ALLIED EARTH TECHNOLOGY

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ROBERT CHAN, P.E.

GEOTECHNICAL INVESTIGATION

PROPOSED SONIC DRIVE-IN RESTAURANT SITE

1215 GRAND AVENUE

SAN MARCOS, CALIFORNIA

FOR

1215 GRAND AVENUE LLC

MPA ARCHITECTS INC.

PROJECT NO. 12-1108E7

NOVEMBER 13, 2012

ALLIED EARTH TECHNOLOGY

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ROBERT CHAN, P.E.

November 13, 2012

MPA Architects Inc.
3578 38th Street
San Diego, CA. 92104

Subject : Project No. 12-1108E7
Geotechnical Investigation
Proposed Sonic Drive-In Restaurant Site
1215 Grand Avenue
San Marcos, California

Gentlemen :

In accordance with your request, we have completed the geotechnical investigation for the proposed Sonic Drive-In restaurant site on subject property, more specifically referred to as being Parcel Nos. 2 and 3 of Parcel Map No. 1473 (APN 219-152-58 & 59-00), in the City of San Marcos, 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 soil 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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GEOTECHNICAL INVESTIGATION

INTRODUCTION

This report presents the findings and conclusions of a geotechnical investigation conducted at the site of a proposed restaurant building on subject property, located at 1215 Grand Avenue, in the City of San Marcos, State of California.

Subject property is more specifically referred to as being Parcel Nos. 2 and 3 of Parcel Map No. 1473 (APN 219-152-58 & 59-00).

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

DESCRIPTION OF PROJECT

It is our understanding that a Sonic Drive-In restaurant is proposed for the site. The proposed single-story restaurant structure will be of wood-frame/stucco and slab-on-grade construction.

SCOPE OF WORK

The objectives of the investigation were to inspect and determine the subsurface soil 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 restaurant structure.

In order to accomplish these objectives, three 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 November 2, 2012, and involved a reconnaissance of the site, and the excavation of three exploratory borings with a tripot-mounted 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 a depth of 8 feet below existing ground surface. The location of the exploratory borings is shown on Figure No. 2, entitled, "Approximate Location of Exploratory Borings".

The drilling operation was performed under the direction of our field personnel, and a continuous log of the soil types encountered in the borings was recorded at the time of excavation, and is shown on Figure Nos. 3 to 5, inclusive, each entitled, "Borings 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.

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; the sulfate contents and Expansion Indices of the soils encountered.

SITE DESCRIPTION

Subject property is a quadrangular-shaped property of 1.06 acres, situated in the southeast corner of Grand Avenue and Via Vera Cruz. The property was previously used as a site for a commercial building. Remnants of the concrete slab of the structure

still exist in the southwesterly portion of the site. Remainder of the property consist of asphaltic concrete driveway and parking area.

The site is currently vacant and level, with surface drainage in a general southwesterly direction into Via Vera Cruz. The property is bordered on the north by Grand Avenue; on the west by Via Vera Cruz; and on the east and south by existing commercial establishments.

PROPOSED SITE DEVELOPMENT

Site development will consist of the construction of a Sonic Drive-In restaurant to be located in the central portion of the property. One entrance driveway from Grand Avenue will be situated in the northeast corner of the property; with another entrance from Via Vera Cruz in the southwest corner. Remainder of the property will be used as a restaurant drive-in and parking area. A patron picnic area is proposed in the front, northwest corner of the site, and the trash enclosure will be located in the rear, southeast corner of the property.

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 City of San Marcos, City of Poway, including the site, occurs within the easterly region and is underlain by Cretaceous-age rocks.

Site Geology and Subsurface Soil Conditions

A review of geologic maps as well as observations made during our subsurface exploration indicated that the general area is underlain by older alluvium of the San Marcos Creek. On subject property, as encountered in the exploratory borings, the alluvial soils were encountered in the form of brown/dark brown/tan silty sands and clayey sands. These alluvial soils were on the order of 5 to 6 feet in thickness. The upper 2 to 3 feet were found to be loose or slightly dense in consistency; while the lower portion is medium dense to dense. The alluvium is underlain by granitic rocks of the Green Valley Tonalite, consisting primarily of fractured granitic rocks which were dense to very dense. Refusal in the granitic rocks were met with the drill rig at a depth of 8 feet below existing ground surface.

Tectonic Setting

No evidence of faulting was noted during our surface reconnaissance or in our exploratory trenches. 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 Marcos area, 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 18.0 km (11.3 miles) from the Rose Canyon Fault zone, and 30.8 km (19.3 miles) from the Elsinore-Julian Fault zone.

GROUNDWATER

No groundwater was encountered in the exploratory trenches to the maximum depth of exploration at 8 feet. Based on our knowledge of groundwater level in this area of the City of San Marcos, the depth to groundwater is on the order of 20 to 27 feet below existing ground level. No 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 2010 edition of the California Building Code were determined, and presented hereinafter.

