Attachment 1

Mitigation Monitoring and Reporting Program

County of Santa Cruz

PLANNING DEPARTMENT
701 Ocean Street, 4th Floor, Santa Cruz, CA 95060
(831) 454-2580 Fax: (831) 454-2131 Tdd: (831) 454-2123

MITIGATION MONITORING AND REPORTING PROGRAM
For
9041 Soquel Drive, Aptos
Application No. 191306, October 2019

No.	Environmental Impact	Mitigation Measures	Responsibility for Compliance	Method of Compliance	Timing of Compliance
Biological Resources					
BIO-1	*Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife, or U.S. Fish and Wildlife Service?*	Prior to any site disturbance, a pre-construction meeting shall be conducted. The purpose of the meeting will be to ensure that the conditions set forth in the proposed project description and Conditions of Approval of the Riparian Exception are communicated to the various parties responsible for constructing the project. The meeting shall involve all relevant parties including the project proponent, construction supervisor and Environmental Planning Staff.	Applicant	Compliance monitored by the County Planning Department and Applicant	To be implemented prior to and during project construction
BIO-2		Prior to construction, high visibility construction fencing shall be installed, to indicate the limits of work and prevent inadvertent grading or other disturbance within the adjacent riparian corridor. No work-related activity including equipment staging, vehicular access, and grading shall be allowed outside the limits of work.	Applicant	Compliance monitored by the County Planning Department and Applicant	To be implemented prior to and during project construction
BIO-3	*Have a substantial adverse effect on any riparian habitat or sensitive natural community identified in local or regional plans, policies, regulations (e.g., wetland, native grassland, special forests, intertidal zone, etc.) or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?*	A revegetation plan using appropriate California native riparian species plants (shrubs and low growing groundcover) with at least three species known as nectar plants for the obscure bumblebee shall be submitted and approved at the building permit review stage and implemented at the rear of the constructed project (five feet from the back of the building and retaining wall to the existing riparian vegetation) in order to restore of the margins of the riparian area, enhance the riparian corridor and for erosion control.	Applicant	Compliance monitored by the County Planning Department and Applicant	To be implemented prior to and during project construction
BIO-4		A permanent three-foot high fence shall be erected approximately 5 feet behind the proposed building to demarcate and prevent disturbance to the riparian restoration area. The location of this fence shall be shown on plans submitted in support of the building permit for the project and shall be approved by Environmental Planning staff.	Applicant	Compliance monitored by the County Planning Department and Applicant	To be implemented prior to and during project construction
BIO-5		Prior to issuance of a building permit, a final detailed lighting plan shall be submitted for review and approval by Environmental Planning staff, showing that all light sources will be cast downward, shielded and directed away from Valencia Creek, so that light does not spill over into the riparian habitat to the north, onto adjacent properties or upwards into the night sky. Lighting shall further be limited to limited to warm light colors with an output temperature of 2,700 kelvin or less.	Applicant	Compliance monitored by the County Planning Department and Applicant	To be implemented prior to and during project construction

Attachment 2

Geotechnical Report by CMAG Engineering, Inc.
Dated December 30, 2018

GEOTECHNICAL INVESTIGATION

9041 Soquel Drive
Aptos, Santa Cruz County, California

Submitted to:

Testorff Construction
335 Spreckels Drive, Suite D
Aptos, California 95003

Prepared by:

CMAG ENGINEERING, INC.

Project No. 18-142-SC
December 30, 2018

CMAG ENGINEERING, INC.

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December 30, 2018
Project No. 18-142-SC

Testorff Construction
335 Spreckels Drive, Suite D
Aptos, California 95003

Attn: Pete Testorff

SUBJECT: **GEOTECHNICAL INVESTIGATION**
Proposed Commercial Building
9041 Soquel Drive,
Aptos, Santa Cruz County, California
APN 041-141-56

Dear Mr. Testorff:

In accordance with your authorization, we have completed a geotechnical investigation for the subject project. This report summarizes the findings, conclusions, and recommendations from our field exploration, laboratory testing, and engineering analysis. It is a pleasure being associated with you on this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office.

Sincerely,

CMAG ENGINEERING, INC.

ADRIAN L. GARNER
Garner
GE2814
6/30/20

Adrian L. Garner, PE, GE
Principal Engineer
C 66087, GE 2814
Expires 6/30/20

Distribution: Addressee (4 Hard Copies; Electronic Copy)

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1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed commercial building at 9041 Soquel Drive in Aptos, Santa Cruz County, California.

The purpose of our investigation was to provide information regarding the surface and subsurface soil and bedrock conditions, and based on our findings, provide geotechnical recommendations for the design and construction of the proposed commercial building and associated improvements. Conclusions and recommendations related to geotechnical hazards, site grading, drainage, foundations, concrete slabs, retaining structures, and pavements are presented herein.

1.1 Terms of Reference

CMAG Engineering, Inc.'s (CMAG) scope of work for this phase of the project included site reconnaissance, subsurface exploration, soil and bedrock sampling, laboratory testing, engineering analyses, and preparation of this report.

The work was undertaken in accordance with CMAG's *Proposal for Geotechnical Services* dated October 22, 2018.

The recommendations contained in this report are subject to the limitations presented in Section 8.0 of this report.

1.2 Site Location

The project site is located on the north side of Highway 1 and the north side of Soquel Drive, between Rio Del Mar Boulevard and Spreckels Drive in Aptos, Santa Cruz County, California. The site location is shown on the Site Location Map, Appendix A, Figure A-1.

1.3 Surface Conditions

The parcel is 0.7 acres in size, irregular in shape, and currently, undeveloped. The parcel is situated on the north side of Soquel Drive. The south side of the parcel is flat to gently sloping. The north side of the parcel consists of a dissected slope that descends to the north towards Valencia Creek. Immediately adjacent to Soquel Drive, the site is relatively flat. The flat area, covered with baserock, extends to the north from Soquel Drive for approximately 35 feet and has been previously graded to create the relatively flat pad. A second, gently sloping terrace, extends further to the north of the flat pad, for an average distance of approximately 60 feet. A dissected north facing slope is located further to the north of the terrace. Immediately adjacent to the north side of the terrace, the slope is steep. Beyond the steep slope, moderate and steep north facing slopes descend towards Valencia Creek.

Adjacent to Soquel Drive, the site is covered with baserock. The gently sloping terrace is vegetated with grass and weeds. The remaining portion of the site, that descends to Valencia Creek, is densely vegetated with mature trees and brush.

2.0 PROJECT DESCRIPTION

It is our understanding that the project consists of the construction of a new two-story commercial building with a partial basement. The proposed building envelope is located on the relatively flat and gently sloping portion of the site. It is our understanding that the north side of the proposed building is to be located approximately 10 to 20 feet from the top of the steep slope. Also proposed is open parking, utility, stormwater retention/detention facilities, and landscape improvements.

The preliminary plan consists of constructing a partial basement on the north side of the building, extending approximately 8 to 10 feet below grade. The proposed parking area is located on the west side of the parcel. A retaining wall will be required to support the north side of the parking area due to the grade change between the relatively flat area and the terrace further to the north.

3.0 FIELD EXPLORATION AND LABORATORY TESTING PROGRAMS

Our field exploration program included drilling, logging, and interval sampling of 5 borings on October 22 and December 7, 2018. The borings were advanced to depths ranging from 17.5± feet to 36.5± feet below the existing grades. Details of the field exploration program, including the Boring Logs, Figures A-4 through A-8, are presented in Appendix A.

Representative samples obtained during the field investigation were taken to the laboratory for testing to determine physical and engineering properties. Details of the laboratory testing program are presented in Appendix B. Test results are presented on the Boring Logs and in Appendix B.

4.0 SUBSURFACE CONDITIONS AND EARTH MATERIALS

4.1 General

The geologic map of Santa Cruz County (Brabb, 1989) depicts the subject property as underlain by Older Flood Plain deposits (Qof; Holocene) described as consisting of unconsolidated fine grained sand, silt, and clay. Alluvial deposits (Qal; Holocene) are depicted on the north side of the parcel, within close proximity to Valencia Creek. Purisima Formation bedrock (Tp; Pliocene and Upper Miocene) described as consisting of yellowish-gray siltstone with interbeds of fine grained sandstone is depicted south and north of the parcel.

Five borings were advanced in the vicinity of the proposed improvements. The subsurface profile encountered in our field exploration consisted of Older Flood Plain Deposits overlying Purisima Formation bedrock within the depths explored. A thin veneer of fill was encountered on the south side of the parcel, adjacent to Soquel Drive. Complete subsurface profiles are presented on the Boring Logs, Appendix A, Figures A-4 through A-8. The boring locations are shown on the Boring Location Plan, Figure A-2.

A representative cross section has been constructed based on the results of our field exploration program. See Appendix A, Figure A-9.

4.2 Artificial Fill - af

Fill was encountered on the south side of the parcel to a maximum depth of approximately 6 feet below grade. Fill was also encountered in Boring B-3, adjacent to the crest of the slope, extending to a depth of approximately 2.5 feet below grade. The fill generally consisted of very loose to medium dense silty and clayey sands with varying amounts of gravel.

4.3 Older Flood Plain Deposits - Qof

Older Flood Plain Deposits were encountered in all the borings. The deposits consisted of interbedded silty sands, sandy silts, clayey sands, and sandy lean and fat clays. The cohesionless deposits were generally medium dense. The cohesive soils were generally firm to very stiff. Based on the results of our laboratory testing, the near surface clays have a high expansion potential.

4.4 Purisima Formation Bedrock - Tp

Purisima Formation bedrock was encountered at depths varying from 24± to 32.5± feet below existing grades. The bedrock generally consisted of dense, non cemented sandstone.

4.5 Groundwater

Groundwater was not encountered during our field exploration.

It should be noted that groundwater conditions, perched or regional, may vary with location and may fluctuate with variations in rainfall, runoff, irrigation, and other changes to the conditions existing at the time our field investigation was performed.

5.0 GEOTECHNICAL HAZARDS

5.1 General

In our opinion, the geotechnical hazards that could potentially affect the proposed project are:

- Seismic Shaking
- Slope Creep

5.2 Seismic Shaking

The seismic hazard due to seismic shaking in California is high in many areas, indicative of the number of large earthquakes that have occurred historically. Intense seismic shaking may occur at the site during the design lifetime of the proposed structure from an earthquake along one of the local fault systems. Generally, the intensity of shaking will increase the closer the site is to the epicenter of an earthquake, however, seismic shaking is a complex phenomenon and may be modified by local topography and soil conditions. The transmission of earthquake vibrations from the ground into the structure may cause structural damage.

5.2.1 2016 California Building Code

The County of Santa Cruz has adopted the seismic provisions set forth in the 2016 California Building Code (2016 CBC) to address seismic shaking. The seismic provisions in the 2016 CBC are minimum load requirements for the seismic design for the proposed structure. The provisions set forth in the 2016 CBC will not prevent structural and nonstructural damage from direct fault ground surface rupture, coseismic ground cracking, liquefaction and lateral spreading, seismically induced differential compaction, or seismically induced landsliding.

Table 1 has been constructed based on the 2016 CBC requirements for the seismic design of the proposed structure. The Site Class has been determined based on our field investigation and laboratory testing.

Table 1. Seismic Design Parameters - 2016 CBC

S_S	S_1	Site Class	F_a	F_v	S_{MS}	S_{M1}	S_{DS}	S_{D1}	PGA_M
1.659g	0.628g	D	1.0	1.5	1.659g	0.942g	1.106g	0.628g	0.633g

5.2.2 2008 USGS PSHA

We determined the PGAs using the USGS *2008 NSHMP PSHA Unified Hazard Tool (UHT).* The PGA has been established for a return period that corresponds to 10 percent chance of exceedance in 50 years. The input parameters for the online tool consist of the site latitude and longitude and a V_{S30} value. A V_{S30} of 760 m/s for the soft rock site condition was used for the determination. The PGA is presented in Table 2.

Table 2. PGA - 2008 USGS PSHA

Return Period (Chance of Exceedance)	PGA - Soft Rock Site Condition (V_{S30} = 760 m/s)
475 Years (10% in 50 Years)	0.41g

5.3 Collateral Seismic Hazards

In addition to seismic shaking, other seismic hazards that may have an adverse affect to the site and/or the structure are: fault ground surface rupture, coseismic ground cracking, seismically induced liquefaction and lateral spreading, seismically induced differential compaction, and seismically induced landsliding. It is our opinion that the potential for collateral seismic hazards to affect the site, and to damage the proposed structure is low. Slope stability, including seismically induced stability is discussed in Section 5.4.

5.4 Slope Stability

5.4.1 Introduction

The proposed commercial building and parking area is situated adjacent to a steep slope that descends to the north. We have analyzed the stability of the steep slope in the immediate vicinity of the proposed improvements.

5.4.2 Analysis

The slope stability analysis for the existing configuration, Cross section A-A' was completed for the static and pseudostatic cases. See Appendix A, Figure A-2 for the location of Cross Section A-A', and Figure A-9 for Cross Section A-A'. We have also analyzed the condition assuming seepage parallel to the ground surface within the upper 4 feet of the steep slope descending from the proposed improvements. The material properties used in our analysis are presented in Appendix C.

The stability of the slope was analyzed using the computer program Slide, Version 7.0 from Rocscience, Inc. This program utilizes a limiting equilibrium method for determining the factor of safety against sliding on an assumed failure surface. The factor of safety against slope failure was calculated using Spencer's method which satisfies both force and moment equilibrium and accounts for inter-slice forces. We also analyzed the slope using a typical infinite slope formulation.

To analyze the seismic stability of the cross section, we performed a pseudostatic analysis based on *Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California* (2008). Our pseudostatic analysis was performed assuming a k_{eq} of 0.27g. The k_{eq} was calculated based on an allowable screen displacement of 5cm. The event that we considered for determination of k_{eq} consisted of a magnitude 8.0 earthquake at a distance of 11.1 km from the site generating a peak ground acceleration of 0.41g. The event is based on the USGS *2008 NSHMP PSHA* for a 10 percent chance of exceedance in 50 years (Section 5.2.2, Table 2).

In terms of slope stability, the factor of safety against sliding is defined as the ratio of resisting forces to driving forces. A factor of safety of unity (1.0) indicates a delicate balance between the resisting and driving forces and represents incipient failure. A factor of safety below unity indicates instability.

5.4.3 Analysis Results

The results of our analysis are presented in Appendix C, Figures C-1 through C-3. A summary of the results are presented in Table 3. The details of our slope stability analysis including the soil and bedrock parameters used are presented in Appendix C.

Table 3. Summary of Calculated Factors of Safety

Figure	Description	Calculated F.S.	Minimum Acceptable F.S.
C-1	Cross Section A-A' - Static Case	1.6	1.5*
C-2	Cross Section A-A' - Pseudostatic Case	1.6	1.0**
C-3	Infinite Slope - Slope Parallel Seepage	1.4	1.5*

Notes: *Considered the minimum industry standard Factor of Safety.

** Considered the minimum Factor of Safety for the pseudostatic analysis procedure outlined in *Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California* (2008).

5.4.4 Acceptable Factors of Safety

The industry standard acceptance criteria for the long-term static stability of a slope is a factor of safety equal to, or greater than 1.5. The pseudostatic slope stability analysis was performed per the procedure recommended by *Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California* (2008). The minimum acceptable factor of safety based on the pseudostatic analysis procedure is 1.0.

5.4.5 Discussion

Based on the results of our analysis, it is our opinion that there is a low probability for overall slope instability to occur under static and seismic conditions in the location of Cross Section A-A'. However, our analysis also indicates that under saturated conditions with slope parallel seepage, the factor of safety of shallow seated erosional failures, on the steep slope adjacent to the proposed improvements, does not meet industry standard factors of safety.

It must be cautioned that slope stability analysis is an inexact science; and that the mathematical models of the slopes and soils contain many simplifying assumptions, not the least of which is homogeneity. Density, moisture content and shear strength may vary within a soil type. There may be localized areas of low strength within a soil.

Slope stability analyses and the generated factors of safety should be used as indicating trendlines. A slope with a safety factor less than one will not necessarily fail, but the probability of slope movement will be greater than a slope with a higher safety factor. Conversely, a slope with a safety factor greater than one may fail, but the probability of stability is higher than a slope with a lower safety factor.

5.5 Slope Creep

Slope creep is an imperceptibly slow downward and outward movement of slope forming rocks and soils. Creep can affect both the near surface soil or deep seated materials. The on-site clays may experience soil creep due to expansion and contraction from seasonal wetting and drying cycles. Typically the amount of movement is governed by the shear strength of the clay, slope angle, slope height, elapsed time, moisture conditions, and thickness of the active creep zone. Based on the results of our expansion index test of the near surface clay and the angle of the steep slope on the north side of the proposed improvements, it is our opinion that the potential for creep to affect the steep slope is high.

6.0 DISCUSSIONS AND CONCLUSIONS

The subsurface profile consists of Older Flood Plain Deposits overlying Purisima Formation bedrock within the depths explored. A thin veneer of fill was encountered on the south side of the parcel, adjacent to Soquel Drive. The Older Flood Plain Deposits consisted of interbedded silty sands, sandy silts, clayey sands, and sandy lean and fat clays. The cohesionless deposits were generally medium dense. The cohesive soils were generally firm to very stiff. Dense sandstone bedrock was encountered beneath the flood plain deposits at depths varying from 24± to 32.5± feet below the existing grades. The fill, on the south side of the parcel, extended to a maximum depth of approximately 6 feet below grade. Fill was also encountered in Boring B-3, adjacent to the crest of the slope, extending to a depth of approximately 2.5 feet below grade. The fill generally consisted of very loose to medium dense silty and clayey sands with varying amounts of gravel. Groundwater was not encountered during the course of our field exploration.

Based on the results of our slope stability analysis, it is our opinion that there is a low probability for overall slope instability to occur under static and seismic conditions on the steep slope that descends to the north from the proposed improvements. However, our analysis also indicates that under saturated conditions with slope parallel seepage, the factor of safety of shallow seated erosional failures, on the steep slope adjacent to the proposed improvements, does not meet industry standard factors of safety.

Valencia Creek is located at the toe of the north facing slope, downslope of the steep slope that we analyzed for our stability analysis (Section 5.4). A quantitative hydraulic and scour analysis of the creek channel was beyond the scope of our services for this project and has not been performed. The slope stability analysis, presented in this report, assumes that Valencia Creek will not adversely affect the stability of the steep slope, descending from the proposed improvements, throughout the life of the project.

The results of our laboratory testing indicates that the near surface clay has a high expansion potential. Based on the results of our laboratory testing coupled with the angle of the steep slope on the north side of the proposed improvements, it is our opinion that the potential for creep to affect the steep slope is high.

7.0 RECOMMENDATIONS

7.1 General

Based on the results of our field investigation, laboratory testing, and engineering analysis, it is our opinion, from the geotechnical standpoint, the subject site will be suitable for the proposed development provided the recommendations presented herein are implemented during grading and construction.

