

# Appendix B

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## Geotechnical Report

Prepared by:

GeoConcepts, Inc.

EnSitu Engineering, Inc.

February 2019

October 2018

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# City of Malibu

23825 Stuart Ranch Road • Malibu, California 90265-4861  
(310) 456-2489 • Fax (310) 456-3356 • www.malibucity.org

## GEOTECHNICAL REVIEW SHEET

### Project Information

<b>Date:</b>	March 22, 2019	<b>Review Log #:</b>	3701
<b>Site Address:</b>	22959 Pacific Coast Highway		
<b>Lot/Tract/PM #:</b>	n/a	<b>Planning #:</b>	CDP 09-067
<b>Applicant/Contact:</b>	Joseph Lezama, joseph@buaia	<b>BPC/GPC #:</b>	
<b>Contact Phone #:</b>	310-456-5905	<b>Fax#:</b>	
		<b>Planner:</b>	Adrian Fernandez
<b>Project Type:</b>	Revised project: New three-level Malibu Inn Motel, grading, retaining walls with soldier piles and tie-backs, subterranean parking, new onsite wastewater treatment system (OWTS)		

### Submittal Information

**Consultant(s) / Report Date(s):** GeoConcepts, Inc. (Barrett, CEG 2088; Walter, RGE 2476): 10-16-18, 6-20-18, 4-28-16, 9-21-15, 5-29-15, 2-26-15, 12-4-14  
*(Current submittal(s) in Bold.)*  
GeoConcepts, Inc. (Barrett, CEG 2088): 6-16-15  
GeoConcepts, Inc. (Lee, CEG 2545; Haddad, RCE 69169): 6-27-12  
GeoConcepts, Inc. (Sousa, CEG 1315; Walter, RGE 2476): 4-27-12, 2-27-12, 6-4-03  
GeoConcepts, Inc. (Sousa, CEG 1315): 11-3-09  
EnSitu Engineering, Inc. (Yaroslaski, RCE 60149): **2-21-19**, 2-25-16, 3-3-15, 9-12-14

Building Plans prepared by Burdge & Associates Architects dated June 8, 2018.

Grading plans prepared by GeoWorks, Inc. dated May 8, 2018.

**Final OWTS plans prepared by EnSitu Engineering, Inc. dated February 19, 2019.**

**Previous Reviews:** 11-8-18; Ref: Environmental Health Review Sheets dated 3-8-19 and 6-25-18; Ref: 5-31-16 (for new commercial development), Environmental Health Review Sheet dated April 19, 2016, 4-8-16, 7-24-15, Environmental Health Review Sheet dated April 3, 2015, 4-1-15, 1-28-15, 7-24-12, 6-4-12, 12-2-09, Geology Review Referral Sheet dated 11-5-09

### Review Findings

#### Coastal Development Permit Review

- The motel development project is **APPROVED** from a geotechnical perspective.
- The motel development project is **NOT APPROVED** from a geotechnical perspective. The listed 'Review Comments' shall be addressed prior to approval.

#### Building/Grading Plan-Check Review

- Awaiting Building plan check submittal. Please respond to the listed 'Building Plan-Check Stage Review Comments' AND review and incorporate the attached 'Geotechnical Notes for Building Plan Check' into the plans.

- APPROVED** from a geotechnical perspective. Please review the attached 'Geotechnical Notes for Building Plan Check' and incorporate into Building Plan-Check submittals.
- NOT APPROVED** from a geotechnical perspective. The listed 'Building Plan-Check Stage Review Comments' shall be addressed prior to Building Plan-Check Stage approval.

### Remarks

The referenced OWTS design report and OWTS plans were reviewed by the City from a geotechnical perspective. The revised project includes constructing a 7,703 square foot three-level motel with 20 lodging units, 46 parking spaces with 24 extra with stacked parking system, grading (11,752 yards of cut under structure: 837 yards of cut and 319 yards of fill non-exempt; and 12,270 yards of export), rear yard retaining walls with tie-back stabilization/soldier piles, terraces and landscaping on the rear-yard ascending slope, and a new onsite wastewater treatment system (OWTS) in the front parking area consisting of a treatment tank system and a new 2,600 square foot leach field with a design peak flow of 4,056 GPD and a design loading rate of 1.56 GPSFD with 100% expansion. A 3,600 square foot expansion dispersal field serving the Malibu Inn property at 22969 Pacific Coast Highway is proposed in the front parking area immediately east of the leach field for the proposed project.