Liquefaction Potential - In consideration of the thin layer of alluvium and the underlying competent granitic rocks on 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 granitic rocks. 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.

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 supplementation 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. Some of the alluvial soils encountered on the site possess medium expansion potential (Expansion Index = 83). Recommendations presented hereinafter reflects this on-site soil condition

Sulfate Content of On-Site Soils

5. The soils encountered on the site are subject to negligible sulfate exposure (sulfate content of 92 ppm).

Grading

6. It is recommended that all earthwork be accomplished in accordance with the Grading Ordinance of the City of San Marcos, 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 the remnants of the

existing concrete slab and foundation, and removal of existing asphaltic concrete, and hauling away of the debris to an approved dump site.

9. It is recommended that the upper 3 feet of the existing alluvial soils within 5 feet outside the foundation line of the proposed restaurant structure be removed. The bottom of the excavation should be inspected by our firm, and then scarified to a depth of 8 inches. The removed soils should then be properly moistened, and uniformly compacted in layers not to exceed 8 inches until finished grade is achieved.

10. All fill soils should be compacted to at least 90 percent of maximum dry density at near optimum moisture content, in accordance with A.S.T.M. D1557.

11. The removed alluvial soils will shrink upon recompaction, and additional fill soils to achieve finished grade will be necessary. It is recommended that these imported fill soils consist of soils having low expansion potential (Expansion Index < 50), and be approved by our firm at the borrow site prior to importation.

Foundation and Slab Design

12. It is recommended that a safe allowable soil bearing value of 1,800 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 18 inches below the lowest adjacent ground surface.

10. The above safe allowable soil bearing value may be increased by one-third when considering wind and/or seismic forces.

11. The settlements of foundation, when designed and loaded as outlined above, are expected to be less than ¾ inch total and ½ inch differential over a span of 40 feet.

12. 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.

13. The concrete slab-on-grade should be 4 inches 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. The concrete slab should be underlain by 4 inches of clean sand. The above foundation and slab reinforcement requirements are based on soil characteristics, and should be superseded by the requirements of the project architect.

Under-Slab Vapor Retarders

14. The concrete slab should be underlain by 4 inches of clean sand, a 15-mil plastic membrane moisture barrier, and another one inch of clean sand cover. 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.

15 It is recommended that our firm inspect the foundation trench excavations for the proposed restaurant structure to ensure proper embedment into competent natural or compacted fill soils.

Retaining Wall Design

16. It is recommended that retaining walls be designed to withstand the pressure exerted by equivalent fluid weights given on the following page :

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 recommended above.

17. 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.

Seismic Earth Pressure

18. 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

19. To resist lateral loads, it is recommended that the pressure exerted by an equivalent fluid weight of 300 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.

20. 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.

21. 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 Coefficients

22. The seismic design factors were determined in accordance with the 2007 California Building Code, and presented on the following page :

Site Coordinates :	Latitude	=	33.14221
	Longitude	=	- 117.19096
Site Class :		=	D
Site Coefficient Fa		=	1.081
Site Coefficient Fv		=	1.605
Spectral Response Acceleration At Short Periods	Ss	=	1.047
Spectral Response Acceleration At 1-second Period	S1	=	0.397
Sms = FaSs		=	1.132
Sm1 = FvS1		=	0.637
Sds = 2/3*Sms		=	0.755
Sd1 = 2/3*Sm1		=	0.425

Concrete Flatwork

23. 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.

Preliminary Structural Pavement Design

24. For preliminary design purposes, it is recommended that structural pavement sections presented on the following page be used. For the pavement subgrade soils, a R-value of 20 had been assumed.

Preliminary Pavement Sections

Pavement Loading Condition	Traffic Index (20-year Life)	R-Value = 20 Pavement Section
Parking Areas	4.5	3 inches AC over 6 inches Class II base
Auto Driveways	5.0	3 inches AC over 8 inches Class II base
Heavy Truck Driveways	6.0	4 inches AC over 9 inches Class II base

25. The upper 8 inches of the subgrade should be compacted to at least 95 percent of maximum dry density at near optimum moisture content.

Surface Drainage and Maintenance

26. 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

27. It is recommended that our firm review the final grading and foundation plans for

the proposed site development to verify their 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 gather 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 car 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.