Based on the proximity of the steep slope to the proposed building footprint, we recommend that the proposed commercial building be founded on drilled, cast-in-place concrete shafts. We also recommend that the retaining wall, supporting the north side of the parking area, be supported by drilled, cast-in-place concrete shafts. The recommendations provided herein are based on the following assumptions:

- The proposed north side of the building is to be located approximately 10 to 20 feet from the top of the slope.
- The building is to incorporate a basement, approximately 8 to 10 feet below grade for the portion of the building adjacent to the steep slope.
- The proposed north side of the parking area is to be located approximately 10 to 20 feet from the top of the slope.
- The grade for the parking area adjacent to the steep slope is to be raised by approximately 6 to 8 feet.

Foundation recommendations are provided in Section 7.3. Retaining wall recommendations, for both the basement walls and the wall supporting the parking area, are provided in Sections 7.3 and 7.4.

Grading recommendations are provided in Section 7.2.

It is our understanding that you are considering permeable pavers for the parking area. This system is most effective in areas where shallow groundwater is not present and/or the underlying base course and subgrade has the ability to drain. If project requirements dictate the need for permeable pavers, the base course and subgrade should be designed and constructed per the recommendations provided by the Interlocking Concrete Pavement Institute (ICPI). The ICPI provides design guidelines for permeable interlocking concrete pavement systems. The near surface native soils generally consist of clay with a low permeability. We Therefore recommend that the paver section be designed assuming no exfiltration. The subgrade should be sloped at a minimum of 2 percent to a subdrain to intercept the groundwater. Mirafi RS380i, or approved equivalent, should be placed between the native subgrade and the rock section to provide additional subgrade stabilization. Additional geotechnical design recommendations for the proposed pavers can be provided upon request.

7.2 Site Grading

7.2.1 Site Clearing

Prior to grading, the areas to be developed for structures, pavements and other improvements, should be stripped of any vegetation and cleared of any surface or subsurface obstructions, including any existing foundations, utility lines, basements, septic tanks, pavements, stockpiled fills, and miscellaneous debris.

Surface vegetation and organically contaminated topsoil should be removed from areas to be graded. The required depth of stripping will vary with the time of year the work is done and should be observed by the Geotechnical Engineer. It is generally anticipated that the required depth of stripping will be 4 to 8 inches.

Holes resulting from the removal of buried obstructions that extend below finished site grades should be backfilled with compacted engineered fill compacted to the requirements of Subsection 7.2.2.

7.2.2 Preparation of On-Site Soils

Drilled, cast-in-place, concrete shafts, require no reworking of materials other than that necessary to rework materials disturbed during earthwork and construction.

For concrete slabs-on-grade, the **native** soil should be overexcavated a minimum of 1 foot below the bottom of the crushed rock, or 2 feet below existing grade, whichever is greater. The exposed surface should then be scarified, moisture conditioned, and compacted to a minimum of 90 percent relative compaction. If slabs are constructed on the south side of the site, in the area of the existing fill soils, the **fill** should be overexcavated a minimum of 2 feet below the bottom of the crushed rock, or 3 feet below existing grade, whichever is greater. Mirafi 600X stabilization fabric should be placed on the bottom of the overexcavation. The material which was removed should then be replaced with engineered fill compacted to a minimum of 90 percent relative compaction. This zone of reworking shall extend a minimum of 3 feet laterally beyond the concrete slabs-on-grade.

Beneath the basement slab, the native soil should be overexcavated a minimum of 1 foot below the bottom of the crushed rock. The exposed surface should then be scarified, moisture conditioned, and compacted to a minimum of 90 percent relative compaction. The material which was removed should then be replaced with engineered fill compacted to a minimum of 90 percent relative compaction.

In drive areas (including concrete, asphalt, and non-permeable pavers), the **native** soil should be overexcavated to a minimum of 1 foot below the bottom of the aggregate base course, or 1.5 feet below existing grade, whichever is greater. The exposed surface should then be scarified, moisture conditioned, and compacted to a minimum of 90 percent relative compaction. For pavements on the south side of the site, in the area of the existing fill soils, the **fill** should be overexcavated a minimum of 1.5 feet below the bottom of the aggregate base course, or 2 feet below existing grade, whichever is greater. Mirafi 600X stabilization fabric should be placed on the bottom of the overexcavation. The material which was removed should then be replaced as engineered fill compacted to a minimum of 90 percent relative compaction. The upper 6 inches of subgrade and all aggregate base and subbase in drive areas shall be compacted to achieve a minimum relative compaction of 95 percent. This zone of reworking should extend laterally a minimum of 2 feet beyond the drive areas.

Beneath new fills, the native soil should be removed to a minimum of 1 foot below existing grade. The exposed surface should then be scarified, moisture conditioned, and compacted to a minimum of 90 percent relative compaction. The material which was removed should then be replaced as engineered fill compacted to a minimum of 90 percent relative compaction.

The on-site soils, with the exception of the clay, may be used as engineered fill. Note: If this work is done during or soon after the rainy season, or in the spring, the soil may require significant drying prior to use as engineered fill. Separation and removal of the expansive clay soils will be necessary if the native soils are processed for use as engineered fill. The soil should be verified by a representative of CMAG in the field during grading operations. All soils, both existing on-site and imported, to be used as fill, should contain less than 3 percent organics and be free of debris and gravel over 2.5 inches in maximum dimension.

Imported fill material should be approved by a representative of CMAG prior to importing. Soils having a significant expansion potential should not be used as imported fill. **The Geotechnical Engineer should be notified not less than 5 working days in advance of placing any fill or base course material proposed for import.** Each proposed source of import material should be sampled, tested, and approved by the Geotechnical Engineer prior to delivery of any soils imported for use on the site.

All fill should be compacted with heavy vibratory equipment. Fill should be compacted by mechanical means in uniform horizontal loose lifts not exceeding 8 inches in thickness. The relative compaction and required moisture content shall be based on the maximum dry density and optimum moisture content obtained in accordance with ASTM D1557. **The Geotechnical Engineer should observe the overexcavations, and placement of engineered fill.**

Any surface or subsurface obstruction, or questionable material encountered during grading, should be brought immediately to the attention of the Geotechnical Engineer for proper processing as required.

7.2.3 Cut and Fill Slopes

Cut and Fill slopes are not anticipated for the project at this time. Cut and fill slopes may affect the stability of the site, and should be analyzed for overall stability and suitability by the Geotechnical Engineer if project requirements change.

7.2.4 Utility Trenches

Bedding material should consist of sand with SE not less than 30 which may then be jetted.

The on-site soils, with the exception of the clay, may be utilized for trench backfill. Separation and removal of the expansive clay soils will be necessary if the native soils are processed for use as trench backfill. Imported fill should be free of organic material and gravel over 2.5 inches in diameter. Backfill of all exterior and interior trenches should be placed in thin lifts and mechanically compacted to achieve a relative compaction of not less than 95 percent in paved areas and 90 percent in other areas per ASTM D1557. Care should be taken not to damage utility lines.

Utility trenches that are parallel to the sides of a building should be placed so that they do not extend below a line sloping down and away at an inclination of 2:1 H:V (horizontal to vertical) from the bottom outside edge of all footings.

A 3 foot concrete plug should be placed in each trench where it passes under the exterior footings. Anti-seep collars (trench dams) should also be placed in utility trenches on steep slopes to prevent migration of water and sand.

Trenches should be capped with 1.5± feet of impermeable material. Import material should be approved by the Geotechnical Engineer prior to its use.

Trenches must be shored as required by the local regulatory agency, the State Of California Division of Industrial Safety Construction Safety Orders, and Federal OSHA requirements.

7.2.5 Vibration During Compaction

The neighboring buildings are within close proximity to the proposed commercial building. The contractor should take all precautionary measures to minimize vibration on the site during grading operations. This may require that the engineered fill be placed in thin lifts using a static roller or hand operated equipment. It is the contractor's responsibility to ensure that the process in which the engineered fill is placed does not adversely affect the neighboring parcels.

7.2.6 Excavating Conditions

We anticipate that excavation of the on-site soils may be accomplished with standard earthmoving and trenching equipment.

Wet conditions should be anticipated, geotextile, rock, or other means may be required to stabilize the base of the overexcavations if constructed during, or shortly after the rainy season.

If drilled shafts extend into the underlying bedrock, difficult drilling conditions due to dense sandstone bedrock should be anticipated.

7.2.7 Surface Drainage

Surface runoff should not be allowed to discharge over the steep slope to the north of the building pad.

Proposed on-site retention / detention systems may affect the stability of the steep slope to the north. Geotechnical input is necessary for the design of on-site retention / detention systems and can be supplied upon request.

Pad drainage should be designed to collect and direct surface water away from structures to approved drainage facilities. A minimum gradient of 2± percent should be maintained and drainage should be directed toward approved swales or drainage facilities. Concentrations of surface water runoff should be handled by providing the necessary structures, paved ditches, catch basins, etc.

All roof eaves should be guttered with the outlets from the downspouts provided with adequate capacity to carry the storm water away from the structure to reduce the possibility of soil saturation and erosion.

Drainage patterns approved at the time of construction should be maintained throughout the life of the structures. The building and surface drainage facilities must not be altered nor any grading, filling, or excavation conducted in the area without prior review by the Geotechnical Engineer.

Irrigation activities at the site should be controlled and reasonable. Planter areas should not be sited adjacent to walls without implementing approved measures to contain irrigation water and prevent it from seeping into walls and under foundations and slabs-on-grade.

The finished ground surface should be planted with erosion resistant landscaping and ground cover and continually maintained to minimize surface erosion.

7.3 Foundations

7.3.1 Drilled, Cast-In-Place Concrete Shafts and Grade Beams

The drilled, cast-in-place concrete shafts adjacent to the slope, for both the proposed building and parking area, should have a minimum embedment depth of **15 feet below the bottom of the grade beams or 20 feet below grade, whichever is greater. The remaining shafts should have a minimum embedment depth of 15 feet below the bottom of the grade beams.** The minimum recommended shaft diameter is 18 inches. Shafts should be spaced no closer than 2.5 diameters, center to center.

Based on the results of our laboratory testing, the underlying clay has a high expansion potential and a swell pressure of approximately 1,600 psf. The grade beams, for foundations at grade, should be designed to withstand 1,600 psf of uplift pressure. The dead load of the building and parking area retaining wall may be used to offset the expansive pressure on the grade beams. Note that this recommendation does not apply to the foundations at the basement level. For foundations at grade, the grade beams should be founded a minimum of 18 inches below lowest adjacent grade.

The clay, exposed in the grade beam, should be pre-soaked to a moisture content of 30 percent to a depth of 2 feet prior to pouring concrete. It is important that the clay be thoroughly saturated for 24 to 48 hours prior to the time the concrete is poured. This applies to all foundation levels, at grade and at the basement level.

The allowable downward and upward axial shaft capacities for 18 inch diameter, drilled, cast-in-place, concrete shafts are included in Table 4. The upward capacity includes the weight of the shaft. The downward capacity includes the weight of the shaft.

Table 4. 18 Inch Diameter - Drilled, Cast-In-Place Concrete Shaft Axial Capacities

Depth Below Grade Beams (ft)	Allowable Downward Capacity (Kips)	Allowable Upward Capacity (Kips)
15	20	10
17	24	14
19	28	19
21	33	24
23	37	29

A passive pressure of 280 psft/ft (equivalent fluid pressure) acting over a plane 2 times the shaft diameter, may be assumed for design purposes. Neglect passive pressure in the top 4 feet of soil, below finished grade. Passive pressure may be mobilized from the top of shafts for shafts supporting the partial basement . Passive pressures may be increased by one-third for seismic loading.

The drilled excavations for the cast-in-place concrete shafts should be clean, dry, and free of debris or loose soil. The drilled excavations should not deviate more than 1 percent from vertical.

Caving was not observed during our field exploration, however, the potential for caving is always present and casing of the drilled excavations may become necessary. If the contractor chooses to use casing, it must be pulled during the concrete pour. It must be pulled slowly with a minimum of 4 feet of casing remaining embedded within the concrete at all times. If the bottom of the holes are unable to be cleaned with conventional drilling and hand equipment, a bucket auger should be utilized to clean the bottom of the shafts and remove all loose slough.

It is not anticipated that groundwater will present a problem during construction. However, if drilled during or shortly after the rainy season, groundwater may present a problem. If groundwater is encountered within the shafts and is unable to be pumped from the drilled excavation, a tremie will be required. The tremie must be placed to the bottom of the drilled excavation to remove all groundwater. The end of the tube must remain embedded a minimum of 4 feet into the concrete at all times. The concrete and steel design of the drilled, cast-in-place concrete shaft should be such that a tremie can be easily placed down the center of the excavation.

For drilled, cast-in-place concrete shafts depths in excess of 8 feet, concrete should be placed via a tremie. The end of the tube must remain embedded a minimum of 4 feet into the concrete at all times.

All shaft construction must be observed by the Geotechnical Engineer before steel reinforcement is placed and concrete is poured.

7.3.2 Concrete Slabs

We recommend that concrete slabs be founded on compacted engineered fill per Subsection 7.2.2. The subgrade should be proof-rolled just prior to construction to provide a firm, relatively unyielding surface, especially if the surface has been loosened by the passage of construction traffic.

The exposed surface should be pre-soaked to a moisture content of 30 percent to a depth of 2 feet prior to pouring concrete. It is important that the clay be thoroughly saturated for 24 to 48 hours prior to the time the concrete is poured.

The slabs should be underlain by a minimum 4 inch thick capillary break of clean crushed rock. It is recommended that neither Class II baserock nor sand be employed as the capillary break material. Where moisture sensitive floor coverings are anticipated or vapor transmission may be a problem, a vapor retarder should be placed between the granular layer and the floor slab in order to reduce moisture condensation under the floor coverings. The vapor retarder should be specified by the slab designer. It should be noted that conventional slab-on-grade construction is not waterproof. Under-slab construction consisting of a capillary break and vapor retarder will not prevent moisture transmission through the slabs. CMAG does not practice in the field of moisture vapor transmission evaluation or mitigation. Where moisture sensitive floor coverings are to be installed, a waterproofing expert should be consulted for their recommended moisture and vapor protection measures.

7.3.3 Settlements

Total and differential settlements beneath foundations are expected to be within tolerable limits. Vertical movements are not expected to exceed 1 inch. Differential movements are expected to be within the normal range (½ inch) for the anticipated loads and spacings. These preliminary estimates should be reviewed by the Geotechnical Engineer when foundation plans for the proposed structures become available.

7.4 Retaining Structures

7.4.1 General

Retaining walls should be founded on drilled, cast-in-place concrete shafts per the recommendations of Subsections 7.3.1.

7.4.2 Lateral Pressure Due to Earthquake Motions

For design purposes, the lateral force on retaining walls due to earthquake motions is $6H^2$ lbs/horizontal foot, acting at a point 1/3H above the wall base, where H is the height of the wall in feet.

7.4.3 Lateral Earth Pressures

The lateral earth pressures presented in Table 5 are recommended for the design of retaining structures with a backdrain and backfill consisting of the native soils.

Table 5. Lateral Earth Pressures

Soil Profile (H:V)	Equivalent Fluid Pressure (psf/ft)	
	Active Pressure	At-Rest Pressure
Level	40	61
6:1	41	72
3:1	46	81
2:1	59	89

Pressure due to any surcharge loads from adjacent footings, traffic, etc., should be analyzed separately. Pressures due to these loading can be supplied upon receipt of the appropriate plans and loads. Refer to Figure 1.

7.4.4 Backfill

Backfill should be placed under engineering control. Backfill should be compacted per Subsection 7.2.2, however, precautions should be taken to ensure that heavy compaction equipment is not used immediately adjacent to walls, so as to prevent undue pressures against, and movement of, the walls.

It is recommended that granular, or relatively low expansivity, backfill be utilized, for a width equal to approximately 1/3 times the wall height, and not less than 1.5 feet, subject to review during construction.

The use of water-stops/impermeable barriers and appropriate waterproofing should be considered for any basement construction, and for building walls which retain earth.

7.4.5 Backfill Drainage

Backdrains should be provided in the backfill. Backdrains should consist of 4 inch diameter SDR 35 PVC perforated pipe or equivalent, embedded in Caltrans Class 2 permeable drain rock. The drain should be a minimum of 18 inches in width and should extend to within 12 inches from the surface. The upper 12 inches should be capped with native soils or the pavement section in drive areas. Mirafi 140N, or approved equivalent, should be placed between the drain rock and the native soil cap / pavement section. The pipe should be 4± inches above the trench bottom; a gradient of 2± percent being provided to the pipe and trench bottom; discharging into suitably protected outlets. See Figure 2 for the standard detail for the backdrain.

Perforations in backdrains are recommended as follows: 1/2 inch diameter, in 2 rows at the ends of a 120 degree arc, at 5 inch centers in each row, staggered between rows, placed downward.

Backdrains should be observed by the Geotechnical Engineer after placement of bedding and pipe and prior to the placement of clean crushed gravel.

An unobstructed outlet should be provided at the lower end of each segment of backdrain. The outlet should consist of an unperforated pipe of the same diameter, connected to the perforated pipe and extended to a protected outlet at a lower elevation on a continuous gradient of at least 1 percent.

7.5 Plan Review

The recommendations presented in this report are based on preliminary design information for the proposed project and on the findings of our geotechnical investigation. When completed, the Grading Plans, Foundation Plans and design loads should be reviewed by CMAG prior to submitting the plans and contract bidding. Additional field exploration and laboratory testing may be required upon review of the final project design plans.

7.6 Observation and Testing

Field observation and testing must be provided by a representative of CMAG to enable them to form an opinion regarding the adequacy of the site preparation, the adequacy of fill materials, and the extent to which the earthwork is performed in accordance with the geotechnical conditions present, the requirements of the regulating agencies, the project specifications, and the recommendations presented in this report. Any earthwork performed in connection with the subject project without the full knowledge of, and not under the direct observation of CMAG will render the recommendations of this report invalid.

CMAG should be notified **at least 5 working days** prior to any site clearing or other earthwork operations on the subject project in order to observe the stripping and disposal of unsuitable materials and to ensure coordination with the grading contractor. During this period, a preconstruction meeting should be held on the site to discuss project specifications, observation and testing requirements and responsibilities, and scheduling.

8.0 LIMITATIONS

The recommendations contained in this report are based on our field explorations, laboratory testing, and our understanding of the proposed construction. The subsurface data used in the preparation of this report was obtained from the borings drilled during our field investigation. Variation in soil, geologic, and groundwater conditions can vary significantly between sample locations. As in most projects, conditions revealed during construction excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by the Project Geotechnical Engineer and the Geologist, and revised recommendations be provided as required. In addition, if the scope of the proposed construction changes from the described in this report, our firm should also be notified.

