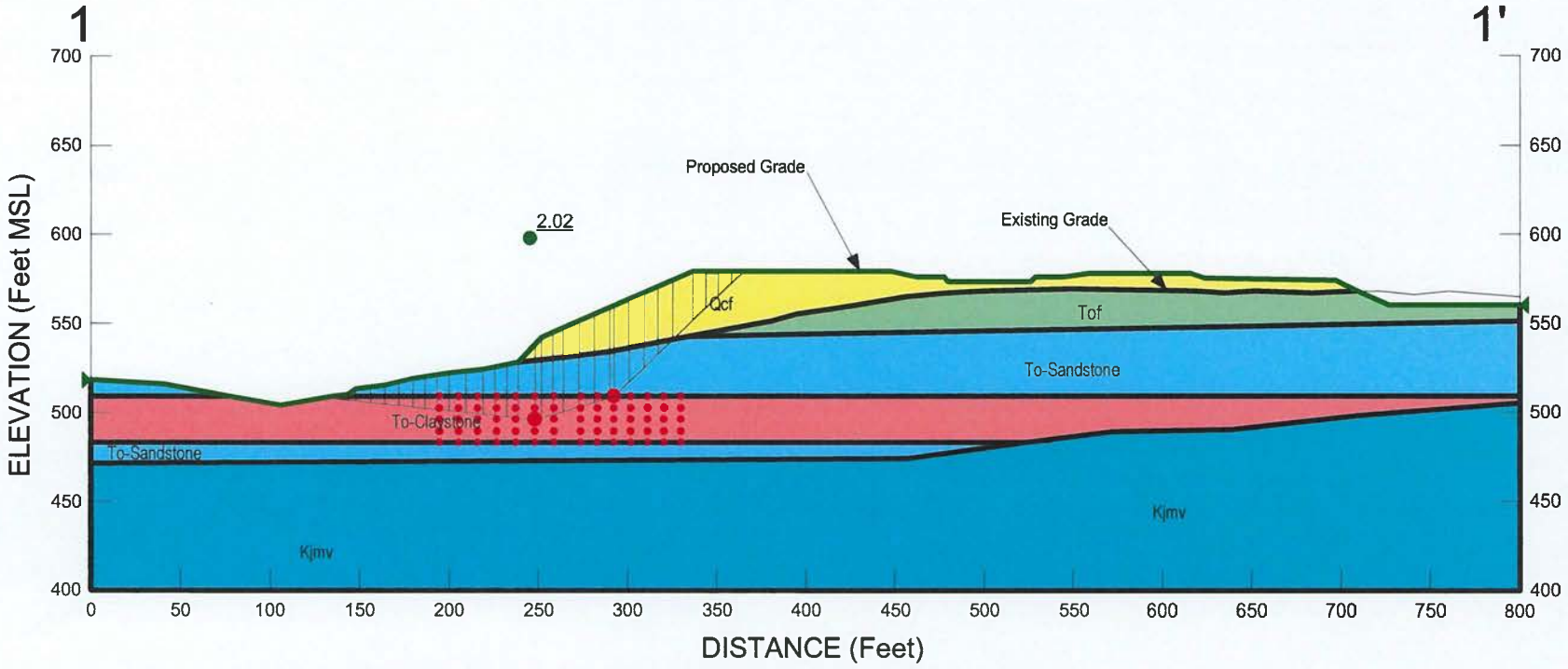
Otay Ranch Resort Village
Project No. G1012-52-02
Cross Section 1-1'
Name: 1-1'_Case 2.gsz
Date: 1/30/2018 Time: 9:05:40 AM
Name: Qcf Unit Weight: 125 pcf Cohesion: 250 psf Phi: 30 °
Name: Kjmv Unit Weight: 130 pcf Cohesion: 1000 psf Phi: 35 °
Name: To-Claystone Unit Weight: 130 pcf Cohesion: 300 psf Phi: 22 °
Name: Tof Unit Weight: 130 pcf Cohesion: 200 psf Phi: 31 °
Name: To-Sandstone Unit Weight: 130 pcf Cohesion: 700 psf Phi: 34 °



