

# **ALLIED EARTH TECHNOLOGY**

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ROBERT CHAN, P.E.

**GEOTECHNICAL INVESTIGATION**  
**PROPOSED RESIDENTIAL BUILDING SITE**  
**3416 CROWN POINT DRIVE**  
**SAN DIEGO, CALIFORNIA**

**FOR**

**BILL & SUSAN GLOCKNER**

**PROJECT NO. 20-1268A1**

**JULY 20, 2020**

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ROBERT CHAN, P.E.

July 20, 2020

Bill & Susan Glockner  
3416 Crown Point Drive  
San Diego, CA. 92109

Subject :      Project No. 20-1268A1  
                  Geotechnical Investigation  
                  Proposed Residential Building Site  
                  3416 Crown Point Drive  
                  San Diego, California

Dear Bill & Susan Glockner :

In accordance with your request, we have completed the geotechnical investigation for the proposed residential building site on subject property, more specifically referred to as being Lot No. 327, in Block No. 15 of Crown Point, according to Map thereof No. 1891 (APN 423-533-10-00), in the City and County of San Diego, State of California.

We are pleased to submit the accompanying geotechnical investigation report to present our findings, conclusions and recommendations relative to the proposed development of the site.

The geotechnical investigation was conducted under the supervision of the undersigned. The scope of our investigation included field exploration, laboratory testing and geotechnical engineering analysis.

No major adverse geotechnical conditions were encountered which would prohibit the currently proposed development of the site.

This opportunity to be of service is sincerely appreciated. Should you have any questions, please do not hesitate to contact our office.

Respectfully submitted,  
ALLIED EARTH TECHNOLOGY

  
ROBERT CHAN, P.E.



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July 20, 2020

## GEOTECHNICAL INVESTIGATION

### INTRODUCTION

This report presents the findings and conclusions of a geotechnical investigation conducted at the site of a proposed residential building on subject property, located at 3416 Crown Point Drive, in the City and County of San Diego, State of California.

Subject property is more specifically referred to as being Lot No. 327, in Block No. 15 of Crown Point, according to Map thereof No. 1891 (APN 423-533-10-00).

The location of the property is shown on Figure No. 1, entitled, "Site Location Map".

### DESCRIPTION OF PROJECT

It is our understanding that the existing residence on the site will be demolished to accommodate the proposed development, which will consist of a single-family residence. The proposed structure will be two stories over basement/subterranean garage; of wood-frame/stucco and slab-on-grade construction.

### SCOPE OF WORK

The objectives of the investigation were to inspect and determine the subsurface

geotechnical conditions and certain physical engineering properties of the soils beneath the site, and to evaluate any potential adverse geotechnical conditions that could affect the proposed project, in order that engineering recommendations could be presented relative to the safe and economical development of the site; and checking and design of foundation for the proposed structure.

In order to accomplish this purpose, two exploratory borings were excavated and inspected, and representative samples of the subsurface soils were collected for laboratory testing and analysis.

The data derived from the field observations and laboratory test results were reviewed and analyzed, and a summary of our preliminary findings, opinions and recommendations is presented in this report.

### **FIELD INVESTIGATION**

The field exploratory phase of our investigation was performed on June 24, 2020, and involved a reconnaissance of the site, and the excavation of two exploratory borings with a truck-mounted motorized continuous flight auger.

The exploratory borings were excavated at various locations on the site where the most useful information relative to subsurface soil conditions may be obtained. The exploratory borings were excavated to depths varying from 20 to 22 feet below existing ground surface. The location of the exploratory borings was recorded at the time of excavation, and is shown on

Figure Nos. 3 to 4, inclusive, each entitled, "Boring Log Sheet".

The soils were visually and texturally classified by the field identification procedures set forth on the Unified Soil Classification Chart. Representative samples were obtained and the in-situ densities of the soils encountered were determined with a Triggs penetrometer.

### **LABORATORY TESTS**

The samples collected during our field investigation were subjected to various tests in the laboratory to evaluate their engineering characteristics. The tests were performed in accordance with current A.S.T.M. testing standards or other regulatory agency testing procedures. A summary of the tests that were performed and the final test results are presented in Appendix II hereto.

The tests that were performed included determinations of the maximum dry densities and optimum moisture contents; soil strength parameters; the sulfate contents and Expansion Indices of the soils encountered.

### **SITE DESCRIPTION**

Subject property is a rectangular-shaped property of 5,400 square feet, situated on the west side of Crown Point Drive, south of La Cima Drive. The existing topography on the site is relatively level, with surface drainage directed in a general easterly direction into Crown Point Drive.

Currently a residence occupies the property, with a detached garage located in the rear, southwest corner of the site. From available public information, it is our understanding that the residence was built in 1942. All improvements on the site will be demolished to accommodate the

proposed development.

The property is bounded on the east by Crown Point Drive and Mission Bay Park beyond; and on the north, south and west by existing residences.

### **PROPOSED SITE DEVELOPMENT**

Site development will consist of demolition of all existing improvements on the property, and the construction of a new single-family residence. The proposed structure will be two stories over subterranean basement/garage; of wood-frame/stucco and slab on grade construction.

### **GENERAL GEOLOGY AND SUBSURFACE SOIL CONDITIONS**

#### **Regional Geology**

The subject property is located within the southern coastal strip region of the Peninsular Range Geomorphic Province of California. This geomorphic province is characterized by mountainous terrain to the east composed mostly of Mesozoic igneous and metamorphic rocks and relatively low-lying coastal terraces to the west underlain by late Cretaceous, Tertiary and Quaternary sedimentary rocks. The westerly portion of the City of San Diego, including the site, occurs within the westerly region and is underlain by sedimentary rocks..

#### **Site Geology and Subsurface Soil Conditions**

A review of geologic maps as well as observations made during our subsurface exploration indicated that the site is underlain by Late to Middle Pleistocene Old Paralic Deposit Unit No. 6. On subject property, the Old Paralic Deposit was encountered in the exploratory borings in the form of medium dense to dense, light brown/brown silty sands.



**Tectonic Setting**

No evidence of faulting was noted during our surface reconnaissance or in our exploratory borings. A review of available geologic literature did not reveal any major faulting in the area. It should be noted that much of southern California, including the City of San Diego, is characterized by a series of Quaternary-age fault zones which typically strike in a northerly to northwesterly direction. Some of these fault zones (and the individual faults within the zone) are classified as active while others are classified as only potentially active according to the criteria of the California Division of Mines and Geology.

A review of available geologic maps indicate that the subject property is approximately 1.6 miles (2.6 km) from the Rose Canyon Fault zone, and 43.0 miles (68.8 km) from the Elsinore-Julian Fault zone.

**GROUNDWATER**

No groundwater was encountered in the exploratory borings to the maximum depth of exploration at 22 feet. No major groundwater related problems, either during or after construction, are anticipated. However, it should be recognized that minor seepage problems may occur after development of a site even where none were present before development. These are usually minor phenomena and are often the results of an alteration of the permeability characteristics of the soils; an alteration in drainage patterns due to grading; and an increase in the use of irrigation water. Based on the permeability characteristics of the soils and anticipated usage of the development, it is our opinion that any seepage problems which may occur will be minor in extent. It is further our opinion that these problems can be most effectively corrected on an individual basis if and

when they develop.

### **GEOLOGIC HAZARDS**

**Ground shaking** – The most likely geologic hazard to affect the site is ground shaking as a result of movement along one of the active fault zones mentioned above.

For seismic design purposes, soil parameters in accordance with the 2013 edition of the California Building Code were determined, and presented hereinafter.