Our investigation was performed in accordance with the usual and current standards of the profession, as they relate to this and similar localities. No other warranty, expressed or implied, is provided as to the conclusions and professional advice presented in this report.

This report is issued with the understanding that it is the responsibility of the Owner, or of his Representative, to ensure that the information and recommendations contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans, and that it is ensured that the Contractor and Subcontractors implement such recommendations in the field. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

This firm does not practice or consult in the field of safety engineering. We do not direct the Contractor's operations, and we are not responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the Contractor. The Contractor should notify the Owner if he considers any of the recommended actions presented herein to be unsafe.

The findings of this report are considered valid as of the present date. However, changes in the conditions of a site can occur with the passage of time, whether they be due to natural events or to human activities on this or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

The scope of our services mutually agreed upon did not include any environmental assessment or study for the presence of hazardous to toxic materials in the soil, surface water, or air, on or below or around the site. CMAG is not a mold prevention consultant; none of our services performed in connection with the proposed project are for the purpose of mold prevention. Proper implementation of the recommendations conveyed in our reports will not itself be sufficient to prevent mold from growing in or on the structures involved.

REFERENCES

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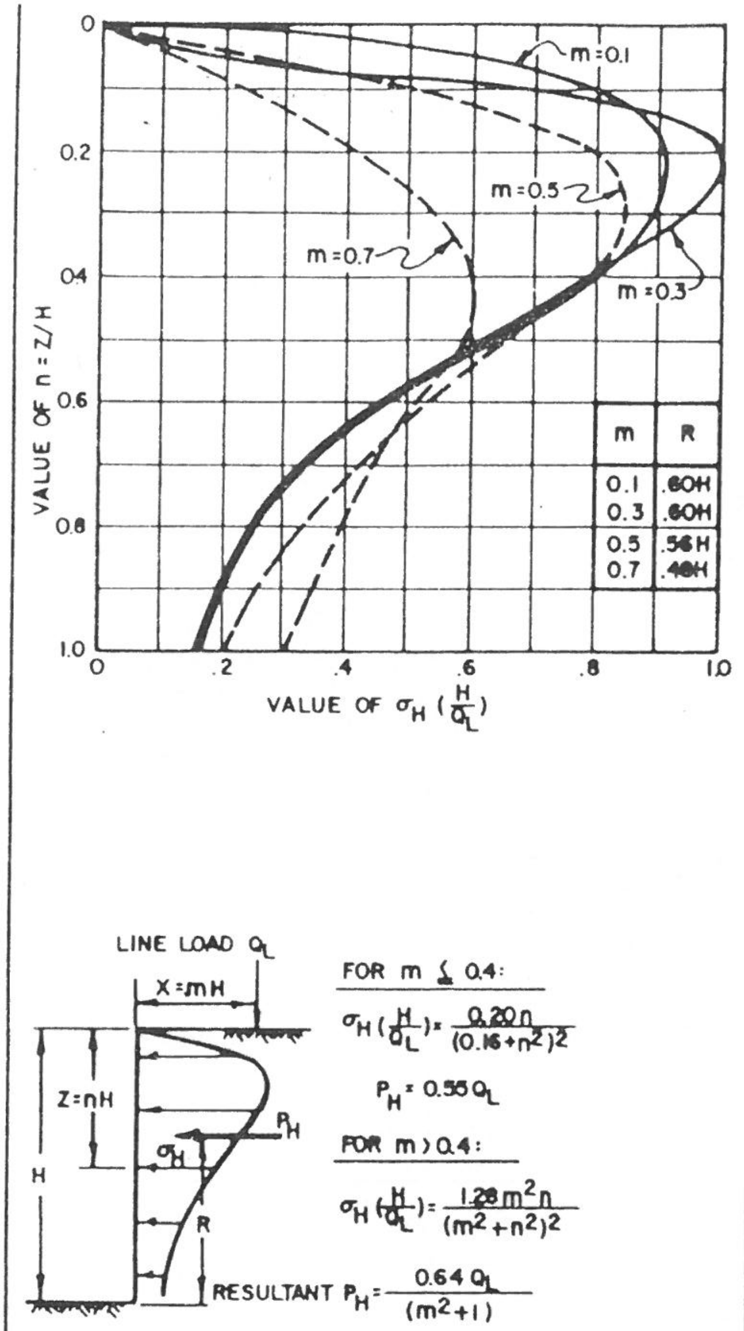
U.S. Geological Survey. *USGS NSHMP Unified Hazard Tool (UHT). (https://earthquake.usgs.gov/hazards/interactive/).*



m	R
0.1	.60H
0.3	.60H
0.5	.56H
0.7	.48H

FOR m ≤ 0.4:

$$\sigma_H\left(\frac{H}{Q_L}\right) = \frac{0.20n}{(0.16+n^2)^2}$$

$$P_H = 0.55Q_L$$

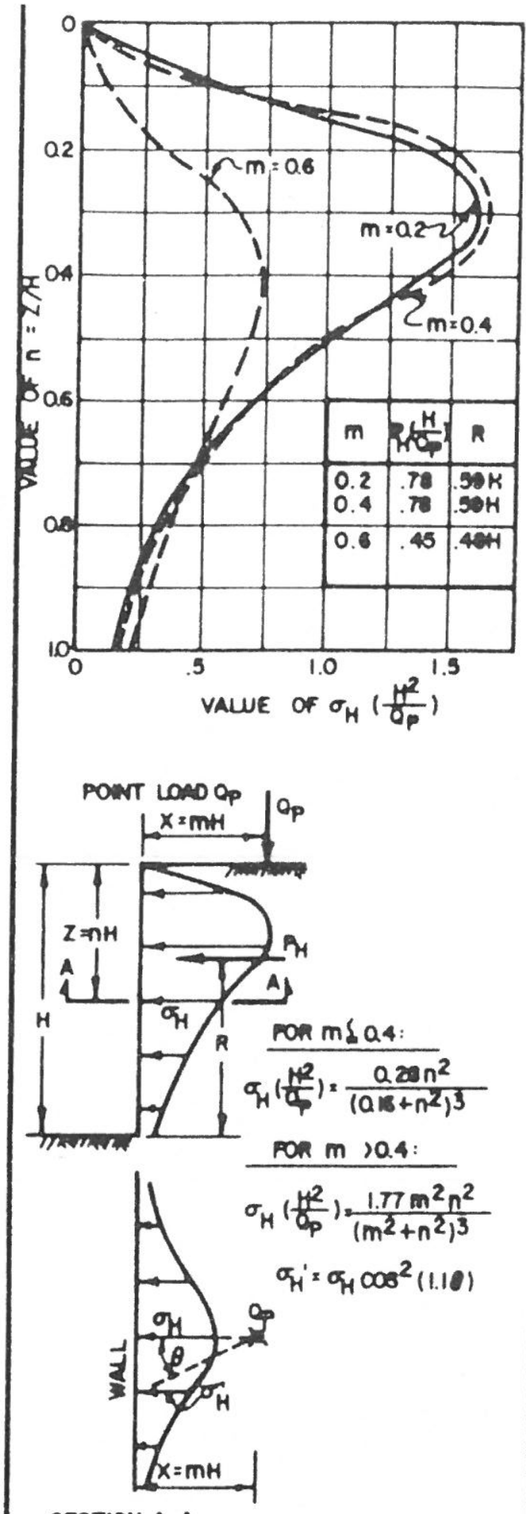
FOR m > 0.4:

$$\sigma_H\left(\frac{H}{Q_L}\right) = \frac{1.28m^2n}{(m^2+n^2)^2}$$

RESULTANT $P_H = \frac{0.64Q_L}{(m^2+1)}$

PRESSURES FROM LINE LOAD Q_L

(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)



m	$P_H(\frac{H}{Q_P})$	R
0.2	.78	.59H
0.4	.78	.59H
0.6	.45	.48H

FOR m ≤ 0.4:

$$\sigma_H\left(\frac{H^2}{Q_P}\right) = \frac{0.28n^2}{(0.16+n^2)^3}$$

FOR m > 0.4:

$$\sigma_H\left(\frac{H^2}{Q_P}\right) = \frac{1.77m^2n^2}{(m^2+n^2)^3}$$

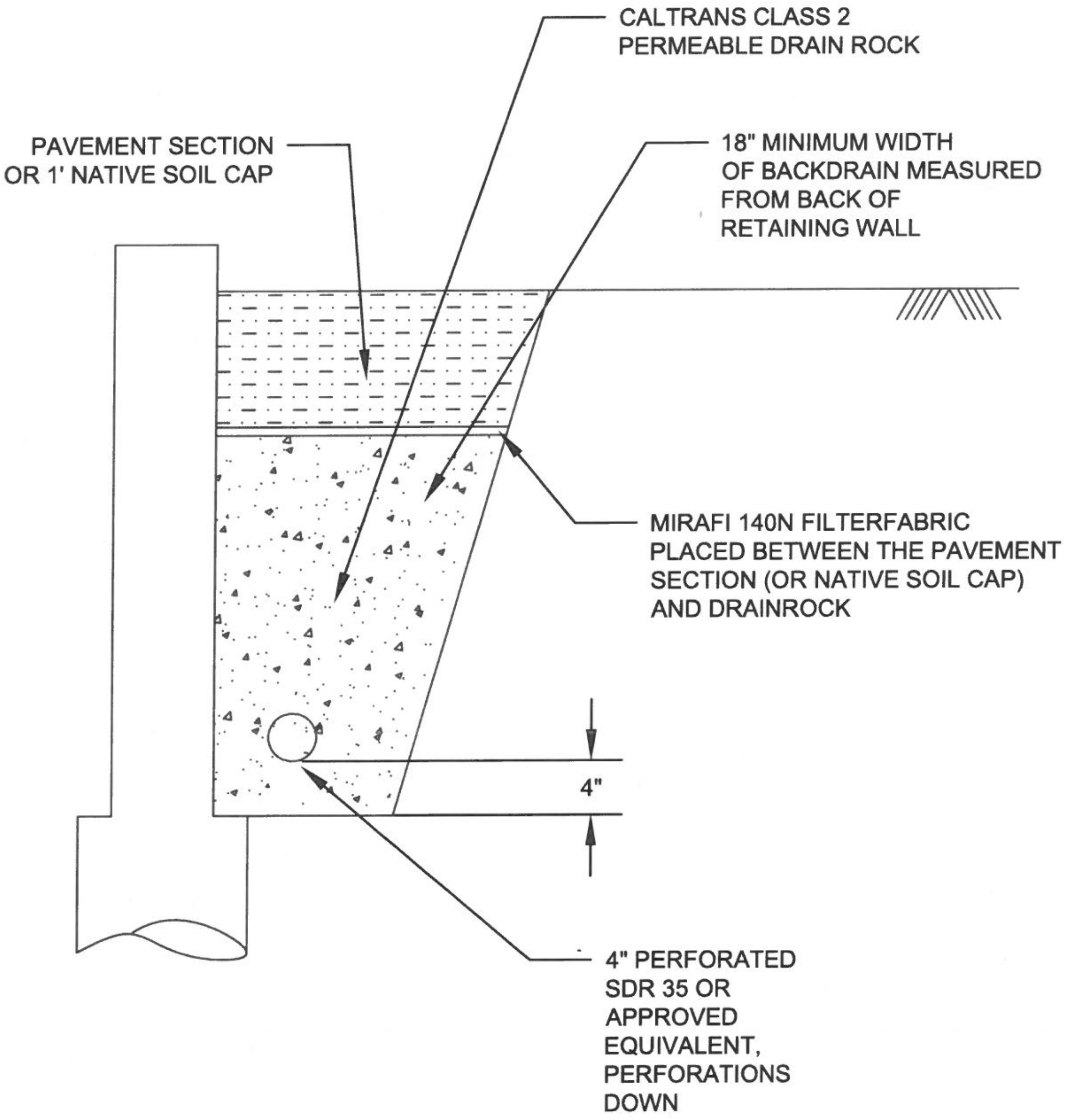
$$\sigma_H' = \sigma_H \cos^2(1.1\theta)$$

SECTION A-A

PRESSURES FROM POINT LOAD Q_P

(BOUSSINESQ EQUATION
MODIFIED BY EXPERIMENT)

CMAG ENGINEERING	SURCHARGE PRESSURE DIAGRAM	FIGURE 1



NOTES:

1. DRAWING IS NOT TO SCALE
2. 2± PERCENT TO PIPE AND TRENCH BOTTOM
3. PERFORATED SDR 35 PVC PIPE, OR APPROVED EQUIVALENT, CONNECTED TO CLOSED CONDUITS THAT DISCHARGE TO AN APPROVED LOCATION
4. INSTALL CLEAN OUTS AT APPROVED LOCATIONS

CMAG ENGINEERING	TYPICAL BACKDRAIN DETAIL	FIGURE 2

APPENDIX A

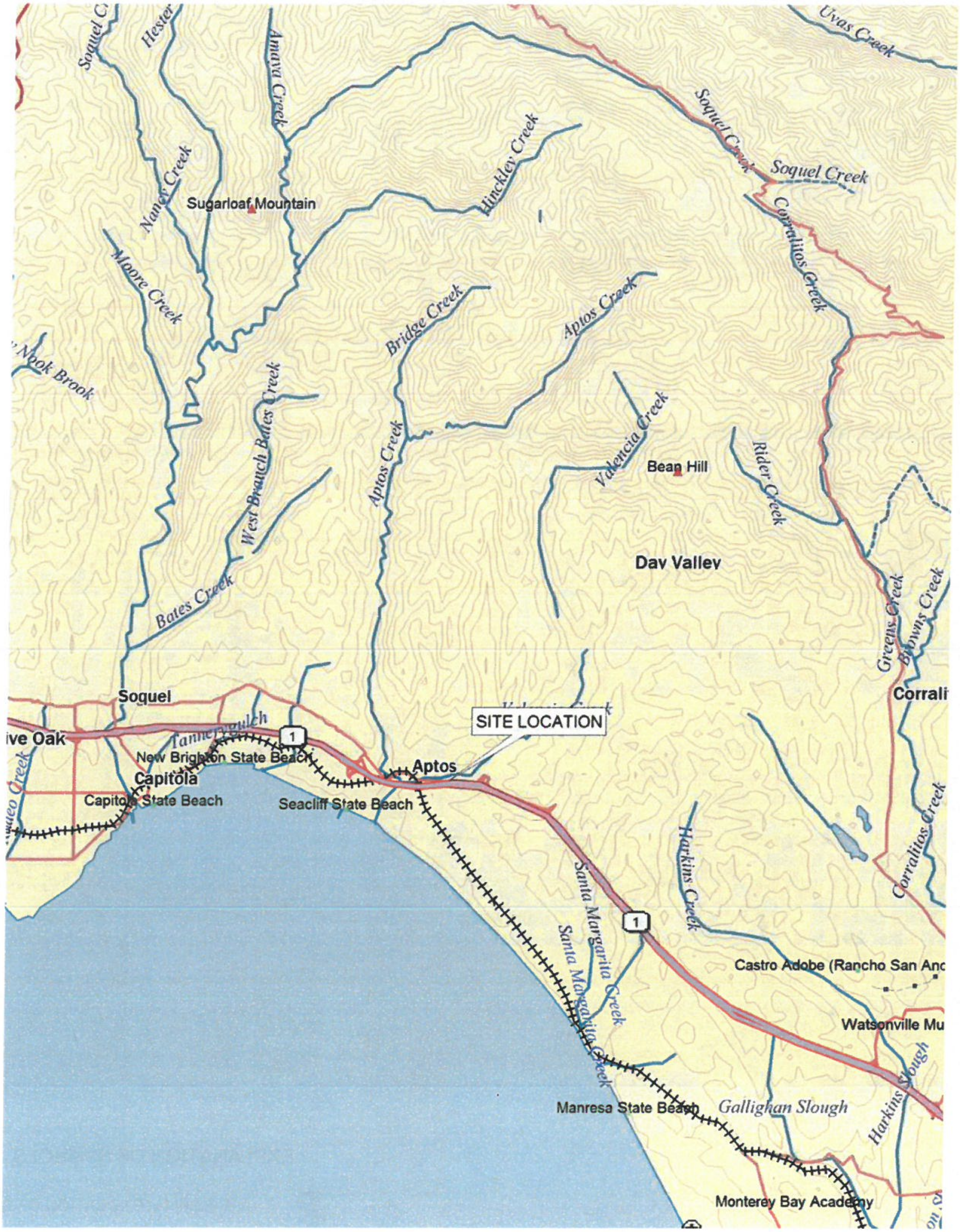
FIELD EXPLORATION PROGRAM

FIELD EXPLORATION PROCEDURES

Subsurface conditions were explored by drilling 5 borings to depths between 17.5± feet and 36.5± feet below the existing grades. The borings were drilled with a track mounted drill rig equipped with 6 inch diameter solid stem augers. The Key to The Logs and the Logs of the Borings are included in Appendix A, Figures A-3 through A-8. The approximate locations of the borings are shown on the Boring Location Plan, Figure A-2.

The earth materials encountered in the borings were continuously logged in the field by a representative of CMAG. Bulk and relatively undisturbed samples for identification and laboratory testing were obtained in the field. These samples were classified based on field observations and laboratory tests. The classification is in accordance with the Unified Soil Classification System (Figure A-3).

Representative samples were obtained by means of a drive sampler, the hammer weight and drop being 140 lb and 30 inches, respectively. These samples were recovered using a 3 inch outside diameter Modified California Sampler or a 2 inch outside diameter Terzaghi Sampler. The number of blows required to drive the samplers 12 inches are indicated on the Boring Logs. The penetration test data for the Terzaghi driven samples has been presented as N_{60} values. The N_{60} values are also indicated on the Boring Logs.
A representative cross section was obtained for the subject site. See Cross Section A-A', Figure A-9. For an explanation of the symbols and units on the cross section, see Section 4.0 of the report.



BASEMAP: DeLorme Topo USA®

SCALE: 1:100,000

CMAG ENGINEERING	**SITE LOCATION MAP**	FIGURE
	9041 Soquel Drive	A-1

EXPLANATION OF SYMBOLS

⊕ B-1 APPROXIMATE LOCATION OF BORING

A ├──┤ A' LOCATION OF CROSS SECTION

BASEMAP: Google Earth

CMAG ENGINEERING	**BORING LOCATION PLAN**	FIGURE
	9041 Soquel Drive	A-2

KEY TO LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More than half of the material is larger than the No. 200 sieve	GRAVELS More than half of the coarse fraction is larger than the No. 4 sieve	CLEAN GRAVELS (Less than 5% fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS More than half of the coarse fraction is smaller than the No. 4 sieve	CLEAN SANDS (Less than 5% fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sands, little or no fines
		SAND WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines
FINE GRAINED SOILS More than half of the material is smaller than the No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50		ML	Inorganic silts and very fine sands, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomacaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils

GRAIN SIZE LIMITS

SILT AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

No. 200 No. 40 No. 10 No. 4 3/4 in. 3 in. 12 in.