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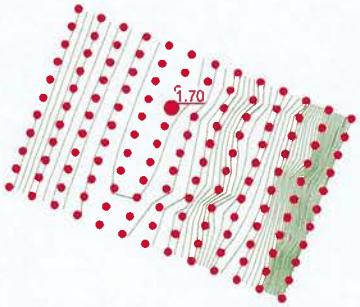
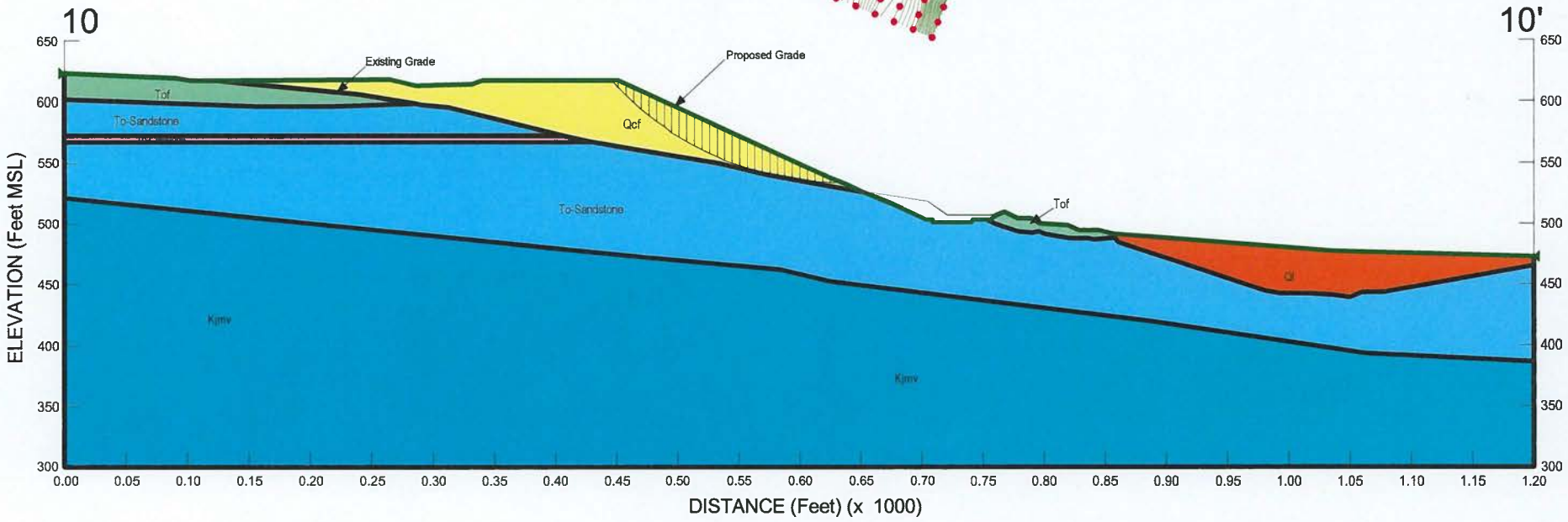
Otay Ranch Resort Village
Project No. G1012-52-02
Cross Section 10-10'
Name: 10-10'_Case 1.gsz
Date: 1/30/2018 Time: 11:31:49 AM
Name: Qcf Unit Weight: 125 pcf Cohesion: 250 psf Phi: 30 °
Name: Ql Unit Weight: 120 pcf Cohesion: 300 psf Phi: 16 °
Name: Kjmv Unit Weight: 130 pcf Cohesion: 1000 psf Phi: 35 °
Name: To-Claystone Unit Weight: 130 pcf Cohesion: 300 psf Phi: 22 °
Name: Tof Unit Weight: 130 pcf Cohesion: 200 psf Phi: 31 °
Name: To-Sandstone Unit Weight: 130 pcf Cohesion: 700 psf Phi: 34 °