**Liquefaction Potential** - In consideration of the competent formational soils underlying the site, and the lack of a high groundwater level, it is our opinion that soil liquefaction does not present a significant geotechnical hazard to the proposed site development.

**Landslides** – Subject property is situated on level terrain and underlain by competent formational soils. A review of available geologic maps did not reveal the presence of any ancient landslides on subject or adjacent properties. The potential for landslides on subject and adjacent properties is considered minimal.

**Tsunami Inundation** - Subject property is located along the west side of San Diego Bay near the south tip of Crown Point, at an elevation of 30 feet above mean sea level. According to the San Diego County Tsunami Inundation Map, the property is outside the area subject to tsunami inundation.

### **FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

#### **General**

1. Based on the results of the investigation, it is our opinion that the currently proposed site



development is feasible from a geotechnical engineering standpoint, provided that the recommendations presented in this report are incorporated into the design plan(s) and are properly implemented during the construction phase.

2. It is noted that some of the recommendations may have to be modified and supplemental recommendations may have to be presented, depending on the actual subsurface conditions encountered during construction.
3. Site grading and earthwork constructions will not impact the adjacent properties provided our recommendations are incorporated into the final designs and implemented during the construction phase. Additional field recommendations, however, may also be necessary and should be given by the project geotechnical consultant for the protection of adjacent properties and should be anticipated.

#### **Expansion Index of On-Site Soils**

4. The soils encountered on the site possess low expansion potential (Expansion Index = 32).

#### **Sulfate Content of On-Site Soils**

5. The soils encountered on the site are subject to negligible sulfate exposure (sulfate content of 54 ppm).

#### **Grading**

6. It is recommended that all earthwork be accomplished in accordance with the Grading Ordinance of the City of San Diego, current edition of the California

Building Code, Appendix I attached hereto, entitled, "General Grading and Earthwork Specifications", and recommendations as presented in this Section.

7. Where the recommendations of this Section of the report conflict with those of Appendix I, this Section of the report takes precedence.
8. Grading operations should begin with the demolition of all existing structures and improvements, and hauling away of the debris to an approved dump site.
9. Grading should begin with the excavation for the proposed basement level.. The soils excavated should be hauled away and disposed of at a City approved dump site.
10. The bottom of the excavation should be inspected and approved by our firm. Any loose materials encountered along the bottom of the excavation should be removed and uniformly compacted.
11. The upper soils on the existing building pad will be disturbed when the foundation of the existing structures and underground utilities are demolished and removed. For footings of the structures to be founded at the main level (level above basement), it is recommended that the upper 3 feet of the existing soils remaining below finished grade be removed. The bottom of the excavation should be inspected and approved by our firm, and then scarified to a depth of 12 inches. The removed soils should then be properly moistened, replaced and uniformly compacted. The area of removal and recompaction should extend at least 5

feet outside the foundation line of the proposed structure.

12. All fill soils are to be compacted to at least 90 percent of maximum dry density at 120% above optimum moisture content, in accordance with ASTM D1557.

### **Foundation and Slab Design**

13. It is recommended that a safe allowable soil bearing value of 2,000 pounds per square foot be used for the design and checking of continuous footings that are 12 inches in minimum horizontal dimension, and isolated pier footings that are 15 inches in minimum horizontal dimension; and are embedded 12 inches (for single story) or 18 inches (for two or more stories) below the surface of the competent natural ground.
14. The above safe allowable soil bearing value may be increased 400 pounds per square foot for each addition foot of depth and width, to a maximum of 3,200 pounds per square foot.
15. The above safe allowable soil bearing value may be increased by one-third when considering wind and/or seismic forces.
16. The settlement of foundation, when designed and loaded as outlined above, are expected to be less than  $\frac{3}{4}$  inch total and  $\frac{1}{2}$  inch differential over a span of 40 feet.
17. It is recommended that all continuous footings be reinforced with a minimum of 4 #5 rebars; two rebars located near the top, and the other two rebars near the bottom of the footings. All isolated pier footings should be reinforced with a minimum of 2 #5 rebars in both directions, placed near the bottom of the footings.

18. The concrete slab-on-grade should be 4 ½ inches net in thickness, and be reinforced with #3 rebars @ 18 inches on center in both directions, placed at mid-height of concrete slab. The slab reinforcement should extend into the perimeter footings at least 6 inches.

#### **Under-Slab Vapor Retarders**

19. The concrete slab should be underlain by a 15-mil plastic membrane vapor retarder over 3 inches of clean sand. The seams of the plastic membrane should be sealed and should extend at least 12 inches down the sides of the interior and perimeter footings. The membrane should be placed in accordance with the recommendation and consideration of ACI 302, "Guide for Concrete Floor and Slab Construction" and ASTM 1643, "Standard Practice for Installation of Water Vapor Retarder Used in Contact with Earth or Granular Fill Under Concrete Slabs". The above foundation and slab reinforcement requirements are based on soil characteristics, and should be superseded by the requirements of the project architect.

#### **Retaining Wall Design**

20. It is recommended that retaining walls be designed to withstand the pressure exerted by equivalent fluid weights given below :

Backfill Surface (horizontal : vertical)	Equivalent Fluid Pressure (pcf)
Level	35
2 : 1	50
1 ½ : 1	58



The above values assume that the retaining walls are unrestrained from movement, and have a granular backfill. For retaining walls restrained from movement at the top, such as basement retaining walls, an uniform horizontal pressure of  $7H$  (where  $H$  is the height of the retaining wall in feet) should be applied in addition to the active pressures

21. All retaining walls should be supplied with a backfill drainage system adequate to prevent the buildup of hydrostatic pressure. The subdrain should consist of one-inch gravel and a perforated pipe near the bottom of the retaining wall. The width of this subdrain should be at least 12 inches, and extend at least  $2/3$  height of the retaining wall. The subdrain should be enclosed in a geotextile fabric such as Mirafi 140N or equal. Prefabricated subdrains such as Miradrain 2000 series or "J" Drains 400 series may also be used.
22. All backfill soils behind the retaining wall should consist of soils having low expansion potential (Expansion Index  $< 50$ ), and be compacted at least 90 percent of maximum dry density.

### **Seismic Earth Pressure**

23. Seismic earth pressures can be taken as an inverted triangular distribution with a maximum pressure at the top equal to  $12H$  pound per square foot (with  $H$  being the height of retained earth in feet). This pressure is in addition to the static design wall load. The allowable passive pressure and bearing capacity can be increased by  $1/3$  in determining the stability of the wall. A factor-of-safety of 1.2

can be used in determining the stability of the retaining wall under seismic conditions.

### **Lateral Loading**

24. To resist lateral loads, it is recommended that the pressure exerted by an equivalent fluid weight of 320 pcf be used for footings or shear keys poured neat against competent natural or compacted fill soils. The upper 12 inches of material in areas not protected by floor slabs or pavements should not be included in the design for passive resistance. This value assumes that the horizontal distance of the soil mass extends at least 10 feet or three times the height of the surface generating the passive pressure, whichever is greater.
25. A coefficient of sliding friction of 0.35 may be used for cast-in-place concrete on competent natural or compacted fill soils. Footings can be designed to resist lateral loads by using a combination of sliding friction and passive resistance. The coefficient of friction should be applied to dead load forces only.

### **Temporary Excavation**

26. Temporary excavations for the basement retaining walls may be safely accomplished at a vertical excavation for a height up to 5 feet. Above a height of 5 feet, the excavation should be flattened to a slope ratio of 1 : 1 (horizontal : vertical) or flatter.
27. The above conclusion assumes that no surcharge loads (such as those from existing buildings) are located above the temporary excavation for a horizontal distance at least equal to the height of the excavation.
28. If the above excavation configuration cannot be accomplished, temporary shoring will have



to be provided.