US STANDARD SIEVE SIZE

RELATIVE DENSITY	
SAND AND GRAVEL	BLOWS/FT*
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

CONSISTENCY	
SILT AND CLAY	BLOWS/FT*
VERY SOFT	0 - 2
SOFT	2 - 4
FIRM	4 - 8
STIFF	8 - 16
VERY STIFF	16 - 32
HARD	OVER 32

MOISTURE CONDITION
DRY
MOIST
WET

BEDROCK
(GROUP SYMBOL)
Brackets Denote Bedrock

* Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 inch I.D.) split spoon (ASTM D-1586).

CMAG ENGINEERING

FIGURE
A-3

LOG OF EXPLORATORY BORING

Project No.: 18-142-SC
Boring: B-1
Project: 9041 Soquel Drive
Santa Cruz County, California
Location: See Figure A-2, Boring Location Plan
Elevation:
Date: October 22, 2018
Method of Drilling: Track Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip
Logged By: ALG

⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
☒ Bulk Sample
◫ Terzaghi Split Spoon Sample
▽ Groundwater
S 3" Shelby Tube

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Content (%)	Other Tests
	SM/SC			**Qof:** Dark Brown Silty and Clayey SAND. Dry to Moist,NP. Sand-FG to CG					
	CL	⧅		Dark Grayish Brown Sandy Lean CLAY. Very Stiff, Moist, Plastic.					
				Sand - Fine Grained.	26		84.3	25.0	
	CL	◫		Light Olive Brown Sandy Lean CLAY. Very Stiff, Moist, Plastic. Sand - Fine	21	21		27.3	
5				Grained.					
									c' = 0 psf
									Φ' = 30°
	SM	⧅		Light Olive Brown and Yellowish Brown Silty SAND. Medium Dense, Moist,	19		96.8	13.4	Particle Size:
		◫		Non Plastic. Sand - Fine Grained.	15	17		10.8	F.C. = 39.9%
10									
				Interbedded: Light Olive Brown and Olive Brown					
	SM/CL	⧅		Silty SAND and Clayey SAND. Medium Dense, Moist, Non Plastic.	19		99.1	13.7	
	ML-CL	◫		Sand - Fine Grained.	5	6		43.8	
15				Sandy SILT to Sandy Lean CLAY. Firm, Moist, Plastic. Sand - Fine Grained.					
				Interbedded: Olive Brown					
	CL	⧅		Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine Grained.	19		76.0	43.7	q_u = 3,778 psf
	CL-SC	◫		Sandy Lean CLAY to Clayey SAND. Stiff, Moist, Plastic. Sand - Fine	11	15		27.9	
20				Grained.					
				Interbedded: Olive Brown					
	SM/SC	⧅		Silty SAND and Clayey SAND. Medium Dense, Moist, Non Plastic.	19		97.4	21.1	q_u = 2,022 psf
	/CL	◫		Sand - Fine Grained to Coarse Grained.	18	25		27.8	
25				Sandy Lean CLAY. Stiff. Moist, Plastic. Sand - Fine Grained.					
				Tp:					
	(SP-SM)	◫		Light Olive Brown SANDSTONE. Dense, Moist. (Poorly Graded Sand with					
		◫		Silt), Sand - Predominately Fine Grained.	24	34		16.1	
30									
				Light Olive Brown SANDSTONE. Very Dense, Moist. (Poorly Graded Sand					
	(SP-SM)	◫		with Silt), Sand - Fine Grained Beds and Fine to Coarse Grained Beds.					
		◫		Trace Gravels - up to 0.5", Subrounded.	43	61		14.6	
35				Boring Terminated at 34.5± ft., No GW, Boring Backfilled With Cuttings.					

CMAG ENGINEERING

FIGURE
A-4

LOG OF EXPLORATORY BORING

Project No.: 18-142-SC
Project: 9041 Soquel Drive
Santa Cruz County, California
Date: December 7, 2018
Logged By: SSC
Boring: B-2
Location: See Figure A-2, Boring Location Plan
Elevation:
Method of Drilling: Track Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip

⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
☒ Bulk Sample
◫ Terzaghi Split Spoon Sample
▽ Groundwater
S 3" Shelby Tube

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Content (%)	Other Tests
	SM/SC			**af:** Dark Yellowish Brown Silty and Clayey SAND with Trace Gravel. Medium Dense, Moist, Non Plastic to Slightly Plastic. Sand - Fine to Coarse Grained. Gravel - up to 1", Subrounded.					
		⧅			32		117.4	14.0	
		◫			17	17		15.2	
5	SC-CL			**Qof:** Black Clayey SAND to Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine to Medium Grained.					
		⧅			26		106.7	18.9	q_u = 3,830psf
		◫			15	16		17.7	
10	CL	◫		Dark Olive Brown Lean CLAY. Very Stiff, Moist, Plastic.	22	25		32.7	
15	SM/ML	◫		Interbedded: Light Olive Brown and Olive Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine Grained. Sandy SILT. Medium Dense, Moist, Non Plastic. Sand - Fine Grained.	11	14		21.7	
20	CH	◫		Olive Brown Fat CLAY. Soft, Moist, Plastic.	5	7		49.7	
25	CL-CH	◫		Olive Brown Lean to Fat CLAY with Sand. Firm, Moist, Plastic.	7	10		39.8	
30	SC/CL	◫		Interbedded: Dark Olive Brown and Olive Brown Sandy Lean CLAY. Firm to Stiff, Moist, Plastic. Sand - Fine Grained. Clayey SAND. Firm to Stiff, Moist, Plastic. Sand - Fine Grained.	12	17		25.9	
35	(SM)			**Tp:** Light Olive Brown SANDSTONE. Moist. (Silty Sand), Sand - FG.					

LOG OF EXPLORATORY BORING

Project No.:	18-142-SC	Boring:	B-2, Continued.
Project:	9041 Soquel Drive Santa Cruz County, California	Location:	See Figure A-2, Boring Location Plan
		Elevation:	
Date:	December 7, 2018	Method of Drilling:	Track Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip
Logged By:	SSC		

⧄ 2" Ring Sample ⧅ 2.5" Ring Sample ☒ Bulk Sample

◫ Terzaghi Split Spoon Sample ▽ Groundwater **S** 3" Shelby Tube

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Content (%)	Other Tests
	(SM)	◫		**Tp:** Light Olive Brown SANDSTONE. Dense, Moist. (Silty Sand), Sand - Fine Grained.	33	47		19.4	
40				Boring Terminated at 36.5± ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.					
45									
50									
55									
60									
65									
70									

CMAG ENGINEERING

FIGURE
A-5.1

LOG OF EXPLORATORY BORING

Project No.:	18-142-SC	Boring:	B-3
Project:	9041 Soquel Drive	Location:	See Figure A-2, Boring Location Plan
	Santa Cruz County, California	Elevation:	
Date:	December 7, 2018	Method of Drilling:	Track Mounted Drill Rig, 6in. Solid Stem
Logged By:	SSC		Auger, 140lb. Automatic Trip

⧄ 2" Ring Sample ⧅ 2.5" Ring Sample ☒ Bulk Sample

◫ Terzaghi Split Spoon Sample ∇ Groundwater S 3" Shelby Tube

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Content (%)	Other Tests
	SM	⧅		**af:** Dark Yellowish Brown Silty SAND with Trace Gravel. Very Loose, Moist, Non Plastic. Sand - FC to CG. Gravel - up to 3/4", Angular.	5	3	105.6	10.3	
	SC-CL	◫		**Qof:** Black Clayey SAND to Sandy Lean CLAY. Very Stiff, Moist, Plastic.	17	17		25.8	
				Sand - Fine to Medium Grained.				28.0	
5	CL	⧅		Dark Brown Lean CLAY with Sand to Sandy Lean CLAY. Very Stiff to Hard, Moist, Plastic. Sand - Fine Grained.	29		81.8	25.1	Swell
		◫			21	23		22.8	
10									
	SM/ML	◫		Interbedded: Olive Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine Grained. Sandy SILT. Medium Dense, Moist, Non Plastic. Sand - Fine Grained.	16	19		13.6	
15	SC/CL	◫		Interbedded: Olive Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine Grained. Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine Grained.	17	22		33.0	
				Boring Terminated at 17.5± ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.					
20									
25									
30									
35									

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FIGURE
A-6

LOG OF EXPLORATORY BORING

Project No.:	18-142-SC	Boring:	B-4
Project:	9041 Soquel Drive Santa Cruz County, California	Location:	See Figure A-2, Boring Location Plan
		Elevation:	
Date:	December 7, 2018	Method of Drilling:	Track Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip
Logged By:	SSC		

⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
☒ Bulk Sample
◫ Terzaghi Split Spoon Sample
▽ Groundwater
S 3" Shelby Tube

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Content (%)	Other Tests
	SM/SC			**Qof:** Black Clayey SAND to Sandy Lean CLAY. Firm, Moist, Plastic. Sand - Fine to Medium Grained.					
	CL	⧅		Olive Brown Lean CLAY with Sand. Very Stiff, Moist, Plastic.	26		97.6	32.0	q_u = 7,678psf
		◫		Sand - Fine Grained.	18	18		25.7	E.I. = 122
5									
	SM/ML	⧅		Interbedded: Light Olive Brown and Yellowish Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine Grained.	17		91.7	13.6	
		◫		Sandy SILT. Medium Dense, Moist, Non Plastic. Sand - Fine Grained.	16	18		18.5	
10									
	CL/ML	◫		Interbedded: Light Olive Brown and Olive Brown Sandy Lean CLAY. Firm to Stiff, Moist, Plastic. Sand - Fine Grained.	9	11		37.2	
15				Sandy SILT. Firm to Stiff, Moist, Plastic. Sand - Fine Grained.					
20	SC/CL	◫		Interbedded: Olive Brown Clayey SAND. Medium Dense, Moist, Plastic. Sand - Fine Grained.	17	23		24.1	
				Sandy Lean CLAY. Firm to Stiff, Moist, Plastic. Sand - Fine Grained.					
25	(SP-SM)	◫		**Tp:** Yellowish Brown and Light Olive Brown SANDSTONE. Dense, Moist. (Poorly Graded Sand with Silt), Sand - Fine to Medium Grained.	32	44		8.6	
30	(SP-SM)	◫		Yellowish Brown and Olive Brown SANDSTONE. Dense, Moist. (Poorly Graded Sand with Silt), Sand - Fine Grained Beds and Fine to Coarse Grained Beds. Trace Gravels - up to 0.5", Subrounded.	34	48		9.6	
35									

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FIGURE
A-7.0

LOG OF EXPLORATORY BORING

Project No.:	18-142-SC	Boring:	B-4, Continued.
Project:	9041 Soquel Drive Santa Cruz County, California	Location:	See Figure A-2, Boring Location Plan
		Elevation:	
Date:	December 7, 2018	Method of Drilling:	Track Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip
Logged By:	SSC		

⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
⊠ Bulk Sample
◫ Terzaghi Split Spoon Sample
▽ Groundwater
S 3" Shelby Tube

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Content (%)	Other Tests
	(SP-SM)	◫		**Tp:** Light Olive Brown SANDSTONE. Dense, Moist. (Poorly Graded Sand with Silt), Sand - Fine Grained.	33	47		7.8	
40				Boring Terminated at 36.5± ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.					
45									
50									
55									
60									
65									
70									

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FIGURE
A-7.1

LOG OF EXPLORATORY BORING

Project No.:	18-142-SC	Boring:	B-5
Project:	9041 Soquel Drive Santa Cruz County, California	Location:	See Figure A-2, Boring Location Plan
		Elevation:	
Date:	December 7, 2018	Method of Drilling:	Track Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip
Logged By:	SSC		

⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
⊠ Bulk Sample
◫ Terzaghi Split Spoon Sample
▽ Groundwater
S 3" Shelby Tube

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Content (%)	Other Tests
	SM/SC			**af:** Dark Yellowish Brown Silty and Clayey SAND with Trace Gravel. Moist to Wet, Loose to Medium Dense, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 1.5", Subrounded. Moist at 2.5'.					
		⧅			4		105.5	17.4	
		◫			10	10		9.2	
5		⧅			25		107.6	9.4	
	SC-CL	◫		**Qof:** Black Clayey SAND to Sandy Lean CLAY. Very Stiff, Moist, Plastic. Sand - Fine to Medium Grained.	15	16		17.2	
10	CL-CH	◫		Olive Brown Lean to Fat CLAY with Sand. Very Stiff, Moist, Plastic. Sand - Fine Grained.	21	24		29.8	
15	ML/SM	◫		Interbedded: Light Olive Brown Sandy SILT. Firm, Moist, Plastic. Sand - Fine Grained. Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine Grained.	8	10		31.5	
20	ML/ CL-CH	◫		Interbedded: Olive Brown and Light Olive Brown Sandy SILT. Firm, Moist, Plastic. Sand - Fine Grained. Lean to Fat CLAY. Stiff, Moist, Plastic.	10	13		42.8	
25				Boring Terminated at 21.5± ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.					
30									
35									

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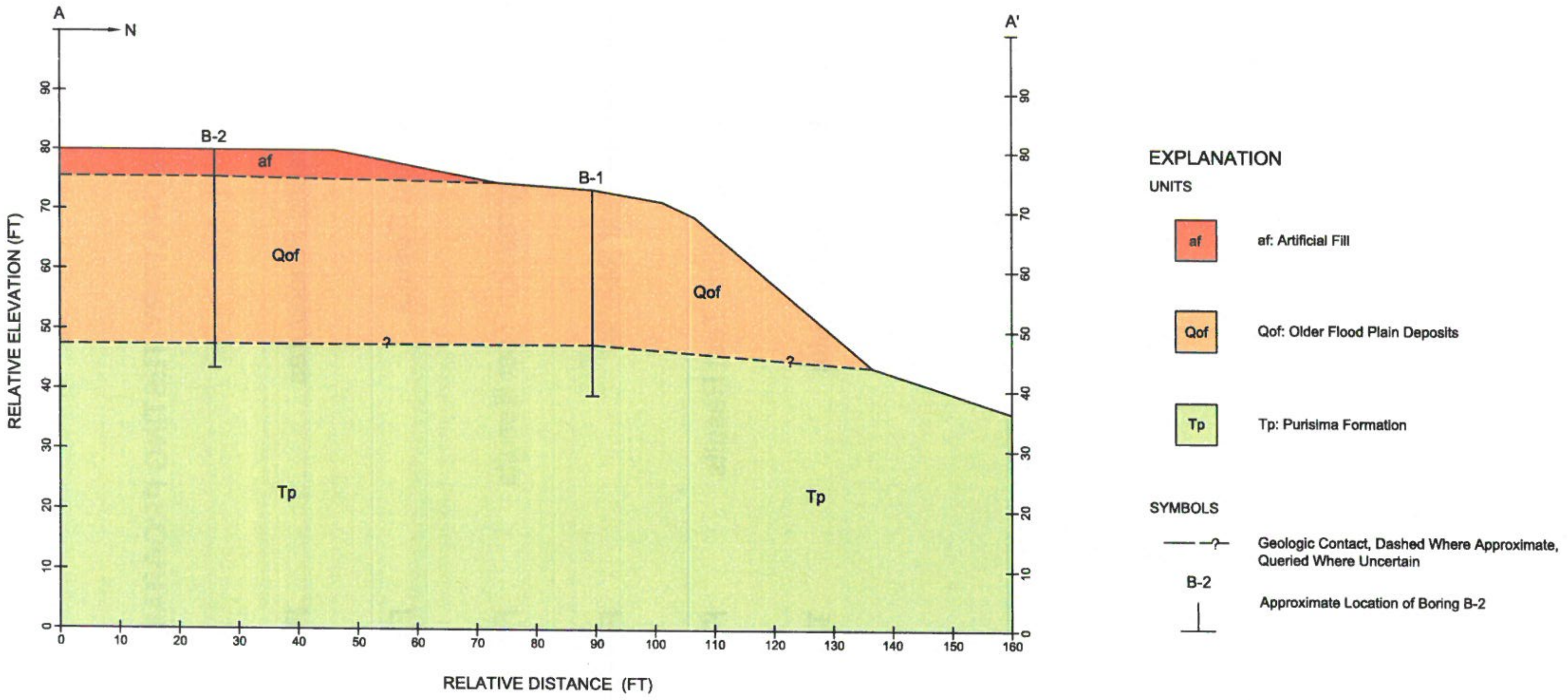
FIGURE
A-8

CROSS SECTION A-A'

SCALE: 1" = 20' H = V



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CROSS SECTION A-A'

9041 Soquel Drive

FIGURE

A-9

APPENDIX B

LABORATORY TESTING PROGRAM

LABORATORY TESTING PROCEDURES

Classification

Soils were classified according to the Unified Soil Classification System in accordance with ASTM D 2487 and D 2488. See Figure A-3. Moisture content and dry density determinations were made for representative, relatively undisturbed samples in accordance with ASTM D 2216. Results of the moisture-density determinations, together with classifications, are shown on the Boring Logs in Appendix A.

Direct Shear

A consolidated drained direct shear test was performed in accordance with ASTM D 3080 on a representative, relatively undisturbed sample of the on-site soils. To simulate possible adverse field conditions the sample was saturated prior to shearing. A saturating device was used which permitted the sample to absorb moisture while preventing volume change. The direct shear test results are presented on the Boring Logs and Figure B-1.

Unconfined Compression

Unconfined compression tests were performed on representative samples of the on-site soils in accordance with ASTM D 2166. The test results are presented on the Boring Logs and Figures B-2 through B-5.

Swell Pressure

A swell pressure test was performed on a representative, relatively undisturbed sample of the on-site soils in accordance with the ASTM D 4546. The test results are presented on Figure B-6.

Particle Size Distribution

A particle size distribution test was performed on a representative sample of the on-site soils in accordance with ASTM D 422. The test results are presented on Figure B-7.

Expansion

An expansion index test was performed on a representative remolded sample of the on-site soils in accordance with the ASTM D 4829. The test results are presented on the Boring Logs and on Table B-1.