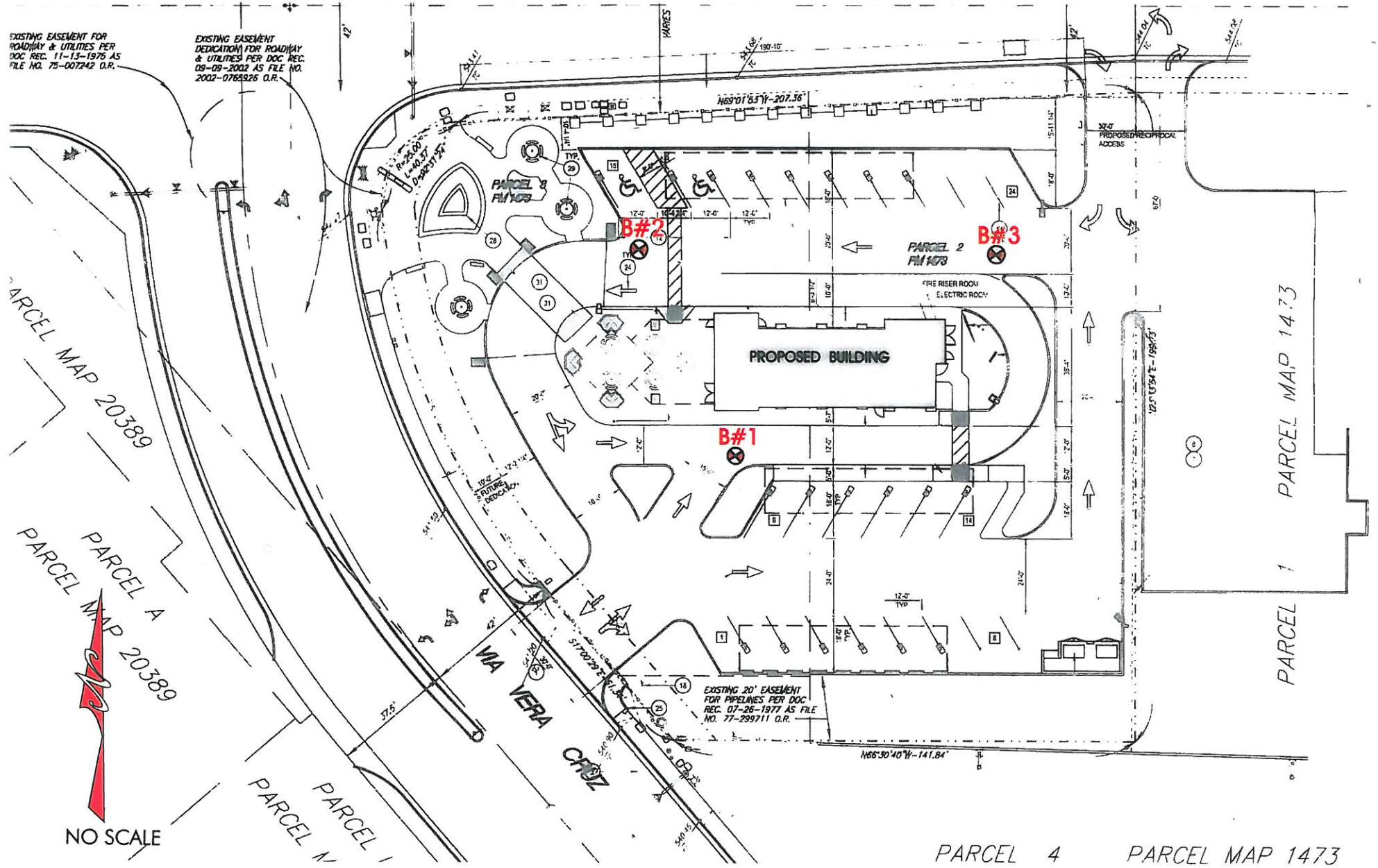
Figure Nos. 1 to 5, inclusive, and Appendices I to III are parts of this report.

SITE LOCATION MAP

NOT TO SCALE

PROJECT NO. 12-1108 E7

FIGURE NO.1



APPROXIMATE LOCATION OF EXPLORATORY BORINGS

LEGEND

⊗ APPROXIMATE LOCATION OF EXPLORATORY BORING

PROJECT NO. 12-1108 E7

FIGURE NO.2

BORING LOG SHEET

BORING NO. 1
ELEV. 541' msl

FT.	DESCRIPTION		SOIL TYPE
0	2" Asphaltic concrete		
1	Brown, most, slightly dense (Alluvium)		SILTY FINE SAND W/CLAY BINDER (SM)
2	(1)		
3			
4	More clay		
5	Very dense	55*	
6	Light brown/gray, moist very dense		DISINTEGRATED GRANITE
7	Small fractured granite (Green Valley Tonalite)		
8			

Bottom of Boring (Refusal in bedrock)

LEGEND

○ Indicates representative sample
* Indicates Standard Penetration Test (NSTP)

No. of Blows, NSTP	Relative Density
0 – 4	Very loose
4 – 10	Loose
10 - 30	Medium
30 – 50	Dense
Over50	Very dense

Project No. 12-1108E7

Figure No. 3

BORING LOG SHEET

BORING NO. 2
ELEV. 544' msl

FT.	DESCRIPTION		SOIL TYPE
0 1 2	2" Asphaltic concrete Dark brown, very moist, loose (Alluvium)		CLAYEY SAND (SC)
3 4 5	Tan, moist, medium dense		SILTY SAND (SM)
6 7 8	Light brown/ gray, moist, Very dense (Green Valley Tonalite)	60*	DISINTEGRATED GRANITE

Bottom of Boring (Refusal in bedrock)

