

GEOLOGIC RECONNAISSANCE

AVION SAN DIEGO, CALIFORNIA



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GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

**CALATLANTIC GROUP, INC.
SAN DIEGO, CALIFORNIA**

**JANUARY 19, 2018
PROJECT NO. G2213-32-01**



Project No. G2213-32-01
January 19, 2018

CalAtlantic Group, Inc.
16465 Via Esprillo, Suite 150
San Diego, California 92127

Attention: Mr. Alex Plishner

Subject: GEOLOGIC RECONNAISSANCE
AVION
SAN DIEGO, CALIFORNIA

Dear Mr. Plishner:

In accordance with your authorization of our Proposal No. LG-17423, dated November 20, 2017, we have performed a geologic reconnaissance for the Avion project in the Del Sur area of San Diego, California. The accompanying report describes the soil and geologic conditions on the property and provides geotechnical considerations related to future design and construction.

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

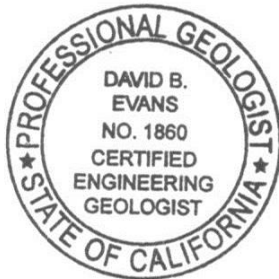
Very truly yours,

GEOCON INCORPORATED

David B. Evans
CEG 1860

DBE:TEM:dmc

(6/del) Addressee



Trevor E. Myers
RCE 63773



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GEOLOGIC RECONNAISSANCE

1. PURPOSE AND SCOPE

This report presents the findings of a geologic reconnaissance for the Avion project located in the Del Sur area of San Diego, California (see *Vicinity Map*, Figure 1). The purpose of this study was to perform reconnaissance-level geologic mapping of the property and identify any known geologic hazards that may adversely impact the proposed development as presently planned.

The scope of our study included a review of readily available published geologic literature, geotechnical reports, and plans pertinent to the surrounding area (see *List of References*), performing a limited field reconnaissance, reviewing stereoscopic aerial photographs of property, and preparing this report summarizing our findings.

The exhibit used as a base map to depict the geologic conditions consists of a reproducible copy of a compilation of digital information provided by Project Design Consultants (*Geologic Map*, Figure 2). The plan depicts the proposed development, existing topography, and mapped geologic contacts based on published information and our reconnaissance. The conclusions and considerations presented herein are based on an analysis of the data reviewed as part of this study and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The site consists of approximately 40-acres of undeveloped land south of Heritage Bluffs II and north of Black Mountain Park. Based on a review of the plans provided by Project Design Consultants, we understand the property will be developed to create approximately 84 building pads with associated underground utilities and landscaping improvements. Maximum cuts and fills during grading are anticipated to be up to approximately 45 feet and 54 feet, respectively. Maximum cut and fill slopes are planned up to 50 feet and 90 feet respectively, inclined at 1.5:1 (horizontal:vertical) and 2:1, respectively.

A backbone roadway will provide ingress and egress to smaller loop roads which will service the subdivision. Retaining walls up to 44-feet in height are contemplated along the main roadway where it exits Taburno Way in Heritage Bluffs II and crosses a drainage which flanks the eastern property margin. A detention basin is planned in the northern portion of the site adjacent to the backbone roadway.

The locations and descriptions of the project are based on review of published geologic literature, in-house geotechnical reports pertinent to the general geographic area of the subject property and our general understanding of the project as presently proposed. If the proposed development details vary

significantly from those described, Geocon Incorporated should be retained to update and/or modify this report accordingly.

3. PREVIOUS GEOTECHNICAL STUDIES

A geotechnical study and geotechnical services during development have been performed by Geocon Incorporated on the adjacent Heritage Bluffs II project (see *List of References*). The subsurface information from these activities, which include exploratory borings, trenches, seismic traverses and air rotary percussion borings and as-graded geologic mapping have been reviewed to provide a general understanding of the soil and geologic conditions anticipated on the subject property. In addition, six seismic refraction traverses were performed on the subject property in 2013 as part of a due diligence study.

4. SOIL AND GEOLOGIC CONDITIONS

Based on a review of published geologic maps, previous geotechnical reports and observations during our site reconnaissance, the geology underlying the property consists of a relatively thin mantle of surficial soil (Artificial Fill, Alluvium, Colluvium and Topsoil) over Santiago Peak metavolcanic rock. The surficial soils and geologic formation are discussed below in order of increasing age. The estimated extent of these units is shown on the *Geologic Map*, Figure 2, with the exception of topsoil and minor artificial fill.

4.1 Artificial Fill (Qaf)

Two artificial fill deposits were observed in the form of dam embankments in the drainage that flanks the east side of the development. In addition, several relatively minor embankments, which were not mapped, are present in the northern portion of the development area where old structure foundations are present. It appears that minor grading occurred in this area to create level ground for these structures. The artificial fill deposits will require remedial grading where they are present within the development footprint.

4.2 Topsoil (Not Mapped)

Topsoil blankets the Santiago Peak Volcanics within the project limits. Based on our experience on the adjacent project, the topsoil is typically two to three-feet-thick and consists of loose, clayey silts and silty clays. These deposits will require remedial grading within the development footprint.

4.3 Alluvium (Qal)

Alluvium is mapped in the drainages that flank the development and is present in the southern project area where the main project access road enters the property (Station 32+00). These deposits are typically characterized as unconsolidated gravels, sands, silts and clays derived from the metavolcanic rock. Since the majority of this deposit is beyond the development footprint, relatively minor remedial grading is anticipated in this unit where the abutments/walls and slopes are planned for the main access road crossing.

4.4 Colluvium (Qcol)

Colluvial deposits have been mapped in the northern portion of the site where relatively gentle topographic conditions are present. We anticipate the colluvium will have similar physical characteristics as the topsoil. Based on remedial grading information from the adjacent cul-de-sac area of Heritage Bluffs II, we anticipate that the colluvial thickness could be up to six-feet-thick in some areas. Due to the relatively unconsolidated nature of these deposits, remedial grading will be necessary where these soils are present within the development footprint.

4.5 Santiago Peak Volcanics (Jsp)

The Santiago Peak Volcanics Formation underlies the property. This formation consists of weakly metamorphosed volcanic and sedimentary rocks that appear relatively dark-colored where exposed. The metavolcanic rock constitution ranges from rhyolite to basalt and commonly includes tuff, tuff-breccias, and andesites. Very fine-grained, silicified sandstones, slate, and other types of metasedimentary rocks can also be present.

The Santiago Peak Volcanics generally exhibits adequate bearing and slope stability characteristics. Cut slopes excavated at an inclination of 1.5:1 (horizontal:vertical) should be stable to the proposed heights if free of adversely oriented joints, fractures or faults. It should be anticipated that excavations within this unit will generate boulders and oversize materials (rocks greater than 12 inches in length) that will require special handling and placement procedures.

The rippability characteristics of the Santiago Peak Volcanics will be a primary consideration during project development. A seismic refraction study was performed in 2013 where six traverses were conducted along the main topographic ridge. The results of the study are contained in Appendix A. The study indicates that heavy ripping and blasting will be required to achieve the majority of the proposed excavations for the project.