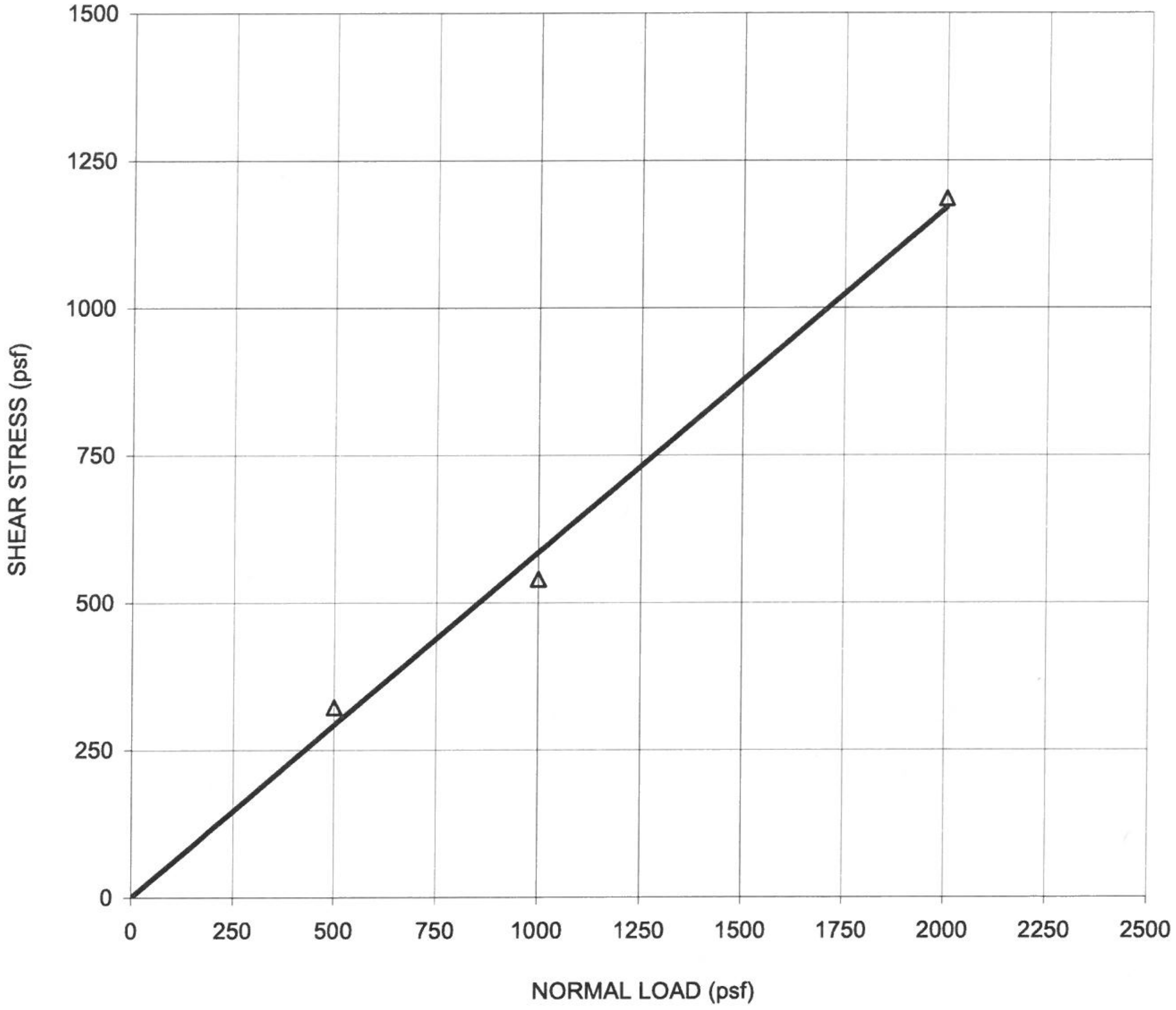
Table B-1. Expansion Index Test Results

Boring	Depth (ft)	Soil Type	Expansion Index	Expansion Potential
B-3	3	CL	122	High

BORING:	B-1		COHESION (psf)	FRICTION ANGLE
DEPTH (ft):	7			
SOIL TYPE (USCS):	SM	▬ PEAK	0	30

MOISTURE: **SATURATED**

TEST TYPE: **CONSOLIDATED - DRAINED**



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DIRECT SHEAR TEST RESULTS

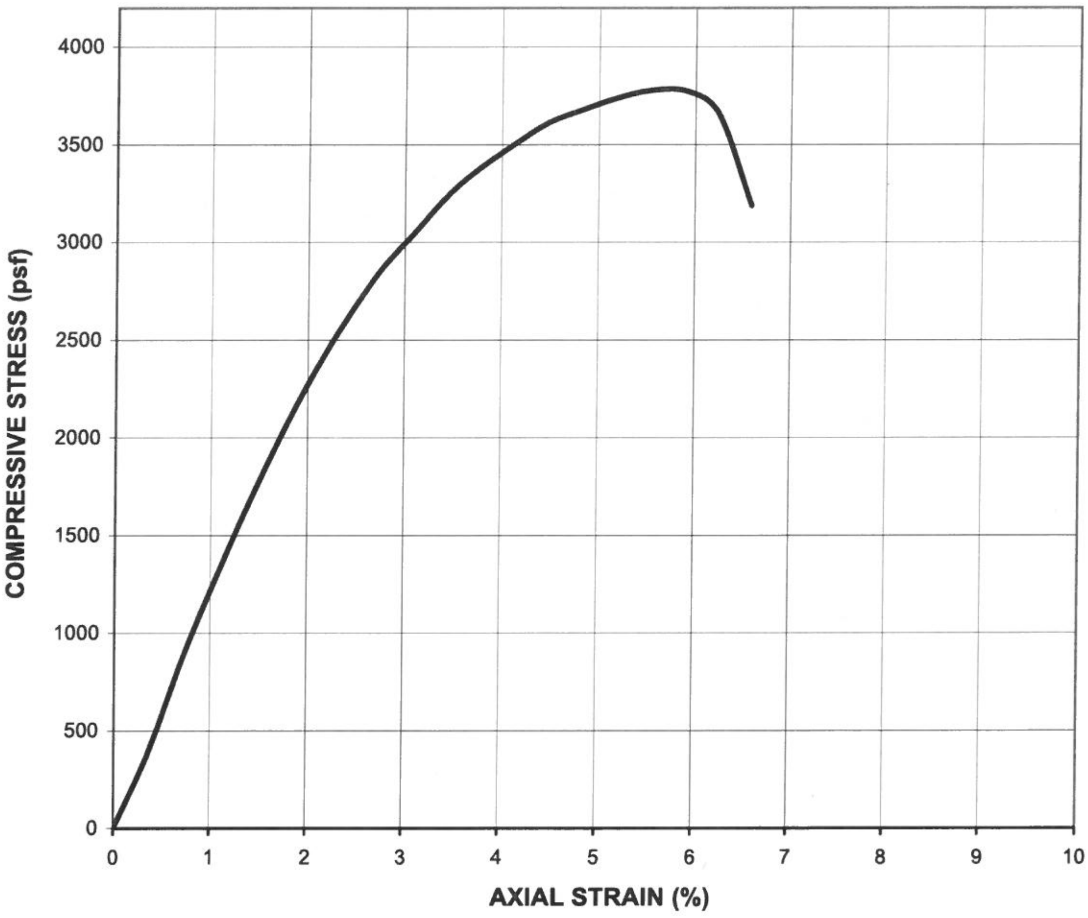
9041 Soquel Drive

FIGURE
B-1

BORING:	B-1	**UNDISTURBED**	UCS
DEPTH (ft):	17		
SOIL TYPE (USCS):	CL		q_u = 3,778 psf

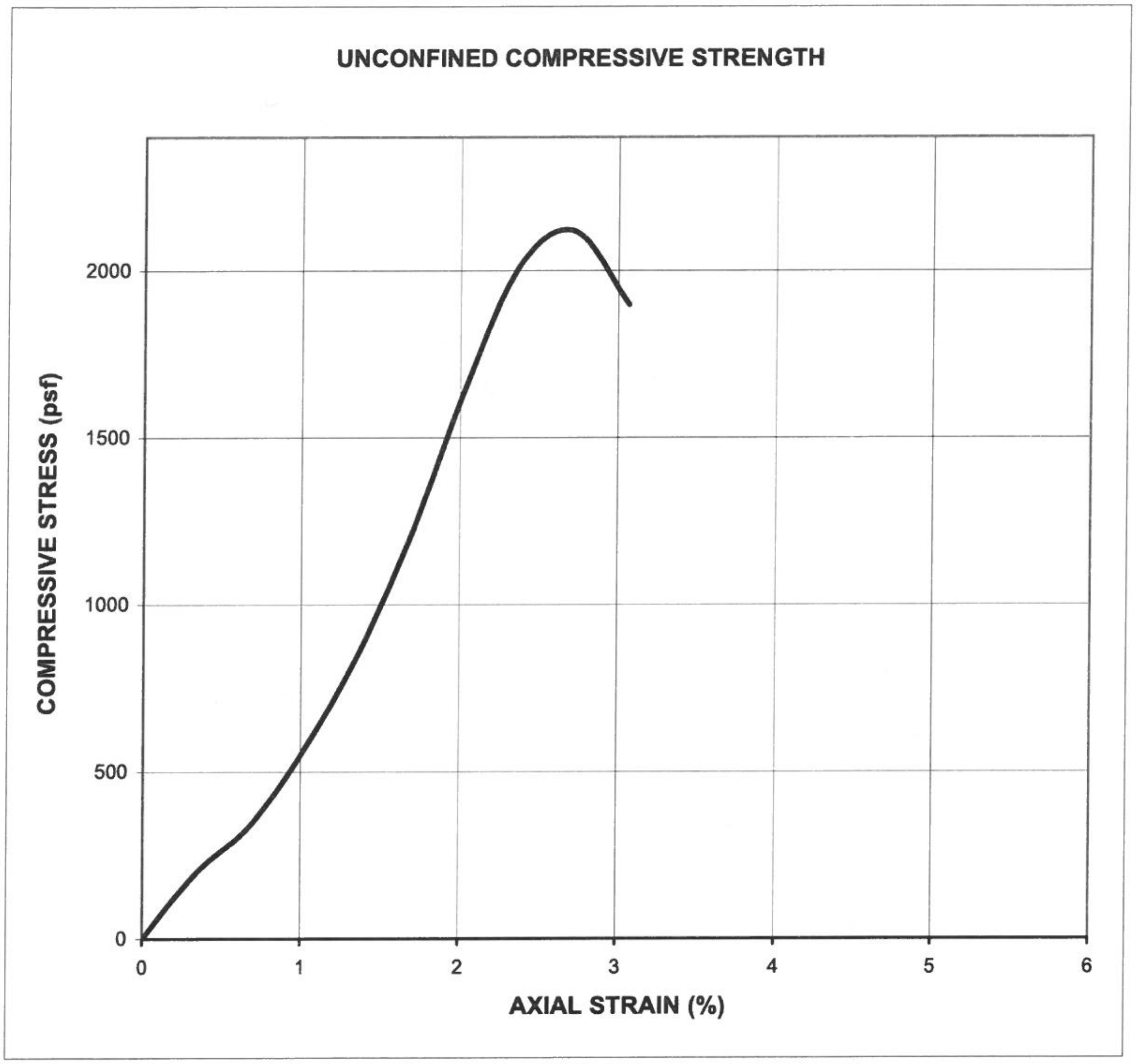
MOISTURE: **INSITU - SATURATED**

UNCONFINED COMPRESSIVE STRENGTH



CMAG ENGINEERING	**UNCONFINED COMPRESSIVE STRENGTH RESULTS**	FIGURE
	9041 Soquel Drive	B-2

BORING:	B-1	**UNDISTURBED**	UCS
DEPTH (ft):	22		
SOIL TYPE (USCS):	SM/SC		q_u = 2,022 psf
MOISTURE: **INSITU - SATURATED**			



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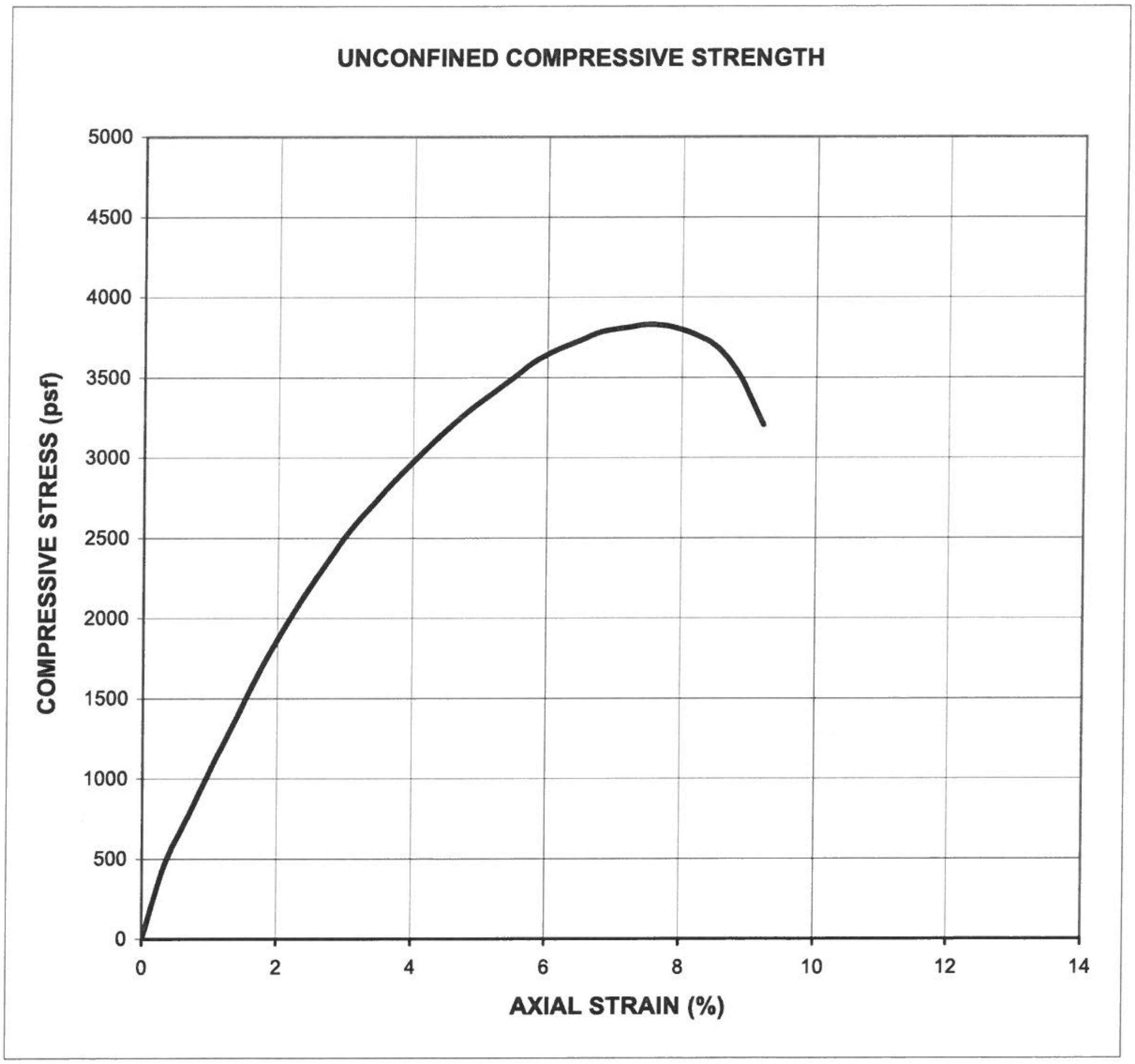
UNCONFINED COMPRESSIVE STRENGTH RESULTS