### **Temporary Shoring**

29. Due to close proximity of existing structures on adjacent properties, temporary shoring along a portion of the north and south sides of the property will be required.
30. The shoring should be designed by a licensed civil engineer and installed by specialty contractors with knowledge of the specific area soil conditions. The following lateral earth pressures should be used for designing the shoring. On-site excavation for the basement is on the order of 10 feet. It should be noted that in general, cantilever shoring is not recommended for excavations deeper than 15 to 20 feet, based on shoring deflection tolerances.

### **Cantilever Shoring System**

Active pressure =  $35 H$  (psf), triangular distribution

Passive pressure =  $250 h$  (psf)

$H$  = wall height (active case) or  $h$  = embedment (passive case)

31. Adjacent surcharge loads on the temporary shoring can be determined using the diagram on Figure No. 5.

### **Seismic Coefficients**

32. The seismic design factors were determined in accordance with the 2019 California Building Code, and presented on the following page :

Site Coordinates :	Latitude	=	32.7811
	Longitude	=	-117.2331
Site Class :		=	C
Spectral Response Acceleration			
At Short Periods	Ss	=	1.354 g
Spectral Response Acceleration			
At 1-second Period	S1	=	0.469 g
Sms	= FaSs	=	1.625 g
Sm1	= FvS1	=	0.704 g
Sds	= 2/3*Sms	=	1.083 g
Sd1	= 2/3*Sm1	=	0.469 g
Fa		=	1.2 g
Fv		=	1.5 g
Seismic Design Category		=	D

### **Concrete Flatwork**

33. In consideration of the on-site soil conditions, it is recommended that concrete flatwork be a minimum of 3 ½ inches in thickness, and be reinforced with 6x6-W1.4xW1.4 (6x6-10/10) welded wire mesh, placed at mid-height of concrete slab. One inch expansion joints should be provided at 15-foot intervals, with ¼ inch weakened plane contraction joints at 5-foot intervals. The concrete flatwork should be underlain by 6 inches of clean sand, with Sand Equivalent of at least 30, extending at least 12 inches beyond the edge of the concrete flatwork.

### **Surface Drainage and Maintenance**

34. Adequate drainage control and proper maintenance of all drainage facilities are imperative to minimize infiltration of surface water into the underlying soil mass in order to reduce settlement potential and to minimize erosion. The building pad

should have drainage swales which direct storm and excess irrigation water away from the structures and into the street gutters or other drainage facilities. No surface runoff should be allowed to pond adjacent to the foundation of structures.

#### **Grading and Foundation Plans Review**

35. It is recommended that our firm review the final grading and foundation plans for compliance with our recommendations.

#### **LIMITATION AND UNIFORMITY OF CONDITIONS**

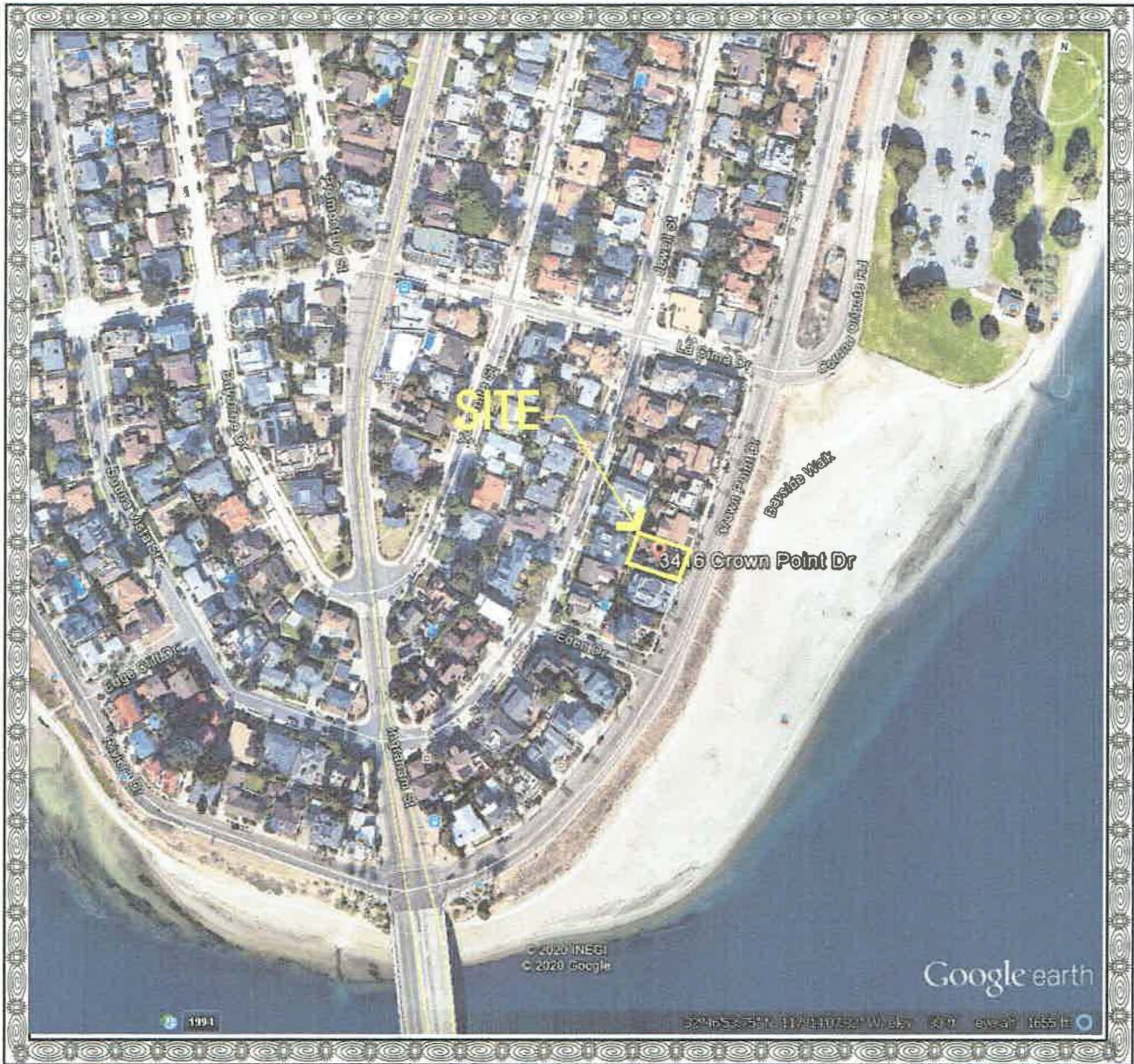
1. The preliminary findings and recommendations contained in this report pertain only to the site investigated and are based on the assumption that the soil conditions beneath the entire site do not deviate substantially from those disclosed in the exploratory borings. If any variations or undesirable conditions are encountered during grading, or if the scope of the project differs from that planned at the present time, our firm should be notified in order that supplemental recommendations can be presented, if necessary.
2. 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 presented herein are brought to the attention of the Project Architect and Engineer and are incorporated into the plans and specifications for the project. Furthermore, the Owner, or his representative, will also be responsible for taking the necessary measures to ensure that the Contractor and subcontractors properly carry out the recommendations in the field.
3. Professional opinions and recommendations presented in this report are based

partly on our evaluation and analysis of the technical information gathered during the study, partly on the currently available information regarding the proposed project, and partly on our previous experience with similar soil conditions and projects of similar scope. Our study has been performed in accordance with the minimum standards of care exercised by other professional geotechnical consultants currently practicing in the same locality. We do not, however, guarantee the performance of the proposed project in any respect, and no warranties of any kind, expressed or implied, are made or intended in connection with the study performed by our firm.

