



GEOTECHNICAL INVESTIGATION

**MENIFEE BUSINESS PARK
33521 ZEIDERS ROAD
MENIFEE, CALIFORNIA**

**AUGUST 20, 2024
PROJECT NO. G3028-42-01**

PREPARED FOR:

**PEMCOR PROPERTIES, INC.
RANCHO SANTA FE, CALIFORNIA**



Project No. G3028-42-01
August 20, 2024

Pemcor Properties Inc.
P.O. Box 903
Rancho Santa Fe, California 92067

Attention: Mr. Paul Mayer

Subject: GEOTECHNICAL INVESTIGATION
MENIFEE BUSINESS PARK
33521 ZEIDERS ROAD
MENIFEE, CALIFORNIA

Dear Mr. Mayer:

In accordance with your request and authorization of our proposal and subsequent Change Order No. 2, we herein submit the results of our geotechnical investigation for the subject project. We performed our investigation to evaluate site soil and geologic conditions and potential geologic hazards, and to assist in the design of the proposed industrial/commercial buildings and associated improvements.

The accompanying report contains the results of our study with conclusions and recommendations pertaining to geotechnical aspects of the proposed project. The site is suitable for the proposed buildings and improvements provided the recommendations in this report are incorporated into the design and construction of the planned project.

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

Very truly yours,

GEOCON INCORPORATED

Lilian E. Rodriguez
RCE 83227

Rupert S. Adams
CEG 2561

Rodney C. Mikesell
GE 2533

LER:RSA:RCM:arm

(e-mail) Addressee

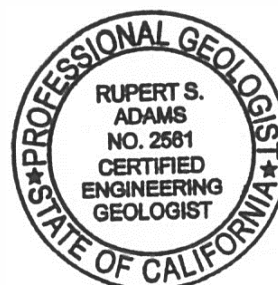


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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed Menifee Business Park located at 33521 Zeiders Road in Menifee, California (see Vicinity Map).



Vicinity Map

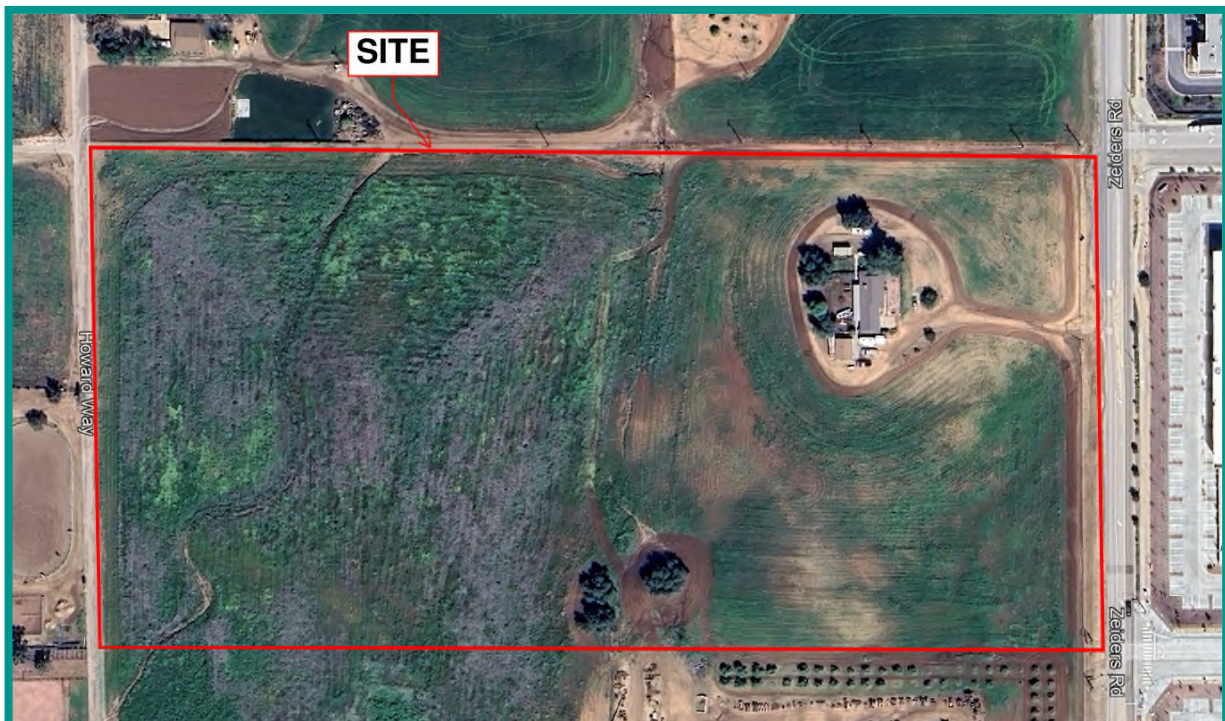
The purpose of this geotechnical investigation was to evaluate the surface and subsurface soil conditions, general site geology, and to identify geotechnical constraints that could affect development of the property including faulting, liquefaction, and seismic shaking. We have included recommendations for remedial grading, shallow foundations, interior concrete slab on grade, exterior concrete flatwork, pavement, and retaining walls.

The scope of this investigation included a review of readily available, pertinent geologic literature; field work; performing engineering analyses; and preparing this report.

Field work consisted of excavating 11 exploratory test pits to a maximum depth of about 14 feet; performing 12 infiltration tests; sampling soil; and performing laboratory tests on selected soil samples. Appendix A presents the test pit logs and details of the field investigation. The details of the laboratory testing and a summary of the test results are shown in Appendix B. Appendix C presents a summary of our storm water management investigation.

2. SITE AND PROJECT DESCRIPTION

The property is located at 33521 Zeiders Road (APN No. 384-150-001) and is mostly undeveloped. The site is bounded by residential properties to the north and west; commercial and residential properties to the south; and a large warehouse building across Zeiders Road to the east. The site is rectangular and is approximately 20.6 acres. Review of historical aerial photographs indicates that portions of the property were used for agricultural purposes. A single-story residential structure is present within the northwest corner of the property. Site topography is undulatory and elevation across the site ranges from approximately 1,580 feet to 1,560 feet Mean Sea Level (MSL). Two shallow, ephemeral drainage courses cross the central and west portions of the property. The current site conditions are shown in the figure below.



Current Site Conditions

We understand the project will consist of the design and construction of 11 industrial/commercial buildings with surrounding parking and driveways. Based on our review of the grading plan (PLSA, 2024), grading will consist of fills up to approximately 10 feet and cuts up to approximately 11 feet across the site. Grading will create 2:1 (horizontal to vertical) fill and cut slopes along the perimeter of the site with heights up to approximately 8 feet. We understand stormwater-management devices are planned.

The locations, site descriptions, and proposed development outlined above are based on our site reconnaissance, our review of published geologic literature, our field investigation, and discussions with project personnel. If development plans differ from those described herein, we should be contacted to review the final plan and possibly provide revisions to our recommendations presented in this report.

3. SOIL AND GEOLOGIC CONDITIONS

Based on the results of the field investigation, the site is underlain by Holocene-age alluvium over Cretaceous-age igneous rock. Descriptions of the soils encountered are provided below. Mapped geologic conditions are depicted on the Geologic Map (Figure 1). Exploratory test pit logs are presented in Appendix A.

3.1 Alluvium (Qya)

Alluvium was encountered in each of our test pits at depths between 1 and 13 feet below existing grades. The thickest alluvium occurred in the northwest portion of the site. The alluvium consisted of loose to medium dense, clayey to silty, fine to coarse sand. The alluvium is compressible and unsuitable for the support of settlement sensitive improvements or structural fills and will require removal and recompaction during grading.

3.2 Igneous Rock (Undivided; Kiu)

Igneous rock was encountered within each of our test pits below the alluvium. The igneous rock consisted of either gabbro or granodiorite. Where encountered, the igneous rock was weak to moderately strong, and completely to moderately weathered. The igneous rock excavated to fine to coarse sand. The igneous rock is suitable for the support of settlement sensitive improvements or structural fills.

4. GROUNDWATER

We did not encounter groundwater or seepage during our site investigation. However, it is not uncommon for shallow seepage conditions to develop where none previously existed when sites are irrigated or infiltration is implemented. Seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project. We do not expect that groundwater will be encountered during construction of the proposed development.

5. GEOLOGIC HAZARDS

5.1 Ground Rupture

The USGS (2016) and Morton (2003) show that there are no mapped Quaternary faults crossing or trending toward the property. The site is not located within the currently established Alquist-Priolo Earthquake Fault Zone (CEG, 2021a).

There are no active faults, potentially active faults, inactive faults, presumed inactive faults, or activity unknown faults at the site or trending toward the site. The risk associated with ground rupture hazard is low.

5.2 Seismicity

Considerations important in seismic design include frequency and duration of motion and soil conditions underlying the site. Seismic design of structures should be evaluated in accordance with the California Building Code currently adopted by the City of Menifee. The risk associated with strong seismic ground motion hazard is high; however, the risk is no greater than that for the site vicinity.

5.3 Liquefaction

The risk associated with liquefaction is low due to the age and density of the underlying sediments and igneous rock, and the lack of shallow groundwater.

5.4 Tsunamis, and Seiches

The site is not mapped within the State of California Tsunami Hazard Zone (CGS, 2021b). The risk associated with flooding due to tsunami hazard is low.

There are no lakes or reservoirs located near the site. The risk associated with inundation hazard due to seiche is low.

5.5 Landslides

No evidence of landsliding was observed during our investigation. No landslides are mapped at the site or in areas that would impact the site (Morton, et al., 2003). The risk associated with landslide hazard is low.

5.6 Flooding

The site has not been mapped in an area associated with flood risk as defined by FEMA (2020).

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

- 6.1.1 We did not encounter soil or geologic conditions during our study that would preclude the proposed development, provided the recommendations presented herein are followed and implemented during design and construction. We will provide supplemental recommendations if we observe variable or undesirable conditions during construction, or if the proposed construction will differ from that anticipated herein.
- 6.1.2 With the exception of possible moderate to strong seismic shaking, we did not observe or know of significant geologic hazards on the site that would adversely affect the proposed project.
- 6.1.3 The site is underlain by alluvium over undifferentiated igneous rock. The alluvium encountered during our investigation extended to depths between 1 to 13 feet below existing site grades. Alluvium is not suitable to support structures and improvements and will require removal and replacement with properly compacted fill. Igneous rock was encountered below the alluvium in all test pits. The igneous rock is suitable to support settlement sensitive improvements.
- 6.1.4 We did not encounter groundwater or seepage during our investigation; however, seepage could be encountered during grading operations in areas not explored, especially during the rainy season.
- 6.1.5 Proper drainage should be maintained to preserve the engineering properties of the soil. Recommendations for site drainage are provided herein.
- 6.1.6 Infiltration on the property is discussed in Appendix C.
- 6.1.7 We do not expect that the planned development, if properly designed and constructed, will destabilize or result in the settlement of adjacent structures or property.
- 6.1.8 Subsurface conditions observed may be extrapolated to reflect general soil/geologic conditions at the site; however, some variations in subsurface conditions between test pit locations should be expected.

6.2 Excavation and Soil Characteristics

- 6.2.1 Excavation of the in-situ soil should be possible with moderate to heavy effort using conventional heavy-duty equipment. Excavation of the formational bedrock will require very heavy effort and may generate oversized material using conventional heavy-duty equipment during the grading operations. Oversized rock (rocks greater than 12-inches in dimension) may be generated in the igneous rock that can be incorporated into landscape use or placed in deeper fill areas, if available. The grading and improvement contractors should review this report and evaluate the proper equipment to use for the planned excavations.
- 6.2.2 Based on our test pits excavated using a rubber-tired backhoe, the igneous rock underlying the site is generally rippable to a depth of approximately 10 feet. The material generated during test pit excavation contained little or no oversize rock (rocks greater than 12-inches in dimension). We anticipate that deeper excavations up to 15 feet below site grades, if required, should be possible with conventional earth moving equipment without the need for rock breaking or blasting. Excavations deeper than 15 feet may require single-shank ripping on using a D-9 Caterpillar Tractor prior to loading. Based on the referenced grading plans (PLSA, 2024), cuts up to approximately 10 feet into igneous rock will be required to achieve planned grades, and underground utilities extend up approximately 10 feet below planned grades. A rippability study may be warranted for excavations deeper than 15 to 20 feet.
- 6.2.3 The soil encountered in the field investigation is considered “non-expansive” (EI less than 20) as defined by 2022 California Building Code (CBC) Section 1803.5.3. We expect most of the near surface soil possess a “very low” to “low” expansion potential (EI of 50 or less) in accordance with ASTM D 4829. The table below presents soil classifications based on the expansion index.

EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

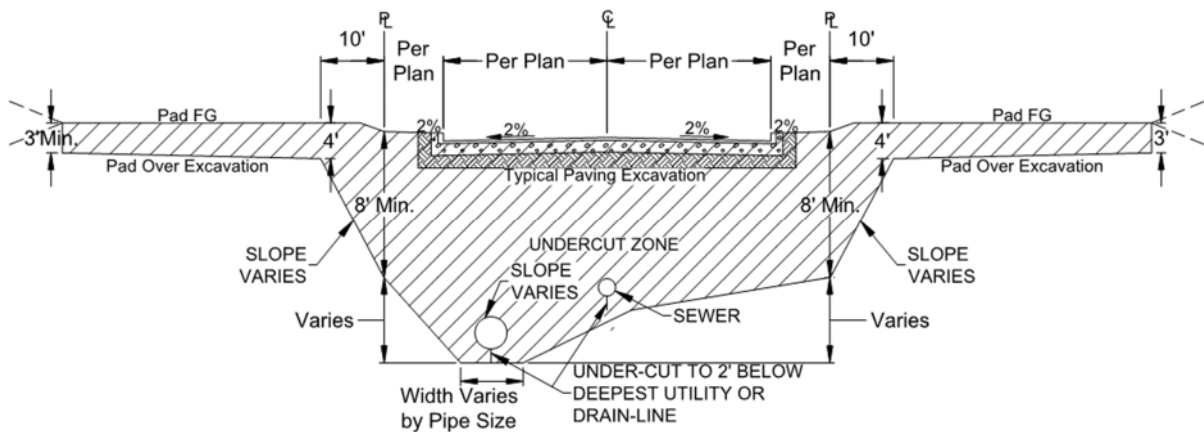
Expansion Index (EI)	ASTM D 4829 Expansion Classification	2022 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

- 6.2.4 We performed a laboratory test on a sample of the site soil to evaluate the percentage of water-soluble sulfate content. Appendix B presents test results, which indicate the on-site soils at the location tested possesses “S0” sulfate exposure to concrete structures as defined by 2022 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Over time, landscaping activities (i.e., addition of fertilizers and other additives) may affect the water-soluble sulfate concentration.
- 6.2.5 Geocon Incorporated does not practice in the field of corrosion engineering; therefore, further evaluation by a corrosion engineer may be needed if improvements susceptible to corrosion are planned.

6.3 Grading

- 6.3.1 Grading should be performed in accordance with the recommendations provided in this report; the Recommended Grading Specifications contained in Appendix D; and the local grading ordinances. Geocon Incorporated should observe the grading operations on a full-time basis and provide testing during fill placement.
- 6.3.2 A preconstruction conference should be held at the site with the agency representative, developer, grading and underground contractors, civil engineer, and geotechnical engineer in attendance. Special soil handling and the grading plans can be discussed at that time.
- 6.3.3 Site preparation should begin with the removal of deleterious material, debris, and vegetation. Deleterious material generated during stripping and demolition should be exported from the site and should not be mixed with the fill soil.
- 6.3.4 Existing building foundations and underground improvements should be removed and disposed off-site and the resultant depressions and trenches backfilled with properly compacted soil.
- 6.3.5 Alluvium within all structural improvement areas (building pads, retaining walls, slopes, pavement, concrete flatwork, etc.) should be removed to expose firm igneous rock and replaced as compacted fill. We should evaluate the actual depth of excavations during the grading operations. The depths of alluvium at the locations of the exploratory test pits are presented on the Geologic Map, Figure 1.

- 6.3.6 If grading creates a cut to fill transition, the cut portion of the transition should be undercut to a depth of at least 3 feet below pad grade or 1-foot below the bottom of building footings, whichever is deeper, and replaced as compacted fill. The undercut should extend into the fill side of the pad such that at least 3 feet of compacted fill and minimum of 1-foot below bottom of building footing exists through the building pad. The undercut should extend to a horizontal distance of at least 5 feet beyond the edge of the building pad.
- 6.3.7 Roadways and adjacent parkways underlain by rock should be undercut a minimum of 1 foot below the deepest utility as shown herein.



Street Overexcavation Detail

- 6.3.8 The following table provides a summary of the remedial grading recommendations.

SUMMARY OF REMEDIAL GRADING RECOMMENDATIONS

Area	Remedial Grading Excavation Requirements
Site Development	Excavate to competent Igneous Rock
Transitions on Building Pads	Undercut to at Least 3 Feet Below Finish Grade, or 1 Foot below Lowest Building Foundation Element (whichever is greater)
Roadways and Utility Corridors	Undercut at Least 1 Foot Below Deepest Utility
Exposed Bottoms of Excavations	Scarify Upper 12 Inches

- 6.3.9 We should observe the excavation bottoms to check the exposure of the igneous rock. Deeper excavations may be required if highly weathered rock is present at the base of the removals.

- 6.3.10 The onsite soils are suitable for use as fill, provided they are free from vegetation, debris, and other deleterious material. Prior to placing fill, the bottom of the excavation should be scarified, moisture conditioned, and compacted. Fill should be placed in layers no greater than 8 inches in loose thickness and no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM Test Procedure D 1557. Fill soil placed below optimum moisture content will require moisture conditioning prior to placing additional fill. The upper 12 inches of subgrade soil underlying pavement should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content shortly before paving operations.
- 6.3.11 Oversize rock placement should be performed in accordance with the Recommended Grading Specifications provided in Appendix D. Rock breaking or blasting, if required, should be done to generate 2-foot minus material.
- 6.3.12 Imported fill (if necessary) should consist of the characteristics presented in the following table. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to determine its suitability as fill material.

SUMMARY OF IMPORT FILL RECOMMENDATIONS

Soil Characteristic	Values
Expansion Potential	“Very Low” to “Low” (Expansion Index of 50 or Less)
Particle Size	Maximum Dimension Less Than 3 Inches
	Generally Free of Debris

6.4 Slope Stability

- 6.4.1 Planned fill and cut slopes less than 10 feet will be constructed along the perimeter of the site. Slope stability analyses for the proposed slopes with inclinations as steep as 2:1 (horizontal to vertical) indicate a calculated factor of safety of at least 1.5 under static conditions for both deep-seated and surficial failure. The table below presents the slope stability analyses for the proposed sloping conditions.

SLOPE STABILITY EVALUATION

Parameter	Value
Slope Height, H	10 Feet
Slope Inclination, I (Horizontal to Vertical)	2:1
Total Soil Unit Weight, γ	125 pcf
Friction Angle, f	26 Degrees
Cohesion, C	200 psf
Slope Factor $\gamma_{cf} = (\gamma H \tan f)/C$	6.1
N_{cf} (From Chart)	26
Factor of Safety = $(N_{cf}C)/(\gamma H)$	2.4

- 6.4.2 The table below presents the surficial slope stability analysis for the proposed sloping conditions.

SURFICIAL SLOPE STABILITY EVALUATION

Parameter	Value
Slope Height, H	∞
Vertical Depth of Saturation, Z	3 Feet
Slope Inclination, I (Horizontal to Vertical)	2:1 (26.6°)
Total Soil Unit Weight, γ	125 pcf
Water Unit Weight, γ_w	62.4 pcf
Friction Angle, f	26 Degrees
Cohesion, C	200 psf
Factor of Safety = $(C + (\gamma + \gamma_w)Z \cos^2 I \tan f) / (\gamma Z \sin I \cos I)$	1.82

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

6.5 Subdrains

- 6.5.1 With the exception of retaining wall drains, we do not expect the installation of other subdrains.

6.6 Seismic Design Criteria – 2022 California Building Code

6.6.1 The following table summarizes site-specific design criteria obtained from the 2022 California Building Code (CBC; Based on the 2021 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. We used SEAOC (2019) to calculate the seismic design parameters. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2022 CBC and Table 20.3-1 of ASCE 7-16. The values presented herein are for the risk-targeted maximum considered earthquake (MCE_R).

2022 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2022 CBC Reference
Site Class	C	Section 1613.2.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_s	1.417g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.526g	Figure 1613.2.1(3)
Site Coefficient, F_A	1.2	Table 1613.2.3(1)
Site Coefficient, F_V	1.474	Table 1613.2.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.701g	Section 1613.2.3 (Eqn 16-20)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.776g	Section 1613.2.3 (Eqn 16-21)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	1.134g	Section 1613.2.4 (Eqn 16-22)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.517g	Section 1613.2.4 (Eqn 16-23)

6.6.2 The following table presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.607g	Figure 22-9
Site Coefficient, F_{PGA}	1.2	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.729g	Section 11.8.3 (Eqn 11.8-1)

- 6.6.3 Conformance to the criteria in the above tables does not constitute a guarantee or assurance that significant structural damage or ground failure will not occur in the event of a large earthquake. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.
- 6.6.4 The values presented herein assume a Risk Category of II and result in a Seismic Design Category D. The project structural engineer and architect should evaluate the appropriate Risk Category and Seismic Design Category for the planned structures. The following table presents a summary of the risk categories in accordance with ASCE 7-16.

ASCE 7-16 RISK CATEGORIES

Risk Category	Building Use	Examples
I	Low risk to Human Life at Failure	Barn, Storage Shelter
II	Nominal Risk to Human Life at Failure (Buildings Not Designated as I, III or IV)	Residential, Commercial and Industrial Buildings
III	Substantial Risk to Human Life at Failure	Theaters, Lecture Halls, Dining Halls, Schools, Prisons, Small Healthcare Facilities, Infrastructure Plants, Storage for Explosives/Toxins
IV	Essential Facilities	Hazardous Material Facilities, Hospitals, Fire and Rescue, Emergency Shelters, Police Stations, Power Stations, Aviation Control Facilities, National Defense, Water Storage

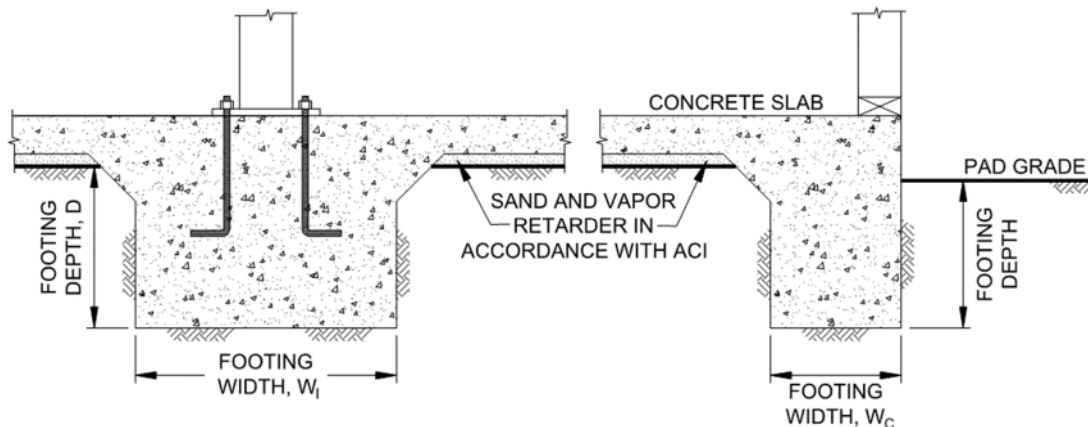
6.7 Shallow Foundations

- 6.7.1 The proposed structures can be supported on a shallow foundation system founded entirely on properly compacted fill or igneous rock. Based on proposed grading, we expect the majority of the buildings will be underlain by compacted fill either placed to reach pad grade or placed during undercutting to eliminate a cut to fill transition. Building foundations should not be supported partially on compacted fill and partially on igneous rock.
- 6.7.2 Foundations for the structure should consist of continuous strip footings and isolated spread footings. The following table provides a summary of the foundation design recommendations.

SUMMARY OF FOUNDATION RECOMMENDATIONS

Parameter	Value
Minimum Continuous Foundation Width, W_c	12 inches
Minimum Isolated Foundation Width, W_i	24 inches
Minimum Foundation Depth, D	24 Inches Below Lowest Adjacent Grade
Minimum Concrete Reinforcement	4 No. 5 Bars, 2 at the Top and 2 at the Bottom
Allowable Bearing Capacity (Compacted Fill)	2,500 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity (Compacted fill)	4,000 psf
Estimated Total Static Settlement	1-Inch
Estimated Differential Static Settlement	½ Inch in 40 Feet
Footing Size Used for Settlement	6-Foot Square
Design Expansion Index	50 or less

- 6.7.3 The foundations should be embedded in accordance with the recommendations herein and the Wall/Column Footing Dimension Detail. The embedment depths should be measured from the lowest adjacent pad grade for both interior and exterior footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.



Wall/Column Footing Dimension Detail

- 6.7.4 The bearing capacity values presented herein are for dead plus live loads and may be increased by one-third for transient loads due to wind or seismic forces.

- 6.7.5 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.
- For fill slopes less than 20 feet high or cut slopes regardless of height, footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.
 - When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to $H/3$ (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. A post-tensioned slab and foundation system or mat foundation system can be used to reduce the potential for distress in the structures associated with strain softening and lateral fill extension. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.
 - Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures that would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.
- 6.7.6 We should observe the foundation excavations prior to the placement of reinforcing steel to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. Foundation modifications may be required if unexpected soil conditions are encountered.
- 6.7.7 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

6.8 Interior Concrete Slabs

- 6.8.1 Concrete slabs for the structure should be constructed in accordance with the table below.