5. GROUNDWATER

No groundwater or seepage was observed on the property during our field reconnaissance. However, groundwater levels in drainage areas can be expected to fluctuate seasonally and may affect grading if the alluvial areas extend into the development footprint. In this regard, grading may encounter wet soils causing excavation and compaction difficulty, particularly if construction is planned during the winter months. Subdrain systems are not anticipated, however, the need for drains will be evaluated during remedial grading when the bedrock surface can be observed.

6. GEOLOGIC HAZARDS

6.1 Faulting and Seismicity

Based on our observations during mass grading in adjacent areas, previous and recent geotechnical studies, and a review of published geologic maps and reports, the site is not located on any known “active,” “potentially active” or “inactive” fault traces as defined by the California Geological Survey (CGS).

The Rose Canyon Fault zone and the Newport-Inglewood Fault, located approximately 8 miles west of the site, are the closest known active faults. The CGS considers a fault seismically active when evidence suggests seismic activity within roughly the last 11,000 years. The CGS has included portions of the Rose Canyon Fault zone within an Alquist-Priolo Earthquake Fault Zone.

We used the computer program *EZ-FRISK* (Version 7.65) to determine the distance of known faults to the site and to estimate ground accelerations at the site for the maximum anticipated seismic event. According to the results, 9 known active faults are located within a search radius of 50 miles from the property. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) NGA in our analysis. The nearest known active faults are the Newport-Inglewood and Rose Canyon Fault Zones, located approximately 8 miles west of the site, respectively, and are the dominant sources of potential ground motion. Table 6.1.1 lists the estimated maximum earthquake magnitudes and PGA’s for the most dominant faults for the site location calculated for Site Class C as defined by Table 1613.3.2 of the 2016 California Building Code (CBC).

TABLE 6.1.1
DETERMINISTIC SEISMIC 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 2008 (g)
Newport-Inglewood	8	7.5	0.27	0.25	0.31
Rose Canyon	8	6.9	0.23	0.23	0.24
Elsinore	20	7.85	0.18	0.13	0.17
Coronado Bank	23	7.4	0.14	0.10	0.12
Palos Verdes Connected	23	7.7	0.16	0.11	0.14
Earthquake Valley	39	6.8	0.07	0.05	0.04
Palos Verdes	40	7.3	0.09	0.06	0.06
San Joaquin Hills	40	7.1	0.08	0.08	0.07
San Jacinto	46	7.88	0.10	0.07	0.09

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 mappable 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 (2008) NGA in the analysis. Table 6.1.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.1.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.41	0.40	0.45
5% in a 50 Year Period	0.31	0.29	0.32
10% in a 50 Year Period	0.23	0.22	0.23

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 evaluated in accordance with the California Building Code (CBC) guidelines currently adopted by the City of San Diego.

6.2 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless, groundwater is encountered within 50 feet of the surface, and soil densities are less than about 70 percent of the maximum dry densities. If all four criteria are met, a seismic event could result in a rapid increase in pore water pressure from the earthquake-generated ground accelerations. The potential for liquefaction at the site is considered to be negligible due to the dense formational material encountered, remedial grading recommended, and lack of a shallow groundwater condition.

6.3 Landslides

No evidence of ancient landslide deposits was observed during our site reconnaissance or geologic literature review.

6.4 Geologic Hazard Category

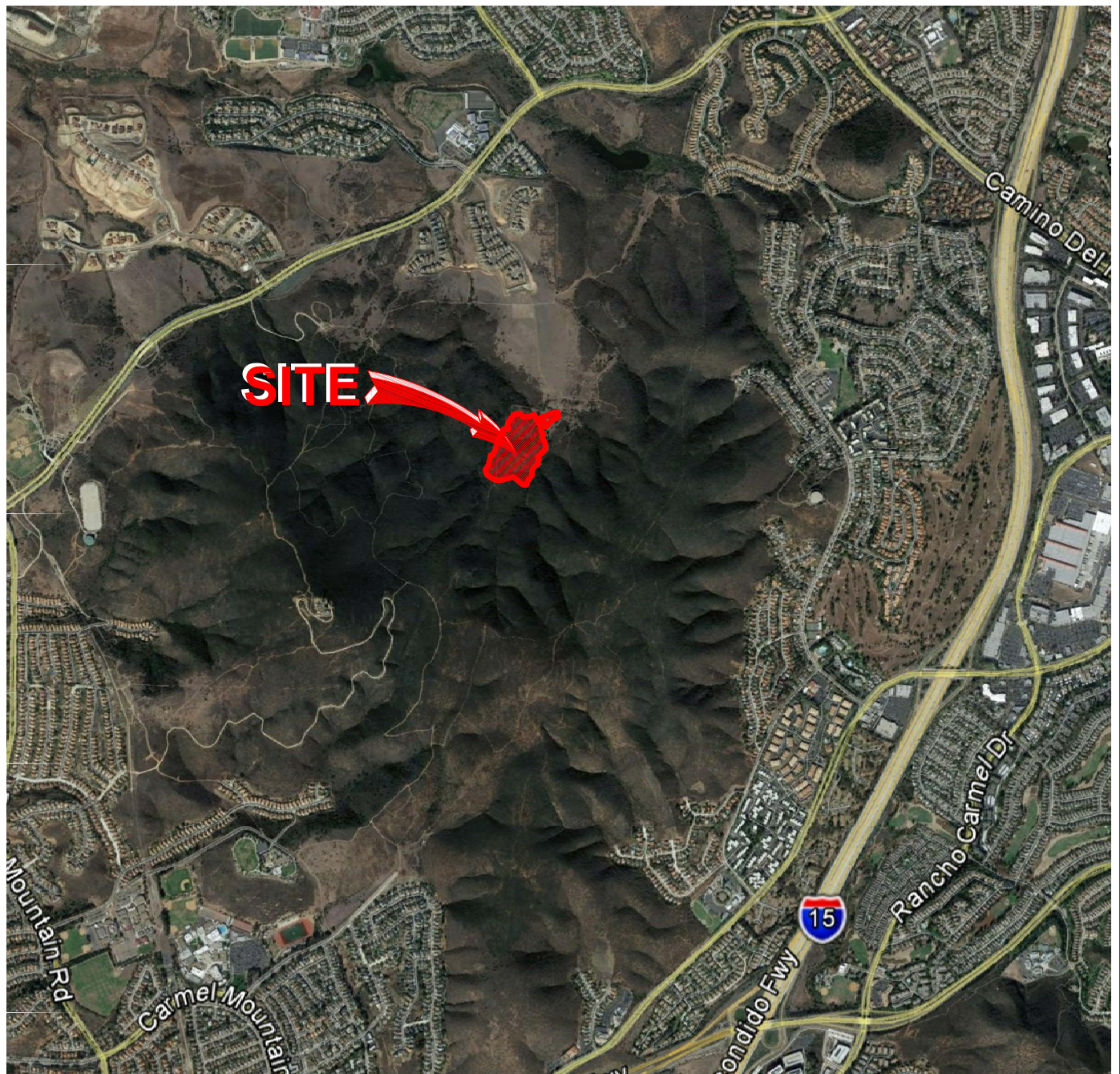
Based on our review of the 2008 City of San Diego Seismic Safety Study Map Sheets 43 and 44, the site is located within Geologic Hazard Category 53. Category 53 indicates *level or sloping terrain, unfavorable geologic structure, low to moderate risk*.