The Consultant asserted that the proposed 20' high 1.5:1 cut slope above the western portion of the rear-yard retaining wall consists of a trim of the thin layer of fill and colluvium on the slope, and that the surficial stability would not be reduced by the cut slope. In addition, the Consultant has recommended 4' of freeboard on the top of the rear-yard retaining wall as well as a debris fence on the slope to protect the development from surficial instabilities, should they occur. The recommendations by the Consultant in this regard appear to be reasonable.

### Building/Grading Plan-Check Stage Review Comments:

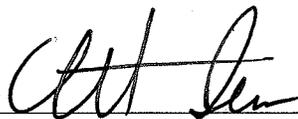
1. As per the plans, access to the site is from the adjacent property. Granting access from the adjacent property owner (recording of an easement) is a pre-requisite to establish the feasibility of the project.
2. The freeboard on the rear yard retaining wall will be designed to provide the Code-required setbacks from ascending slopes. The freeboard should be designed as an impact wall with a minimum equivalent fluid pressure of 125 pcf, based on the Consultant's recommendations.
3. The proposed location and extent (vertical and horizontal) of the impact fence should be depicted on the grading plans and cross-sections. Specifications for the installation of the fence should be provided by the manufacturer and incorporated, as appropriate, with the project documents. Details of the fence installation at the eastern and western property lines should be designed and outlined to prevent debris deflecting into adjacent properties.
4. Based on assumptions by the Consultant in calculating the lateral spreading resistance, pile spacing should not exceed two times the diameter of piles.
5. *Please provide to the City an as-built geotechnical report documenting the installation of the pile and soldier pile foundation elements for the motel and retaining walls. The report should document total depth, depth into bedrock, depth to groundwater, and include a map with the final locations of the piles. Please include this comment as a note on the Building plans.*
6. Section 7.4 of the City's geotechnical guidelines requires a minimum thickness of 10 mils for vapor barriers beneath slabs-on-grade. The Project Geotechnical Engineer has recommended that the vapor barrier be a minimum thickness of 15 mils and conform to ASTM E1745 Class A requirements. Building plans shall reflect the Consultant's recommendation.
7. The following note must appear on the foundation plans: *"Tests shall be performed prior to pouring foundations to evaluate corrosivity of the supporting soils. Foundation plans should be reviewed by the*

*Civil or Structural Engineer and revised, if necessary.”*

8. It appears from the cross sections that the soldier pile walls may be integral to the proposed structure(s). The Consultant should work with the structural engineer to ensure that pile deflections do not induce catastrophic failure or induce other negative impacts to the structure(s).
9. The grading plans need to include specific details for tiebacks including unbonded, bonded, and minimum lengths, bar type and size, and procedures for proof and performance testing. The proof and performance testing should be under the observation of the project geotechnical consultant, who must document the results and submit the observations to the City for review and state that the tiebacks were installed per the approved plans and specifications.
10. Prior to final approval of the project, an as-built report documenting the installation of the retaining wall tie-back systems shall be prepared by the Project Geotechnical Consultant. The report shall include, as a minimum, the locations and details of the installations such as tieback lengths, dates of installation, and test results of tension capacities. The report shall include a statement that the retaining walls and tie-back systems were installed under the observation of the geologist and geotechnical engineer of record and that the installations conformed to the approved plan and specifications. Any modifications to the plans necessary for the conditions encountered during the construction must be documented in the final report. Please include this comment as a note on the plans.
11. A letter should be provided by the Project Structural Engineer indicating that they are aware of the anticipated displacements associated with the installation of the soil nail walls and, given the potential for some slope displacement, the proposed design is adequate to provide slope support required by the CBC (e.g., safeguard against major structural failures and loss of life).
12. Two sets of final grading, retaining wall, soldier pile, tie-back, and motel plans (**APPROVED BY BUILDING AND SAFETY**) incorporating the Project Geotechnical Consultant’s recommendations and items in this review sheet must be **reviewed and wet stamped and manually signed by the Project Engineering Geologist and Project Geotechnical Engineer**. City geotechnical staff will review the plans for conformance with the Project Geotechnical Consultants’ recommendations and items in this review sheet over the counter at City Hall.

Please direct questions regarding this review sheet to City Geotechnical staff listed below.