MINIMUM INTERIOR CONCRETE-SLAB-ON-GRADE RECOMMENDATIONS

Parameter	Value
Minimum Concrete Slab Thickness	5 inches
Minimum Concrete Reinforcement	No. 3 Bars 18 Inches on Center, Both Directions
Typical Slab Underlayment	3 to 4 Inches of Sand/Gravel/Base
Design Expansion Index	50 or less

- 6.8.2 A vapor retarder should underlie slabs that could receive moisture-sensitive floor coverings or be used to store moisture-sensitive materials. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The membrane should be installed in a manner that prevents puncture in accordance with manufacturer's recommendations and ASTM requirements. The project architect or developer should specify the vapor retarder used based on the type of floor covering that will be installed and if the structure will possess a humidity-controlled environment.
- 6.8.3 The project foundation engineer, architect, or developer should determine the thickness of the slab bedding. It is common to have 3 to 4 inches of sand in the southern California region. We should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.
- 6.8.4 The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab. The foundation design engineer should present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the specifications presented on the foundation plans.
- 6.8.5 Concrete slabs should be provided with adequate crack-control joints, construction joints, and expansion joints. American Concrete Institute (ACI) guidelines should be used to establish crack-control spacing. Crack-control joints should be spaced at intervals no greater than 12 feet. Additional reinforcement, concrete admixtures, and closer crack-control-joint spacing should be considered where bare-concrete finished floors are planned.
- 6.8.6 Subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisturized to maintain a moist condition as would be expected in any such concrete placement.

- 6.8.7 The concrete-slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting expected loads.
- 6.8.8 The recommendations of this report are intended to reduce potential cracking of slabs due to expansive soil (if present), differential settlement of existing soil or fill soil with varying thicknesses, however, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade could still exhibit cracking due to soil movement and concrete shrinkage. The occurrence of concrete-shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

6.9 Exterior Concrete Flatwork

- 6.9.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations presented in the table below. The recommended concrete reinforcement would help reduce potential cracking.

MINIMUM EXTERIOR CONCRETE FLATWORK RECOMMENDATIONS

Expansion Index, EI	Minimum Steel Reinforcement* Options	Minimum Thickness
EI ≤ 50	6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh	4 Inches
	No. 3 Bars 24 inches on center, Both Directions	

*In excess of 8 feet square.

- 6.9.2 The subgrade soil should be properly moisturized and compacted prior to the placement of steel and concrete. The subgrade soil should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557.
- 6.9.3 Even with the incorporation of the recommendations presented in this report, the exterior concrete flatwork could experience uplift due to expansive soil. Flatwork should be structurally connected to the curbs, where practical, to reduce potential offsets between the curbs and the flatwork.

- 6.9.4 Concrete flatwork should be provided with crack-control joints to control shrinkage cracking. American Concrete Institute (ACI) guidelines should be taken into consideration when establishing crack-control spacing.
- 6.9.5 Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be verified prior to placing concrete. Base materials will not be required below concrete improvements.
- 6.9.6 The exterior slab should be dowelled into the foundation stem wall at entrant and exit points. This recommendation is intended to reduce potential differential elevations resulting from settlement or heave of the flatwork. Dowelling details should be designed by the project structural engineer.
- 6.9.7 The recommendations presented herein are intended to reduce potential cracking of exterior slabs resulting from differential movement. Even with the incorporation of the recommendations presented herein, slabs on grade could still crack. The occurrence of concrete shrinkage cracks is independent of the soil-support characteristics. Their occurrence could be controlled by limiting the slump of the concrete, the use of crack-control joints, and proper concrete placement and curing. Crack-control joints should be spaced at intervals no greater than 12 feet. Portland Concrete Association (PCA) and American Concrete Institute (ACI) provide guidelines for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

6.10 Retaining Walls

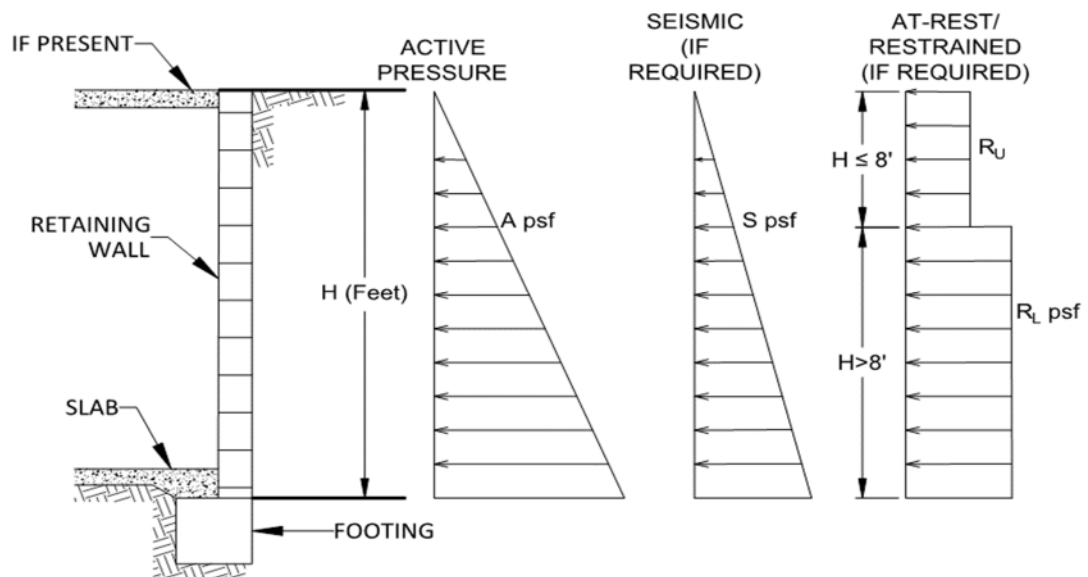
- 6.10.1 Retaining walls should be designed using the values presented in the table below. Soil with an expansion index (EI) of greater than 50 should not be used as backfill behind retaining walls.

RETAINING WALL DESIGN RECOMMENDATIONS

Parameter	Value
Active Soil Pressure (Level Backfill), A	35H psf
Active Soil Pressure (2:1 Sloping Backfill), A	50H psf
Seismic Pressure, S	15H psf
At-Rest/Restrained Walls Additional Uniform Pressure, R_U (0 to 8 Feet High)	7H psf
At-Rest/Restrained Walls Additional Uniform Pressure, R_L (8+ Feet High)	13H psf
Expected Expansion Index for the Subject Property	$EI \leq 50$

H equals the height of the retaining portion of the wall

- 6.10.2 The project retaining walls should be designed as shown in the Retaining Wall Loading Diagram.

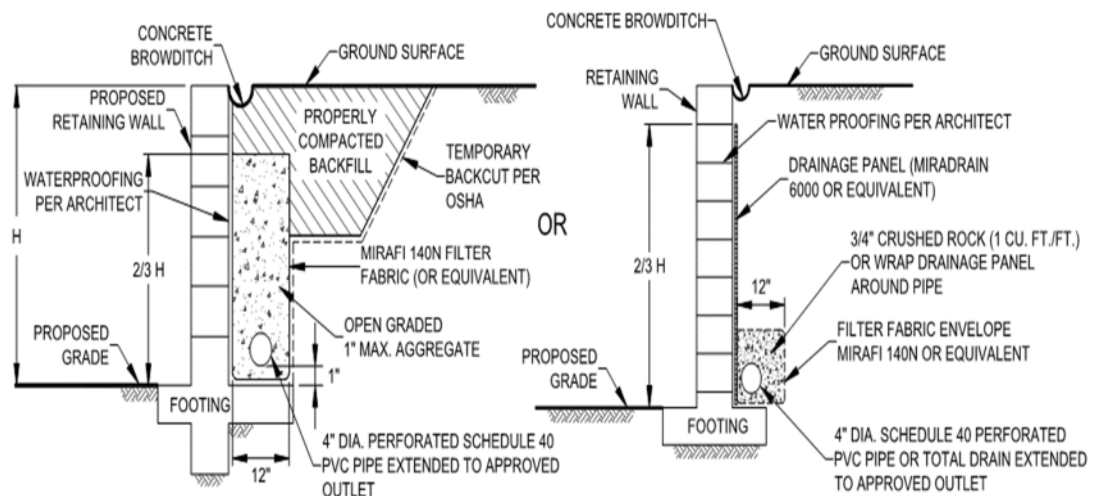


Retaining Wall Loading Diagram

- 6.10.3 Unrestrained walls are those that are allowed to rotate more than $0.001H$ (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure should be applied to the wall. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added to the upper 10 feet of the retaining wall.
- 6.10.4 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613 of the 2022 CBC or Section 11.6 of ASCE 7-16. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6

feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2022 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall.

- 6.10.5 It is not necessary to consider active pressure on the keyway.
- 6.10.6 Drainage openings through the base of the wall should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted granular (EI of 90 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. The retaining wall should be properly drained as shown in the Typical Retaining Wall Drainage Detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.



Typical Retaining Wall Drainage Detail

- 6.10.7 In general, wall foundations should be designed in accordance with the table below. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, retaining wall foundations should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

SUMMARY OF RETAINING WALL FOUNDATION RECOMMENDATIONS

Parameter	Value
Minimum Retaining Wall Foundation Width	12 inches
Minimum Retaining Wall Foundation Depth	12 Inches
Minimum Concrete Reinforcement	Per Structural Engineer
Allowable Bearing Capacity (Compacted Fill)	2,500 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity (Compacted fill)	4,000 psf
Estimated Total Settlement	1 Inch
Estimated Differential Settlement	½ Inch in 40 Feet

- 6.10.8 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls. In the event that other types of walls (such as mechanically stabilized earth [MSE] walls, soil nail walls, or soldier pile walls) are planned, Geocon Incorporated should be consulted for additional recommendations.
- 6.10.9 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.
- 6.10.10 Soil contemplated for use as retaining wall backfill, including imported soil, should be identified prior to backfilling. We should be provided with samples of the proposed backfill soil for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. We should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

6.11 Lateral Loading

- 6.11.1 The table below should be used to help design the proposed structures and improvements to resist lateral loads for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating

the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in the design for passive resistance. Where walls are planned adjacent to and/or on descending slopes, a passive pressure of 150 pcf should be used in design.

SUMMARY OF LATERAL LOAD DESIGN RECOMMENDATIONS

Parameter	Value
Passive Pressure Fluid Density	350 pcf
Passive Pressure Fluid Density Adjacent to and/or on Descending Slopes	150 pcf
Coefficient of Friction (Concrete and Soil)	0.35
Coefficient of Friction (Along Vapor Barrier)	0.2 to 0.25*

*Per manufacturer's recommendations.

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

6.12 Preliminary Pavement Recommendations

- 6.12.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Index (TI) of 5.0, 5.5, 6.0, and 7.0 for parking stalls, driveways, medium truck traffic areas, and heavy truck traffic areas, respectively. The project civil engineer should review the pavement designations to determine appropriate locations for pavement thickness. The final pavement sections should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. We have assumed an R-Value of 20 and 78 for the subgrade soil and base materials, respectively, for the purposes of this preliminary analysis. The table below presents the preliminary flexible pavement sections.

PRELIMINARY FLEXIBLE PAVEMENT SECTION

Location	Assumed Traffic Index	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Parking Stalls for Automobiles and Light-Duty Vehicles	5.0	3	7
Driveways for Automobiles and Light-Duty Vehicles	5.5	3	9
Medium Truck Traffic Areas	6.0	3.5	10
Driveways for Heavy Truck Traffic	7.0	4	12

- 6.12.2 Prior to placing aggregate base, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompact to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Similarly, the base should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.
- 6.12.3 Aggregate base should conform to Section 26-1.02B of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* with a $\frac{3}{4}$ -inch maximum size aggregate. Asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook)*.
- 6.12.4 We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330-21 *Commercial Concrete Parking Lots and Site Paving Design and Construction – Guide*. The table below provides the traffic categories and design parameters used for the calculations for 20-year design life.

TRAFFIC CATEGORIES

Traffic Category	Description	Reliability (%)	Slabs Cracked at End of Design Life (%)
A	Car Parking Areas and Access Lanes	60	15
E	Heavy Truck Traffic and Fire Truck Lane	75	15

- 6.12.5 We used the parameters presented in the table below to calculate the pavement design sections. We should be contacted to provide updated design sections, if necessary.

RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of Subgrade Reaction, k	100 pci
Modulus of Rupture for Concrete, M_R	500 psi
Concrete Compressive Strength	3,000 psi
Concrete Modulus of Elasticity, E	3,150,000 psi

- 6.12.6 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in the table below.

RIGID PAVEMENT RECOMMENDATIONS

Traffic Category	Trucks Per Day	Portland Cement Concrete, T (Inches)
A = Car Parking Areas and Access Lanes	≤ 5	5
	10	5.25
E = Heavy Truck Traffic and Fire Lanes	≤ 5	6.5
	10	7

- 6.12.7 The PCC vehicular pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content.
- 6.12.8 The trash-truck pad should be large enough such that all wheels are on the concrete pad during the loading operations.
- 6.12.9 Adequate joint spacing based on ACI guidelines should be incorporated into the design and construction of the rigid pavement.
- 6.12.10 Reinforcing steel will not be necessary within the concrete pavement.