Project No. 12-1108E7

Figure No. 4

BORING LOG SHEET

BORING NO. 3
ELEV. 544' msl

FT.	DESCRIPTION	SOIL TYPE
0 1 2 3	2" Asphaltic concrete Brown, moist, slightly dense (Alluvium)	SILTY SANDS (SM)
4 5	Dark brown, moist, dense (Alluvium) 51*	CLAYEY SANDS (SC)
6 7 8	Light brown/gray, moist Very dense Fractured granitic pieces (Green Valley Tonalite)	DISINTEGRATED GRANITE

Bottom of Boring (Refusal in bedrock)

Project No. 12-1108E7

Figure No. 5

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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 City of San Diego; Chapter 18 and 18A, and Appendix J of the 2010 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 supercede these specifications. Observations during the course of earthwork operations may result in addition, new or revised recommendations that could supercede 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, backfilling compacting 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, recommend 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 conditioning 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 compaction, 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 area, 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 humps 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 elevations 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 finish 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 as 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 purposes, 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 Geotechincal 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

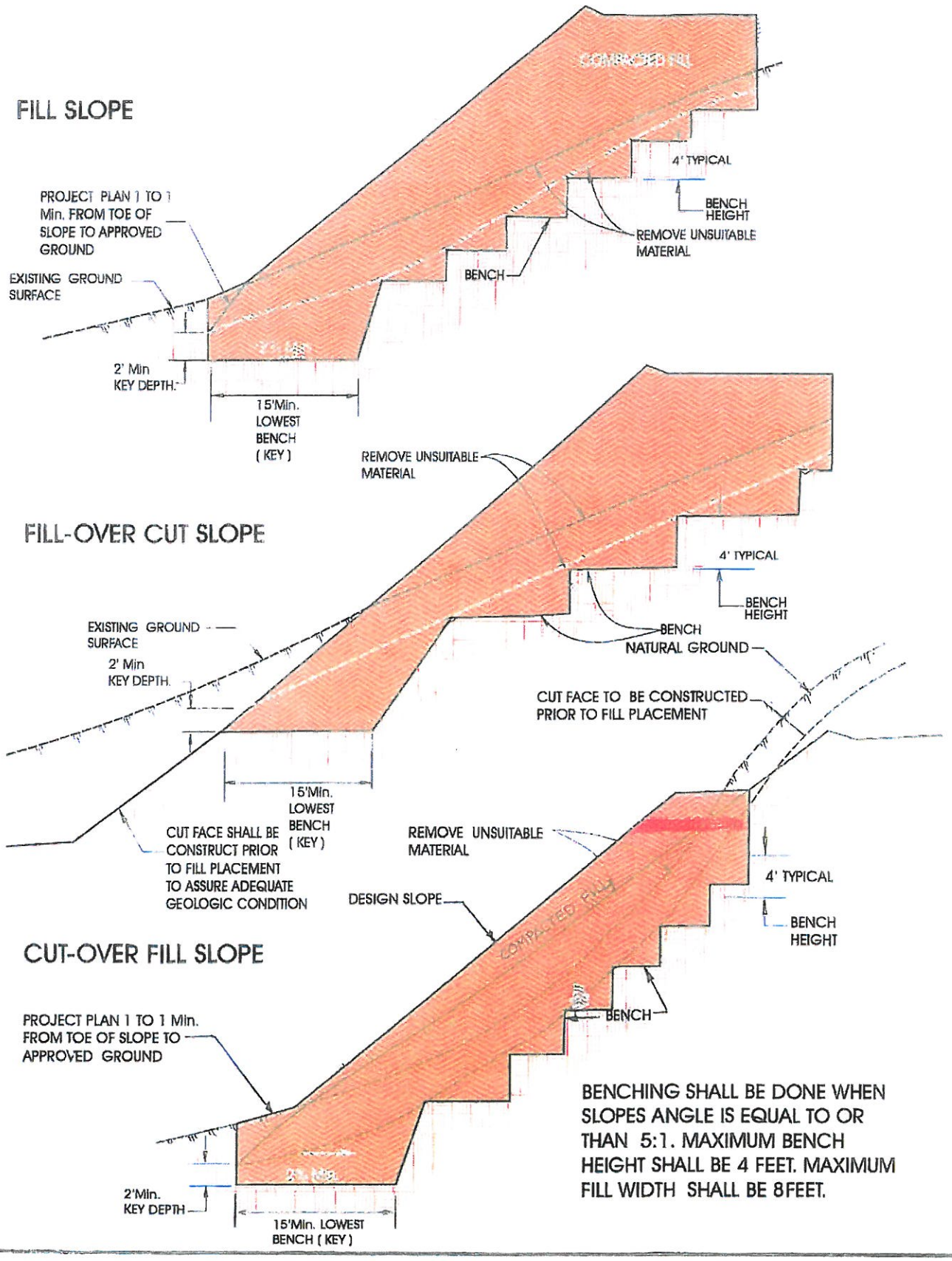
7.1 The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations.