9041 Soquel Drive

FIGURE B-3

BORING:	B-2	**UNDISTURBED**	UCS
DEPTH (ft):	6		
SOIL TYPE (USCS):	SC-CL		q_u = 3,830 psf

MOISTURE: **INSITU - SATURATED**

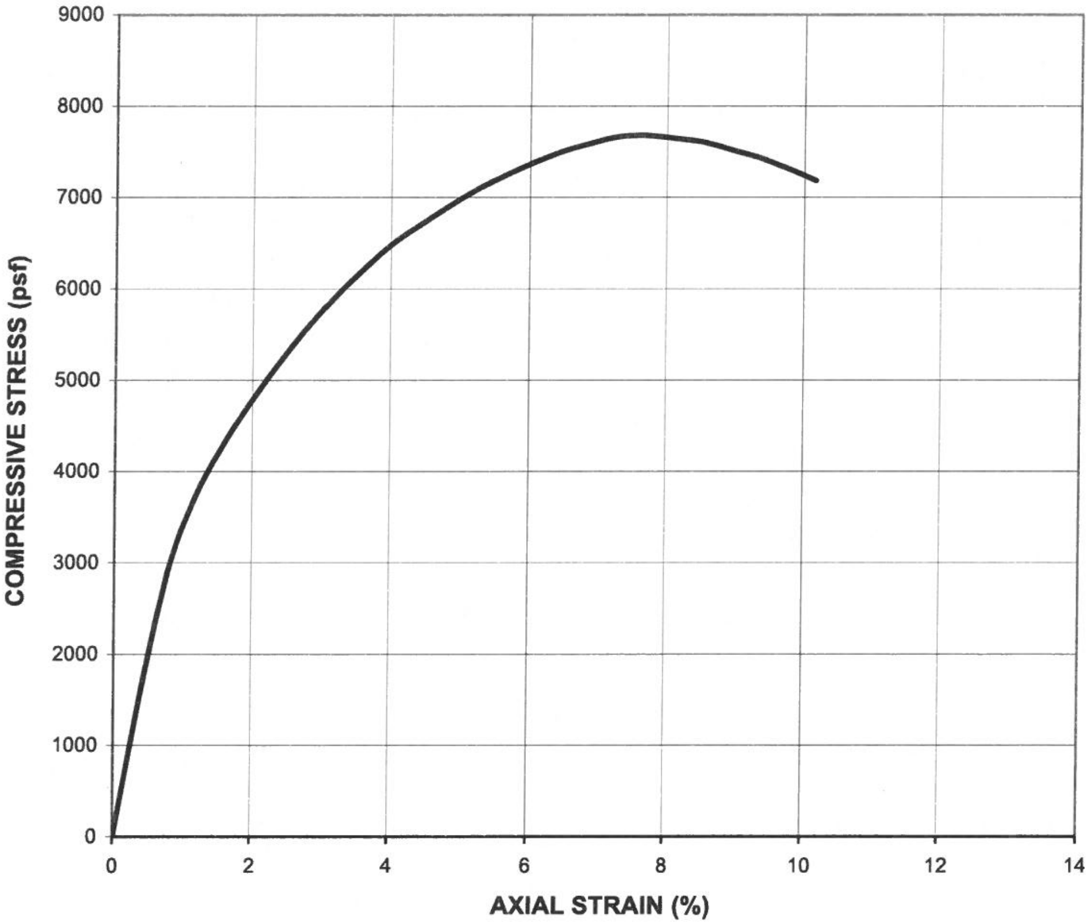


CMAG ENGINEERING	**UNCONFINED COMPRESSIVE STRENGTH RESULTS**	FIGURE
	9041 Soquel Drive	B-4

BORING:	B-4	**UNDISTURBED**	UCS
DEPTH (ft):	3		
SOIL TYPE (USCS):	CL		q_u = 7,678 psf

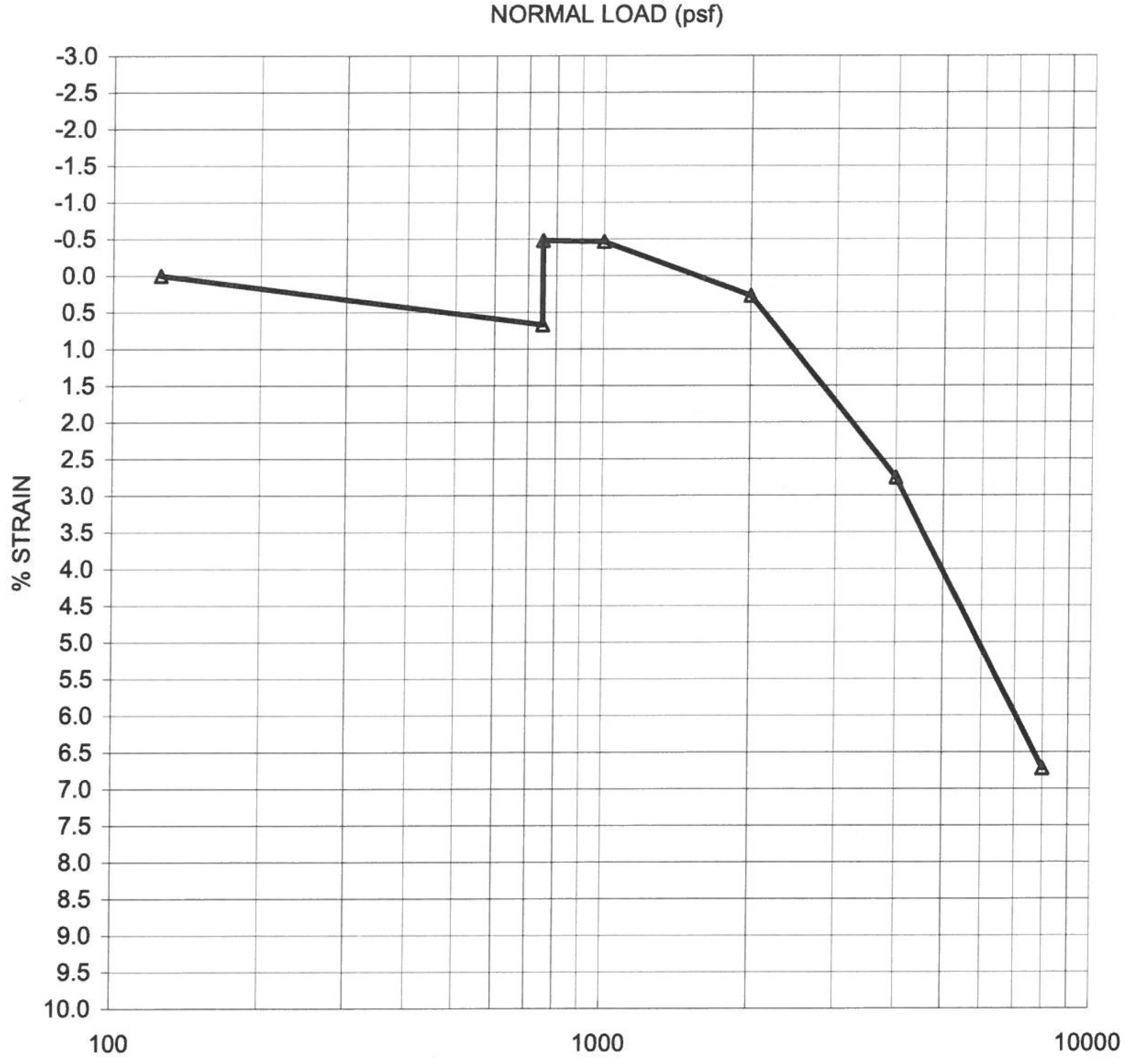
MOISTURE: **INSITU - SATURATED**

UNCONFINED COMPRESSIVE STRENGTH



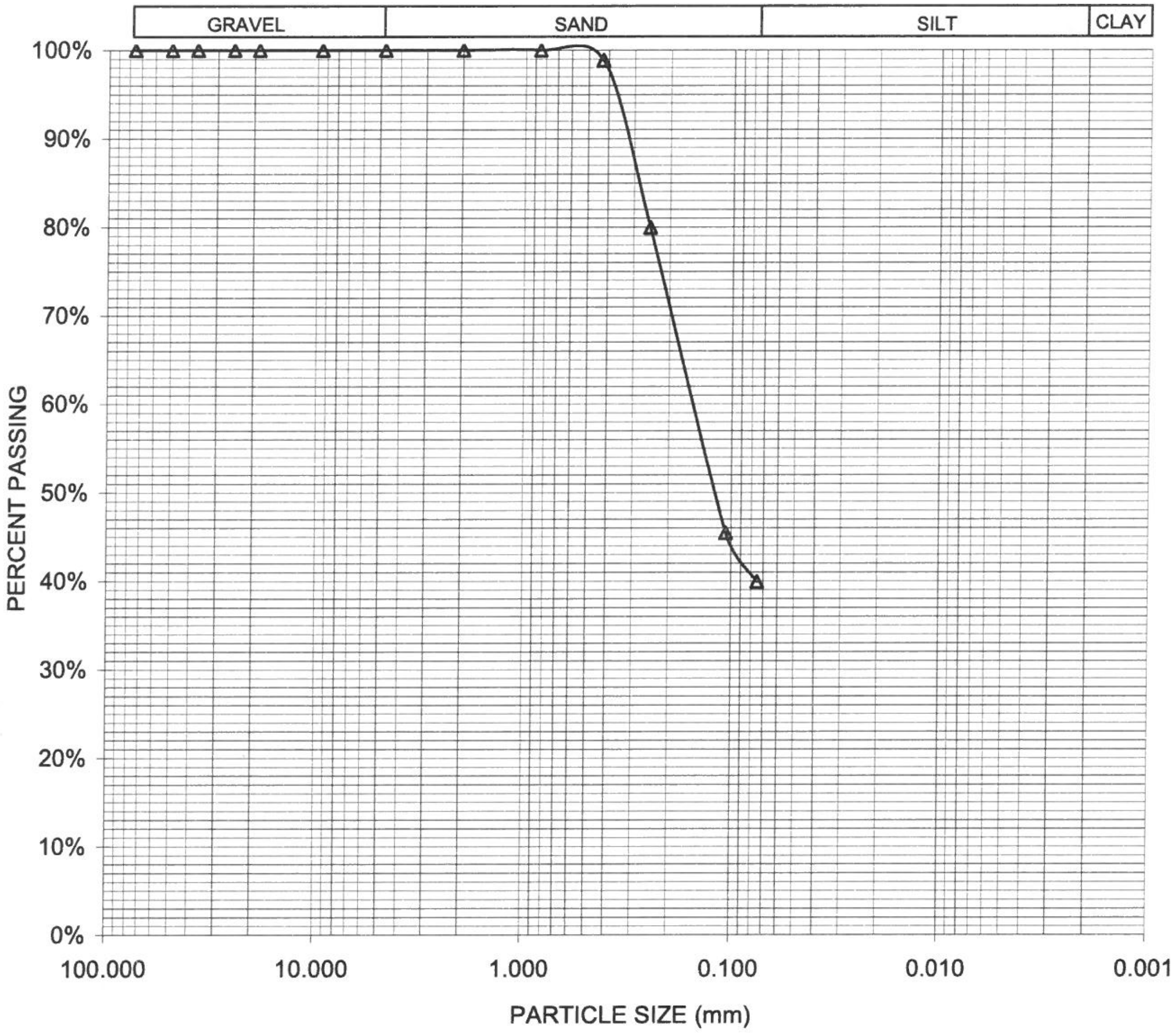
CMAG ENGINEERING	**UNCONFINED COMPRESSIVE STRENGTH RESULTS**	FIGURE
	9041 Soquel Drive	B-5

BORING:	B-3	FIELD MOISTURE:	25.1%
DEPTH (ft):	5	INITIAL SATURATION:	63.8%
SOIL TYPE (USCS):	CL	FINAL MOISTURE:	33.4%



CMAG ENGINEERING	**SWELL TEST RESULTS**	FIGURE
	9041 Soquel Drive	B-6

BORING:	B-1	PERCENT	PERCENT
DEPTH (ft):	7	PASSING No. 4	PASSING No. 200
SOIL TYPE (USCS):	SM	100.0%	39.9%



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PARTICLE SIZE DISTRIBUTION

9041 Soquel Drive

FIGURE

B-7

APPENDIX C

SLOPE STABILITY PROGRAM

SLOPE STABILITY RESULTS AND METHODOLOGY

The stability of Cross Section A-A' was analyzed using the computer program Slide, Version 7.0 from Rocscience, Inc. This program utilizes a limiting equilibrium method for determining the Factor of Safety against sliding on an assumed failure surface. The cross section was analyzed and the results of the analyses are presented on Figures C-1 and C-2. The location of the cross section analyzed is shown in Appendix A, Figure A-2.

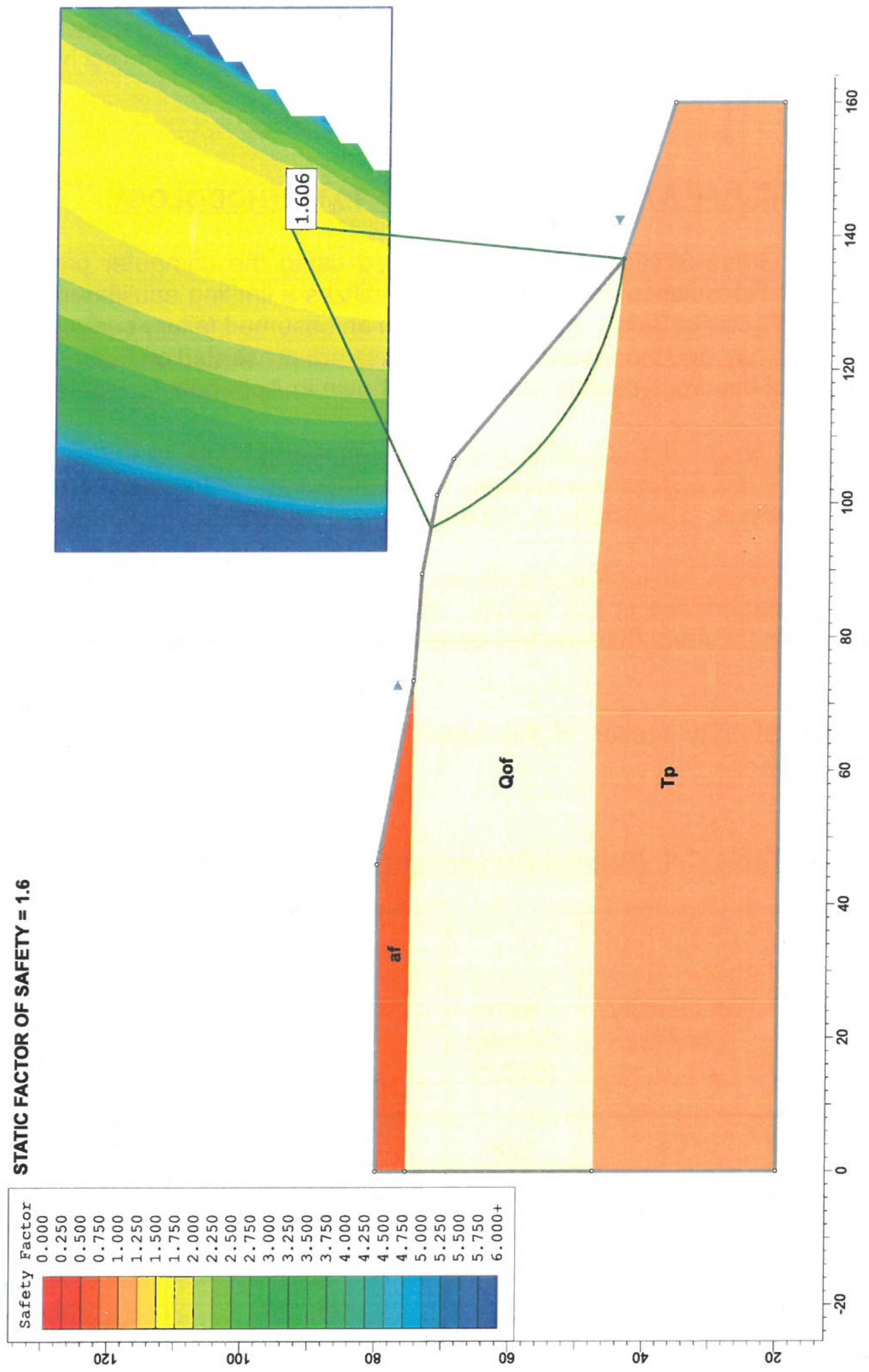
We have also analyzed the condition assuming seepage parallel to the ground surface within the upper 4 feet of the slope adjacent to the proposed commercial building using an infinite slope analysis. The results of the analysis are presented on Figure C-3.

Material properties chosen for these analyses are conservatively based on laboratory test results and on experience in the vicinity. Shear parameters are based on saturated strengths. The shear strength properties used in our slope stability analyses are presented on Table C-1.

See the Slope Stability section of this report for discussions regarding the calculated Factors of Safety.

Table C-1. Material Properties For Cross Section A-A'

Geologic Unit	Wet Density (lbs/ft^3)	Sat'd Density (lbs/ft^3)	Angle of Internal Friction (°)	Cohesion (lb/ft^2)
			Static / Pseudostatic	Static / Pseudostatic
af	118	128	34 / 34	30 / 30
Qof	113	124	30 / 0	250 / 1,000
Tp	120	125	38 / 38	500 / 500



STATIC FACTOR OF SAFETY = 1.6

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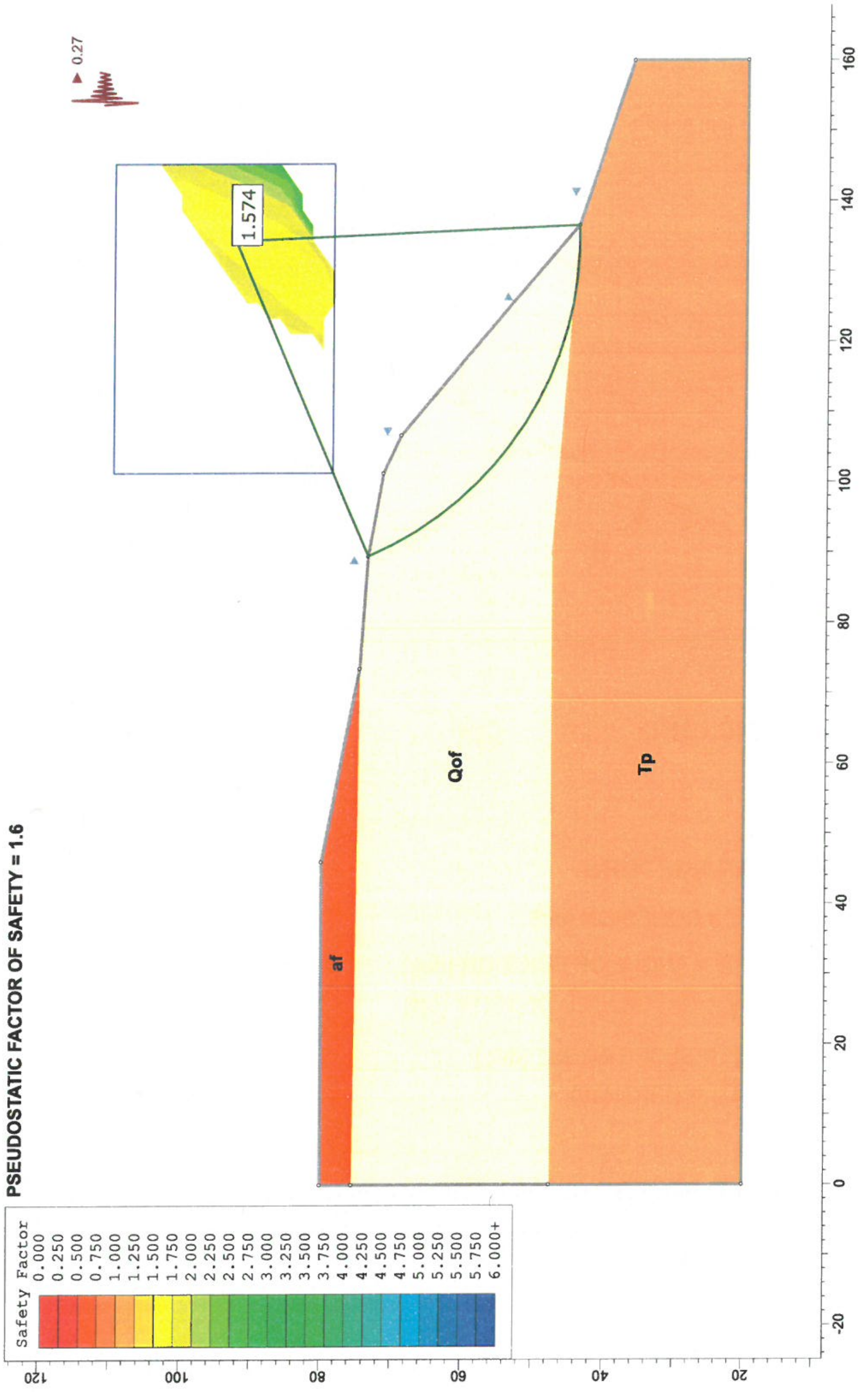
SLOPE STABILITY - CROSS SECTION A-A' - STATIC CASE

9041 Soquel Drive

FIGURE

C-1



PSEUDOSTATIC FACTOR OF SAFETY = 1.6

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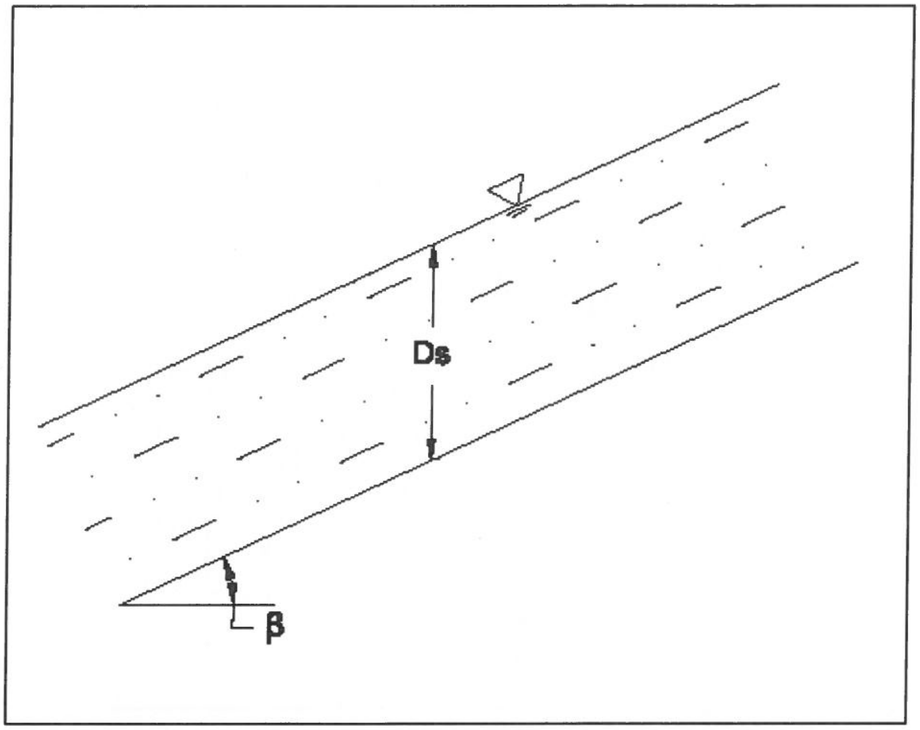
CMAG ENGINEERING	**SLOPE STABILITY - CROSS SECTION A-A' - PSEUDOSTATIC CASE**	FIGURE
	9041 Soquel Drive	C-2



GEOLOGIC UNIT: Qof

INPUT PARAMETERS:

c' = COHESION (psf) = 250

Φ' = ANGLE OF FRICTION (deg) = 30

γ_s = SATURATED DENSITY (pcf) = 124

β = SLOPE ANGLE (deg) = 40

D_s = DEPTH (ft) = 4

EFFECTIVE STRESS ANALYSIS:

$$FS = \frac{c' + (\gamma_S - \gamma_w)\, D_S \cos^2\beta \ \tan \Phi'}{\gamma_S\, D_S \cos\beta \sin\beta} = \mathbf{1.37}$$

CMAG ENGINEERING	**INFINTE SLOPE - SLOPE PARALLEL SEEPAGE**	FIGURE
	9041 Soquel Drive	C-3

Attachment 3

Geotechnical Report Acceptance Letter
Dated January 9, 2020

CMAG ENGINEERING, INC.
P.O. BOX 640, APTOS, CALIFORNIA 95001
PHONE: 831.475.1411
WWW.CMAGENGINEERING.COM

April 13, 2020
Project No. 18-142-SC

Testorff Construction
335 Spreckels Drive, Suite D
Aptos, California 95003

Attn: Pete Testorff

SUBJECT: **ON-SITE RETENTION**
Proposed Commercial Building
9041 Soquel Drive,
Aptos, Santa Cruz County, California
APN 041-141-56

REFERENCES: CMAG Engineering, Inc. (December 30, 2018). *Geotechnical Investigation , Proposed Commercial Building, 9041 Soquel Drive, Aptos, Santa Cruz County, California*, *APN 041-141-56.* Project No. 18-142-SC.