- 6.12.11 Perimeter curbs adjacent to landscape areas should extend at least 6 inches below the bottom of the pavement aggregate base. In lieu of extending the perimeter curb, an impermeable liner should be installed.
- 6.12.12 Concrete flatwork should be structurally connected to the curbs to help reduce potential offsets between the curbs and the flatwork.
- 6.12.13 To control the location and spread of concrete shrinkage cracks, crack-control joints should be included in the design of the concrete-pavement slab. Crack-control joints should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be in accordance with ACI guidelines.
- 6.12.14 Construction joints should be provided at the interface between areas of concrete placed at different times during construction. The project structural engineer should provide details for load transfer.
- 6.12.15 Concrete curb and gutter should be placed on soil subgrade compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Cross-gutters should be placed on subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Base materials should not be placed below the curb and gutter, or cross-gutters so water is not able to migrate from the adjacent parkways to the pavement sections. Where flatwork is located directly adjacent to the curb and gutter, the concrete flatwork should be structurally connected to the curbs to help reduce the potential for offsets between the curbs and the flatwork.

6.13 Site Drainage and Moisture Protection

- 6.13.1 Adequate site drainage is critical to reduce the risk for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2022 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

- 6.13.2 Underground utilities should be leak-free. Utility and irrigation lines should be checked at appropriate intervals for leaks. Detected leaks should be promptly repaired. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

- 6.13.3 Landscaping planters adjacent to paved areas are not advised due to risk for water infiltration into the pavement subgrade and base courses. Impervious above-grade planter boxes or area drains to collect excess irrigation water and transmit it to drainage structures may be used. Where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

- 6.13.4 We have prepared a storm water management investigation, and it is included in Appendix C.

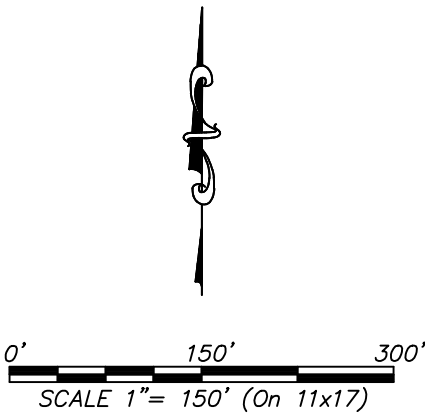
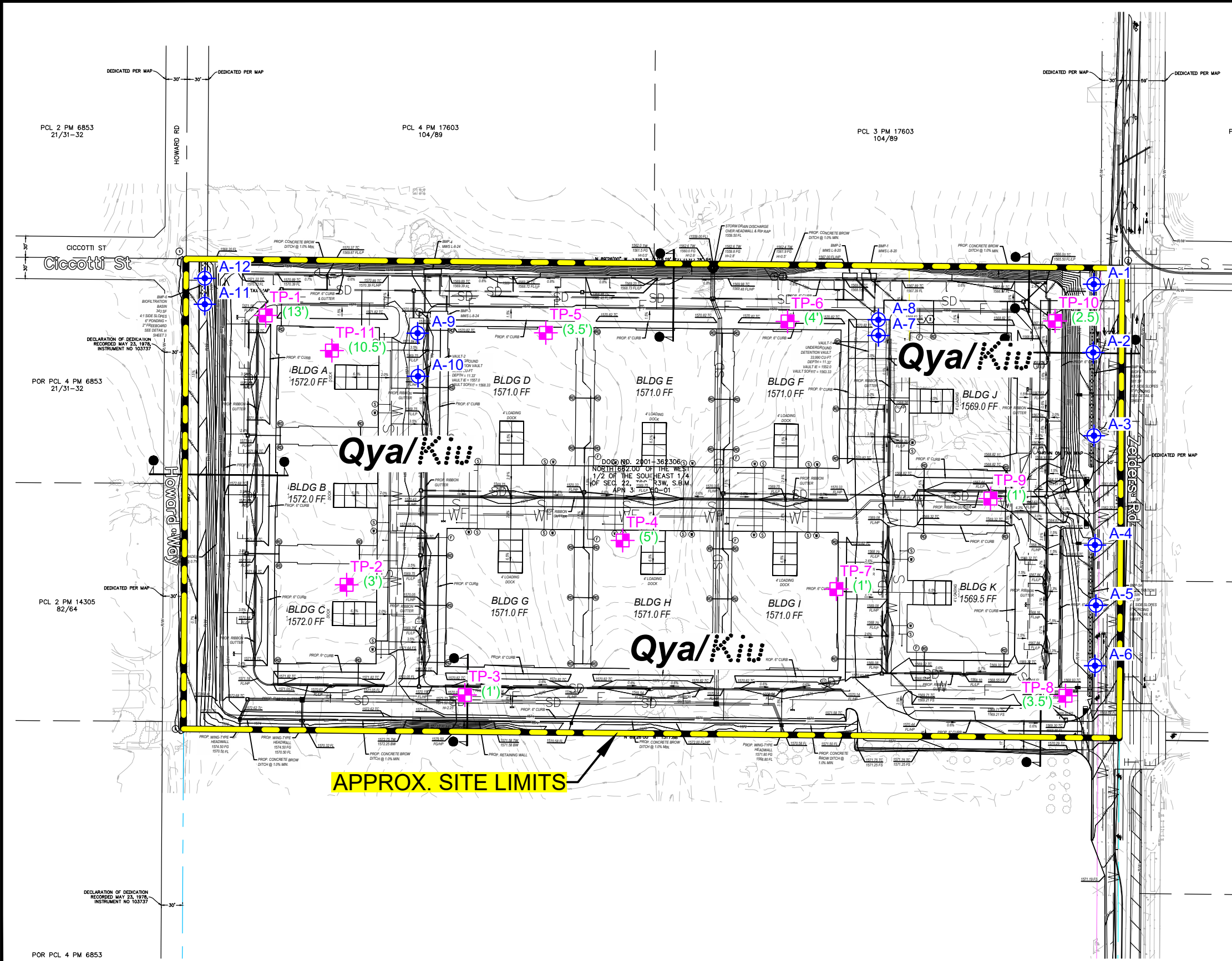
6.14 Grading and Foundation Plan Review

- 6.14.1 Geocon Incorporated should review the grading and building foundation plans for the project prior to final design submittal to evaluate if additional analyses or recommendations are required.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.
2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon.
3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.
4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

MENIFEE BUSINESS PARK
33512 ZEIDERS ROAD
SUN CITY, CALIFORNIA



GEOCON LEGEND

- Qya** ALLUVIUM
- Kiu** IGNEOUS ROCK (Undivided)
(Dotted Where Buried)
- TP-11** APPROX. LOCATION OF TEST PIT
- A-12** APPROX. LOCATION OF INFILTRATION TEST
- (5')** APPROX. DEPTH TO IGNEOUS ROCK
(In Feet)

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159
PROJECT NO. G3028 - 42 - 01

FIGURE 1
DATE 08 - 20 - 2024

GEOLOGIC MAP

APPENDIX

A

APPENDIX A

FIELD INVESTIGATION

We performed our field investigation on September 19, 2022. Our investigation consisted of logging eleven exploratory test pits. The test pits were excavated to depths between about 3 and 14 feet using a CAT 430 F backhoe excavator. Infiltration tests were performed on January 4, 2024, in borings excavated with hand digging equipment. The approximate locations of the test pits and infiltration tests are shown in Figure 1.

The soil conditions encountered in the test pits were visually examined, classified, and logged in general conformance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). Exploratory test pit logs are presented in Figures A-1 through A-11. The logs depict the various soil types encountered and indicate the depths at which samples were obtained.

G3028-42-01.GPJ

SAMPLE SYMBOLS

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

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

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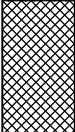
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP 3 ELEV. (MSL.) 1583' DATE COMPLETED 09-19-2022 EQUIPMENT CAT 430 F BY: R. ADAMS	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	MATERIAL DESCRIPTION			
					ALLUVIUM (Qya) Loose, dry, grayish-brown, Silty, fine to medium SAND; disturbed			
2					IGNEOUS ROCK (UNDIVIDED)(Kiu) Moderately strong, slightly weathered, grayish-brown to orangish-brown IGNEOUS ROCK ; excavates to fine to coarse SAND			
					PRACTICAL REFUSAL AT 3 FEET No groundwater Backfilled 09-19-2022			

Figure A-3,
Log of Test Pit TP 3, Page 1 of 1

G3028-42-01.GPJ

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

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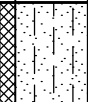
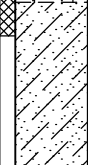
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP 6 ELEV. (MSL.) 1567' DATE COMPLETED 09-19-2022 EQUIPMENT CAT 430 F BY: R. ADAMS	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TP6-1			SM	ALLUVIUM (Qya) Loose, dry, reddish-brown, Silty, fine to medium SAND; porous			
2				SC	Loose to medium dense, damp, dark reddish-brown, Clayey, fine to medium SAND; porous, abundant rootlets			
4					IGNEOUS ROCK (UNDIVIDED)(Kiu) moderately weak, completley to moderately weathered, orangish-brown, IGNEOUS ROCK ; excavates to a clayey coarse sand			
					TOTAL DEPTH AT 5 FEET No groundwater Backfilled 09-19-2022			

Figure A-6,
Log of Test Pit TP 6, Page 1 of 1

G3028-42-01.GPJ

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

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SAMPLE SYMBOLS

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APPENDIX

B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in general accordance with the test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected soil samples for *in-situ* dry density and moisture content, maximum dry density and optimum moisture content, expansion potential, water-soluble sulfate, chloride content, pH and resistivity, consolidation, gradation, and direct shear strength. The results of our laboratory tests are presented in the following tables and graphs.

SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS ASTM D 1557-02

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
TP4-1	Dark gray, Silty, fine to coarse SAND	139.9	8.5

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS (ASTM D 4829)

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	2022 CBC Classification
	Before Test	After Test			
TP2-1	8.4	16.5	117.5	13	Very Low

SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS CALIFORNIA TEST NO. 417

Sample No.	Depth (feet)	Geologic Unit	Water-Soluble Sulfate (%)	ACI 318 Sulfate Exposure
TP2-1	1-3	Qya	0.0002	S0
TP4-1	5-7	Kiu	0.0002	S0

**SUMMARY OF LABORATORY CHLORIDE TEST RESULTS
AASHTO T 291**

Sample No.	Depth (Feet)	Geologic Unit	Chloride Ion Content (ppm)	Chloride Ion Content (%)
TP2-1	1-3	Qya	97	0.010
TP4-1	5-7	Kiu	66	0.007

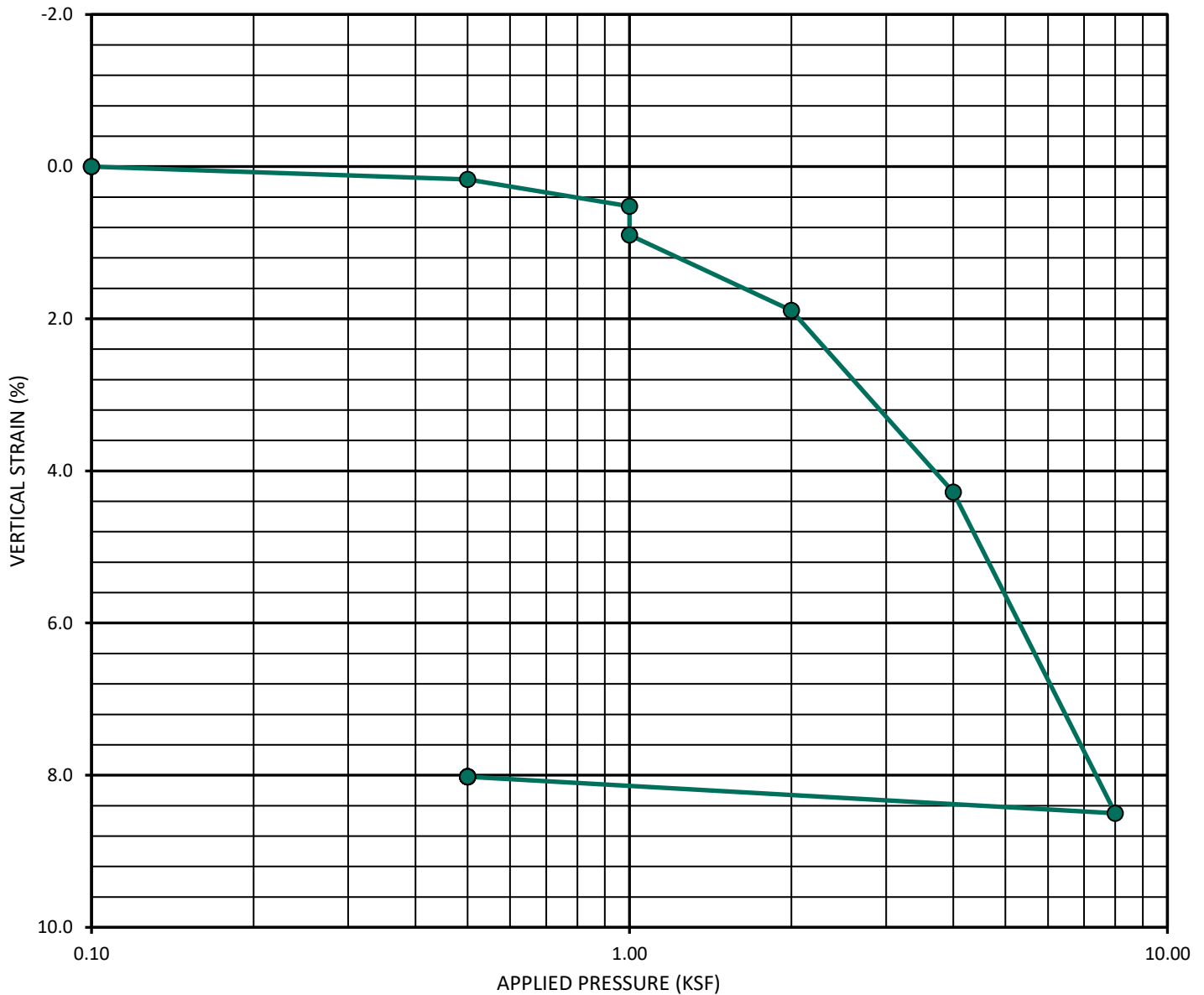
**SUMMARY OF LABORATORY POTENTIAL OF
HYDROGEN (PH) AND RESISTIVITY TEST RESULTS
CALIFORNIA TEST NO. 643**