7. CONCLUSIONS AND CONSIDERATIONS

- 7.1 No soil or geologic conditions were encountered during our reconnaissance or literature review that would preclude development of the site as presently planned.
- 7.2 A future geotechnical study that includes a subsurface investigation should be performed to evaluate the underlying geologic conditions on the property and to provide specific geotechnical recommendations for the project.
- 7.3 The site is underlain by surficial units that include artificial fill, topsoil, alluvial, and colluvial deposits. These deposits are unsuitable in their present condition and will require remedial grading in the form of removal and compaction where improvements are planned.
- 7.4 The presence of hard rock at or near the existing ground surface will require special consideration during site grading. Based on the seismic refraction survey, it is anticipated that a significant portion of the excavations will encounter hard rock conditions and will require blasting or special excavation techniques.
- 7.5 It is anticipated that excavations within the metavolcanic rock will generate oversize materials that will require special handling and placement in fills in accordance with the grading specifications contained in Appendix B. An earthwork analysis should be performed to determine if there is an adequate volume of fill area available to accommodate the anticipated volume of blasted/oversize materials. This study should consider the proposed grading, rippability information contained in this report, rock placement requirements and include proposed undercutting. Crushing may be necessary to meet the project grading specifications with respect capping and particle size restriction zones.
- 7.6 Cut slopes should be observed by an engineering geologist during grading to verify that the soil and geologic conditions do not differ significantly from those anticipated. Additional recommendations will be provided in in event that adverse conditions are encountered. Scaling of loose rock fragments from proposed cut slopes should be anticipated.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. 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.
2. 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 or corrosive materials was not part of the scope of services provided by Geocon Incorporated.
3. This report is issued with the understanding that it is the responsibility of the owner or 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.
4. 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 be 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.



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NO SCALE

VICINITY MAP

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DSK/GTPD

DATE 01 - 19 - 2018

PROJECT NO. G2213 - 32 - 01


FIG. 1



- GEOCON LEGEND**
- Qaf**ARTIFICIAL FILL
 - Qal**ALLUVIUM
 - Qcol**COLLUVIUM
 - Jsp**SANTIAGO PEAK VOLCANICS
 -APPROX. LOCATION OF GEOLOGIC CONTACT
 - S-1**APPROX. LOCATION OF SEISMIC REFRACTION TRAVERSE

GEOLOGIC MAP
AVION
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SCALE 1" = 50'
PROJECT NO. G2213 - 32 - 01
SHEET 1 OF 1

DATE 01 - 19 - 2018
FIGURE 2

PROJECT: 01/19/2018 12:34 PM | BY: PIERRE AUDUBERT | FILE: L:\avion\G2213\G2213-01.dwg | PLOT: 01/19/2018 13:52:01 | 064444.dwg

APPENDIX

A

APPENDIX A

**SEISMIC REFRACTION STUDY
PREPARED BY SOUTHWEST GEOPHYSICS,
DATED AUGUST 8, 2013; PROJECT NO. 113283**

FOR

**AVION
SAN DIEGO, CALIFORNIA**

PROJECT NO. G2213-32-01

**SEISMIC REFRACTION SURVEY
DEBEVOISE PROPERTY
SAN DIEGO, CALIFORNIA**

PREPARED FOR:

Geocon Incorporated
6960 Flanders Drive
San Diego, CA 92121-2974

PREPARED BY:

Southwest Geophysics, Inc.
8057 Raytheon Road, Suite 9
San Diego, CA 92111

August 8, 2013
Project No. 113283

August 8, 2013
Project No. 113283

Mr. Troy Reist
Geocon Incorporated
6960 Flanders Drive
San Diego, CA 92121-2974

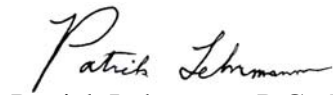
Subject: Seismic Refraction Survey
Debevoise Property
San Diego, California

Dear Mr. Reist:

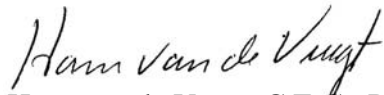
In accordance with your authorization, we have performed a seismic refraction survey pertaining to the Debevoise property located in the Rancho Bernardo area of San Diego, California. Specifically, our survey consisted of performing six seismic refraction traverses at the project site. The purpose of our services was to evaluate the apparent rippability of the subsurface materials and develop a subsurface velocity model of the areas surveyed for use in the design and construction of future improvements.

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, P.G., P.Gp.
Principal Geologist/Geophysicist



Hans van de Vrugt, C.E.G., P.Gp.
Principal Geologist/Geophysicist

HV/PFL/hv

Distribution: Addressee (electronic)



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1. INTRODUCTION

In accordance with your authorization, we have performed a seismic refraction survey pertaining to the Debevoise property located in the Rancho Bernardo area of San Diego, California (Figure 1). Specifically, our survey consisted of performing six seismic refraction traverses at the project site. The purpose of our services was to evaluate the apparent rippability of the subsurface materials and develop a subsurface velocity model of the areas surveyed for use in the design and construction of future improvements.

2. SCOPE OF SERVICES

Our scope of services included:

- Performance of six 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 is located along the south side of Bernardo Center Drive and is accessed at the south side of the intersection of Dove Canyon Road and Bernardo Center Drive (Figures 1 and 2). The study area is located along a dirt road which generally follows a south to north trending ridge. Vegetation in the area of the lines primarily consists of sage brush, scattered trees, and annual grass. Fragments of metavolcanic rock were observed in and near the study area; however, no undisturbed outcrops were observed in the area of the lines. Figures 2 and 3 depict the general site conditions.

Based on our discussions with you, it is our understanding that a residential development is planned for the project site and that grading will likely include substantial cuts and fills. Details regarding the proposed cuts are not yet known.

4. SURVEY METHODOLOGY

A seismic P-wave (compression wave) refraction survey was conducted at the site to evaluate the characteristics of the subsurface materials and specifically the depth to bedrock. 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 Geode 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.

Six seismic lines (SL-1 through SL-6) were conducted in the study area. The general locations and lengths of the lines were selected by your office. Shot points (signal generation locations) were generally conducted at five equally spaced locations along the lines.

The seismic refraction theory requires that subsurface velocities increase with depth. A layer having a velocity lower than that of the layer above will not generally 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, intrusions or boulders 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 homogeneous 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 Blasting
5,500 to 7,000 feet/second	Very Difficult, Probable 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, 2011). 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, six 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 SeisOpt Pro (Optim, 2008). SeisOpt Pro uses first arrival picks and elevation data to produce a subsurface velocity model through a nonlinear optimization technique called adaptive simulated annealing. The resulting velocity model provides a tomography image of the estimated geologic conditions. Both vertical and lateral velocity information is contained in the tomography model. Changes in layer velocity are revealed as gradients rather than discrete contacts, which typically are more representative of actual conditions.