Engineering Geology Review by:



3/22/19  
Date

Christopher Dean, C.E.G. #1751, Exp. 9-30-20  
Engineering Geology Reviewer (310-456-2489, x306)  
Email: cdean@malibucity.org

*This review sheet was prepared by representatives of Cotton, Shires and Associates, Inc. and GeoDynamics, Inc., contracted through Cotton, Shires and Associates, Inc., as an agent of the City of Malibu.*



**COTTON, SHIRES AND ASSOCIATES, INC.**  
CONSULTING ENGINEERS AND GEOLOGISTS



**GeoDynamics, Inc.**

Applied Earth Sciences  
Geotechnical Engineering & Engineering Geology Consultants



# City of Malibu

- GEOTECHNICAL -

## NOTES FOR BUILDING PLAN-CHECK

The following standard items should be incorporated into Building Plan-Check submittals, as appropriate:

1. One set of grading, retaining wall, OWTS, soldier pile, and office building plans, incorporating the Geotechnical Consultant's recommendations and items in this review sheet, must be submitted to City geotechnical staff for review. **Additional review comments may be raised at that time that may require a response.**
  2. Show the name, address, and phone number of the Geotechnical Consultant(s) on the cover sheet of the Building and grading Plans.
  3. Include the following note on the Foundation Plans: *"All foundation excavations must be observed and approved by the Geotechnical Consultant prior to placement of reinforcing steel."*
  4. Include the following note on Grading and Foundation Plans: *"Subgrade soils shall be tested for Expansion Index prior to pouring footings or slabs; Foundation Plans shall be reviewed and revised by the Geotechnical Consultant, as appropriate."*
  5. The Foundation Plans for the proposed structures shall clearly depict the embedment material and minimum depth of embedment for the foundations in accordance with the Geotechnical Consultant's recommendations.
  6. Show the onsite wastewater treatment system on the grading and building plans.
  7. Please contact the Building and Safety Department regarding the submittal requirements for a grading and drainage plan review.
- results of all density tests as well as a map depicting the limits of fill, locations of all density tests, locations and elevations of all removal bottoms, locations and elevations of all keyways and back drains, and locations and elevations of all retaining wall backdrains and outlets. Geologic conditions exposed during grading must be depicted on an as-built geologic map. This comment must be included as a note on the grading plans.

### **Retaining Walls (As Applicable)**

1. Show retaining wall backdrain and backfill design, as recommended by the Geotechnical Consultant, on the Plans.
2. Retaining walls separate from a residence require separate permits. Contact the Building and Safety Department for permit information. One set of retaining wall plans shall be submitted to the City for review by City geotechnical staff. Additional concerns may be raised at that time which may require a response by the Project Geotechnical Consultant and applicant.

### **Grading Plans (as Applicable)**

1. Grading Plans shall clearly depict the limits and depths of overexcavation, as applicable.
2. Prior to final approval of the project, an as-built compaction report prepared by the Project Geotechnical Consultant must be submitted to the City for review. The report must include the



# City of Malibu

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 Malibu, California 90265  
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## GEOTECHNICAL REVIEW FIXED FEE FORM

PROJECT OWNER/APPLICANT: Joseph Lezama  
 PROJECT ADDRESS: 22959 Pacific Coast Highway  
 GEOTECHNICAL LOG NO: 3701  
 PLANNING NO: CDP 09-067  
 PLAN CHECK NO: \_\_\_\_\_

ITEM	STATUS	DATE	DEPOSIT	CHARGE	BALANCE	COMMENTS
FIXED FEE BY: Joseph Lezama		6/12/2018	\$4,375.00	\$0.00	\$0.00	Fixed Fee
Initial Review, CDP 09-067, revised project, new Motel	Response Required	8/6/2018		\$0.00	\$0.00	Items to address
Second review, CDP 09-067, revised project, new Motel	Response Required	11/8/2018		\$0.00	\$0.00	Need responses to EH review letter
Additional Reviews: Time & Material			X	X	X	
Supplemental Deposit		12/10/2018	\$678.00		\$678.00	Check # 001125
Third Review, CDP 09-067, new Motel	Approved	3/22/2019		\$678.00	\$0.00	Planning Only
Applicant Paid Balance Due						
Fifth review						
Applicant Paid Balance Due						
					\$0.00	
REFUND DUE APPLICANT						REFUND # _____
BALANCE DUE CITY OF MALIBU					\$ -	

**NOTE:**  
 The Fixed Fee incorporates the initial and one subsequent geotechnical review. Subsequent reviews will be performed in accordance with the City's time and materials rate of \$226.00 per hour.