Sample No.	Depth (Feet)	Geologic Unit	pH	Minimum Resistivity (ohm-centimeters)
TP2-1	1-3	Qya	7.75	2,400

SAMPLE NO.: **TPI-1**
SAMPLE DEPTH (FT): **7 to 9 Feet**

GEOLOGIC UNIT: **Qya**

TEST INFORMATION	
INITIAL DRY DENSITY (PCF):	97.8
INITIAL WATER CONTENT (%):	6.3%
SAMPLE SATURATED AT (KSF):	1.0
INITIAL SATURATION (%):	23.8%



CONSOLIDATION CURVE - ASTM D 2435

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GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
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ZEIDERS ROAD

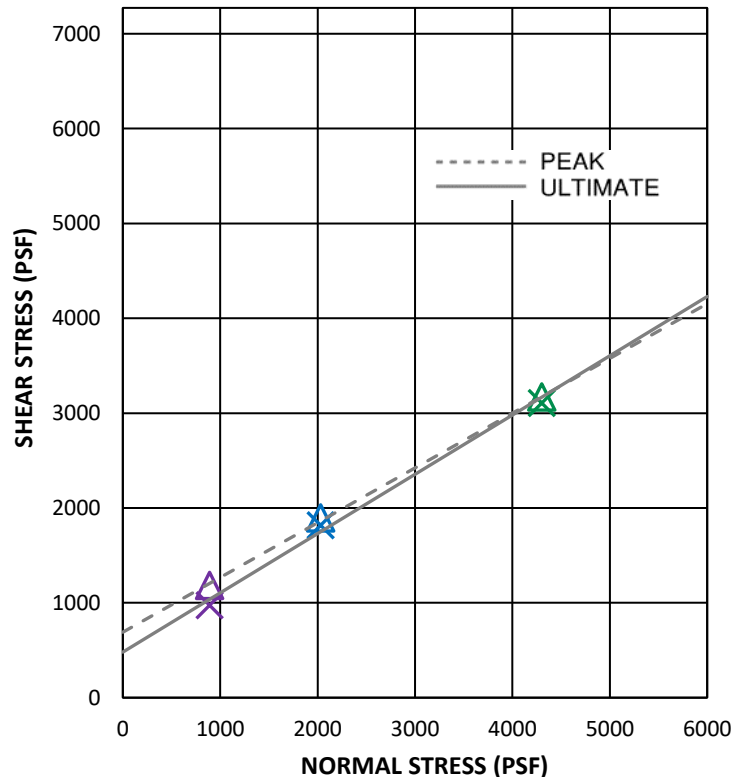
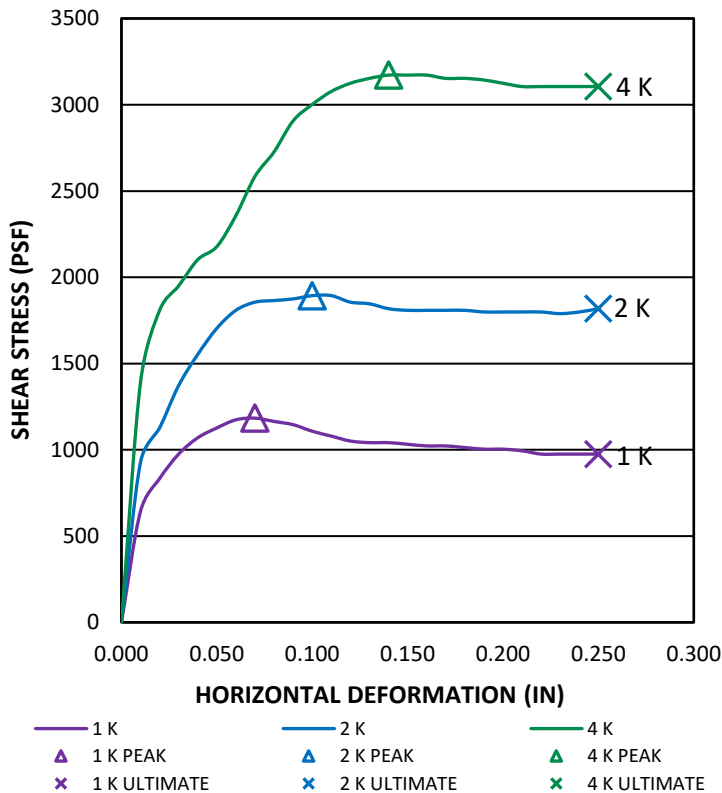
PROJECT NO.: G3028-42-01

SAMPLE NO.: **4-1** GEOLOGIC UNIT: **Kgr**
 SAMPLE DEPTH (FT): **5 to 7 Feet** NATURAL/REMOLDED: **R**

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
ACTUAL NORMAL STRESS (PSF):	890	2030	4300	--
WATER CONTENT (%):	8.2	8.7	8.4	8.4
DRY DENSITY (PCF):	126.5	126.1	126.2	126.3

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
WATER CONTENT (%):	12.0	12.6	12.3	12.3
PEAK SHEAR STRESS (PSF):	1183	1894	3172	--
ULT.-E.O.T. SHEAR STRESS (PSF):	975	1818	3105	--

RESULTS		
PEAK	COHESION, C (PSF)	690
	FRICTION ANGLE (DEGREES)	30
ULTIMATE	COHESION, C (PSF)	480
	FRICTION ANGLE (DEGREES)	32



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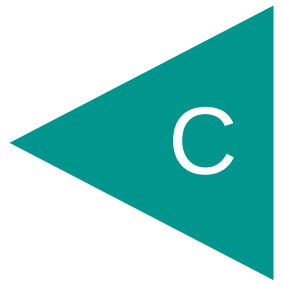
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DIRECT SHEAR - AASHTO T-236

ZEIDER ROAD

PROJECT NO.: G3028-42-01

APPENDIX



APPENDIX C

STORM WATER MANAGEMENT INVESTIGATION

We understand storm water management devices are being proposed in accordance with the current Riverside County LID BMP Handbook. If not properly constructed, there is a risk for potential distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, possesses general information regarding the existing soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. The table below presents the descriptions of the hydrologic soil groups. In addition, the USDA website also provides an estimated saturated hydraulic conductivity for the existing soil.

HYDROLOGIC SOIL GROUP DEFINITIONS

Soil Group	Soil Group Definition
A	Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
D	Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The table below presents the information from the USDA website for the subject property.

USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k _{SAT} of Most Limiting Layer (Inches/ Hour)
Cajalco fine sandy loam, 8 to 15 percent slopes, eroded	CaD2	4	C	0.00 – 0.06
Las Posas loam, 2 to 8 percent slopes	LaC	44	D	0.00 – 0.06
Las Posas loam, 5 to 8 percent slopes, eroded	LaC2	12	D	0.00 – 0.06
Wyman loam, 2 to 8 percent slopes, eroded	Wyc2	40	C	0.20 – 0.57

Infiltration Testing

We performed 12 borehole infiltration tests at the locations shown on Figure 1 (A-1 through A-12). The tests were performed in 6-inch-diameter borings that were approximately 5 to 10 feet deep. The table below presents the results of the testing. Calculation sheets are attached.

INFILTRATION TEST RESULTS

Test No.	Geologic Unit	Test Depth (feet)	Field-Saturated Hydraulic Conductivity/Infiltration Rate, k _{sat} (inch/hour)	Infiltration Rate ¹ (inch/hour)
A-1	Kiu	5	0.06	0.03
A-2	Kiu	5	0.198	0.099
A-3	Kiu	5	0.001	0.001
A-4	Kiu	4.7	0.038	0.019
A-5	Kiu	4.5	0.072	0.036
A-6	Kiu	5.1	0.035	0.018
A-7	Kiu	5	0.078	0.039
A-8	Kiu	5	0.05	0.025
A-9	Qya	10	0.21	0.105
A-10	Kiu	10	0.297	0.148
A-11	Qya	4.8	0.181	0.091
A-12	Qya	5.3	0.094	0.047
Average			0.11	0.055

¹ Using a Factor of Safety of 2.

GEOTECHNICAL CONSIDERATIONS

Groundwater Elevations

We did not encounter groundwater during our field investigation. It is not uncommon for shallow seepage conditions to develop where none previously existed when sites are irrigated or infiltration is implemented. Groundwater and seepage are dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result.

New or Existing Utilities

Utilities are located on the property and adjacent to the property within roadways. Infiltration within the areas near these utilities should be considered infeasible. Setbacks for infiltration should be incorporated if infiltration were to be considered. The setback for infiltration devices should be a minimum of 10 feet and a 1:1 plane of 1 foot below the closest edge of the deepest adjacent utility.

Existing and Planned Structures

Existing and proposed buildings are present on and adjacent to the site. Water should not be allowed to infiltrate in areas where it could affect the neighboring properties and existing adjacent structures, improvements, and roadways. Mitigation for existing structures consists of not allowing water infiltration within a lateral distance of at least 10 feet from the new or existing foundations and property lines.

Soil or Groundwater Contamination

We are unaware of contaminated soil on the property. Therefore, infiltration associated with this risk is considered unrestricted. In addition, groundwater mounding would not be a concern due to the lack of a near surface groundwater table.

CONCLUSIONS AND RECOMMENDATIONS

Storm Water Evaluation Conclusion

Based on the results of our infiltration tests, it is our opinion that the property is not suitable for infiltration. The civil engineer may consider allowing incidental infiltration, where possible. This would still require the proper setbacks from utilities, improvements and structures and would require side liners to prevent lateral water migration

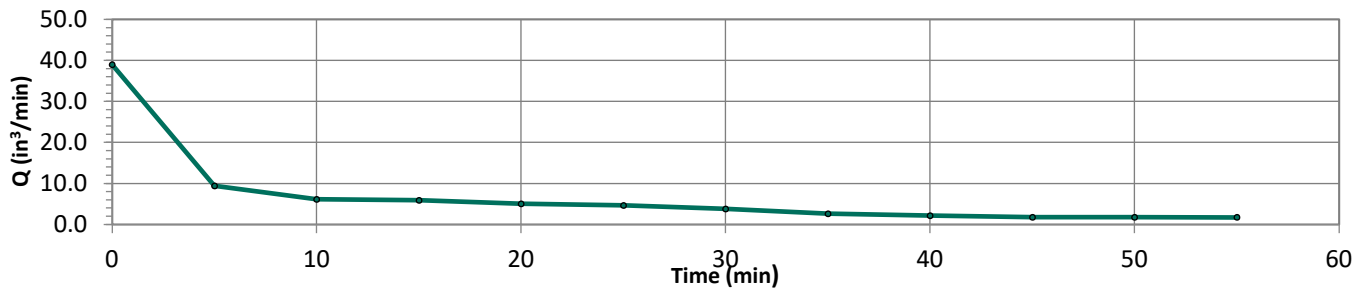
Storm Water Management Devices

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

TEST NO.: **A-1**GEOLOGIC UNIT: **Kiu**EXCAVATION ELEVATION (MSL, FT): **1562**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	5.0
TEST/BOTTOM ELEVATION (MSL, FT):	1557
MEASURED HEAD HEIGHT (IN):	5.0
CALCULATED HEAD HEIGHT (IN):	5.1
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	1.763
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.060
FACTORED INFILTRATION RATE (IN/HR):	0.030



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	7.035	194.82	38.963
3	5.00	1.695	46.94	9.388
4	5.00	1.105	30.60	6.120
5	5.00	1.065	29.49	5.898
6	5.00	0.905	25.06	5.012
7	5.00	0.840	23.26	4.652
8	5.00	0.690	19.11	3.822
9	5.00	0.480	13.29	2.658
10	5.00	0.395	10.94	2.188
11	5.00	0.320	8.86	1.772
12	5.00	0.320	8.86	1.772
13	5.00	0.315	8.72	1.745

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BOREHOLE INFILTRATION TEST RESULTS