The approximate locations of the seismic refraction traverses are shown on the Line Location Map (Figure 2). The velocity models are included in Figures 4a through 4c. In general, the effective depth of evaluation for a seismic refraction traverse is approximately one-third to one-fifth the length of the traverse.

6. CONCLUSIONS AND RECOMMENDATIONS

The results from our seismic survey revealed distinct layers/zones in the near surface that likely represent soil (topsoil and colluvium) overlying metavolcanic bedrock with varying degrees of weathering. Figures 4a through 4c provide the velocity gradient models calculated from SeisOpt Pro. Several feet of soil-like materials are present along portions of the lines, but in general weathered bedrock appears to be fairly shallow across the site. Based on the models, significant lateral variations in velocity are also present in the survey area. The cause of the velocity variations are likely related to remnant boulders, fracturing, and differential weathering of the bedrock materials. As a result, variability in the excavatability (including depth of rippability) of the subsurface materials should be expected across the project area.

Based on our results, very difficult conditions where blasting may be required will likely be encountered depending on the excavation depth, location, and desired rate of production. In addition, oversized materials should be expected. A contractor with excavation experience in similar difficult conditions should be consulted for expert advice on excavation methodology, equipment and production rate. In addition, once grading plans have been prepared we recommend that additional seismic lines be conducted in areas of proposed significant cuts.

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 condi-

tions 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

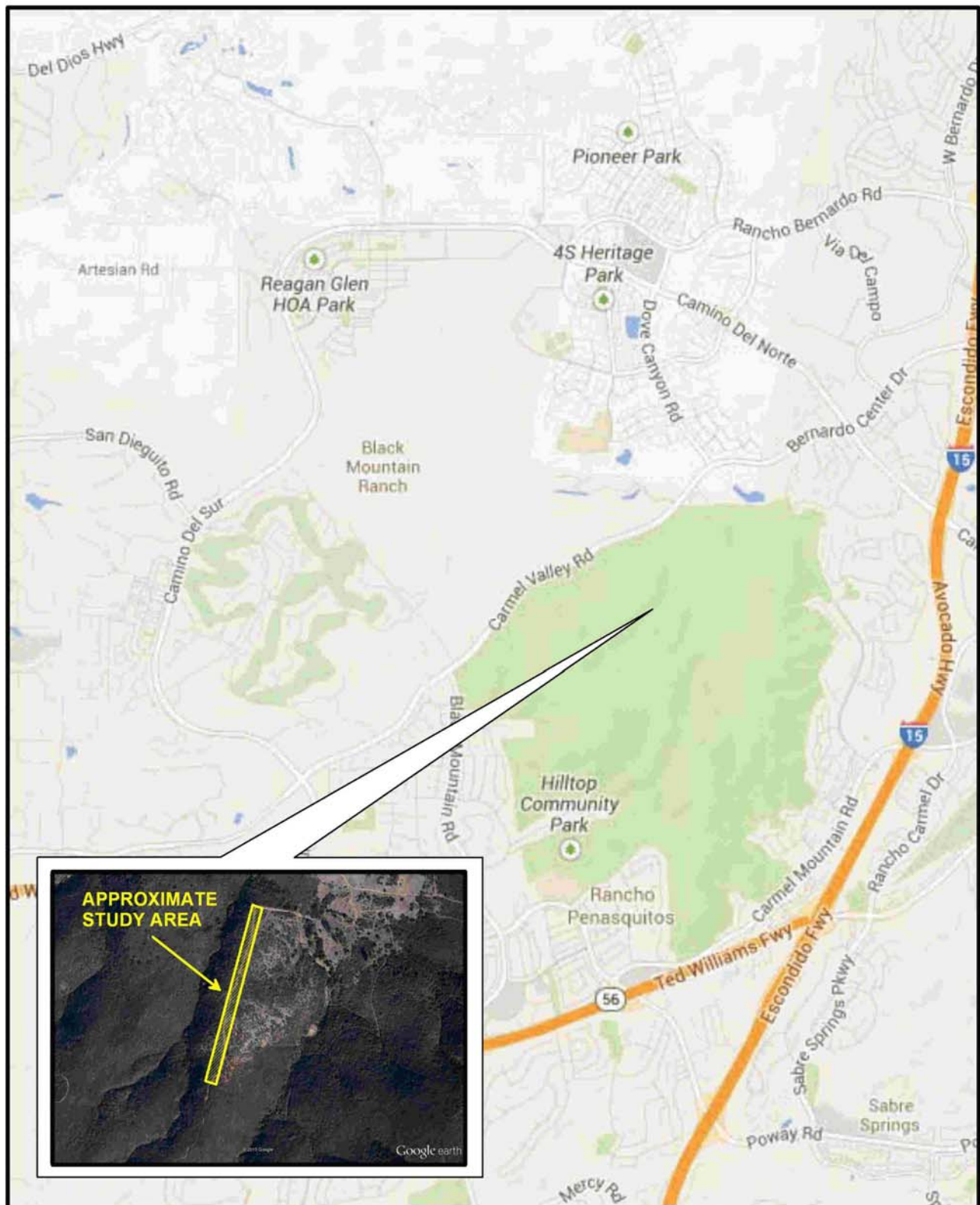
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SITE LOCATION MAP