Ramsey Civil Engineering, Inc. (April 1, 2020). *Testorff Construction, 9041 Soquel Drive, Aptos, CA, APN 041-141-56.* Sheets C1.0, C2.0, C2.1, C3.0, C4.0, C5.0 and C5.1. Project No. 18-001.

Dear Mr. Testorff:

Per our conversations with the project Civil Engineer, David Ramsey, PE, we have prepared this letter to provide geotechnical recommendations related to on-site retention of stormwater. As indicated in the referenced *Geotechnical Investigation* report (CMAG, 2018), "Proposed on-site retention / detention systems may affect the stability of the steep slope to the north" and, "The near surface native soils generally consist of clay with a low permeability. We therefore recommend that the paver section be designed assuming no exfiltration."

It is our opinion that the site is not feasible for "typical" retention of on-site stormwater. We have worked closely with David Ramsey, PE on the design of the stormwater system outlined in the referenced plans (Ramsey Civil Engineering, Inc., April 1, 2020) consisting of a series of raingardens that consist of treatment, detention, and dishcharge of the stormwater, at pre-development rates, at the base of the slope to the north of the proposed development. It is our opinion that this system is acceptable from a geotechnical standpoint.

It is a pleasure being associated with you on this project. If you have any questions or if we may be of further assistance please do not hesitate to contact our office.

Sincerely,

CMAG ENGINEERING, INC.

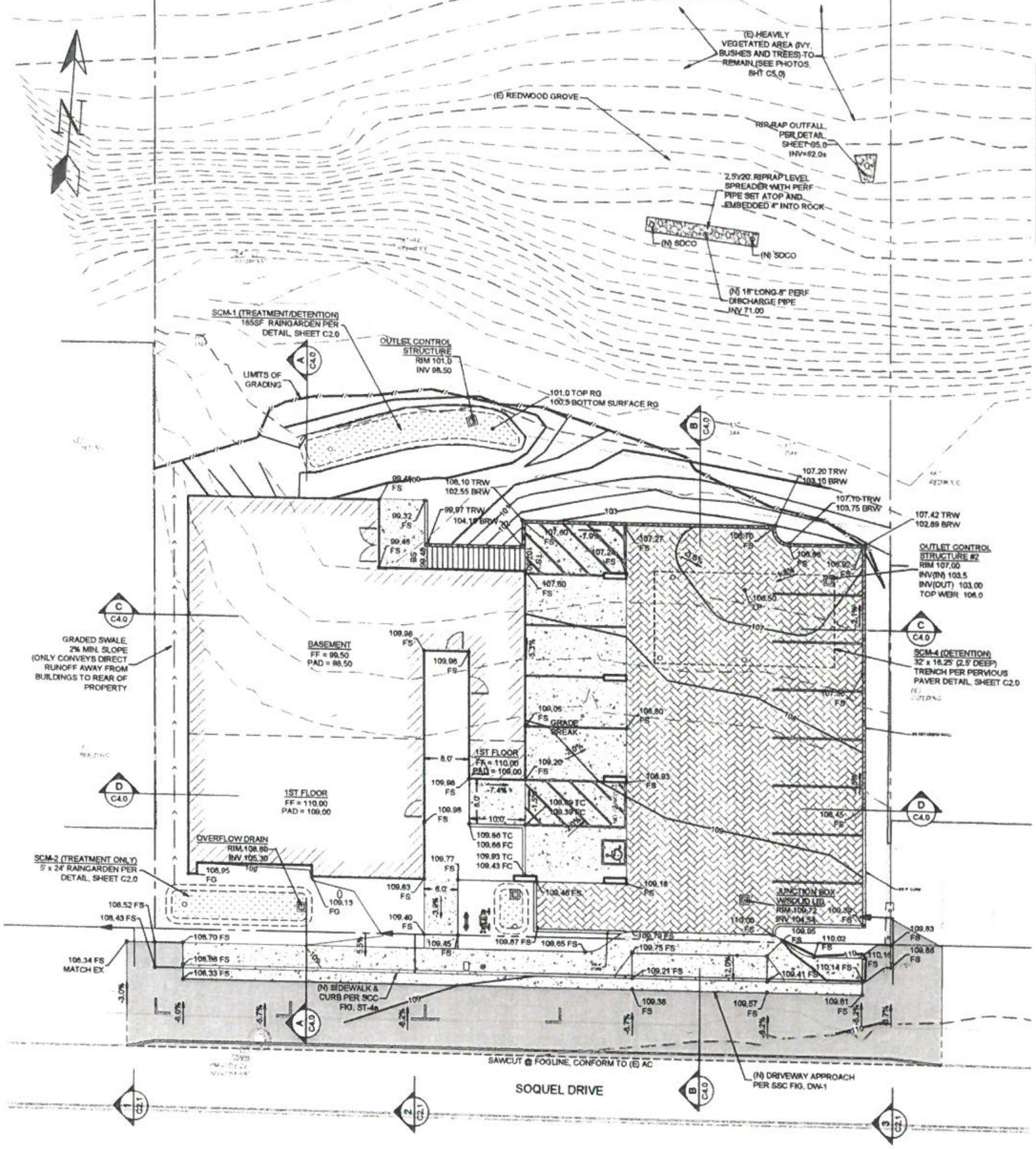
ADRIAN L. GARNER
GE2814
6/30/20

Adrian L. Garner, PE, GE
Principal Engineer
C 66087, GE 2814
Expires 6/30/20

Distribution:	Addressee (Electronic Copy) David Ramsey (Electronic Copy)

Attachment 4

Approved Locations of Drainage Outlets



PRELIMINARY GRADING & DRAINAGE PLAN

10' 0 5' 10' 20'
GRAPHIC SCALE: 1 INCH = 10 FEET

GRADING/PAVING LEGEND

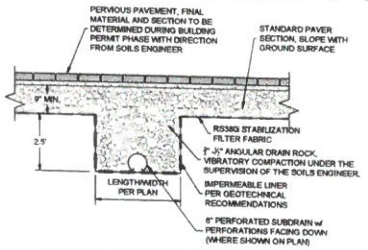
▒	ASPHALT
▨	PERVIOUS PAVERS
░	CONCRETE

NOTES

1. FOUNDATION PREPARATION PER GEOTECHNICAL RECOMMENDATIONS:
   - 1.1. DRILLED, CAST-IN-PLACE, CONCRETE SHAFTS, REQUIRE NO REWORKING OF MATERIALS OTHER THAN THAT NECESSARY TO REWORK MATERIALS DISTURBED DURING EARTHWORK AND CONSTRUCTION.
   - 1.2. FOR CONCRETE SLABS-ON-GRADE, THE NATIVE SOIL SHOULD BE OVEREXCAVATED A MINIMUM OF 1 FOOT BELOW THE BOTTOM OF THE CRUSHED ROCK, OR 2 FEET BELOW EXISTING GRADE, WHICHEVER IS GREATER. THE EXPOSED SURFACE SHOULD THEN BE SCARIFIED, MOISTURE CONDITIONED, AND COMPACTED TO A MINIMUM OF 90 PERCENT RELATIVE COMPACTION. IF SLABS ARE CONSTRUCTED ON THE SOUTH SIDE OF THE SITE, IN THE AREA OF THE EXISTING FILL SOILS, THE FILL SHOULD BE OVEREXCAVATED A MINIMUM OF 2 FEET BELOW THE BOTTOM OF THE CRUSHED ROCK, OR 3 FEET BELOW EXISTING GRADE, WHICHEVER IS GREATER. MIRAFI 600X STABILIZATION FABRIC SHOULD BE PLACED ON THE BOTTOM OF THE OVEREXCAVATION. THE MATERIAL WHICH WAS REMOVED SHOULD THEN BE REPLACED WITH ENGINEERED FILL COMPACTED TO A MINIMUM OF 90 PERCENT RELATIVE COMPACTION. THIS ZONE OF REWORKING SHALL EXTEND A MINIMUM OF 3 FEET LATERALLY BEYOND THE CONCRETE SLABS-ON-GRADE.
   - 1.3. BENEATH THE BASEMENT SLAB, THE NATIVE SOIL SHOULD BE OVEREXCAVATED A MINIMUM OF 1 FOOT BELOW THE BOTTOM OF THE CRUSHED ROCK. THE EXPOSED SURFACE SHOULD THEN BE SCARIFIED, MOISTURE CONDITIONED, AND COMPACTED TO A MINIMUM OF 90 PERCENT RELATIVE COMPACTION. THE MATERIAL WHICH WAS REMOVED SHOULD THEN BE REPLACED WITH ENGINEERED FILL COMPACTED TO A MINIMUM OF 90 PERCENT RELATIVE COMPACTION.
2. IN DRIVE AREAS (INCLUDING CONCRETE, ASPHALT, AND NON-PERMEABLE PAVERS), THE NATIVE SOIL SHOULD BE OVER EXCAVATED TO A MINIMUM OF 1' BELOW THE BOTTOM OF THE AGGREGATE BASE COURSE, OR 1.5' BELOW EXISTING GRADE, WHICHEVER IS GREATER AND SHALL EXTEND LATERALLY A MINIMUM OF 2' BEYOND THE DRIVE AREAS. CONTRACTOR TO COORDINATE WITH GEOTECHNICAL ENGINEER FOR OVER EXCAVATION LIMITS ON NORTH SIDE OF PROPERTY.
3. THE MATERIAL REMOVED SHOULD BE REPLACED WITH ENGINEERED FILL COMPACTED TO A MINIMUM OF 90% RELATIVE COMPACTION. THE UPPER 6 INCHES OF SUBGRADE AND ALL AGGREGATE BASE AND SUBBASE IN DRIVE AREAS SHALL BE COMPACTED TO ACHIEVE A MINIMUM RELATIVE COMPACTION OF 95%.
4. GROUND IMMEDIATELY ADJACENT TO BUILDING SHALL BE A MINIMUM OF 8" BELOW FINISHED FLOOR AND SLOPE AWAY FROM FOUNDATION AT A MINIMUM OF 5% PER 2016 CDC 18.04.4.
5. PERVIOUS PAVEMENT STRUCTURAL SECTION IS SUBJECT TO CHANGE UPON RECOMMENDATIONS FROM THE GEOTECHNICAL ENGINEER DURING CONSTRUCTION DOCUMENT PHASE. TRENCH DIMENSIONS WITHIN PERVIOUS AREA IS NECESSARY FOR STORMWATER MITIGATION PURPOSES.
6. THE SUBJECT PARCEL RECEIVES MINIMAL RUNOFF FROM ADJACENT PARCELS AND SOQUEL DRIVE. THE MINIMAL RUNOFF ALONG THE WESTERLY PROPERTY LINE WILL BE DIRECTED TO THE NORTH VIA A NEW VEGETATED SWALE. SEE PLANS. PROPERTY OWNER UNDERSTANDS THAT THE SITE DOES RECEIVE SOME RUNOFF AND SHALL NOT BLOCK THE DRAINAGE FROM ADJACENT PARCEL.
7. RIPRAP OUTFALLS TO BE LOCATED AT <u>BASE</u> OF SLOPE WITH A NOTE: "FINAL LOCATION TO BE DETERMINED BY GEOTECHNICAL ENGINEER IN THE FIELD DURING CONSTRUCTION"

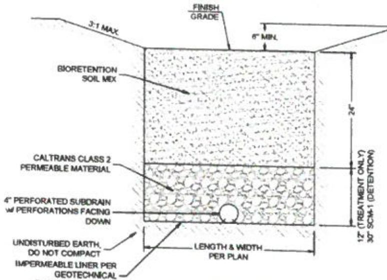
ROOF DRAINAGE NOTE

FLAT ROOF SHALL BE SLOPED AND DRAINED PER THE STORMWATER CONTROL PLAN, SHEET C5.0. ROOF IS DIVIDED INTO THREE SEPARATE DRAINAGE AREAS, EACH DRAINING TO A RAIN GARDEN FACILITY FOR TREATMENT PURPOSES. ASSOCIATED DOWNSPOUTS SHALL DISCHARGE AT GRADE AND DIRECTED TOWARDS MITIGATION FACILITY, AS SHOWN ON SHEET C5.0.



PERVIOUS PAVEMENT DETAIL

NTS



RAINGARDEN DETAIL

NTS

811
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www.ramseycivilengineering.com

DAVID RAMSEY
NO. C73735
CIVIL

DAVID RAMSEY DATE
RCE# 73735

APN# 041-141-56

PLAN TYPE
MIXED USE

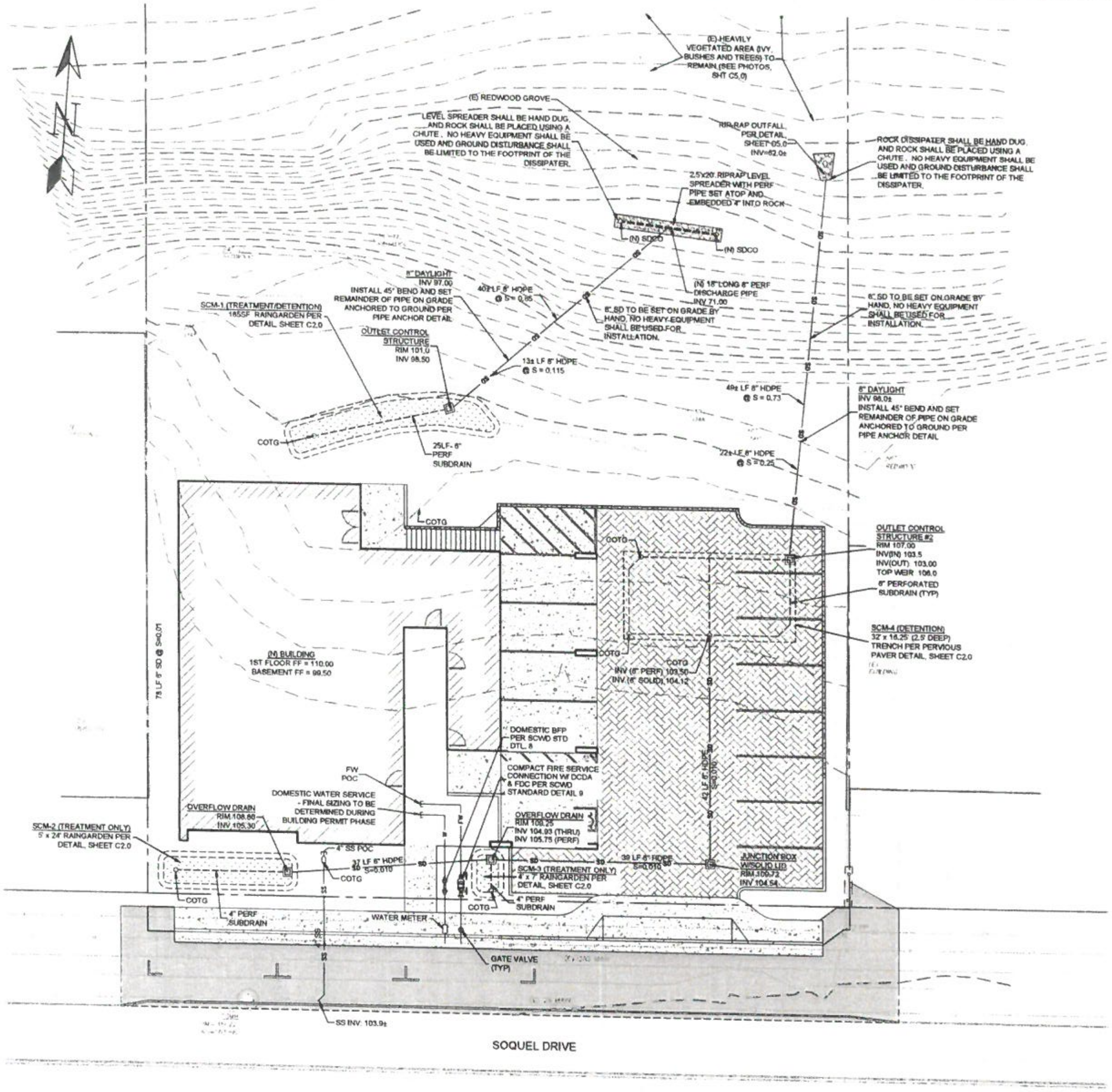
PRELIMINARY GRADING & DRAINAGE PLAN
TESTORFF CONSTRUCTION
9041 SOQUEL DRIVE, APTOS, CA