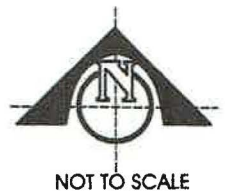
4. The findings and recommendations contained in this report are valid as of the present date. However, changes in the conditions of the property could occur with the passage of time, whether they be due to natural processes or due to man-made actions on the subject and/or adjacent properties. In addition, 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 of our control. Therefore, this report is subject to review by our firm and should not be relied upon after a period of two years.

Figure Nos. 1 to 5, inclusive, and Appendices I, II and III are parts of this report.





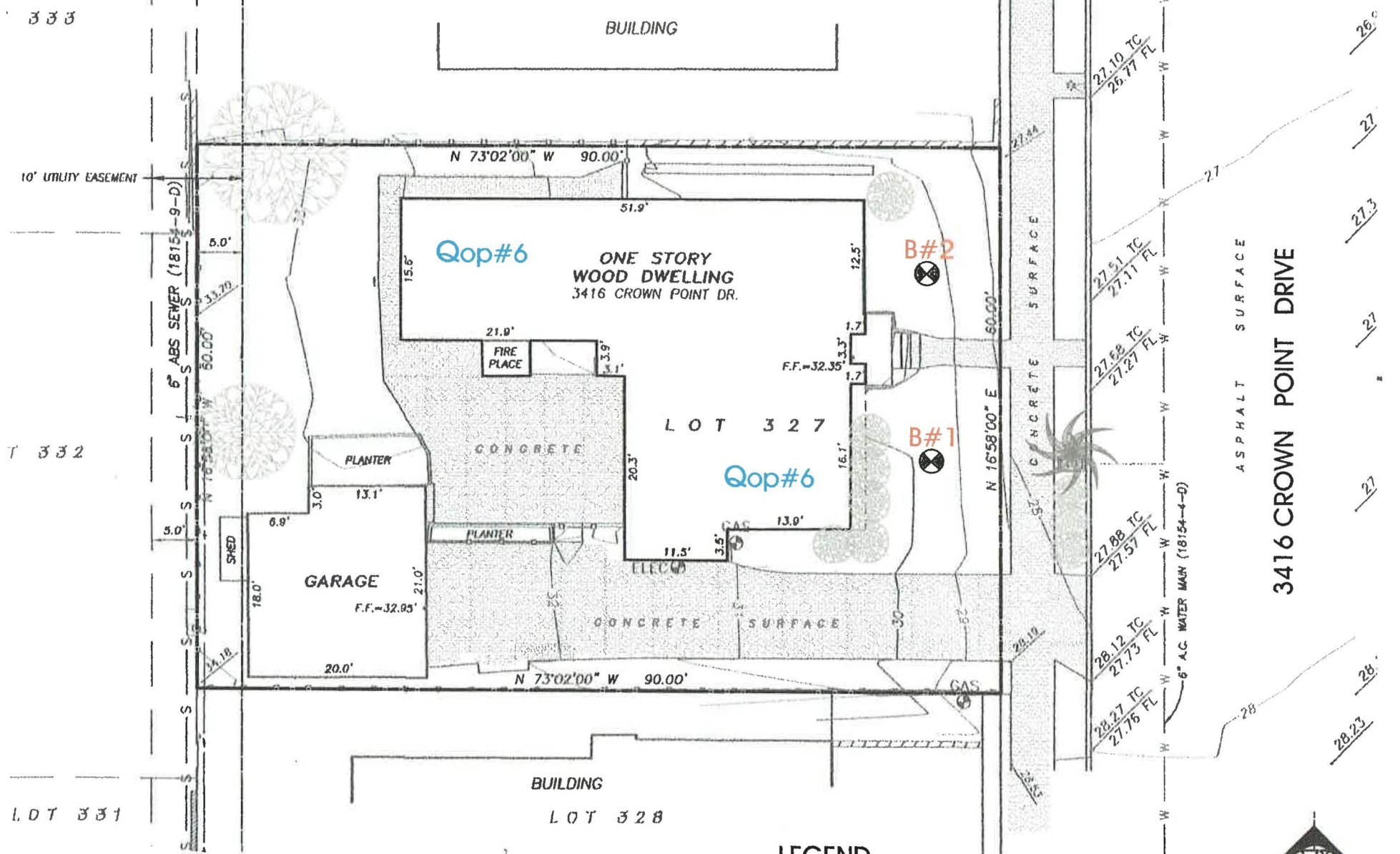
# **SITE LOCATON MAP**



PROJECT NO. 20- 1268 A1

FIGURE NO.1

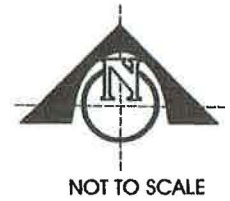




# APPROXIMATE LOCATION OF EXPLORATORY BORINGS

## LEGEND

- X B#1 Approximate Location of Exploratory Boring
- Qop#6 Old Paralitic Deposit#6





# BORING LOG SHEET

**BORING NO. 1**

**ELEV. 24' msl**

FT.	DESCRIPTION	SOIL TYPE
0	Light brown/brown, damp, loose (Topsoil)	SILTY FINE SAND (SM)
2		
4	Light brown/brown, moist, medium (Old Paralic Deposit #6) <span style="border: 1px solid black; padding: 2px;">1</span>	SILTY FINE SAND (SM)
6		18*
8		24*
10		21*
12	Dense	32*
14	<span style="border: 1px solid black; padding: 2px;">2</span>	35*
16		
18		
20		

Bottom of Boring (No Refusal)

### LEGEND

- =====
- 1 - Indicates representative sample
  - \* - Indicates blowcount/10 cm/Triggs penetrometer

Granular		Cohesive	
0	Very loose	0	Very soft
5	Loose	2	Soft
11	Medium dense	5	Medium stiff
31	Dense	9	Stiff
51	Very dense	16	Very stiff
		31	Hard

# BORING LOG SHEET

**TRENCH NO. 2**  
**ELEV. 24'msl**

FT.	DESCRIPTION	SOIL TYPE
0	Light brown/brown, damp, loose to slightly dense	SILTY FINE SAND (SM)
2	<u>(Topsoils)</u>	
4	Light brown/brown, moist (Old Paralic Deposit #6)      12*	SILTY FINE SAND (SM)
6	①      18**	
8	25*	
10	Dense      32*	
12		
14		
16		
18		
20		

Bottom of Boring (No Refusal)

## APPENDIX I

### GENERAL GRADING AND EARTHWORK SPECIFICATIONS

#### 1.0 General

- 1.1 All earthwork shall be accomplished in accordance with the Grading Ordinance of the Agency having jurisdiction; Chapter 18 and 18A, and Appendix J of the 2019 edition of the California Building Code; Appendix I hereinafter, and recommendations as presented in the Geotechnical Report.
- 1.2 These recommended grading and earthwork specifications are intended to be a part of and to supplement the Geotechnical Report(s). In the event of a conflict, the recommendations of the Geotechnical Report(s) will supersede these specifications. Observations during the course of earthwork operations may result in additional, new or revised recommendations that could supersede these specifications and/or the recommendations in the Geotechnical Report(s).
- 1.3 The Owner or his authorized representative shall procure the services of a qualified Geotechnical Consulting Firm, hereinafter to be referred to as the "Geotechnical Consultant" (often the same entity that produced the Geotechnical Report(s)).
- 1.4 The Geotechnical Consultant shall be given a schedule of work by the Earthwork contractor for the subject project, so as to be able to perform required observations; testing and mapping of work in progress in a timely manner.
- 1.5 The work herein includes all activities from clearing and grubbing through fine grading. Included are trenching, excavating, backfill compaction and grading. All work shall be as shown on the approved project drawings.
- 1.6 The Geotechnical Consultant or a qualified representative shall be present on the site as required, to observe, map and document the subsurface exposures so as to verify the geotechnical design suppositions. In the event that observed conditions are found to be significantly different from the interpreted conditions during the design phase, the Geotechnical Consultant shall notify the Owner, recommended appropriate changes in the design to suit the observed conditions and notify the agenc(ies) having jurisdiction, where required. Subsurface areas to be geotechnically observed, mapped, record elevations or tested included cleared natural ground for receiving fill or structures, "remedial removal" areas, key bottoms and benches.