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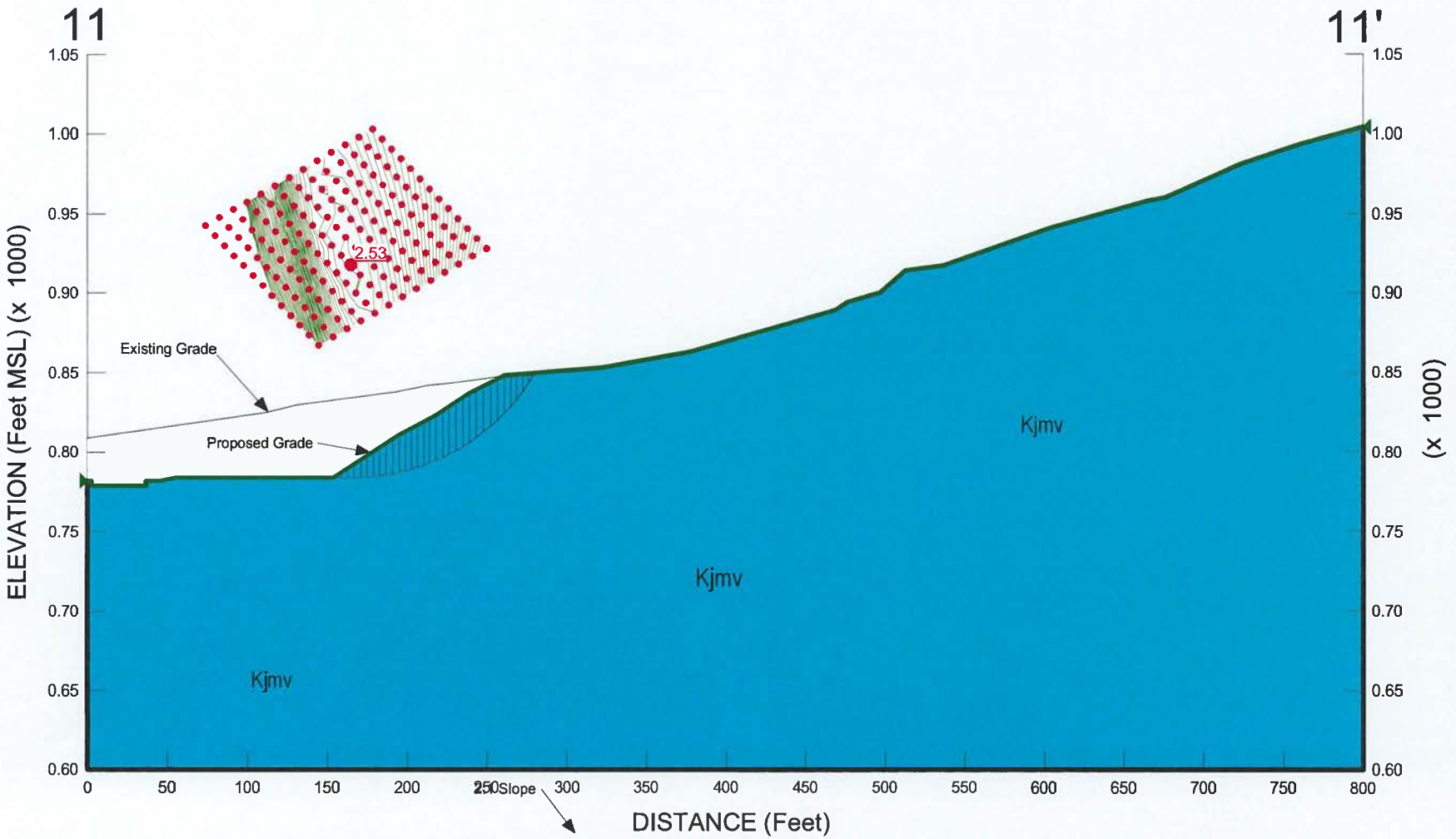
Otay Ranch Resort Village
Project No. G1012-52-02
Cross Section 11-11'
Name: 11-11'_Case 1.gsz
Date: 1/30/2018 Time: 11:43:48 AM
Name: Kjmv Unit Weight: 130 pcf Cohesion: 1000 psf Phi: 35 °