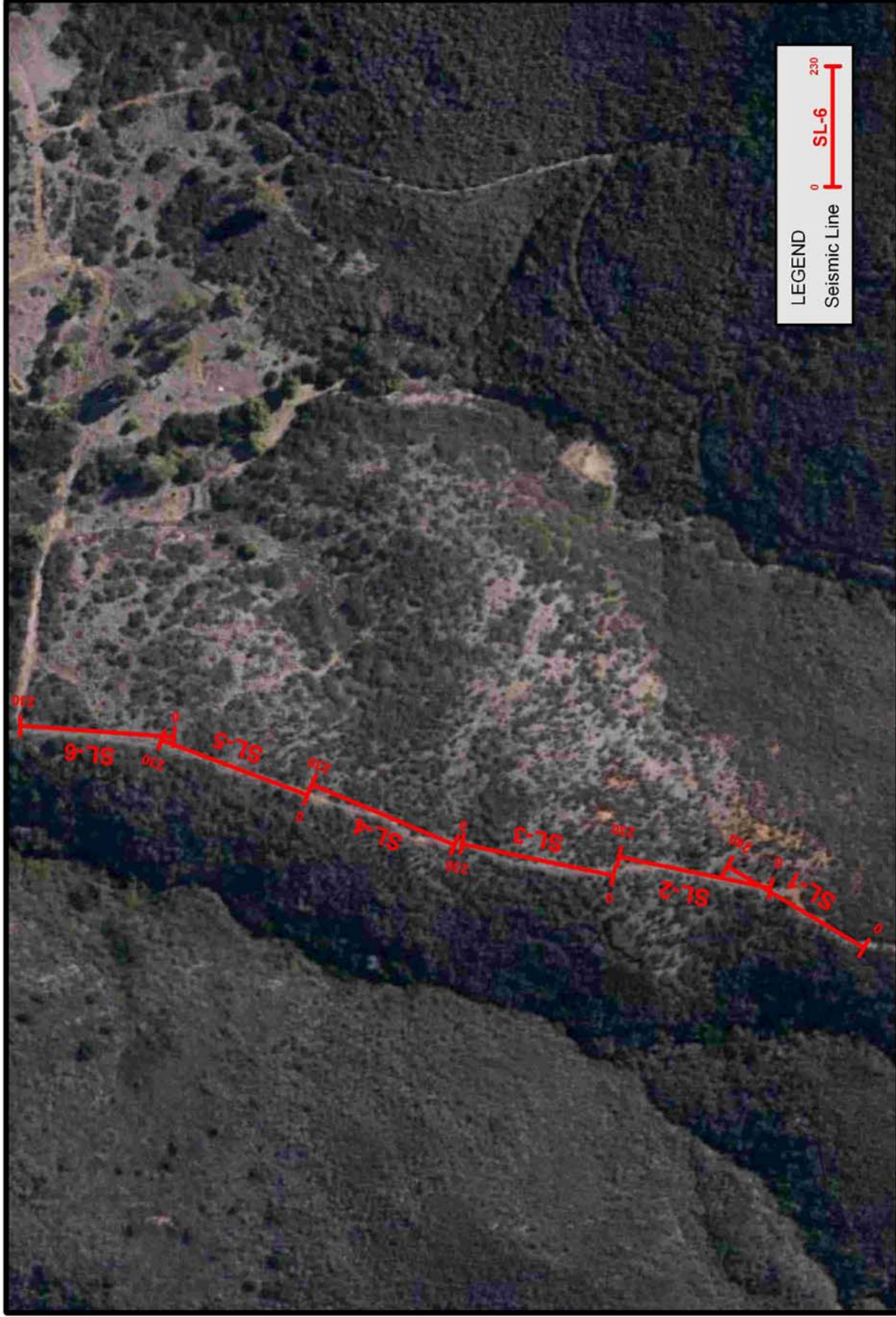
Debevoise
San Diego, California

Project No.: 113283

Date: 08/13



Figure 1



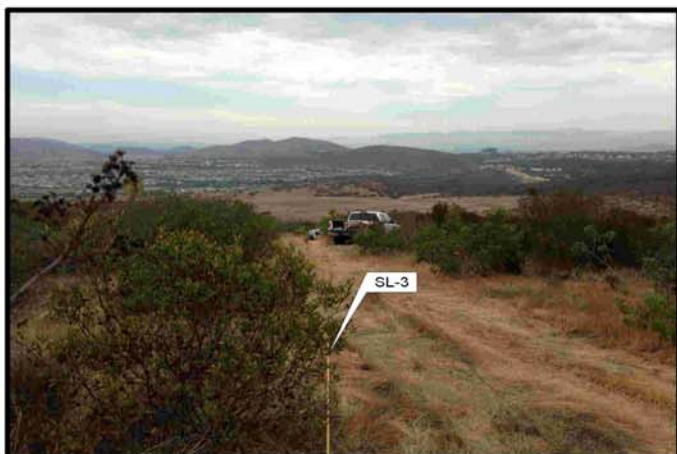
LINE LOCATION MAP

Debevoise Property
San Diego, California

Project No.: 113283 Date: 08/13



Figure 2



SITE PHOTOGRAPHS

Debevoise Property
San Diego, California

Project No.: 113283

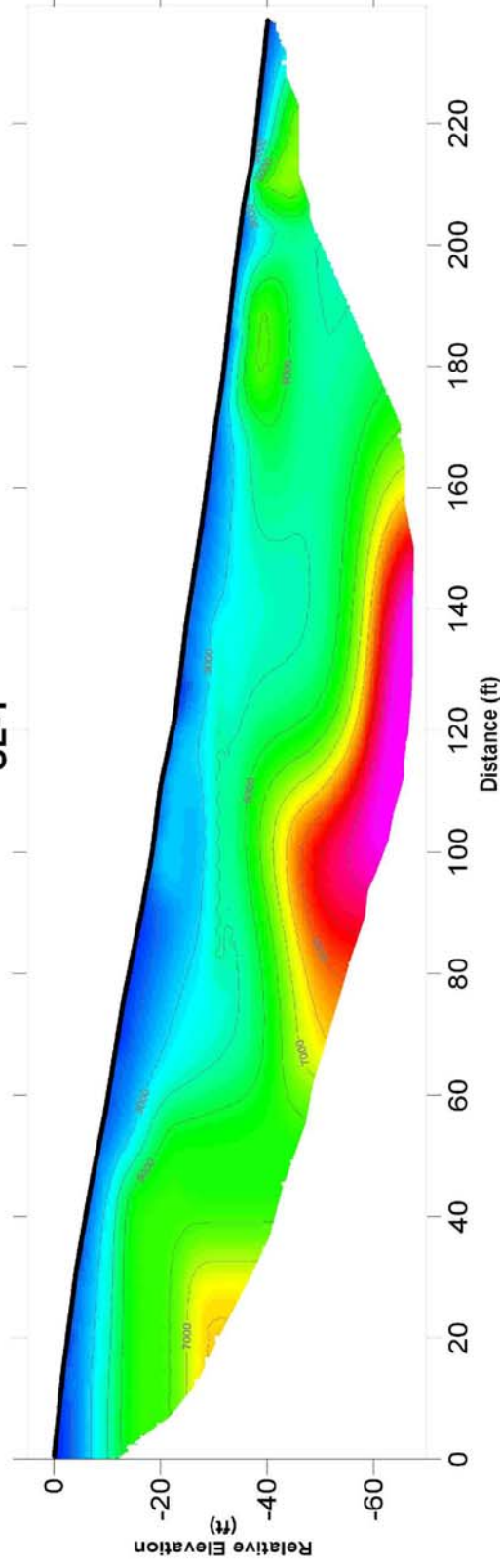
Date: 08/13