- 1.7 The guidelines contained herein and any standard details attached herewith represent this firm's recommendations for the grading and all associated operations on the subject project. These guidelines shall be considered to be a part of these Specifications.
- 1.8 If interpretation of these guidelines or standard details result in a dispute(s), the Geotechnical Consultant shall conclude the appropriate interpretation.
- 1.9 The Geotechnical Consultant shall observe the processing of subgrade and fill materials and perform the necessary compaction testing. The test results shall be provided to the Owner and the Contractor and if so required, to the agenc(ies) having jurisdiction.
- 1.10 The Geotechnical Consultant shall not provide "supervision" or any "direction" of work in progress to the Earthwork Contractor, or to any of the Contractor's employees or to any of the Contractor's agent.
- 1.11 The Earthwork Contractor : The Earthwork Contractor (contractor) shall be qualified, experienced and knowledgeable in earthwork logistics; preparation and processing of ground to receive fill, moisture condition and processing of fill and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the Owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the Owner and the Geotechnical Consultant of change in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading Codes and agency ordinances, these Specifications and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soils,



improper moisture conditions, inadequate compactions, insufficient buttress key size, adverse weather, etc. are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the Owner that construction be stopped until the conditions are rectified.

## 2.0 Preparation of Areas to be Filled

- 2.1 Clearing and grubbing : vegetation, such as brush, grass, roots, and other deleterious materials shall be sufficiently removed and properly disposed of in a method acceptable to the Owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lifts shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected areas, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fine and/or imprisonment and shall not be allowed.

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, Article 9 and 10; 40 CRF; 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.

- 2.2 Any asphaltic pavement material removed during clearing operations should be properly disposed of at an approved off-site facility. Concrete fragments which are free of reinforcing steel may be placed in fills, provided that they are placed in accordance with Section 3.1 of this document.
- 2.3 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 conditions.
- 2.4 Processing : Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be over-excavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay clumps or clods and the working surface is reasonable uniform, flat, and free of uneven features that would inhibit uniform compaction.
- 2.5 Over-excavation : In addition to removals and over-excavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich highly fractured or otherwise unsuitable ground shall be over-excavated to competent ground as evaluated by the Geotechnical Consultant during grading.
- 2.6 Benching : Where fills are to be placed on ground with slopes steeper than 5 : 1 (horizontal : vertical), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5 : 1 (horizontal : vertical) shall also be benched or otherwise over-excavated to provide a flat subgrade for the fill.
- 2.7 Evaluation/Acceptance of Fill Areas : All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevation of processed areas, keys and benches.



**3.0 Fill Material**

- 3.1 General : Materials to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill materials.
- 3.2 Oversized Material : Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches shall not be buried or placed in fill unless location, materials and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finished grade or within 2 feet of future utilities or underground construction.
- 3.3 Import : If importing of fill materials is required for grading, proposed import material shall meet the requirements of Section 3.1 The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

**4.0 Fill Placement and Compaction**

- 4.1 Fill Layer : Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near vertical layers generally not exceeding 8 inches in thickness when compacted. The Geotechnical Consultant may accept thicker layers if testing indicates that the grading procedure can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.
- 4.2 Fill Moisture Conditioning : Fill soils shall be watered, dried back blended, and/or mixed as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557).

- 4.3 Compaction of Fill : After each layer has been moisture-conditioned, mixed and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.
- 4.4 Compaction of Fill Slopes : In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increment of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum dry density per ASTM Test Method D1557.
- 4.5 Compaction Testing : Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).
- 4/6 Frequency of Compaction Testing : Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.
- 4.7 Compaction Test Locations : The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.



## 5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

## 6.0 Excavation

Excavations, as well as over-excavation for remedial purpose, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-overcut slopes are to be graded, the cut portion of the slopes shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

## 7.0 Trench Backfill

- 7.1 The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations.
- 7.2 All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 ( $SE > 30$ ). The bedding shall be placed and compacted to at a minimum of 90 percent of maximum dry density from 1 foot above the top of the conduit to the surface.
- 7.3 The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.
- 7.4 The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

- 7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

### FILL SLOPE

PROJECT PLAN 1 TO 1 Min.  
FROM TOE OF SLOPE TO  
APPROVED GROUND

EXISTING  
GROUND  
SURFACE

2' Min.  
KEY DEPTH

2.0% Min.

15' Min. LOWEST  
BENCH (KEY)

COMPACTED FILL

BENCH

REMOVE  
UNSUITABLE  
MATERIAL

4' TYPICAL

BENCH  
HEIGHT

NATURAL  
GROUND

### FILL OVER CUT SLOPE

CUT FACE SHALL BE  
CONSTRUCTED PRIOR  
TO FILL PLACEMENT TO  
ASSURE ADEQUATE  
GEOLOGIC CONDITIONS

2' Min.  
KEY DEPTH

2.0% Min.

15' Min. LOWEST  
BENCH (KEY)

COMPACTED FILL

BENCH

REMOVE  
UNSUITABLE  
MATERIAL

NATURAL  
GROUND

CUT FACE TO BE  
CONSTRUCTED  
PRIOR TO FILL  
PLACEMENT

### CUT OVER FILL SLOPE

PROJECT PLAN 1 TO 1 Min.  
FROM TOE OF SLOPE TO  
APPROVED GROUND

2' Min.  
KEY DEPTH

2.0% Min.

DESIGN  
SLOPE

COMPACTED  
FILL

BENCH

REMOVE  
UNSUITABLE  
MATERIAL

4' TYPICAL

BENCH  
HEIGHT

FOR SUBDRAIN SEE  
STANDARD DETAIL "C"