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 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.

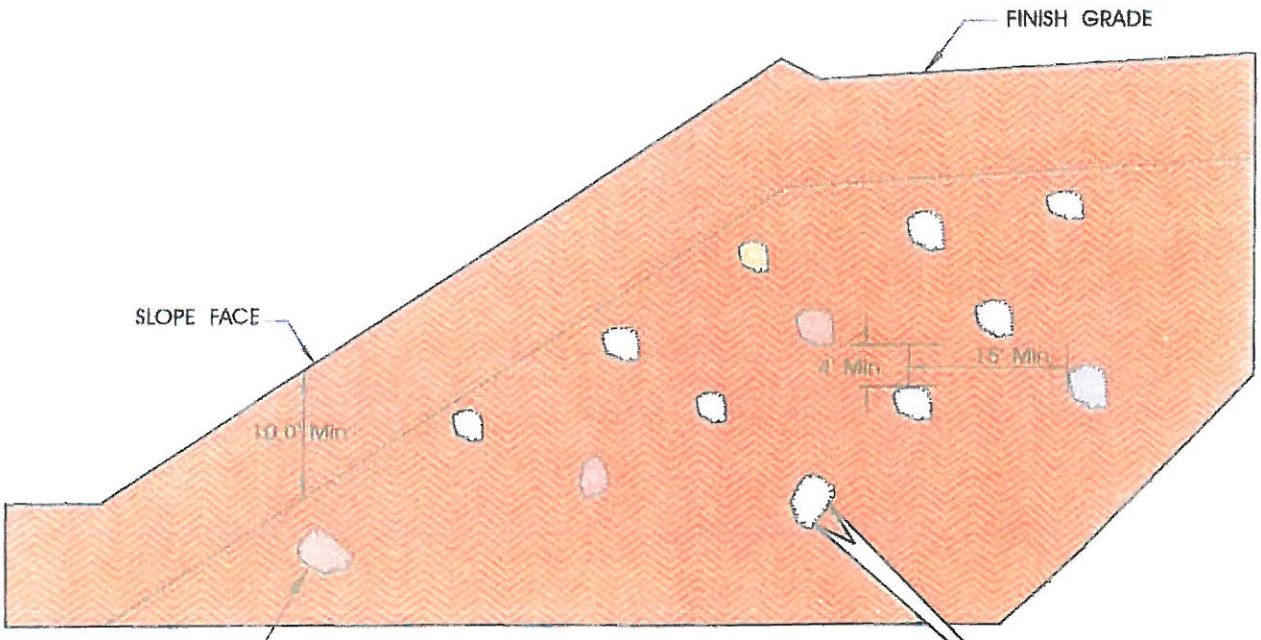
7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and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