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ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= Infinite
DEPTH OF SATURATION	Z	= 3 feet
SLOPE INCLINATION	2 : 1 (Horizontal : Vertical)	
SLOPE ANGLE	i	= 26.6 degrees
UNIT WEIGHT OF WATER	γ_w	= 62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 130 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 30 degrees
APPARENT COHESION	C	= 250 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z\ cos^2\ i\ tan\ \phi}{\gamma_t\ Z\ sin\ i\ cos\ i} = 2.2$$

REFERENCES :

1.....Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2.....Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS

GEOCON INCORPORATED

GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

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OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

JH / RA		DSK/GTYPD

PROJECT NO. G1012 - 52 - 02

Plotted:02/09/2018 8:25AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\G1012-52-02 OTR-Village 13\DETAILS\Slope Stability Analyses-Surficial (SFSSA).dwg

APPENDIX H

APPENDIX H

RECOMMENDED GRADING SPECIFICATIONS

FOR

OTAY RANCH RESORT VILLAGE
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO. G1012-52-02

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9

and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

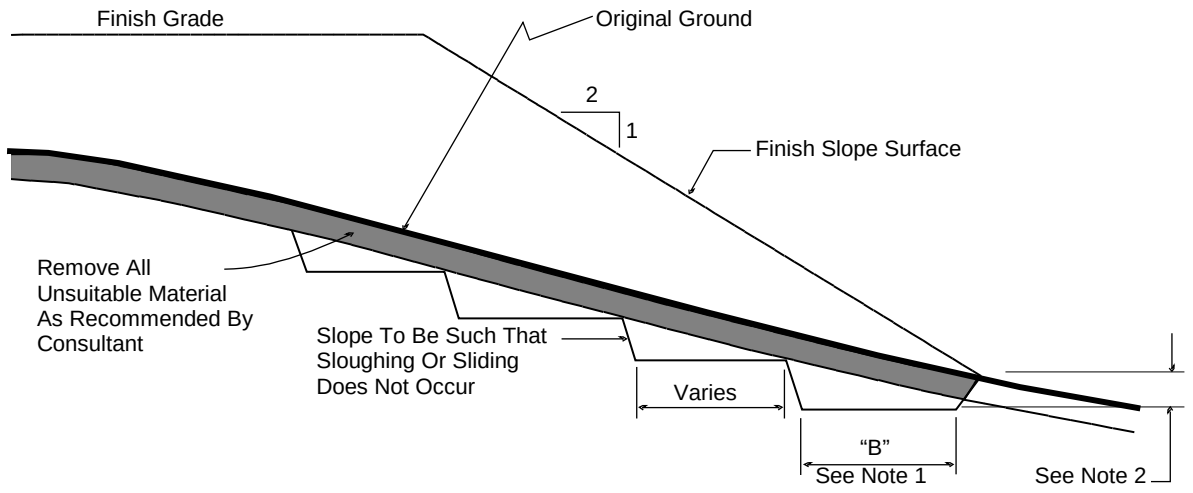
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection

variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

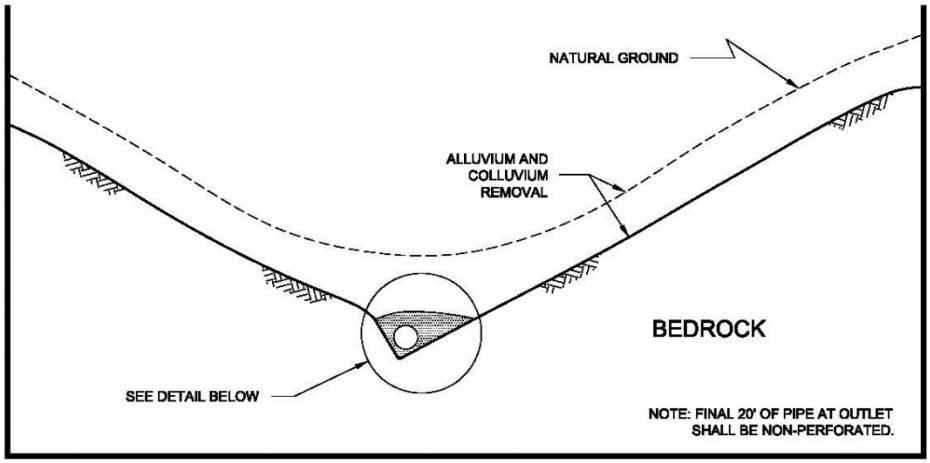
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