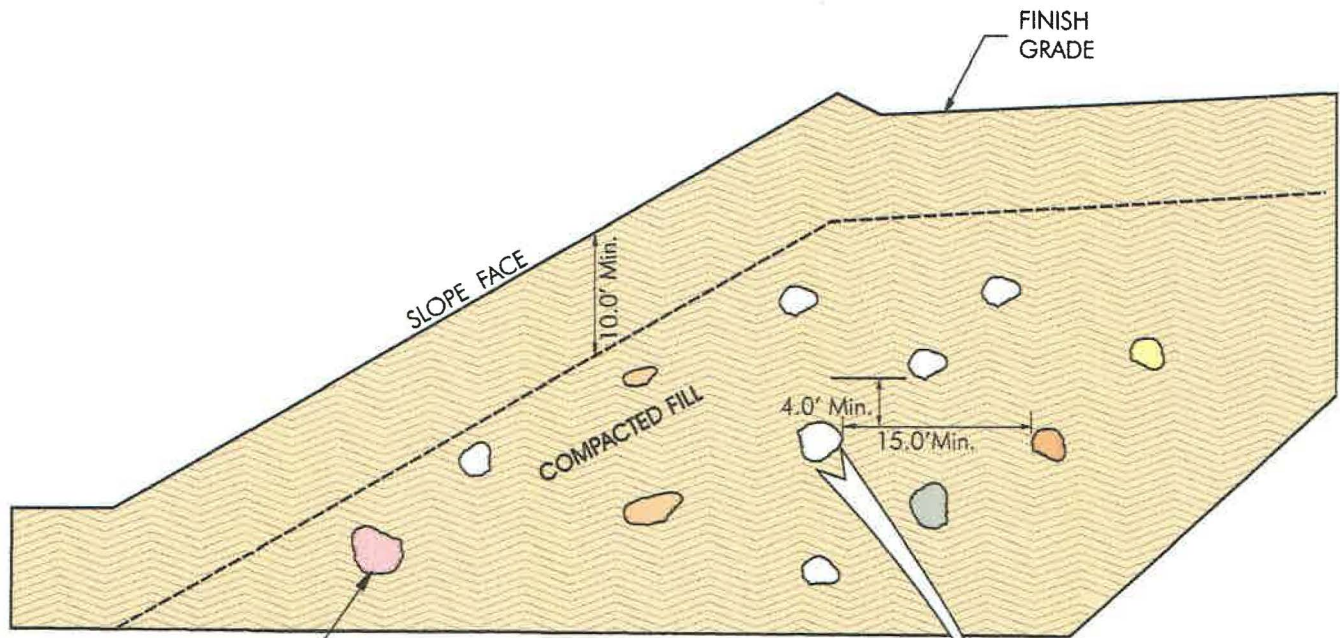
BENCHING SHALL BE DONE WHEN  
SLOPES ANGLE IS EQUAL TO OR  
THAN 5:1. MAXIMUM BENCH HEIGHT  
SHALL BE 4 FEET. MAXIMUM FILL WIDTH  
SHALL BE 8 FEET.

KEYING AND BENCHING

DETAIL A

ALLIED EARTH  
TECHNOLOGY

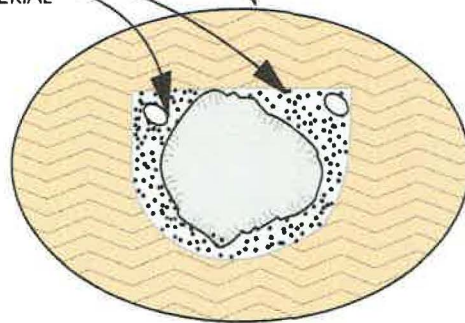




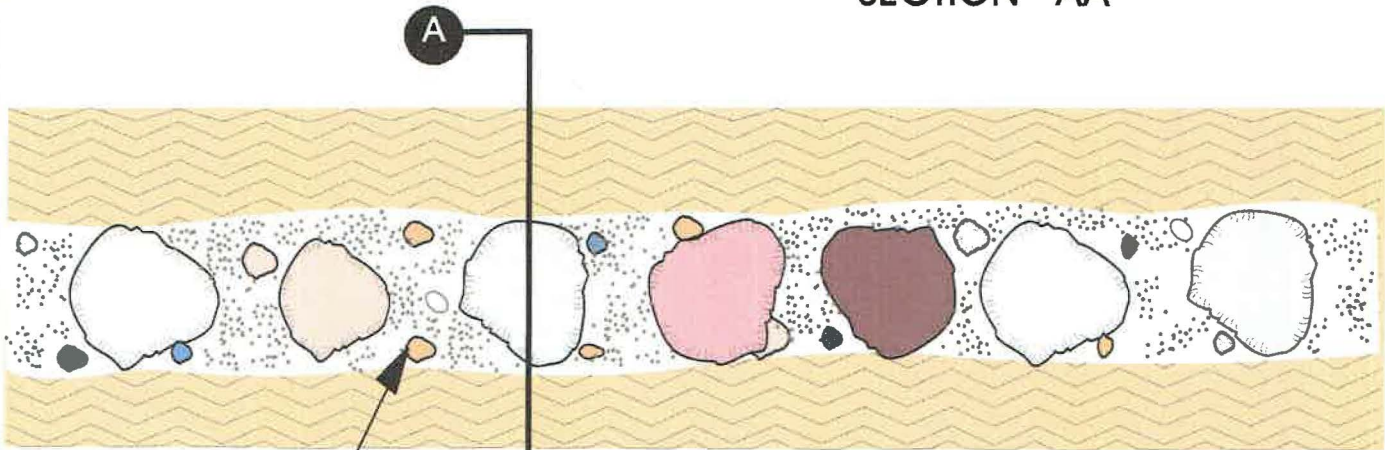
OVER SIZE WINDROW

- OVER SIZE ROCK IS LARGER THAN INCHES IN LARGEST DIMENSION
- EXCAVATE A TRENCH IN THE COMPACTED FILL DEEP ENOUGH TO BURY ALL THE ROCK
- BACKFILL WITH GRANULAR SOIL JETTED OR FLOODED IN PLACE TO FILL ALL THE ROCK VOIDS
- DO NOT BURY ROCK WITHIN 10 FEET OF FINISH GRADED.
- WINDROW OF BURIED ROCK SHALL BE PARALLEL TO THE FINISH SLOPE FILL.

JETTED OR FLOODED GRANULAR MATERIAL



SECTION "AA"



JETTED OR FLOODED GRANULAR MATERIAL

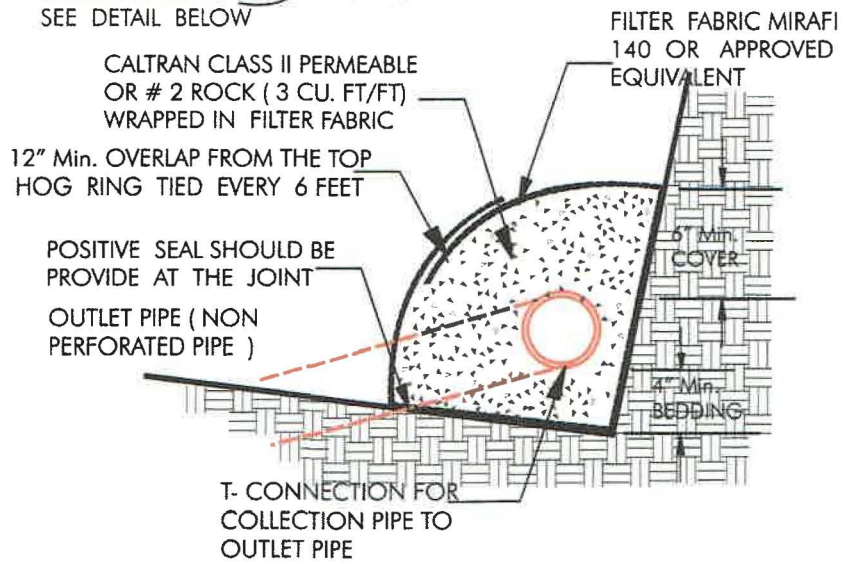
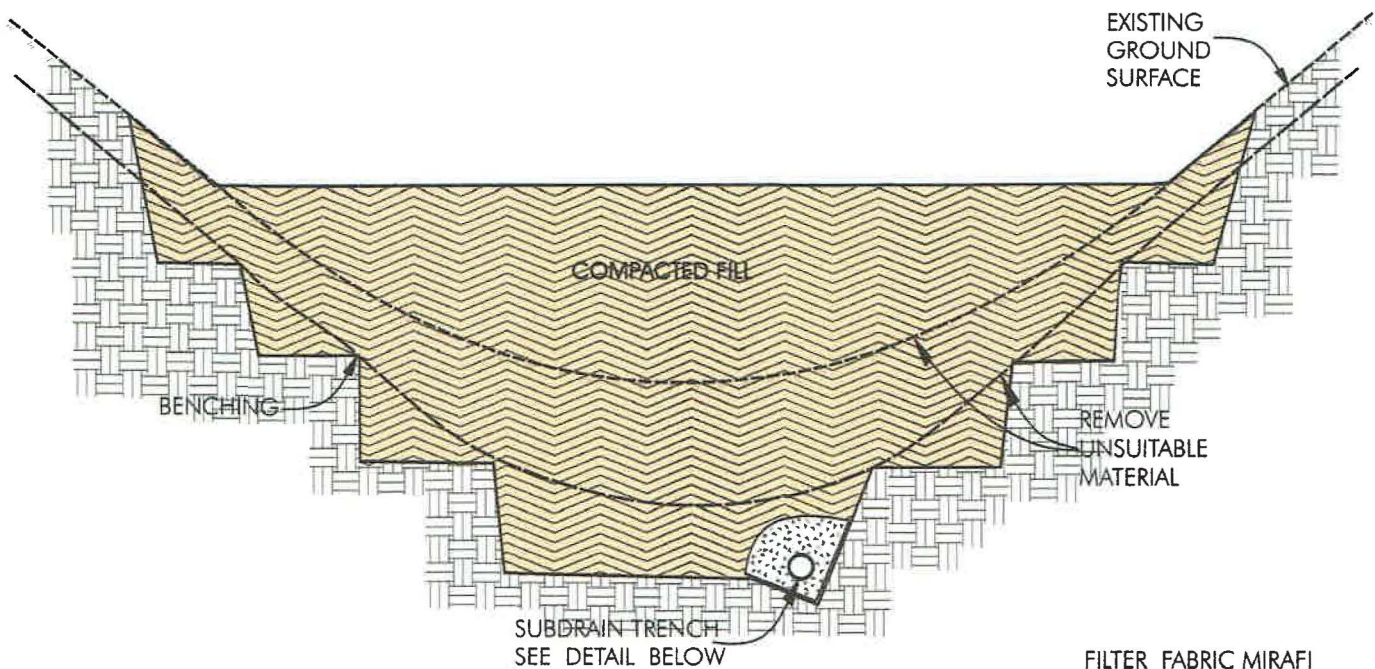
PROFILE ALONG WINDROW