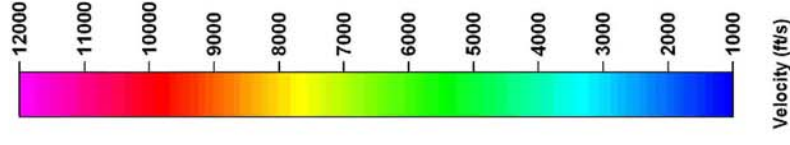
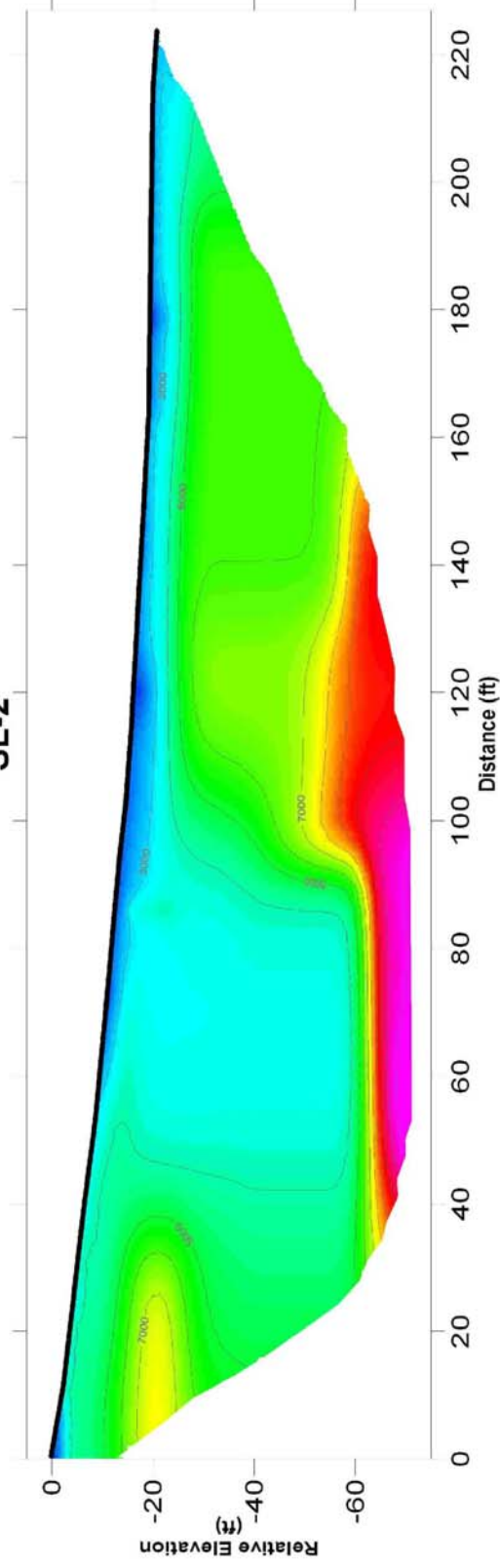
Figure 3

TOMOGRAPHY MODELS

SL-1



SL-2



SEISMIC PROFILES SL-1 & SL-2

Debevoise Property
San Diego, California

Project No.: 113283

Date: 08/13

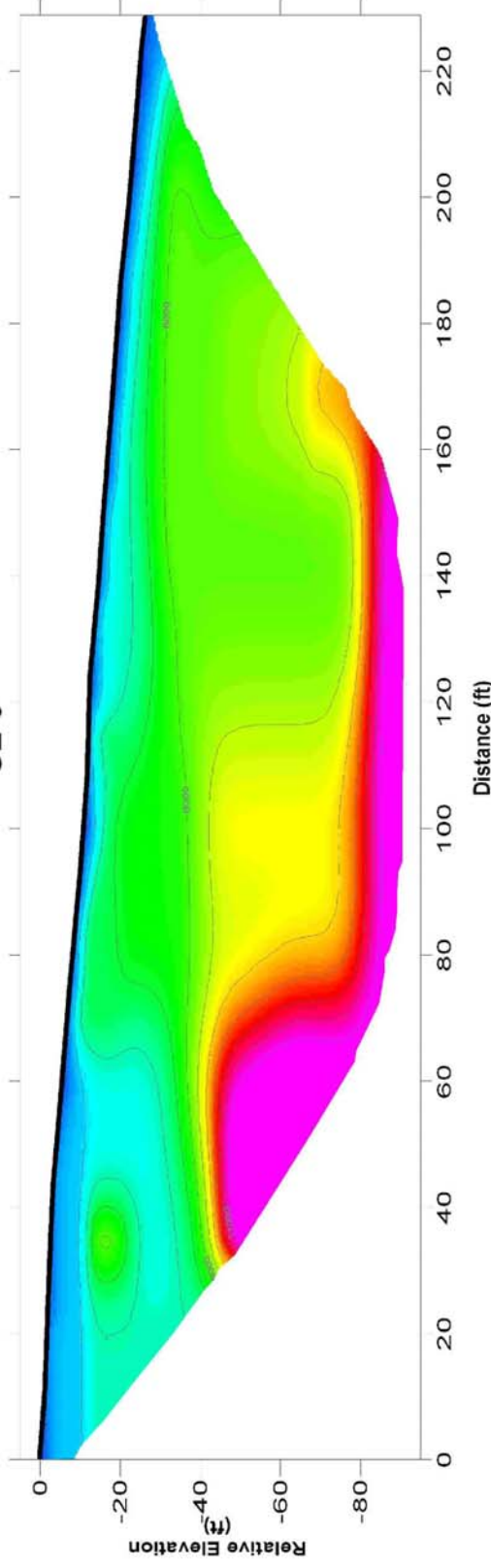


Figure 4a

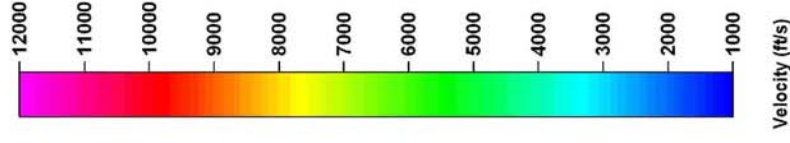
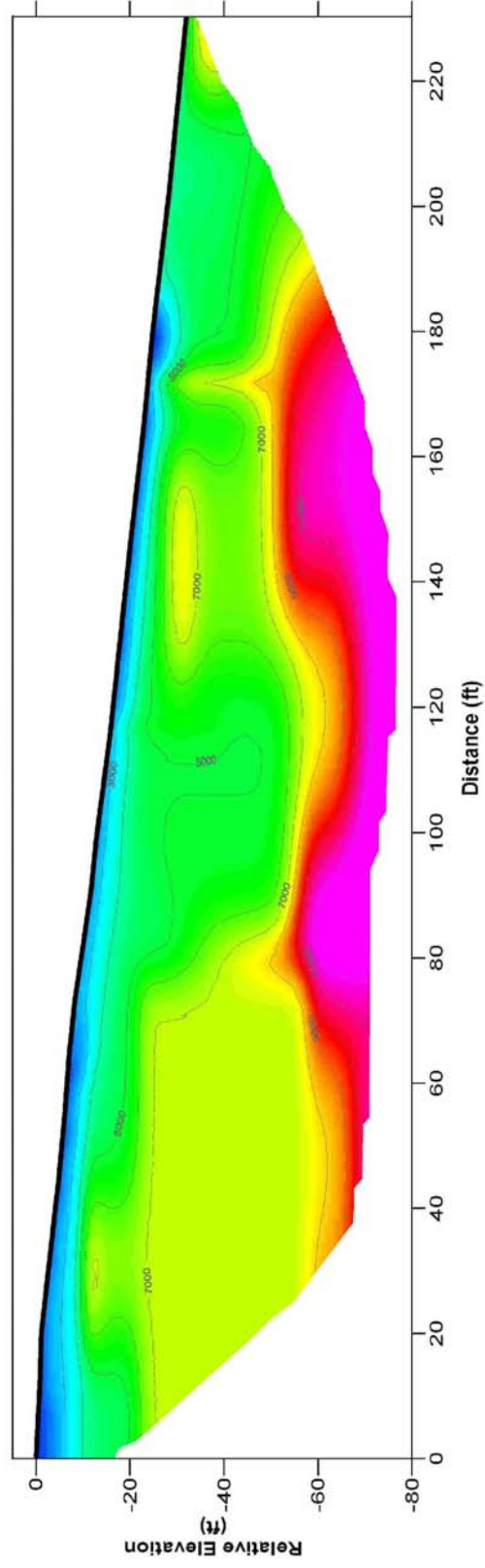
Note: Contour Interval = 1,000 feet per second