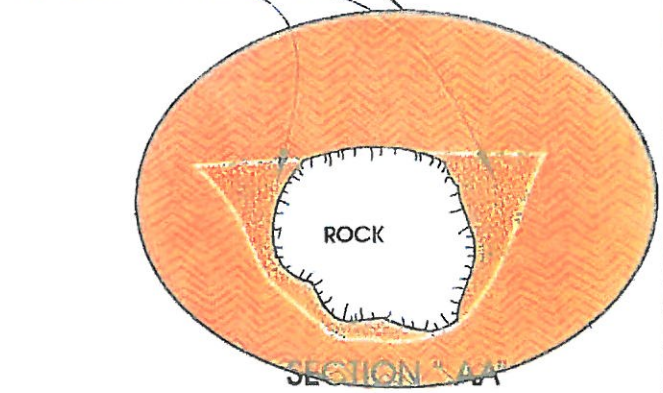
KEYING AND BENCHING

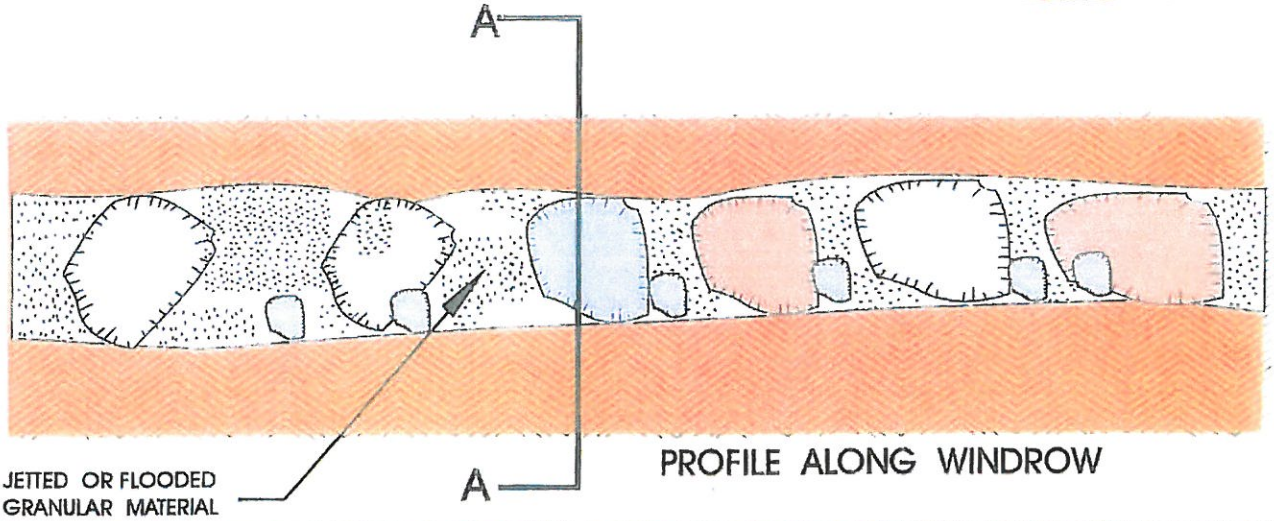
ALLIED EARTH TECHNOLOGY

DETAIL - A



- 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 VOIDS.
- DO NOT BURY ROCK WITHIN 10 FEET OF FINISH GRADE.
- WINDROW OF BURIED ROCK SHALL BE PARALLEL TO THE FINISH SLOPE FILL.