## OVER SIZE ROCK DISPOSAL

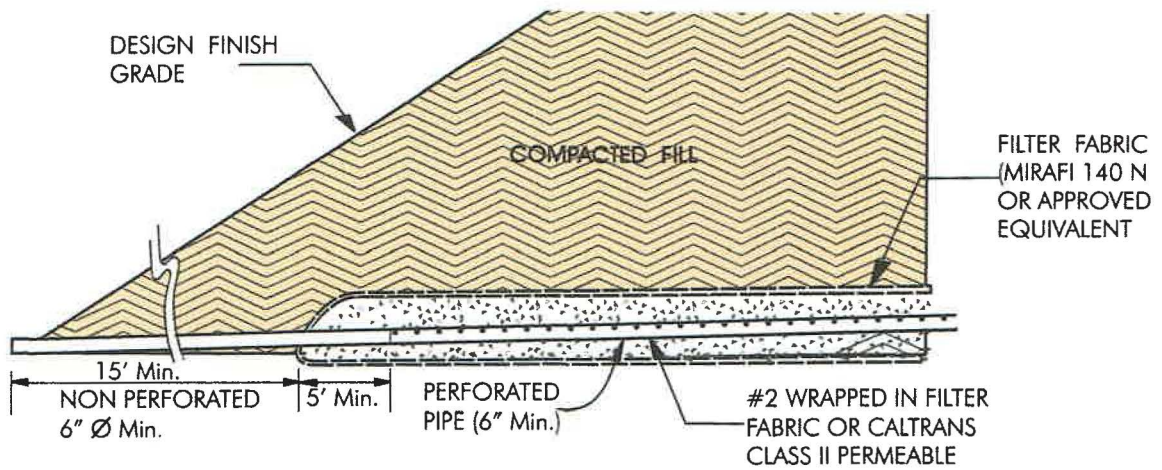
DETAIL B

ALLIED EARTH  
TECHNOLOGY

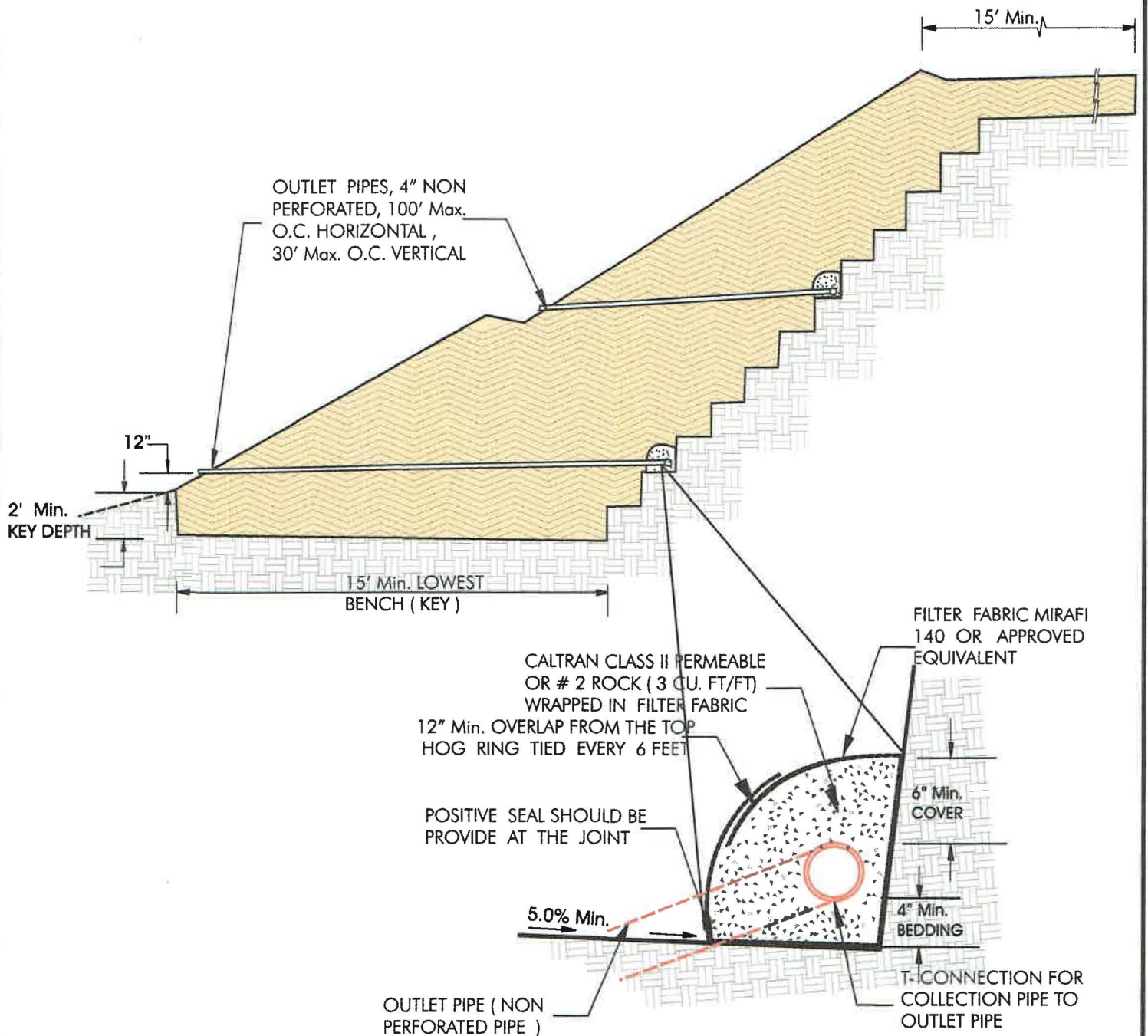




DETAIL OF CANYON SUBDRAIN TERMINAL







**SUBDRAIN INSTALLATION-** SUBDRAIN COLLECTOR PIPE SHALL BE INSTALLED WITH PERFORATIONS DOWN OR UNLESS OTHERWISE DESIGNED BY THE GEOTECHNICAL CONSULTAN. OUTLET SHALL BE NON-PERFORATED PIPE. THE SUBDRAIN PIPE SHALL HAVE AT LEAST 8 PERFORATIONS UNIFORMLY SPACED PER FOOT. PERFORATION SHALL BE 1/4" TO 1/2" IF DRILLED HOLES ARE USED. ALL SUBDRAIN PIPES SHALL HAVE A GRADIENT AT LEAST 2% TOWARD THE OUTLET.