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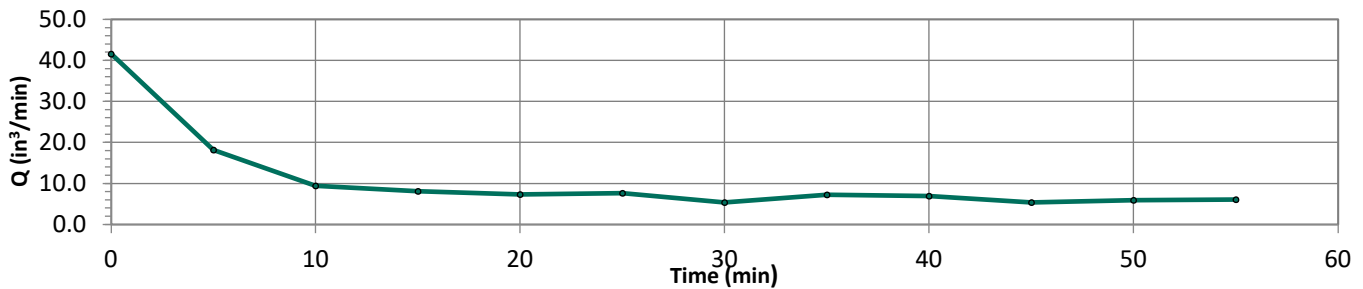
PROJECT NO.:

G3028-42-01

TEST NO.: **A-2**GEOLOGIC UNIT: **Kiu**EXCAVATION ELEVATION (MSL, FT): **1562**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	5.0
TEST/BOTTOM ELEVATION (MSL, FT):	1557
MEASURED HEAD HEIGHT (IN):	5.0
CALCULATED HEAD HEIGHT (IN):	5.3
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	5.788
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.198
FACTORED INFILTRATION RATE (IN/HR):	0.099



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	7.505	207.83	41.566
3	5.00	3.285	90.97	18.194
4	5.00	1.700	47.08	9.415
5	5.00	1.455	40.29	8.058
6	5.00	1.320	36.55	7.311
7	5.00	1.375	38.08	7.615
8	5.00	0.970	26.86	5.372
9	5.00	1.310	36.28	7.255
10	5.00	1.250	34.62	6.923
11	5.00	0.975	27.00	5.400
12	5.00	1.060	29.35	5.871
13	5.00	1.100	30.46	6.092

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BOREHOLE INFILTRATION TEST RESULTS

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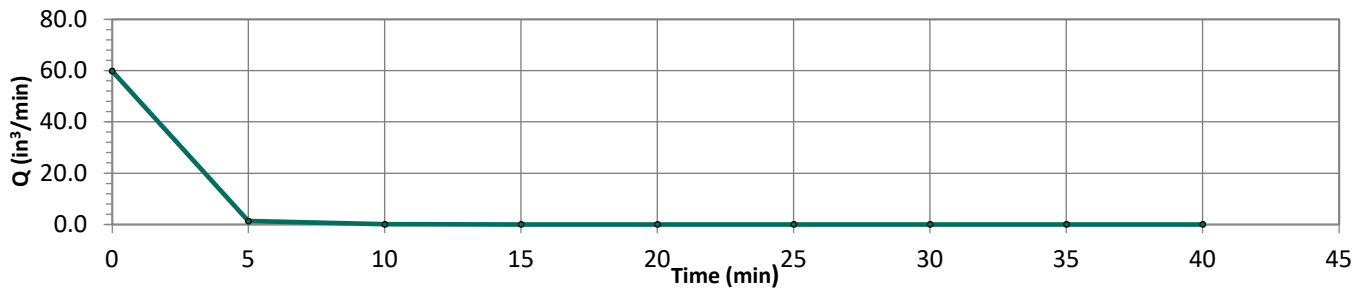
PROJECT NO.:

G3028-42-01

TEST NO.: **A-3**GEOLOGIC UNIT: **Kiu**EXCAVATION ELEVATION (MSL, FT): **1562**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	5.0
TEST/BOTTOM ELEVATION (MSL, FT):	1557
MEASURED HEAD HEIGHT (IN):	4.0
CALCULATED HEAD HEIGHT (IN):	5.3
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	0.028
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.001
FACTORED INFILTRATION RATE (IN/HR):	0.001



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	10.805	299.22	59.843
3	5.00	0.245	6.78	1.357
4	5.00	0.015	0.42	0.083
5	5.00	0.005	0.14	0.028
6	5.00	0.005	0.14	0.028
7	5.00	0.005	0.14	0.028
8	5.00	0.005	0.14	0.028
9	5.00	0.005	0.14	0.028
10	5.00	0.005	0.14	0.028

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BOREHOLE INFILTRATION TEST RESULTS

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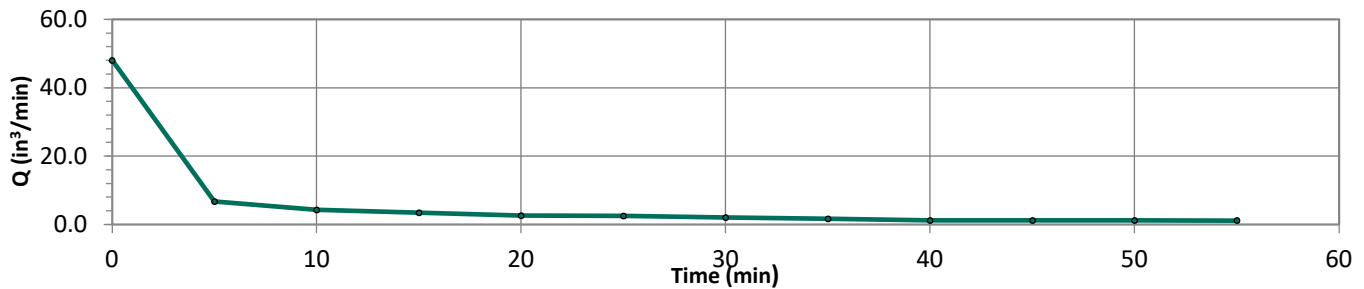
PROJECT NO.:

G3028-42-01

TEST NO.: **A-4**GEOLOGIC UNIT: **Kiu**EXCAVATION ELEVATION (MSL, FT): **1566**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	4.7
TEST/BOTTOM ELEVATION (MSL, FT):	1561
MEASURED HEAD HEIGHT (IN):	6.0
CALCULATED HEAD HEIGHT (IN):	5.2
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	1.200
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.038
FACTORED INFILTRATION RATE (IN/HR):	0.019



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	8.670	240.09	48.018
3	5.00	1.210	33.51	6.702
4	5.00	0.775	21.46	4.292
5	5.00	0.620	17.17	3.434
6	5.00	0.465	12.88	2.575
7	5.00	0.445	12.32	2.465
8	5.00	0.370	10.25	2.049
9	5.00	0.300	8.31	1.662
10	5.00	0.220	6.09	1.218
11	5.00	0.220	6.09	1.218
12	5.00	0.220	6.09	1.218
13	5.00	0.210	5.82	1.163

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BOREHOLE INFILTRATION TEST RESULTS

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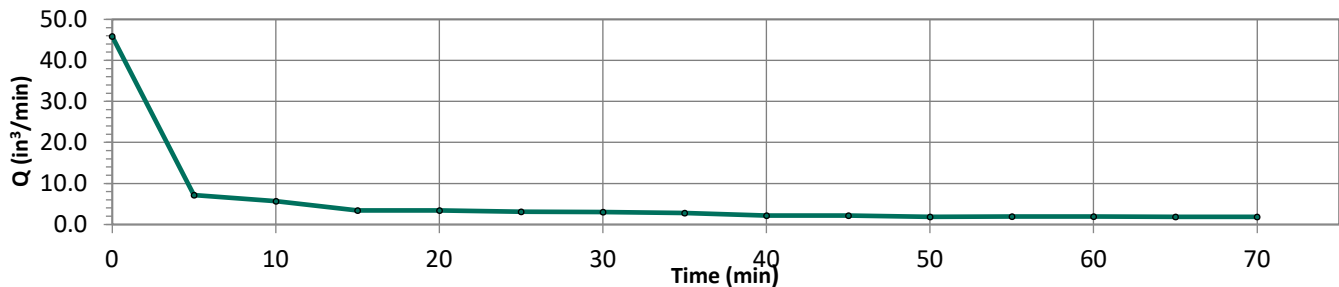
PROJECT NO.:

G3028-42-01

TEST NO.: **A-5**GEOLOGIC UNIT: **Kiu**EXCAVATION ELEVATION (MSL, FT): **1569**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	4.5
TEST/BOTTOM ELEVATION (MSL, FT):	1565
MEASURED HEAD HEIGHT (IN):	4.0
CALCULATED HEAD HEIGHT (IN):	5.2
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	1.892
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.072
FACTORED INFILTRATION RATE (IN/HR):	0.036



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	8.275	229.15	45.831
3	5.00	1.295	35.86	7.172
4	5.00	1.030	28.52	5.705
5	5.00	0.620	17.17	3.434
6	5.00	0.610	16.89	3.378
7	5.00	0.565	15.65	3.129
8	5.00	0.545	15.09	3.018
9	5.00	0.500	13.85	2.769
10	5.00	0.395	10.94	2.188
11	5.00	0.395	10.94	2.188
12	5.00	0.340	9.42	1.883
13	5.00	0.355	9.83	1.966
14	5.00	0.345	9.55	1.911
15	5.00	0.340	9.42	1.883
16	5.00	0.340	9.42	1.883

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BOREHOLE INFILTRATION TEST RESULTS

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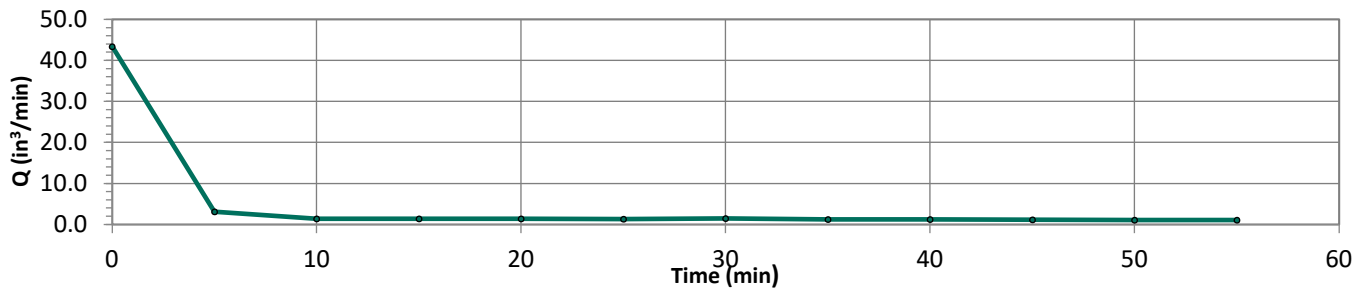
PROJECT NO.:

G3028-42-01

TEST NO.: **A-6**GEOLOGIC UNIT: **Kiu**EXCAVATION ELEVATION (MSL, FT): **1571**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	5.1
TEST/BOTTOM ELEVATION (MSL, FT):	1566
MEASURED HEAD HEIGHT (IN):	6.0
CALCULATED HEAD HEIGHT (IN):	5.3
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	1.126
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.035
FACTORED INFILTRATION RATE (IN/HR):	0.018



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	7.835	216.97	43.394
3	5.00	0.565	15.65	3.129
4	5.00	0.256	7.09	1.418
5	5.00	0.255	7.06	1.412
6	5.00	0.250	6.92	1.385
7	5.00	0.230	6.37	1.274
8	5.00	0.260	7.20	1.440
9	5.00	0.225	6.23	1.246
10	5.00	0.215	5.95	1.191
11	5.00	0.210	5.82	1.163
12	5.00	0.200	5.54	1.108
13	5.00	0.200	5.54	1.108

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BOREHOLE INFILTRATION TEST RESULTS

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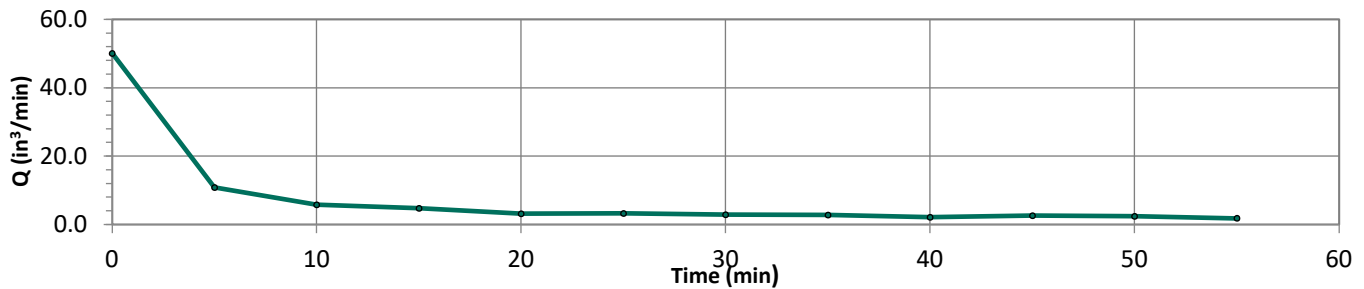
PROJECT NO.:

G3028-42-01

TEST NO.: **A-7**GEOLOGIC UNIT: **Kiu**EXCAVATION ELEVATION (MSL, FT): **1570**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	5.0
TEST/BOTTOM ELEVATION (MSL, FT):	1565
MEASURED HEAD HEIGHT (IN):	5.0
CALCULATED HEAD HEIGHT (IN):	5.1
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	2.262
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.078
FACTORED INFILTRATION RATE (IN/HR):	0.039