# City of Malibu

23825 Stuart Ranch Rd., Malibu, California CA 90265-4861  
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RECEIVED  
FEB 26 2019  
PLANNING DEPT.

## ENVIRONMENTAL HEALTH REVIEW REFERRAL SHEET

TO: City of Malibu Environmental Health Administrator DATE: 6/11/2018  
FROM: City of Malibu Planning Department

PROJECT NUMBER: CDP 09-067  
JOB ADDRESS: 22959 PACIFIC COAST HWY  
APPLICANT / CONTACT: Joseph Lezama, Burdge and Associates Architects  
APPLICANT ADDRESS: 24911 Pacific Coast Highway  
Malibu, CA 90265  
APPLICANT PHONE #: (310) 456-5905  
APPLICANT FAX #:  
APPLICANT EMAIL: joseph@buaia.com  
PROJECT DESCRIPTION: New Motel, Grading, Retaining Walls, NAOWTS.  
Previously proposed as a new commercial building.

TO: Malibu Planning Department and/or Applicant  
FROM: City of Malibu Environmental Health Reviewer

**Conformance Review Complete** for project submittals reviewed with respect to the City of Malibu Local Coastal Plan/Local Implementation Plan (LCP/LIP) and Malibu Municipal Code (MMC). The Conditions of Planning conformance review and plan check review comments listed on the attached review sheet(s) (or else handwritten below) shall be addressed prior to plan check approval.

**Conformance Review Incomplete** for the City of Malibu LCP/LIP and MMC. The Planning stage review comments listed on the City of Malibu Environmental Health review sheet(s) shall be addressed prior to conformance review completion.

**OWTS Plot Plan:**  NOT REQUIRED  
 REQUIRED (attached hereto)  REQUIRED (not attached)

Melinda Talent  
Signature

3-8-19  
Date



# City of Malibu

Environmental Health • Environmental Sustainability Department  
 23825 Stuart Ranch Road · Malibu, California · 90265-4861  
 Phone (310) 456-2489 · Fax (310) 456-3356 · [www.malibucity.org](http://www.malibucity.org)

## ENVIRONMENTAL HEALTH REVIEW SHEET

### PROJECT INFORMATION

Applicant: (name and email address)	Joseph Lezama Burdge & Associates joseph@buaia.com	
Project Address:	<b>22959 Pacific Coast Hwy, Malibu Inn Motel</b> Malibu, CA 90265	
Planning Case No.:	CDP 09-067 Revised	
Project Description:	New motel, grading, retaining walls, new AOWTS	
Date of Review:	March 8, 2019	
Reviewer:	Melinda Talent	Signature: <i>Melinda Talent</i>
Contact Information:	Phone: (310) 456-2489 ext.364	Email: <a href="mailto:mtalent@malibucity.org">mtalent@malibucity.org</a>

### SUBMITTAL INFORMATION

Architectural Plans:	Burdge & Associates dated 6-8-18
Grading Plans:	Grading and Drainage plan by GeoWorks dated 5-8-18
OWTS Plan:	Ensitu Engineering dated 5-30-18, Revised plan dated 2-19-19
OWTS Report:	Ensitu Engineering dated 7-26-18, 2-21-19
Geology Report:	Geologic Map by GeoConcepts dated May 2018
Miscellaneous:	Reduced setback letter by GeoConcepts dated 1-24-19. Reduced setback letter by Kurt Fischer Structural Engineering Dated 1-28-19.
Previous Reviews:	EH Complete Conformance Review dated 4-9-16 for CDP 09-067, commercial office building. Revised EH Conformance review dated 6-25-18.

### REVIEW FINDINGS

Planning Stage:	<input checked="" type="checkbox"/> <b>CONFORMANCE REVIEW COMPLETE</b> for the City of Malibu Local Coastal Program/Local Implementation Plan (LIP) and Malibu Municipal Code (MMC). The listed conditions of Planning stage conformance review and plan check review comments shall be addressed prior to plan check approval.
	<input type="checkbox"/> <b>CONFORMANCE REVIEW INCOMPLETE</b> for the City of Malibu LIP and MMC. The listed Planning stage review comments shall be addressed prior to conformance review completion.
OWTS Plot Plan:	<input type="checkbox"/> <b>NOT REQUIRED</b>

Based upon the project description and submittal information noted above, a **conformance review** was completed for a new advanced onsite wastewater treatment system (OWTS) proposed to serve the onsite wastewater treatment and disposal needs of the subject property. The proposed advanced OWTS meets the minimum requirements of the Malibu Municipal Code and the City of Malibu Local Coastal Program (LCP)/Local Implementation Plan (LIP). Please distribute this review sheet to all of the project consultants and, prior to final approval, provide a coordinated submittal addressing all conditions for final approval and plan check items.