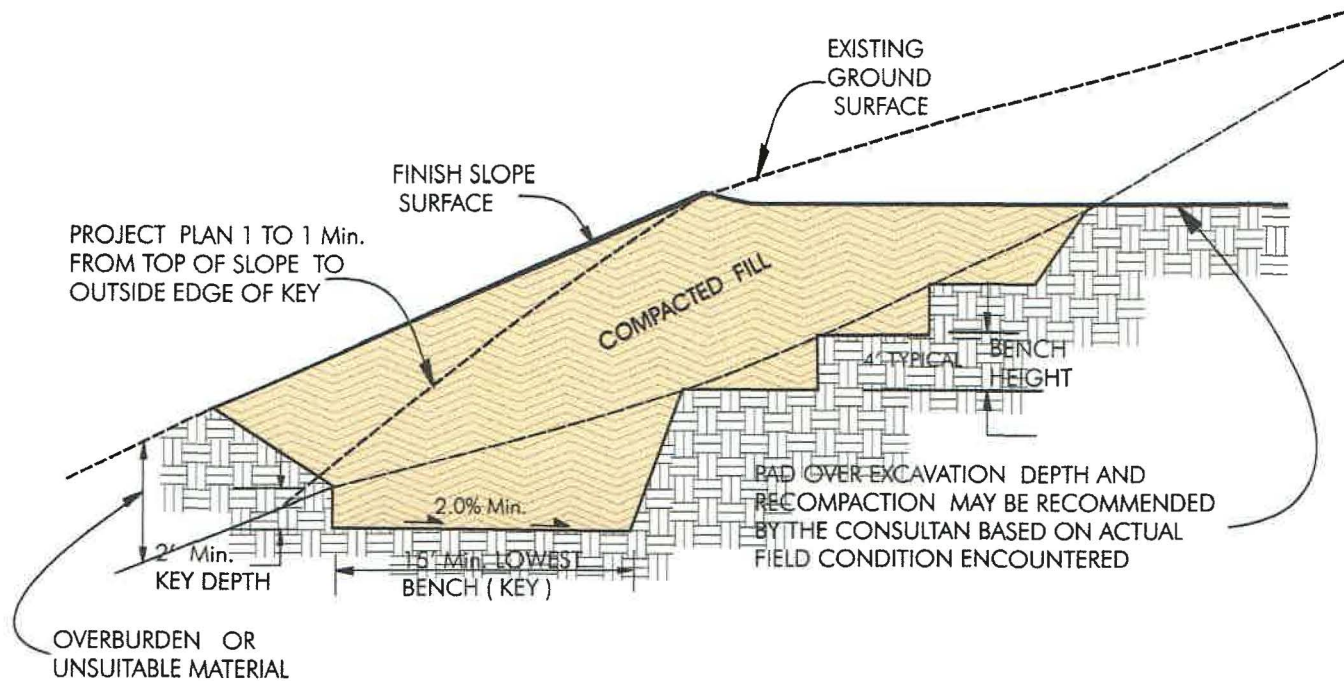
**SUBDRAIN PIPES-** SUBDRAIN PIPE SHALL BE ASTMD 2751, SDR 23.5 OR ASTMD 1527, SCHEDULE 40, OR ASTMD 3034, SDR 23.5, SCHEDULE 40 POLYVINYL CHORIDE PLASTIC (PVC) PIPE.

ALL OUTLET PIPE SHALL BE PLACED IN A TRENCH NO WIDER THAN TWICE THE SUBDRAIN PIPE, PIE SHALL BE IN SOIL OF SE>30 JETTED OR FLOODED IN PLACED EXCEPT FOR THE OUTSIDE 5 FEET WHICH BE NATIVE SOIL BACKFILL

**BUTTRESS OR REPLACEMENT  
SUBDRAIN**

**DETAIL D**

**ALLIED EARTH  
TECHNOLOGY**



**NOTE:** SUBDRAIN DETAILS AND KEY WIDTH RECOMMENDATIONS TO BE PROVIDED BASED ON EXPOSED SURFACE CONDITIONS



## APPENDIX II

LABORATORY TEST RESULTS

1. The maximum dry density and optimum moisture content of the fill soils encountered were determined in accordance with A.S.T.M. D1557, Method A. The results of the tests are presented as follows :

	Soil Description	Maximum Dry Density (lbs./cu.ft.)	Optimum Moisture Content (% Dry Wt.)
Boring #1 Sample #1 Depth 5.0'	Light brown/brown silty fine sand (SM)	122.0	10.5

2. The Expansion Index of the most clayey soils was determined in accordance with **A.S.T.M. D4929-11**. The results of the test are presented as follows :

	Soil Description	Expansion Index
Boring #1 Sample #1 Depth 5.0'	Light brown/brown silty fine sand (SM)	32*

\*Considered to possess LOW expansion potential

3. The sulfate content of the soils were determined in accordance with A.S.T.M. D516. The results are presented below :

	Soil Description	Sulfate Content (ppm)	
Boring #1 Sample #1 Depth 5.0'	Light brown/brown silty sand (SM)	54	Negligible

### APPENDIX III

#### REFERENCES

- California Building Code, 2019, Title 24, Part 2 Volume 1 & 2
- California Department of Conservation, Division of Mines and Geology (California Geological Survey), 1997. Guidelines for Evaluating and Mitigating Seismic Hazards in California, DMG Special Publications 17. 71p.
- Foundation and Earth Structures, Naval Facilities Engineering Command, DM7.02
- Frontis Architecture – Building Plan, Glockner Residence, 3416 Crown Point Drive, San Diego, CA.
- “Green Book” Standard Specifications for Public Works Construction, Public Works Standards, 2018 edition.
- Joyner, W.B. and Boore, D.M. 1982, Prediction of Earthquake response spectra, U.S. Geological Survey Open File Report 82-922, 16pp.
- Kennedy, M.P. and Tan S.S., 2005 Geologic Map of the San Diego 30' x 60' Quadrangle, California Geologic Survey and U.S. Geological Survey digital map series.
- Lindvall, S.C., Rockwell, T.K., and Lindvall, C.E., 1990, the seismic hazard of San Diego revised : New evidence of Magnitude 6+ Holocene earthquakes on the Rose Canyon Fault Zone, in Proceedings of U.S. National Conference on Earthquake Engineering, Palm Springs, California, vol 1 : Earthquake Engineering Research Inst., p. 679-688
- Tan, S.S., and Kennedy, M. P., 1996 Geologic Maps of the Northwestern Part of San Diego County, California, Plate 1, Geologic Maps of the Oceanside, San Luis Rey, and San Marcos 7.5 Quadrangles., Div. Mines and Geology Open File Report 96-02.
- Tsunami Inundation Map for Emergency Planning, 2009, California Emergency Management Agency, California Geological Survey and University of Southern California.