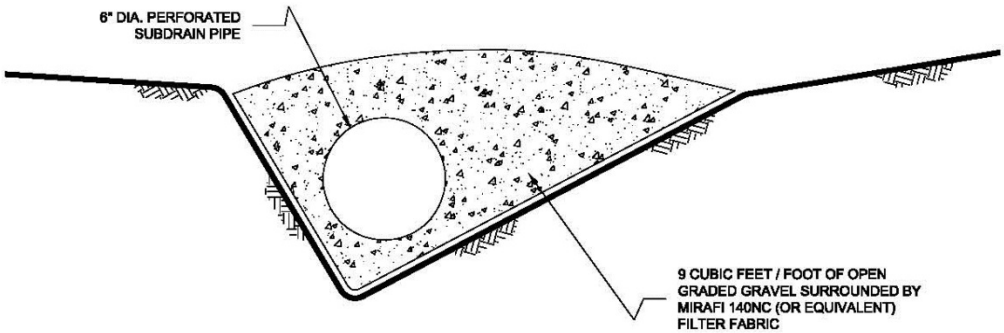
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

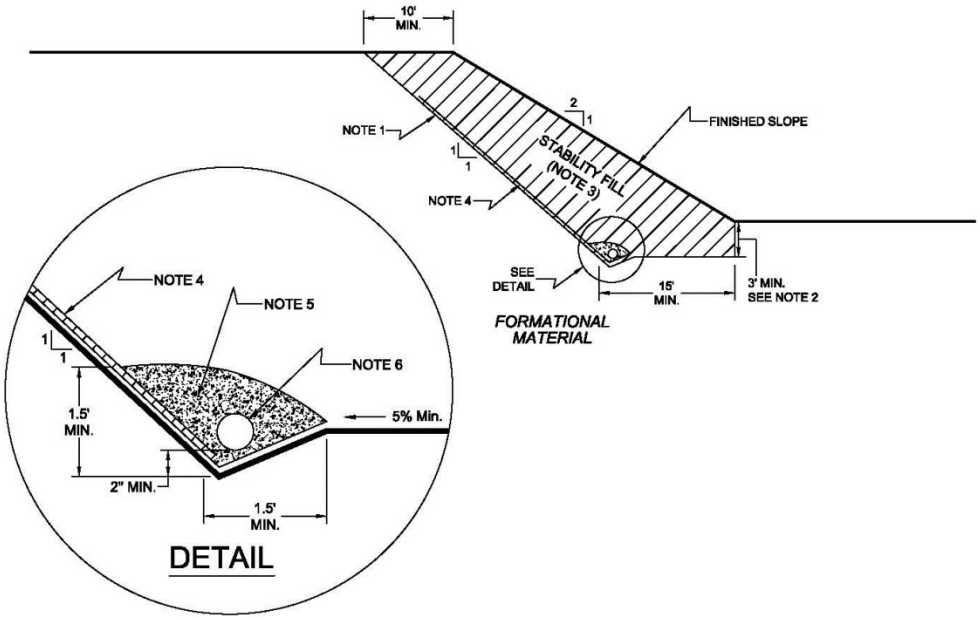
1.....8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS
IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS
LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