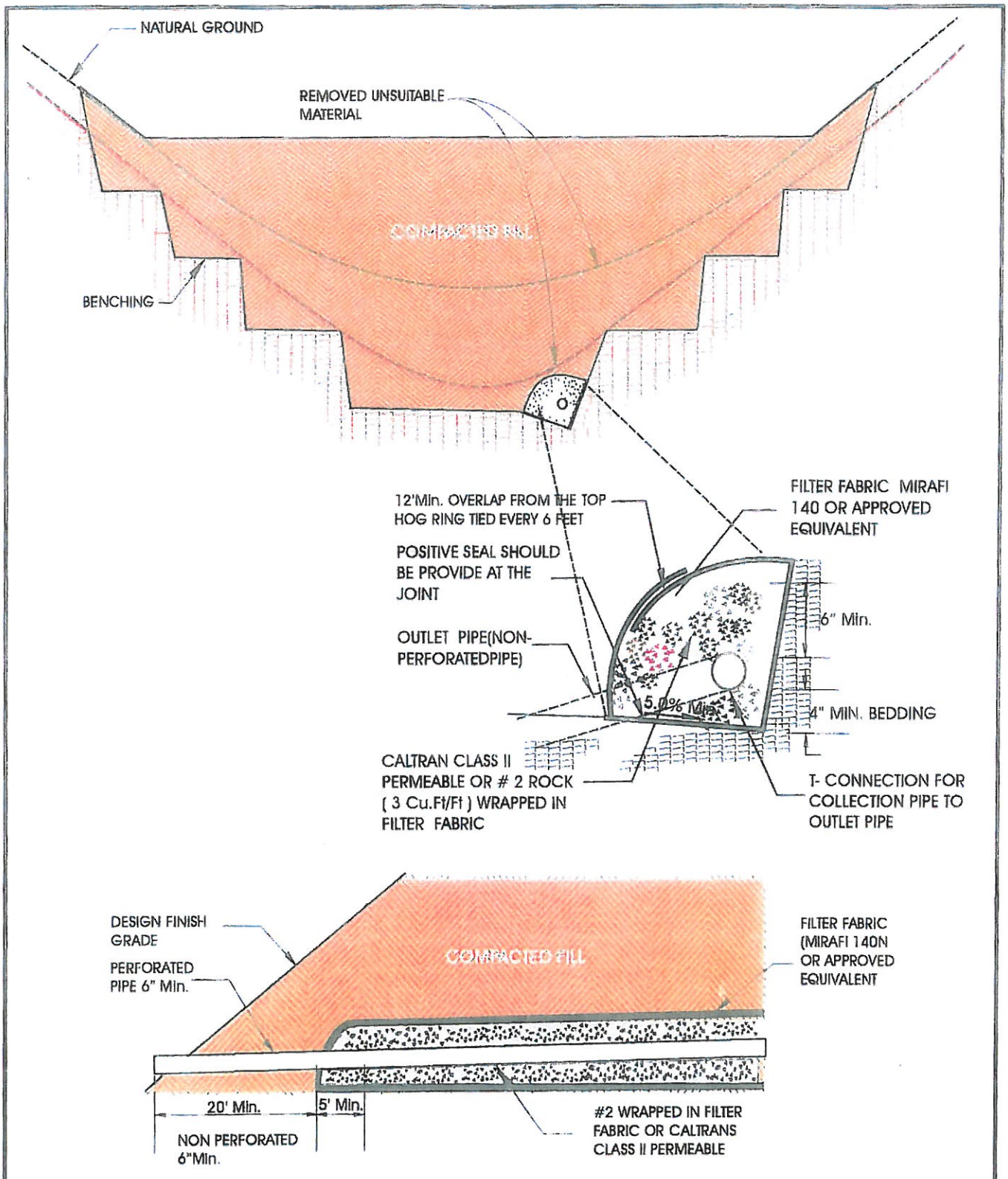




OVERSIZE ROCK DISPOSAL

ALLIED EARTH TECHNOLOGY

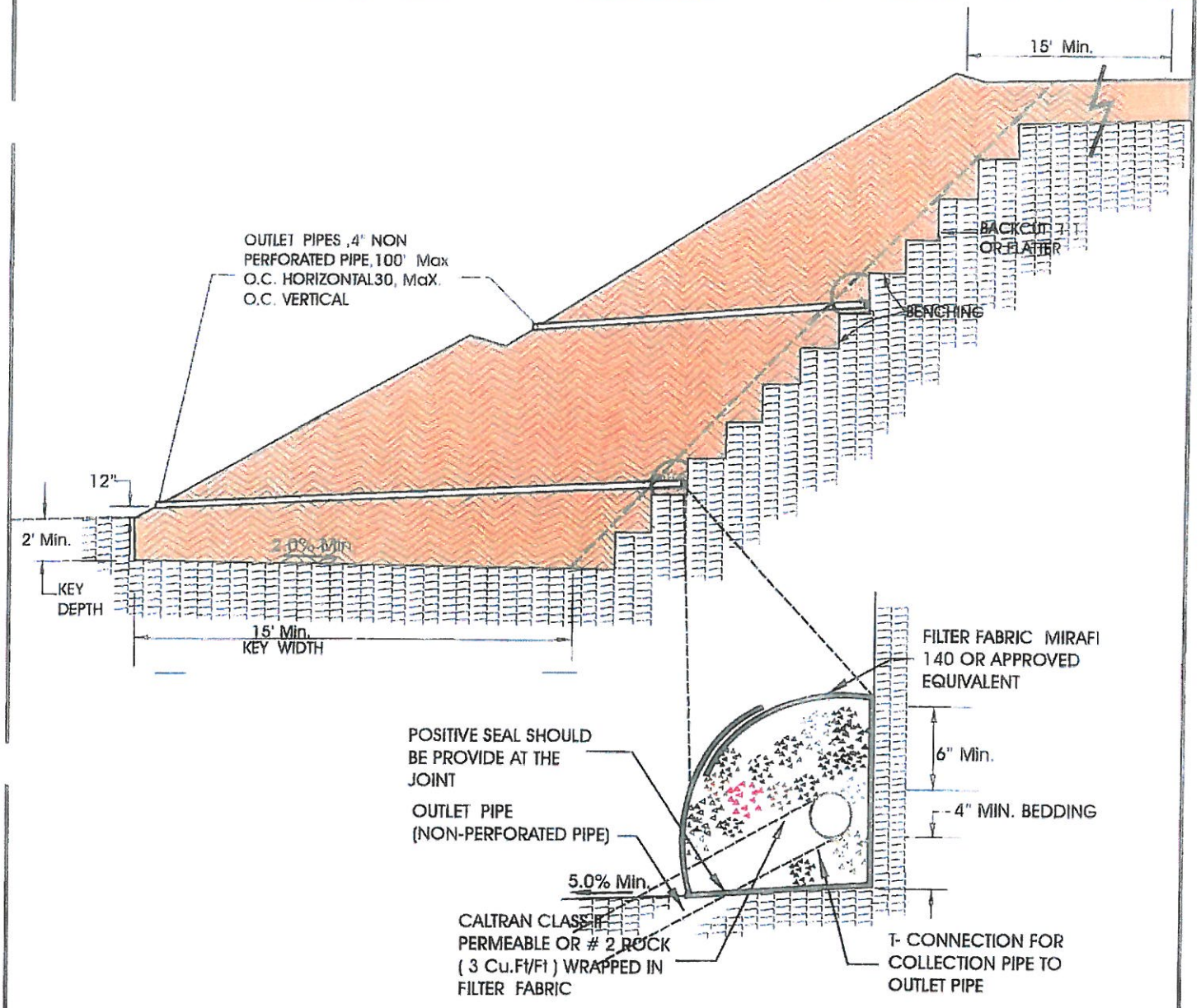
DETAIL-B



CANYON SUBDRAIN

ALLIED ERATH TECHNOLOGY

DETAIL C



SUBDRAIN INSTALLATION - SUBDRAIN COLLECTOR PIPE SHALL BE INSTALLED WITH PERFORATIONS DOWN OR, UNLESS OTHERWISE DESIGNED BY THE GEOTECHNICAL CONSULTANT. 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