The conditional conformance findings hereby transmitted complete the Planning stage Environmental Health review of the subject development project. In order to obtain Environmental Health final approval



of the project OWTS Plot Plan and associated construction drawings (during Building Safety plan check), all conditions and plan check items listed below must be addressed through submittals to the Environmental Health office.

**Conditions of Planning Conformance Review for Building Plan Check Approval:**

- 1) **Final Onsite Wastewater Treatment System (OWTS) Plot Plan:** A final plot plan prepared by a City Registered OWTS Designer shall be submitted showing an OWTS design meeting the minimum requirements of the Malibu Municipal Code (MMC) and the Local Coastal Program (LCP)/Local Implementation Plan (LIP). The plans must include all necessary construction details, the proposed drainage plan for the developed property, and the proposed landscape plan for the developed property. The OWTS Plot Plan shall show essential features of the OWTS, existing improvements, and proposed/new improvements. The plot must fit on an 11" x 17" sheet leaving a 5" left margin clear to provide space for a City-applied legend. If the plan scale is such that more space is needed to clearly show construction details and/or all necessary setbacks, larger sheets may also be provided (up to a maximum size of 18" x 22" for review by Environmental Health).
- 2) **Final OWTS Design Report, Plans, and System Specifications:** A final OWTS design report and large set of construction drawings with system specifications (four sets) shall be submitted to describe the OWTS design basis and all components proposed for use in the construction of the OWTS. All plans and reports must be signed by a City Registered OWTS Designer and the plans stamped by the project Geologist, Coastal Engineer, and Structural Engineer as applicable. The final OWTS design report and construction drawings shall be submitted with the designer's signature, professional registration number, and stamp (if applicable).

The final OWTS design submittal shall contain the following information (in addition to the items listed above).

- a. Required treatment capacity for wastewater treatment and disinfection systems. The treatment capacity shall be specified in terms of flow rate, gallons per day (gpd), and shall be supported by calculations relating the treatment capacity to the number of bedroom equivalents, plumbing drainage fixture units, and the subsurface effluent dispersal system acceptance rate. The drainage fixture unit count must be clearly identified in association with the design treatment capacity, even if the design is based on the number of bedrooms. Average and peak rates of hydraulic loading to the treatment system shall be specified in the final design.
- b. Sewage and effluent pump design calculations (as applicable).
- c. Description of proposed wastewater treatment and/or disinfection system equipment. State the proposed type of treatment system(s) (e.g., aerobic treatment, textile filter, ultraviolet disinfection, etc.); major components, manufacturers, and model numbers for "package" systems; and the design basis for engineered systems.
- d. Specifications, supporting geology information, and percolation test results for the subsurface effluent dispersal portion of the onsite wastewater disposal system. This must include the proposed type of effluent dispersal system (drainfield, trench, seepage pit, subsurface drip, etc.) as well as the system's geometric dimensions and basic construction features. Supporting calculations shall be presented that relate the results of soils analysis or percolation/infiltration tests to the projected subsurface effluent acceptance rate, including any

unit conversions or safety factors. Average and peak rates of hydraulic loading to the effluent dispersal system shall be specified in the final design. The projected subsurface effluent acceptance rate shall be reported in units of total gallons per day (gpd) and gallons per square foot per day (gpsf). Specifications for the subsurface effluent dispersal system shall be shown to accommodate the design hydraulic loading rate (i.e., average and peak OWTS effluent flow, reported in units of gpd). The subsurface effluent dispersal system design must take into account the number of bedrooms, fixture units, and building occupancy characteristics.