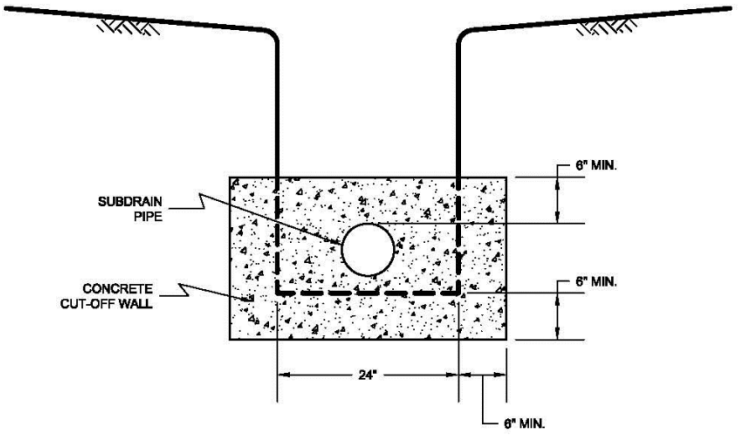
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

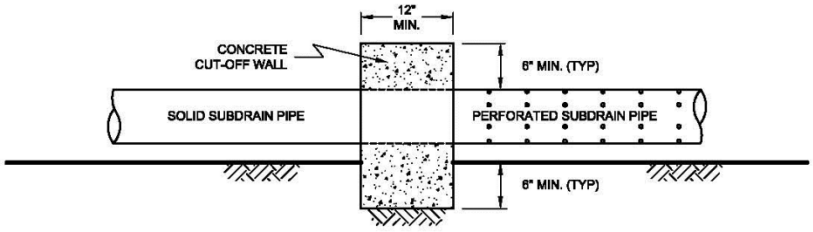
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

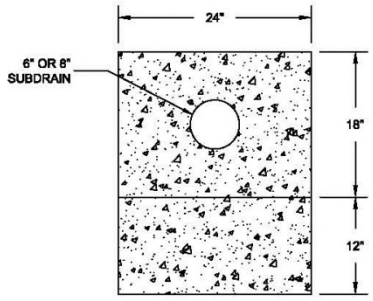


NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

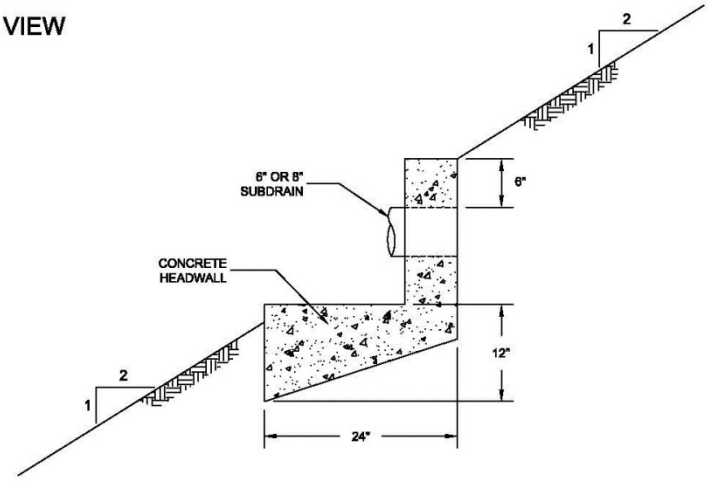
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

1. *2016 California Building Code, California Code of Regulations, Title 24, Part 2, based on the 2015 International Building Code,* prepared by California Building Standards Commission, dated July, 2016.

2. *ACI 318-11, Building Code Requirements for Structural Concrete and Commentary,* prepared by the American Concrete Institute, dated August, 2011.

3. *ACI 330-08, Guide for the Design and Construction of Concrete Parking Lots,* prepared by the American Concrete Institute, dated June, 2008.

4. Afrouz, A. A., 1992, *Practical Handbook of Rock Mass Classifications and Modes of Ground Failure,* CRC Press.

5. American Geological Institute, 1982, *AGI Data Sheets for Geology in the Field, Laboratory, and Office,* second edition, Data Sheet 58.2.

6. ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures, Second Printing,* April 6, 2011.

7. Bieniawski, Z. T., 1989, *Engineering Rock Mass Classifications,* Wiley: New York.

8. Boore, D. M. and G. M Atkinson (2008), *Ground-Motion Prediction for the Average Horizontal Component of PGA, PGV, and 5%-Damped PSA at Spectral Periods Between 0.01 and 10.0 S,* Earthquake Spectra, Volume 24, Issue 1, pages 99-138, February 2008.

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