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	9.045	250.48	50.095
3	5.00	1.950	54.00	10.800
4	5.00	1.050	29.08	5.815
5	5.00	0.855	23.68	4.735
6	5.00	0.575	15.92	3.185
7	5.00	0.580	16.06	3.212
8	5.00	0.520	14.40	2.880
9	5.00	0.510	14.12	2.825
10	5.00	0.380	10.52	2.105
11	5.00	0.470	13.02	2.603
12	5.00	0.430	11.91	2.382
13	5.00	0.325	9.00	1.800

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BOREHOLE INFILTRATION TEST RESULTS

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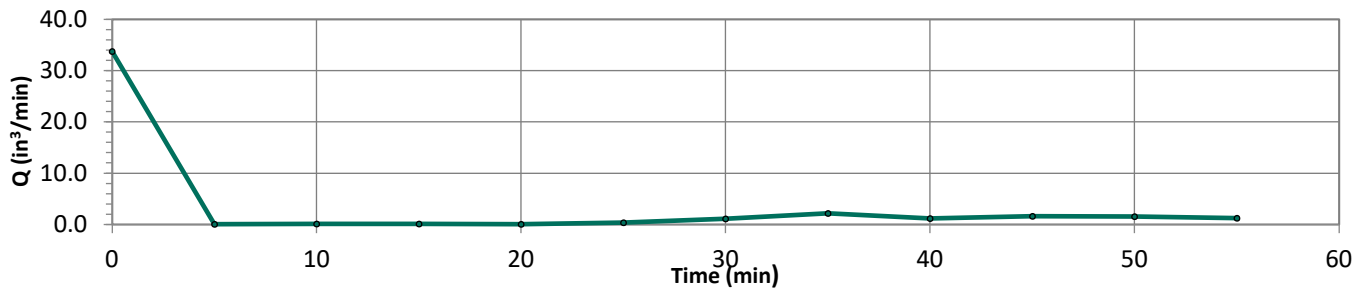
PROJECT NO.:

G3028-42-01

TEST NO.: **A-8**GEOLOGIC UNIT: **Kiu**EXCAVATION ELEVATION (MSL, FT): **1566**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	5.0
TEST/BOTTOM ELEVATION (MSL, FT):	1561
MEASURED HEAD HEIGHT (IN):	5.0
CALCULATED HEAD HEIGHT (IN):	5.3
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	1.458
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.050
FACTORED INFILTRATION RATE (IN/HR):	0.025



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	6.090	168.65	33.729
3	5.00	0.010	0.28	0.055
4	5.00	0.015	0.42	0.083
5	5.00	0.015	0.42	0.083
6	5.00	0.010	0.28	0.055
7	5.00	0.070	1.94	0.388
8	5.00	0.200	5.54	1.108
9	5.00	0.390	10.80	2.160
10	5.00	0.215	5.95	1.191
11	5.00	0.295	8.17	1.634
12	5.00	0.275	7.62	1.523
13	5.00	0.220	6.09	1.218

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BOREHOLE INFILTRATION TEST RESULTS

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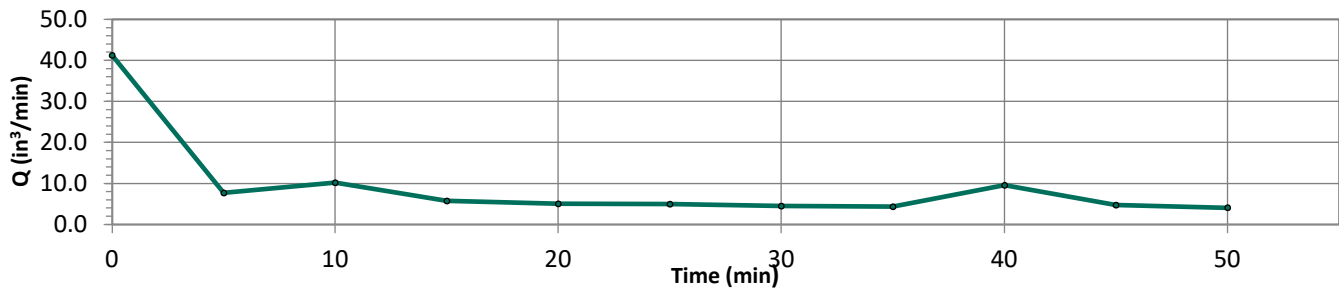
PROJECT NO.:

G3028-42-01

TEST NO.: **A-9**GEOLOGIC UNIT: **Qal**EXCAVATION ELEVATION (MSL, FT): **1566**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	10.0
TEST/BOTTOM ELEVATION (MSL, FT):	1556
MEASURED HEAD HEIGHT (IN):	5.0
CALCULATED HEAD HEIGHT (IN):	6.3
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	6.138
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.210
FACTORED INFILTRATION RATE (IN/HR):	0.105



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	7.445	206.17	41.234
3	5.00	1.385	38.35	7.671
4	5.00	1.835	50.82	10.163
5	5.00	1.035	28.66	5.732
6	5.00	0.915	25.34	5.068
7	5.00	0.895	24.78	4.957
8	5.00	0.815	22.57	4.514
9	5.00	0.790	21.88	4.375
10	5.00	1.735	48.05	9.609
11	5.00	0.850	23.54	4.708
12	5.00	0.740	20.49	4.098

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BOREHOLE INFILTRATION TEST RESULTS

33521 Zeiders Road

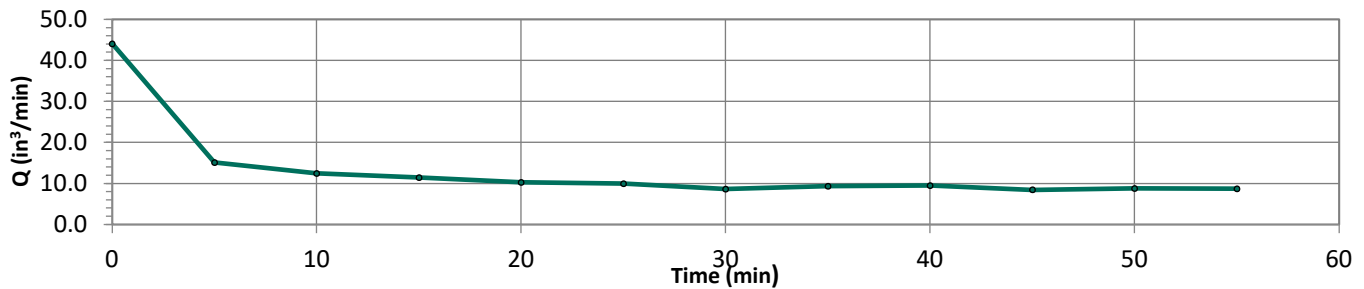
PROJECT NO.:

G3028-42-01

TEST NO.: **A-10**GEOLOGIC UNIT: **Kiu**EXCAVATION ELEVATION (MSL, FT): **1568**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	10.0
TEST/BOTTOM ELEVATION (MSL, FT):	1558
MEASURED HEAD HEIGHT (IN):	5.0
CALCULATED HEAD HEIGHT (IN):	6.3
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	8.658
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.297
FACTORED INFILTRATION RATE (IN/HR):	0.148



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	7.960	220.43	44.086
3	5.00	2.725	75.46	15.092
4	5.00	2.245	62.17	12.434
5	5.00	2.060	57.05	11.409
6	5.00	1.855	51.37	10.274
7	5.00	1.795	49.71	9.942
8	5.00	1.560	43.20	8.640
9	5.00	1.680	46.52	9.305
10	5.00	1.720	47.63	9.526
11	5.00	1.525	42.23	8.446
12	5.00	1.595	44.17	8.834
13	5.00	1.570	43.48	8.695

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BOREHOLE INFILTRATION TEST RESULTS

33521 Zeiders Road

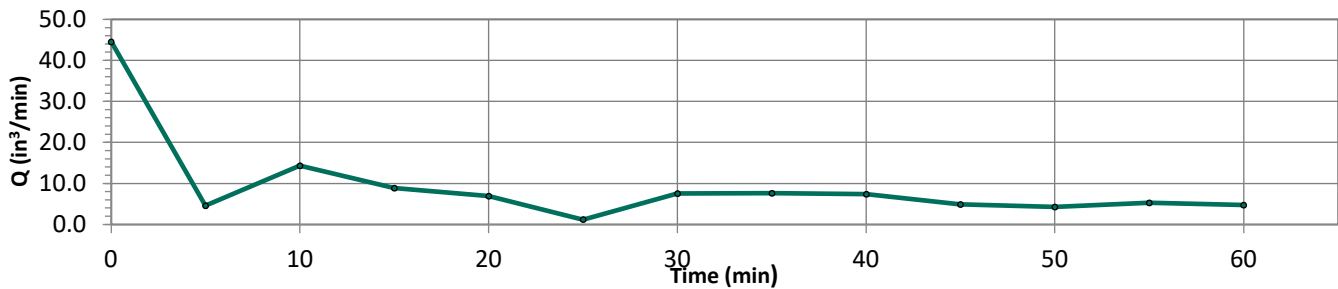
PROJECT NO.:

G3028-42-01

TEST NO.: **A-11**GEOLOGIC UNIT: **Qal**EXCAVATION ELEVATION (MSL, FT): **1570**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	4.8
TEST/BOTTOM ELEVATION (MSL, FT):	1565
MEASURED HEAD HEIGHT (IN):	4.0
CALCULATED HEAD HEIGHT (IN):	5.3
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	4.754
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.181
FACTORED INFILTRATION RATE (IN/HR):	0.091



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	8.045	222.78	44.557
3	5.00	0.830	22.98	4.597
4	5.00	2.595	71.86	14.372
5	5.00	1.605	44.45	8.889
6	5.00	1.250	34.62	6.923
7	5.00	0.215	5.95	1.191
8	5.00	1.360	37.66	7.532
9	5.00	1.380	38.22	7.643
10	5.00	1.330	36.83	7.366
11	5.00	0.880	24.37	4.874
12	5.00	0.765	21.18	4.237
13	5.00	0.955	26.45	5.289
14	5.00	0.855	23.68	4.735

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BOREHOLE INFILTRATION TEST RESULTS

33521 Zeiders Road

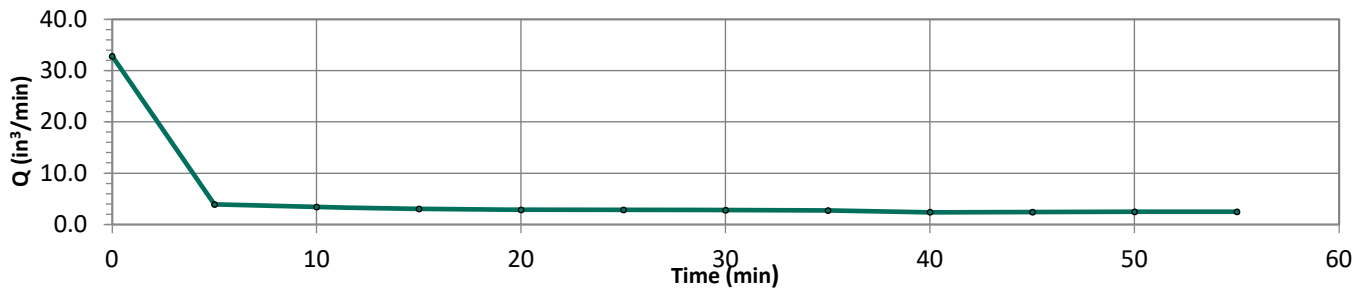
PROJECT NO.:

G3028-42-01

TEST NO.: **A-12**GEOLOGIC UNIT: **Qal**EXCAVATION ELEVATION (MSL, FT): **1569**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	6
BOREHOLE DEPTH (FT):	5.3
TEST/BOTTOM ELEVATION (MSL, FT):	1564
MEASURED HEAD HEIGHT (IN):	4.0
CALCULATED HEAD HEIGHT (IN):	5.4
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN ³ /MIN):	2.474
FIELD-SATURATED INFILTRATION RATE (IN/HR):	0.094
FACTORED INFILTRATION RATE (IN/HR):	0.047



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in ³)	Q (in ³ /min)
1	0.00	0.000	0.00	0.00
2	5.00	5.925	164.08	32.815
3	5.00	0.710	19.66	3.932
4	5.00	0.620	17.17	3.434
5	5.00	0.550	15.23	3.046
6	5.00	0.520	14.40	2.880
7	5.00	0.520	14.40	2.880
8	5.00	0.500	13.85	2.769
9	5.00	0.495	13.71	2.742
10	5.00	0.435	12.05	2.409
11	5.00	0.440	12.18	2.437
12	5.00	0.450	12.46	2.492
13	5.00	0.450	12.46	2.492

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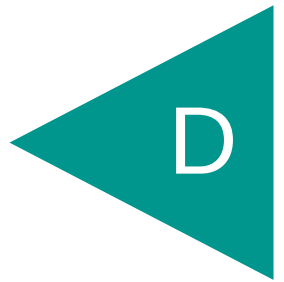
BOREHOLE INFILTRATION TEST RESULTS

33521 Zeiders Road

PROJECT NO.:

G3028-42-01

APPENDIX



APPENDIX D

GRADING RECOMMENDATIONS

FOR

MENIFEE BUSINESS PARK
33521 ZEIDERS ROAD
MENIFEE, CALIFORNIA

PROJECT NO. G3028-42-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

- 1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.
- 1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.
- 1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

- 2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.
- 2.2 **Contractor** shall refer to the Contractor performing the site grading work.
- 2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

- 2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.
- 2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.
- 2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.
- 2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

- 3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.
- 3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than $\frac{3}{4}$ inch in size.
- 3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.
- 3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than $\frac{3}{4}$ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

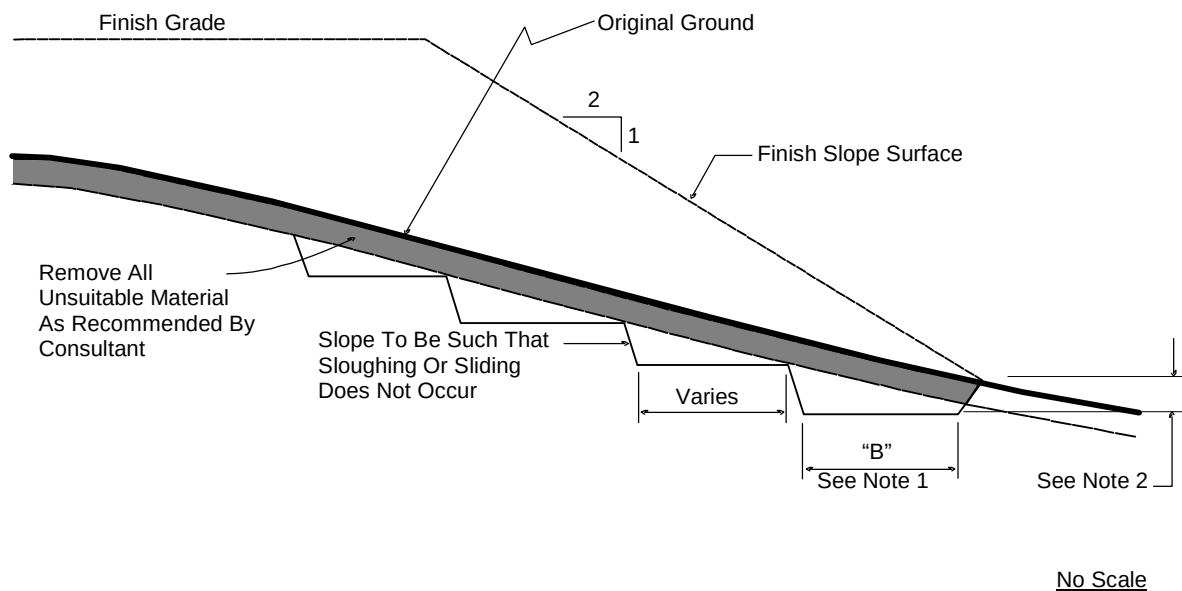
- 3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.
- 3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.
- 3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.
- 3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.
- 3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

4. CLEARING AND PREPARING AREAS TO BE FILLED

- 4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

- 4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.
- 4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.
- 4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



- DETAIL NOTES:
- (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.
 - (2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

- 4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

- 5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.
- 5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

- 6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:
- 6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.
- 6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.
- 6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.
- 6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

- 6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.
- 6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.
- 6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.
- 6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.
- 6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:
- 6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.
- 6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in

maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

- 6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.
- 6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.
- 6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.
- 6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.
- 6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:
 - 6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.
 - 6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the

rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

- 6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.
- 6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of “passes” have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.
- 6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.
- 6.3.6 To reduce the potential for “piping” of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock*

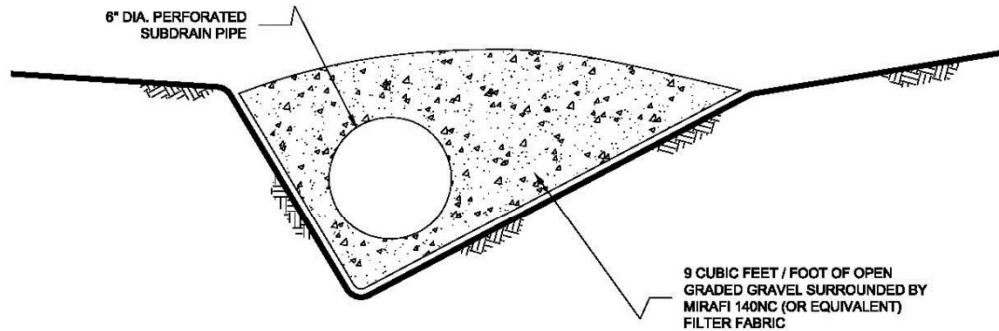
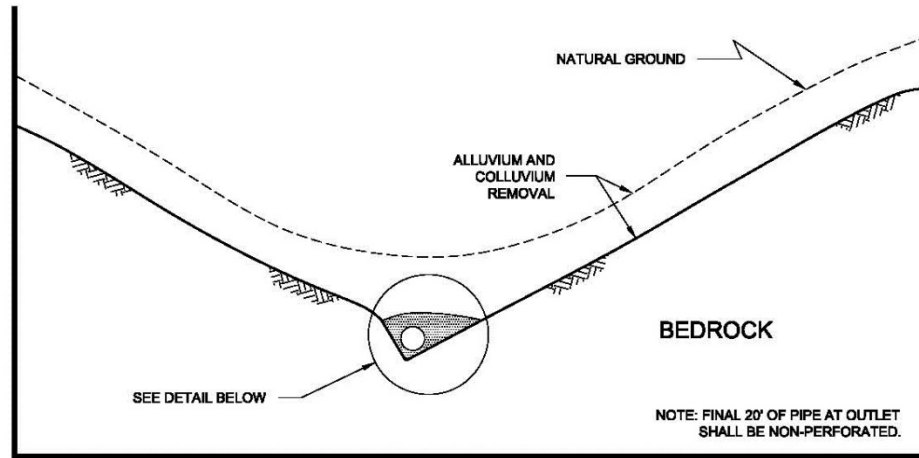
should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

- 6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

- 7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL



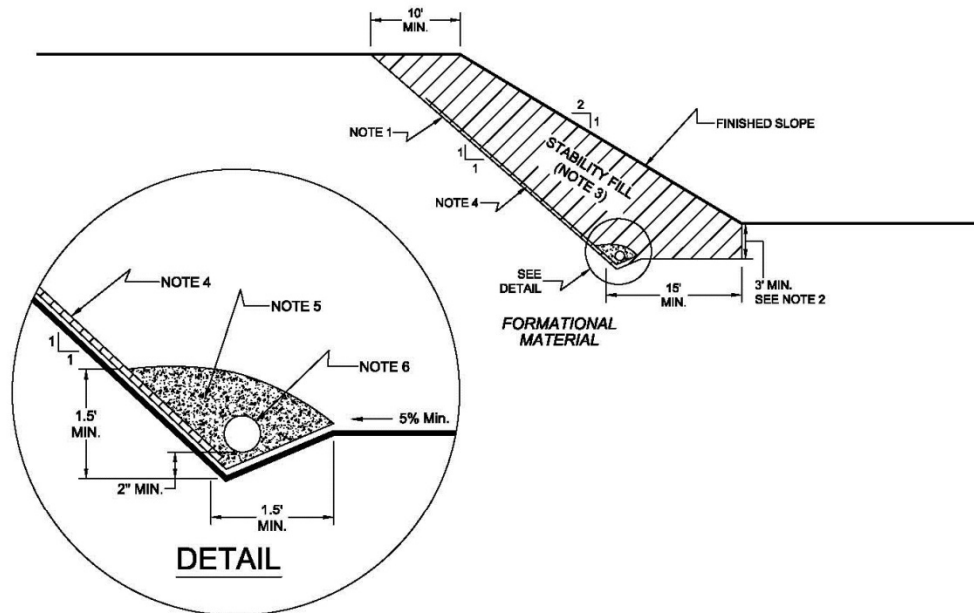
NOTES:

- 1.....6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.
- 2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or larger) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

- 1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).
- 2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.
- 3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.
- 4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.
- 5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).
- 6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

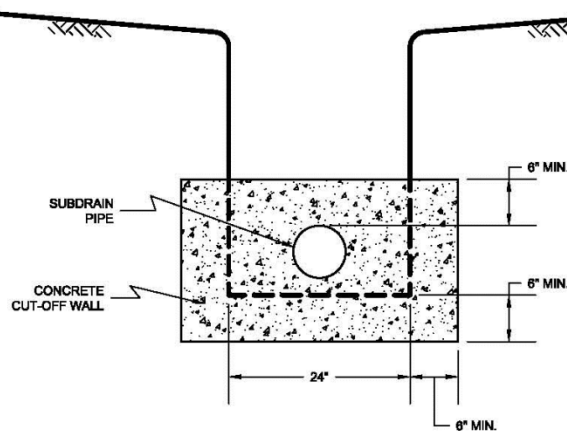
NO SCALE

- 7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.
- 7.4 *Rock fill or soil-rock fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. Rock fill drains should be constructed using the same requirements as canyon subdrains.*

- 7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

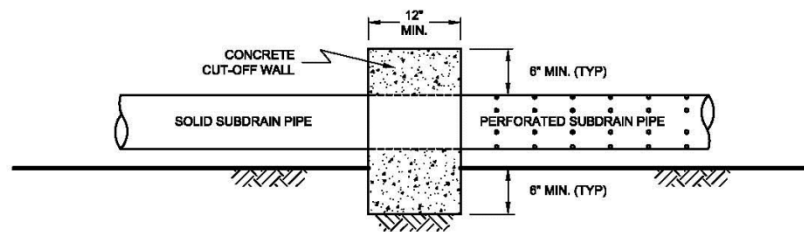
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

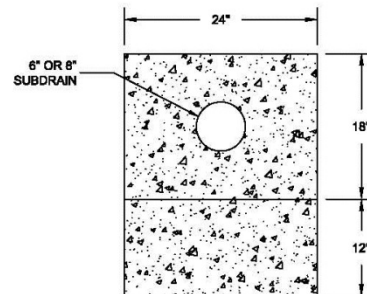


NO SCALE

- 7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

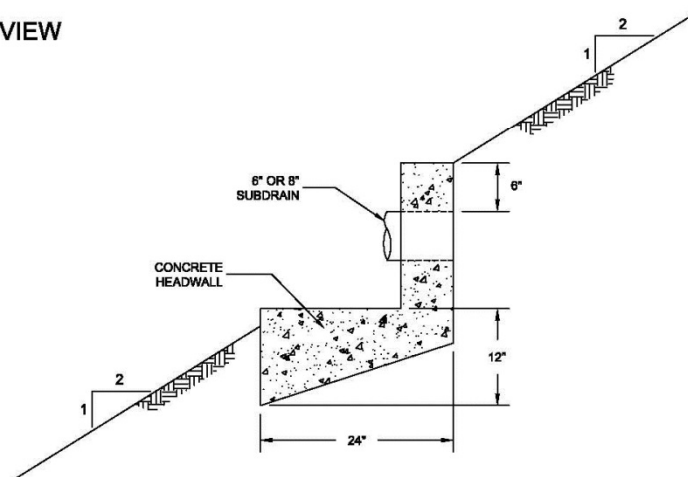
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE
OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

- 7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after

burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

- 8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.
- 8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.
- 8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.
- 8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.
- 8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.
- 8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

- 8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method*.
- 8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)*.
- 8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.
- 8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

- 9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.
- 9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

- 10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.
- 10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in

geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

- ASCE (2017), *ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, American Society of Civil Engineers.
- CGS (2008), *Special Publication 117A, Guidelines For Evaluating and Mitigating Seismic Hazards in California 2008*, California Geological Survey, Revised and Re-adopted September 11, 2008.
- CGS (2021a), EQ Zapp: California Earthquake Hazards Zone Application, web application that queries California Geological Survey mapped earthquake hazard zones, <https://www.conservation.ca.gov/cgs/geohazards/eq-zapp>, accessed August 16, 2024.
- CGS (2021b), *California Tsunami Maps and Data*, web application for accessing tsunami inundation hazard, <https://www.conservation.ca.gov/cgs/tsunami/maps>, accessed August 16, 2024.
- FEMA (2020), Flood Insurance Rate Map (FIRM), Map Numbers 06065C2070H, Effective August 18, 2014, <http://www.fema.gov/portal/home>, accessed August 16, 2024.
- PLSA (2024), *Preliminary Grading and Utility Plans For: Menifee Business Park, 33521 Zeiders Road, Menifee, California*, dated May 21, 2024, Jon Number 3983.
- Morton, D.M.(2003), *Geologic Map of the Romoland 7.5' Quadrangle, Riverside County, California*, Version 1.0, USGS Open-File Report OF 2003-102, Scale 1:24,000.
- SEAOC (2019), OSHPD Seismic Design Maps: Structural Engineers Association of California website, <http://seismicmaps.org/>, accessed August 16, 2024.
- USGS (2016), *Quaternary Fault and Fold Database of the United States*: U.S. Geological Survey website, <https://www.usgs.gov/programs/earthquake-hazards/faults>, accessed August 16, 2024.