TOMOGRAPHY MODELS

SL-3



SL-4



SEISMIC PROFILES SL-3 & SL-4

Debevoise Property
San Diego, California

Project No.: 113283

Date: 08/13

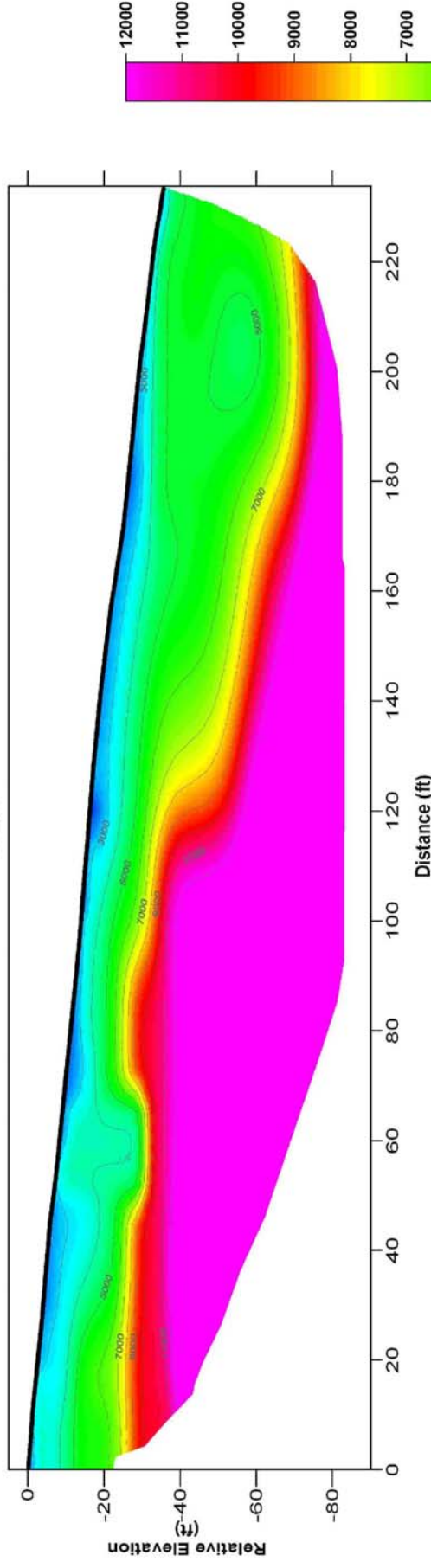


Figure 4b

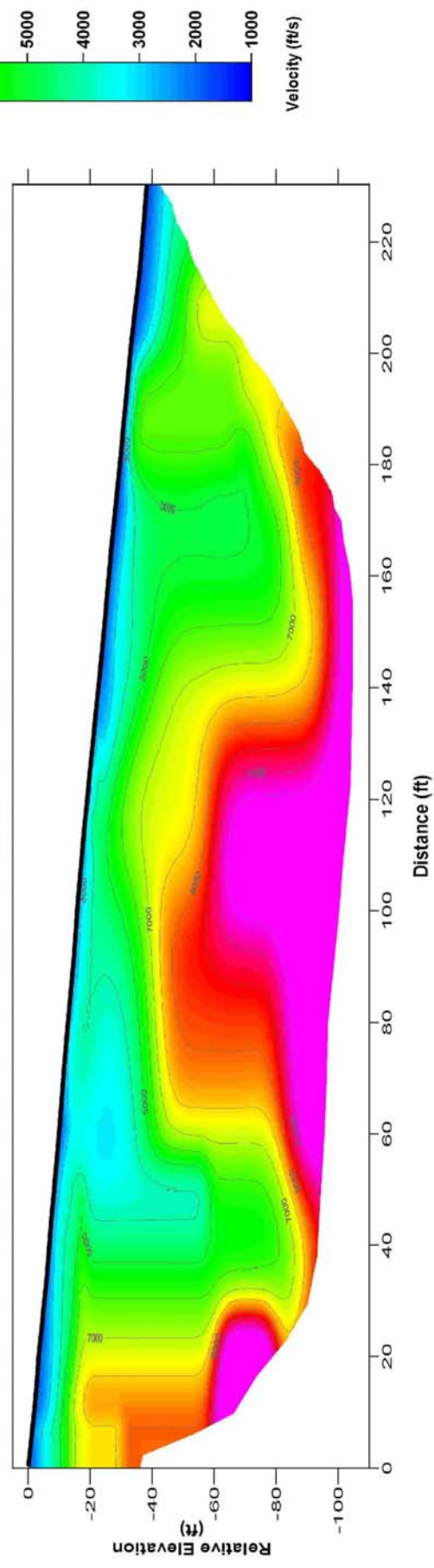
Note: Contour Interval = 1,000 feet per second

TOMOGRAPHY MODELS

SL-5



SL-6



SEISMIC PROFILES SL-5 & SL-6

Debevoise Property
San Diego, California

Project No.: 113283

Date: 08/13



Figure 4c

Note: Contour Interval = 1,000 feet per second

APPENDIX

B

APPENDIX B

RECOMMENDED GRADING SPECIFICATIONS

FOR

AVION
SAN DIEGO, CALIFORNIA

PROJECT NO. G2213-32-01

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 $\frac{3}{4}$ 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 $\frac{3}{4}$ 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.

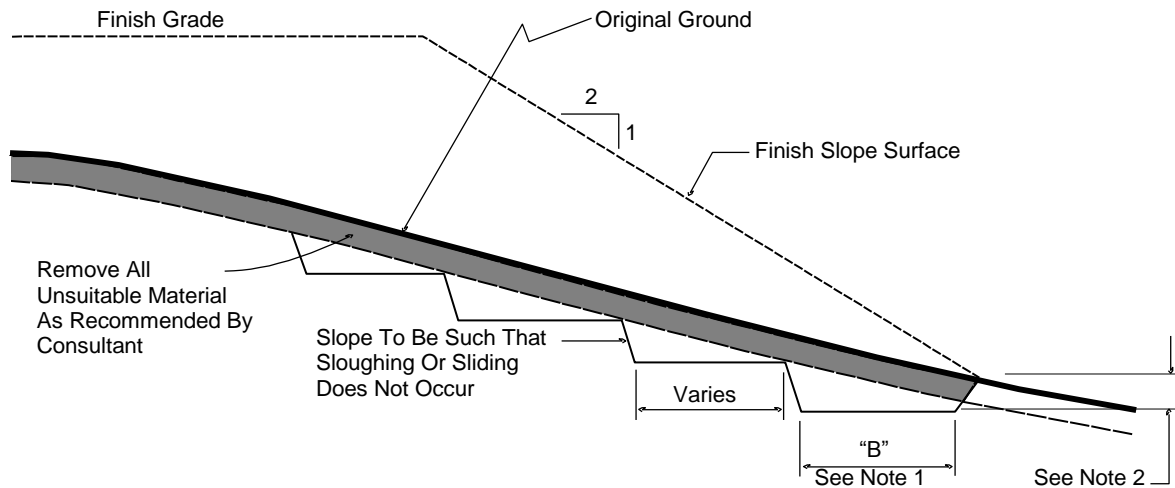
- 3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker 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