NUMBER	BY	DESCRIPTION	DATE
2	DMR	PLANNING 2ND ROUTING COMMENTS	1/1/2021
1	DMR	PLANNING 1ST ROUTING COMMENTS	4/1/2020

REVISION BLOCK

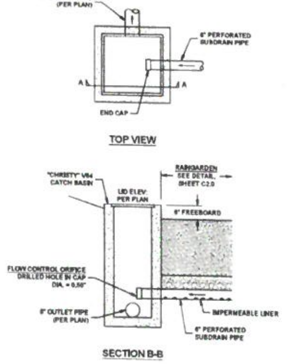
DRAWN BY:	DMR
DESIGNED BY:	DMR
DATE:	01/26/21
SCALE:	AS NOTED
PROJECT NO:	18-001

SHEET:
C2.0



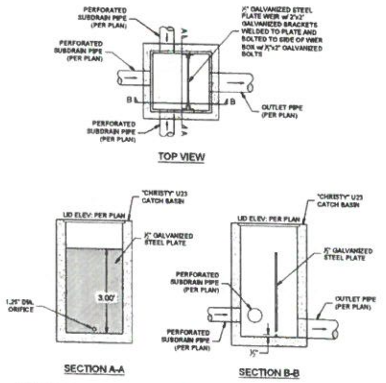
PRELIMINARY UTILITY PLAN

10' 0 5' 10' 20'
GRAPHIC SCALE: 1 INCH = 10 FEET



OUTLET CONTROL STRUCTURE #1 - DETAIL

SCALE: 1" = 2'



OUTLET CONTROL STRUCTURE #2 - DETAIL

SCALE: 1" = 2'

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TEL (831) 462-2905
www.ramseycivilengineering.com

DAVID RAMSEY
RCE# 73735
DATE

APN# 041-141-56

PLAN TYPE
MIXED USE

PRELIMINARY UTILITY PLAN
TESTORFF CONSTRUCTION
9041 SOQUEL DRIVE, APTOS, CA

2	DMR	PLANNING 2ND ROUTING COMMENTS	1/1/2021
1	DMR	PLANNING 1ST ROUTING COMMENTS	4/1/2020
NUMBER	BY	DESCRIPTION	DATE

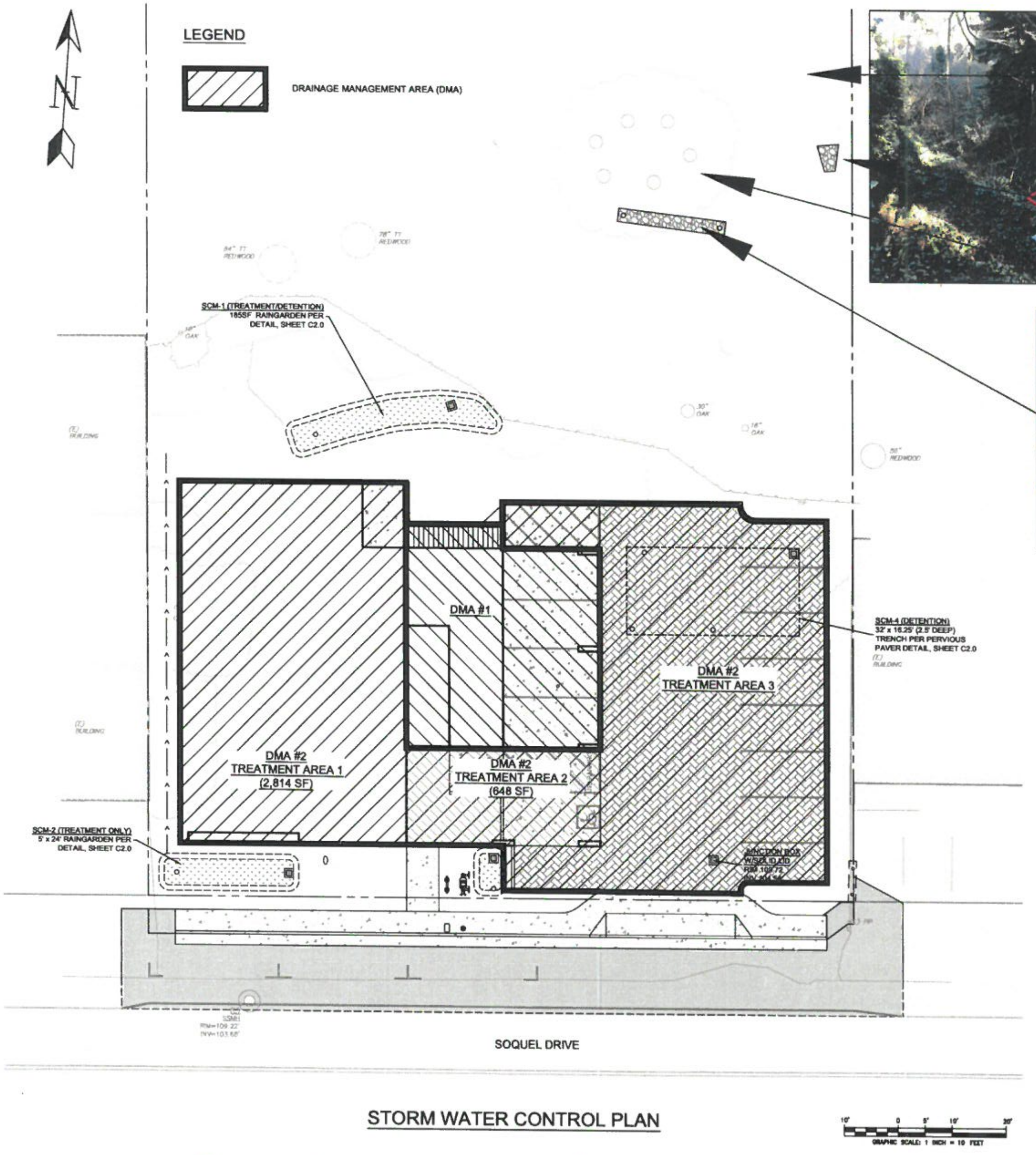
REVISION BLOCK

DRAWN BY:	DMR
DESIGNED BY:	DMR
DATE:	01/26/21
SCALE:	AS NOTED
PROJECT NO:	18-001

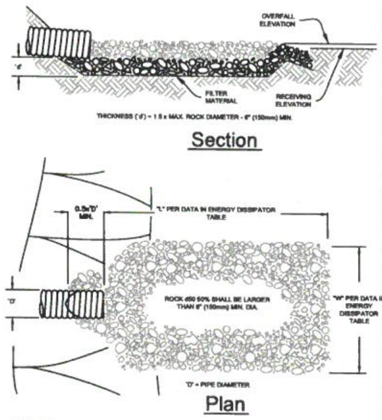
SHEET:
C3.0

LEGEND

▨ DRAINAGE MANAGEMENT AREA (DMA)



STORM WATER CONTROL PLAN



NOTES:

1. "La" = LENGTH OF APRON. DISTANCE "La" SHALL BE OF SUFFICIENT LENGTH TO DISSIPATE ENERGY.

2. APRON SHALL BE SET AT A ZERO GRADE AND ALIGNED STRAIGHT.

3. FILTER MATERIAL SHALL BE FILTER FABRIC OR 6" (150mm) THICK MINIMUM GRADED GRAVEL LAYER.

Energy Dissipator

NTS

CONSTRUCTION SPECIFICATIONS:

ENSURE THAT THE SUBGRADE FOR THE FILTER AND RIPRAP FOLLOWS THE REQUIRED LINES AND GRADES SHOWN IN THE PLAN. COMPACT ANY FILL REQUIRED IN THE SUBGRADE TO THE DENSITY OF THE SURROUNDING UNDISTURBED MATERIAL. LOW AREAS IN THE SUBGRADE ON UNDISTURBED SOIL MAY ALSO BE FILLED BY INCREASING THE RIPRAP THICKNESS.

THE RIPRAP AND GRAVEL FILTER MUST CONFORM TO THE SPECIFIED GRADING LIMITS SHOWN ON THE PLANS.

FILTER CLOTH, WHEN USED, MUST MEET DESIGN REQUIREMENTS AND BE PROPERLY PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION. REPAIR ANY DAMAGED FABRIC BY REMOVING THE RIPRAP AND PLACING ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA. ALL CONNECTING JOINTS SHOULD OVERLAP A MINIMUM OF 1 FOOT (300 MM). IF THE DAMAGE IS EXTENSIVE, REPLACE THE ENTIRE FILTER CLOTH. REFER TO APPENDIX -GEOTEXTILES&GEOSYNTHETICS

RIPRAP MAY BE PLACED BY EQUIPMENT, BUT TAKE CARE TO AVOID DAMAGING THE FILTER.

THE MINIMUM THICKNESS OF THE RIPRAP SHOULD BE 1.5 TIMES THE MAXIMUM STONE DIAMETER.

RIPRAP MAY BE FIELD STONE OR ROUGH QUARRY STONE. IT SHOULD BE HARD, ANGULAR, HIGHLY WEATHER-RESISTANT AND WELL GRADED.

CONSTRUCT THE APRON ON ZERO GRADE WITH NO OVERFALL AT THE END. MAKE THE TOP OF THE RIPRAP AT THE DOWNSTREAM END LEVEL WITH THE RECEIVING AREA OR SLIGHTLY BELOW IT.

ENSURE THAT THE APRON IS PROPERLY ALIGNED WITH THE RECEIVING STREAM AND PREFERABLY STRAIGHT THROUGHOUT ITS LENGTH. IF A CURVE IS NEEDED TO FIT SITE CONDITIONS, PLACE IT IN THE UPPER SECTION OF THE APRON.

IMMEDIATELY AFTER CONSTRUCTION, STABILIZE ALL DISTURBED AREAS WITH VEGETATION.

INSPECTION AND MAINTENANCE:

INSPECT RIPRAP OUTLET STRUCTURES AFTER HEAVY RAINS TO SEE IF ANY EROSION AROUND OR BELOW THE RIPRAP HAS TAKEN PLACE OR IF STONES HAVE BEEN DISLODGED. IMMEDIATELY MAKE ALL NEEDED REPAIRS TO PREVENT FURTHER DAMAGE.

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DAVID RAMSEY
NO. C73735
CIVIL

DAVID RAMSEY DATE
RCE# 73735

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TESTORFF CONSTRUCTION
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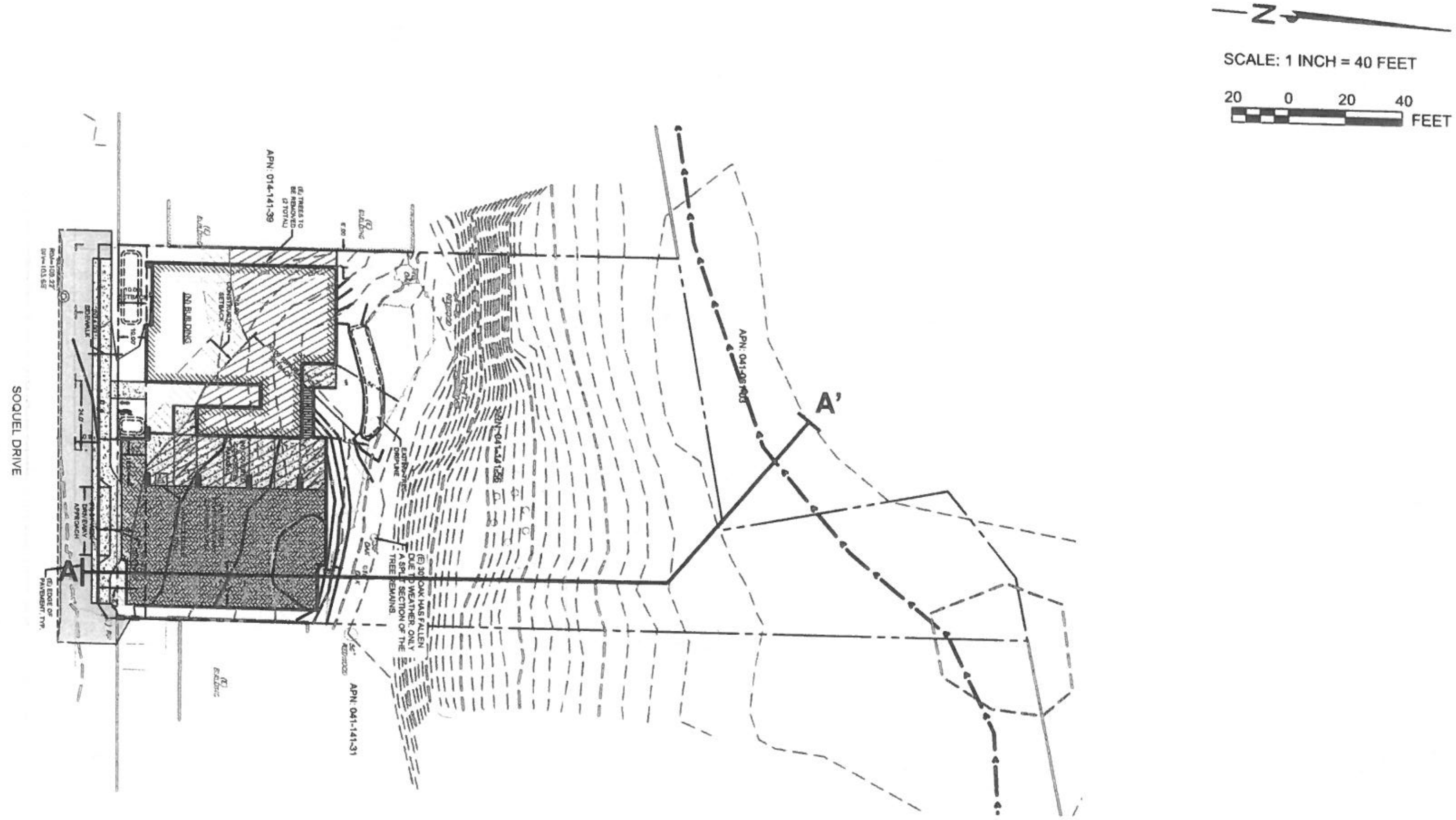

BASEMAP: Ramsey Civil Engineering, Inc. (January 26, 2021). *Preliminary Site Plan, Testorff Construction, 9041 Soquel Drive, Aptos, CA.* Original Scale: 1" = 20'.

EXPLANATION OF SYMBOLS

A ⊢——⊣ A' LOCATION OF CROSS SECTION

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SITE MAP

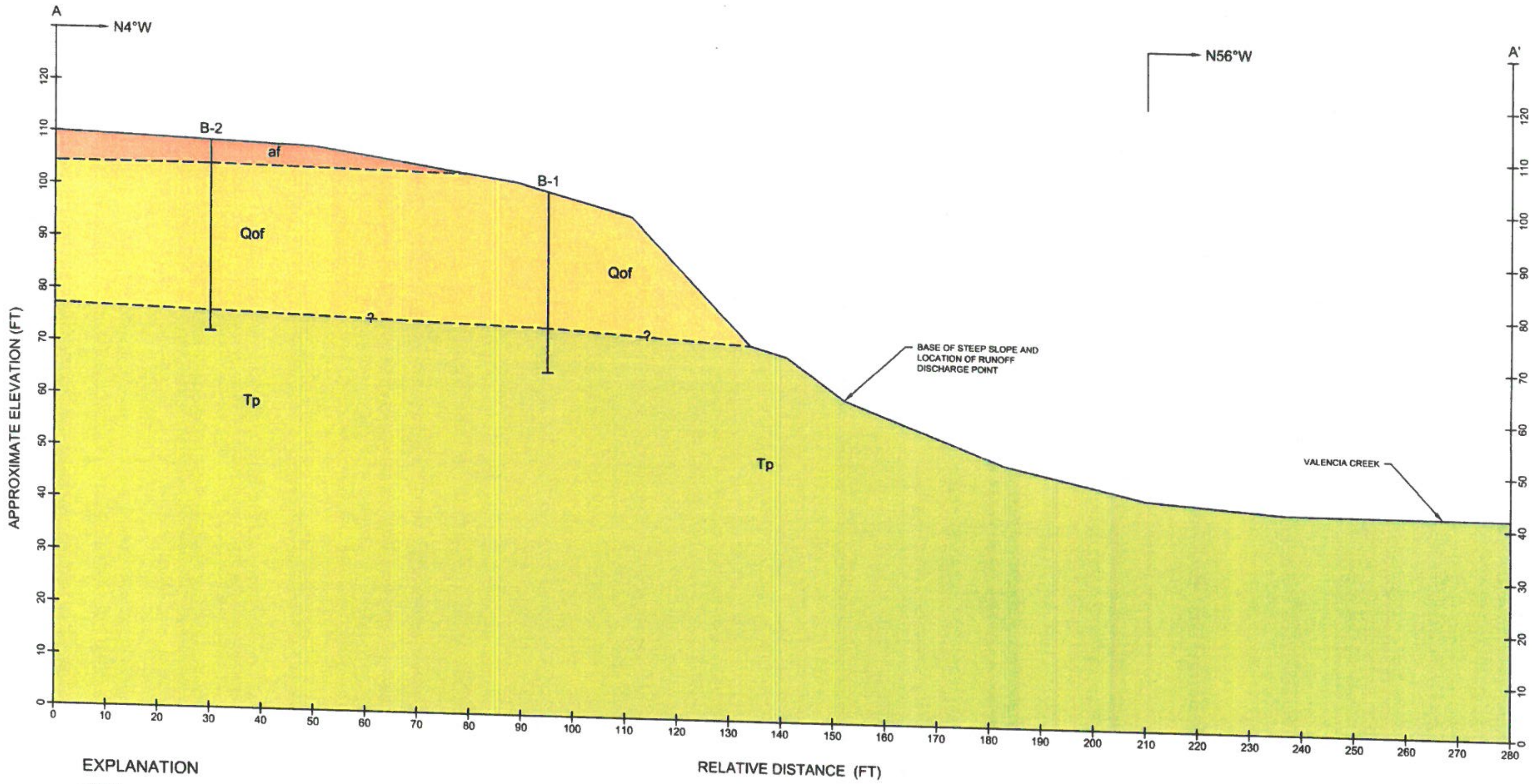
9041 Soquel Drive

FIGURE

1

CROSS SECTION A-A'

SCALE: 1" = 20' H = V



EXPLANATION

UNITS

af — af: Artificial Fill

Qof — Qof: Older Flood Plain Deposits

Tp — Tp: Purisima Formation

SYMBOLS

— —?— Geologic Contact, Dashed Where Approximate, Queried Where Uncertain

B-2 ⊥ Approximate Location of Boring B-2

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CROSS SECTION A-A'

9041 Soquel Drive

FIGURE

2