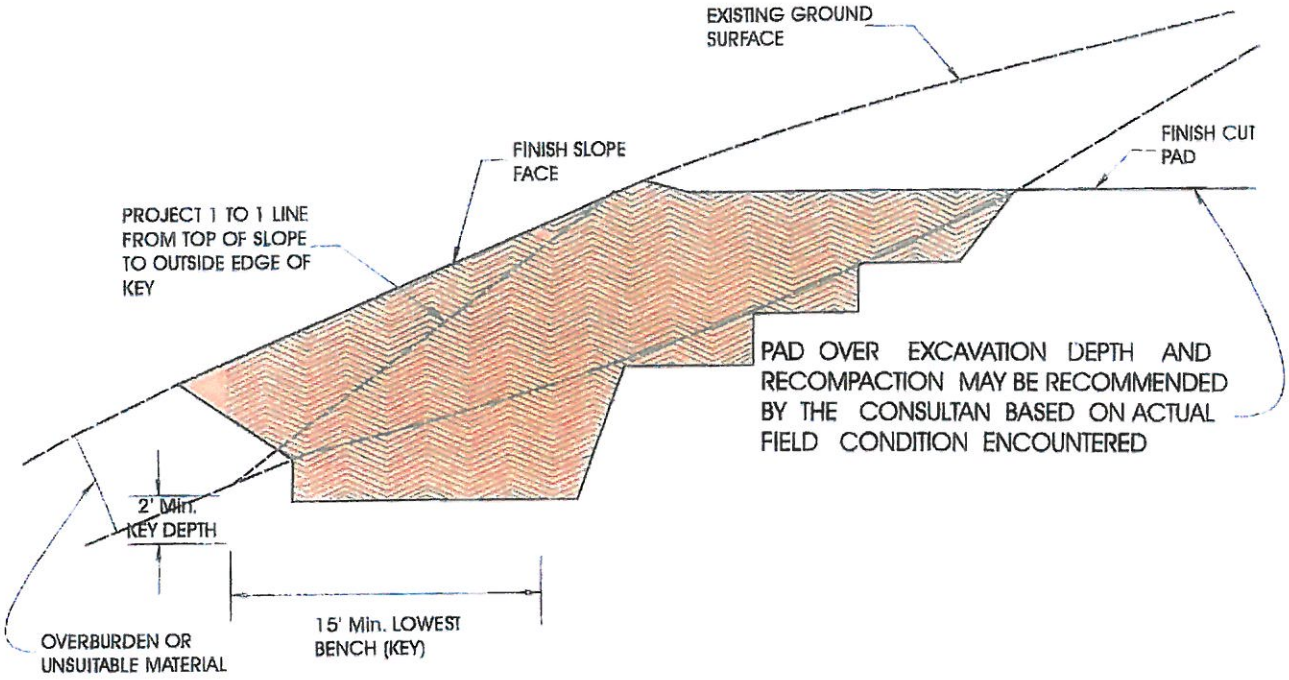
SUBDRAIN PIPE - SUBDRAIN PIPE SHALL BE ASTMD 2751, SDR 23.5 OR ASTMD 1527, SCHEDULE 40, OR ASTMD 3034, SDR 23.5, SCHEDULE 40 POLYVINYL CHLORIDE PLASTIC (PVC) PIPE.

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

BUTTRESS OR REPLACEMENT FILL SUBDRAIN

ALLIED EARTH TECHNOLOGY

DETAIL D



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

HILL SIDE STABILITY FILL

DETAIL- E

ALLIED EARTH TECHNOLOGY

Project No. 12-1108E7 Sonic Drive-In 11/13/12
1215 Grand Avenue

APPENDIX II

LABORATORY TEST RESULTS

1. The maximum dry densities and optimum moisture contents 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 2.5'	Brown silty fine sand (SM)	120.0	12.0
Boring #2 Sample #1 Depth 2.0'	Dark brown clayey sand (SC)	116.0	16.5

2. The Expansion Index of the most clayey soils was determined in accordance with A.S.T.M. D4929-08. The results of the test are presented as follows :

	Soil Description	Expansion Index
Boring #2 Sample #1 Depth 2.0	Dark brown clayey sand (SC)	83*

*Considered to possess MEDIUM expansion potential

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APPENDIX II (Cont'nd)

LABORATORY TEST RESULTS

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)	
Trench #2 Sample #1 Depth 2.0'	Dark brown clayey sand (SC)	92	Negligible

APPENDIX III

REFERENCES

- California Building Code, Volumes 1 & 2, International Conference of Building Officials, 2010
- California Department of Conservation, Division of Mines and Geology (California Geological Survey), 1997, Guidelines for Evaluating and Mitigating Seismic Hazards in California, DMG Special Publication 117, 71p.
- "Foundations and Earth Structures", Naval Facilities Engineering Command, DM 7.02
- "Green Book" Standard Specifications for Public Works Construction, Public Works Standards, Inc. 2003 Edition.
- Kennedy, Michael P. – Geology of the Poway Quadrangle, San Diego County, California, California Department of Conservation, Division of Mines and Geology
- Site Plan for Sonic Drive-In, prepared by MPA Architects, Inc., San Diego, CA.
- "Soil Mechanics", Naval Facilities Engineering Command, DM 7.01
- "Soil Mechanics in Engineering Practice", Karl Terzaghi, Ralph B. Peck, Gholamreza Mesri.