- 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

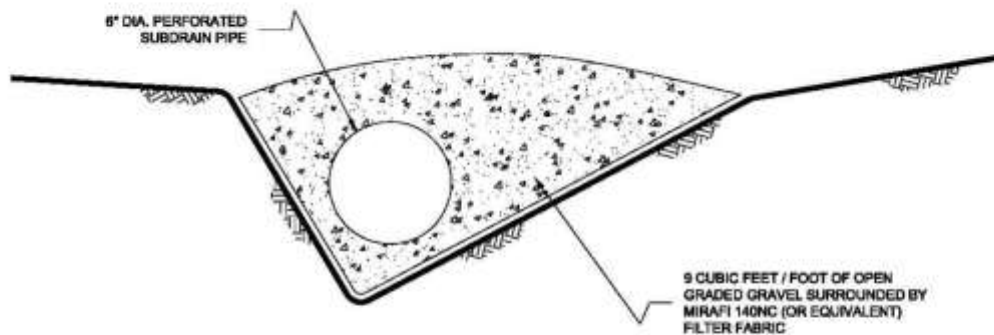
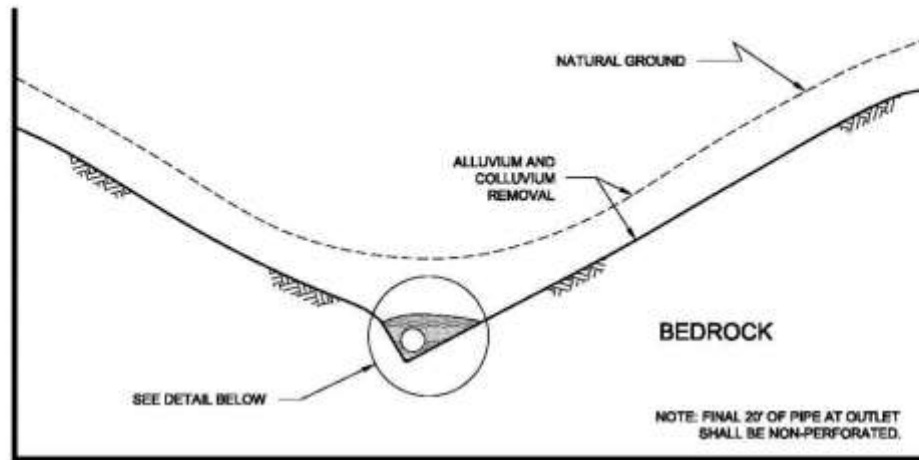
variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

- 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



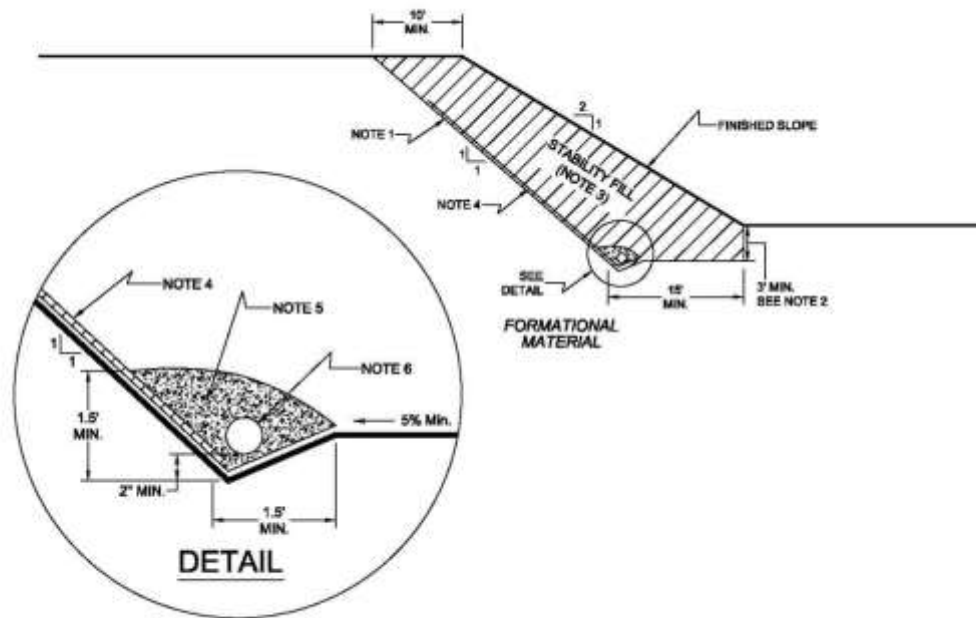
NOTES:

- 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 larger) pipes.

TYPICAL STABILITY FILL DETAIL



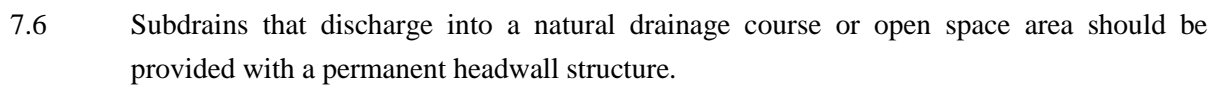
NOTES:

- 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

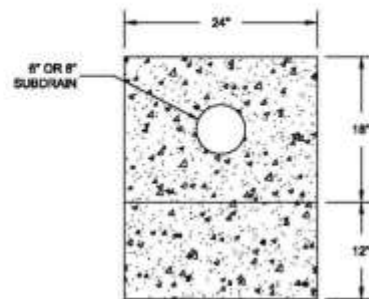
- 7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 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.

- ## TYPICAL CUT OFF WALL DETAIL



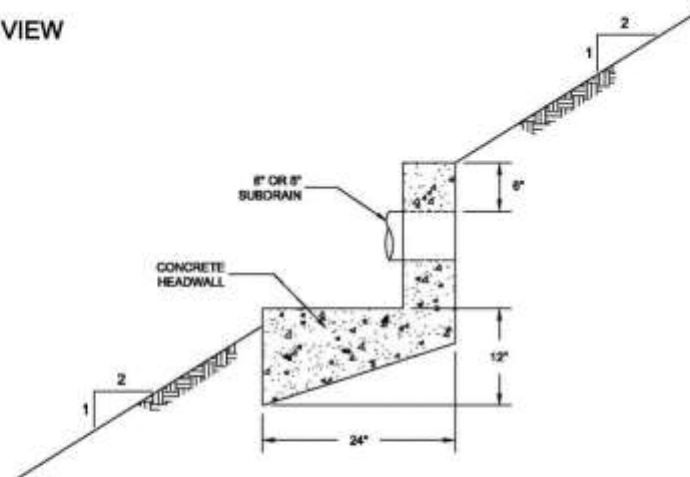
TYPICAL HEADWALL DETAIL

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.

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2. California Department of Conservation, Division of Mines and Geology, *Probabilistic Seismic Hazard Assessment for the State of California*, Open File Report 96-08, 1996.
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