- e. All OWTS design drawings shall be submitted with the wet signature and typed name of the OWTS designer. If the plan scale is such that more space than is available on the 11" x 17" plot plan is needed to clearly show construction details, larger sheets may also be provided (up to a maximum size of 18" x 22" for review by Environmental Health). [Note: For OWTS final designs, full-size plans for are also required for review by Building & Safety and Planning.]
- 3) **Building Plans:** All project architectural plans and grading/drainage plans shall be submitted for Environmental Health review and approval. These plans must be approved by the Building Safety Division prior to receiving Environmental Health final approval.
  - 4) **Traffic-Rated Slab Plan(s):** All project traffic rated slab plans shall be submitted for Environmental Health review and approval. These plans must be approved by the Building Safety Division prior to receiving Environmental Health final approval.
  - 5) **Notice of Decision:** The final onsite wastewater treatment system plans shall include the Conditions of Approval sections of the Notice of Decision (NOD) from the Planning Department.
  - 6) **Architect / Engineer Certification for Reduction in Setbacks to Buildings or Structures:**

All proposed reductions in setbacks from the onsite wastewater treatment system to structures or other features less than those shown in Malibu Municipal Code (MMC) Section 15.42 must be supported by letters from the project consultants. The wastewater plans and the construction plans must be specifically referenced in all certification letters. The construction plans for all structures and/or buildings with reduced setback must be approved by City of Malibu Building Safety prior to Environmental Health final approval. The architectural and/or structural plans submitted for Building Safety plan check must detail methods of construction that will compensate for the reduction in setback (e.g., waterproofing, concrete additives). For complex waterproofing installations, submittal of a separate waterproofing plan may be required. All plans must show the location of onsite wastewater treatment system components in relation to those structures from which the setback is reduced, and the plans must be signed and stamped by the architect, structural engineer, and geotechnical consultants (as applicable).

    - Structures – All proposed reductions in setback from the onsite wastewater treatment system to structures (i.e., setbacks less than those shown in MMC Section 15.42) must be supported by a letter from the project Structural Engineer and a letter from the project Soils Engineer (i.e., a Geotechnical Engineer or Civil Engineer practicing in the area of soils engineering). Both engineers must certify unequivocally that the proposed reduction in setbacks from the treatment tank and effluent dispersal area will not adversely affect the structural integrity of the onsite wastewater treatment system, and will not adversely affect the structural integrity of the structures for which the setback is reduced.

- Buildings – All proposed reductions in setback from the onsite wastewater treatment system to buildings (i.e., setbacks less than those shown in MMC Section 15.42) also must be supported by a letter from the project Architect, who must certify unequivocally that the proposed reduction in setbacks will not produce a moisture intrusion problem for the proposed building(s). If the building designer is not a California licensed architect, then the required Architect's certification may be supplied by an Engineer who is responsible for the building design with respect to mitigation of potential moisture intrusion from reduced setback to the wastewater system; in this case the Engineer must include in the letter an explicit statement of responsibility for mitigation of potential moisture intrusion. If any specific construction features are proposed as part of a moisture intrusion mitigation system in connection with the reduced setback(s), then the Architect (or Engineer) must provide associated construction documents for review and approval during Building Plan Check.

- 7) **Proof of Ownership:** Proof of ownership of subject property shall be submitted.
- 8) **Operations & Maintenance Manual:** An operations and maintenance manual specified by the OWTS designer shall be submitted to the property owner and maintenance provider of the proposed advanced OWTS.
- 9) **Maintenance Contract:** A maintenance contract executed between the owner of subject property and an entity qualified in the opinion of the City of Malibu to maintain the proposed advanced onsite wastewater treatment system shall be submitted prior to Environmental Health approval. **Please note only original "wet signature" documents are acceptable.**
- 10) **Advanced Onsite Wastewater Treatment System (OWTS) Covenant:** A covenant running with the land shall be executed between the City of Malibu and the holder of the fee simple absolute as to subject real property and recorded with the City of Malibu Recorder's Office. Said covenant shall serve as constructive notice to any future purchaser for value that the onsite wastewater treatment system serving subject property is an advanced method of sewage disposal pursuant to the City of Malibu Municipal Code. Said covenant shall be provided by the City of Malibu Environmental Health Administrator. **Please submit a certified copy issued by the City of Malibu Recorder.**
- 11) **Covenant to Forfeit 100% Expansion Effluent Disposal Area:** A covenant running with the land shall be executed by the property owner and recorded with the City of Malibu Recorder's Office. Said covenant shall serve as constructive notice to any successors in interest that (1) the private sewage disposal system serving the development on the property does not have a 100% expansion effluent dispersal area (i.e., replacement disposal field(s) or seepage pit(s)) and (2) if the primary effluent dispersal area fails to drain adequately, the City of Malibu may require remedial measures including, but not limited to, limitations on water use enforced through an operating permit and/or repairs, upgrades or modifications to the private sewage disposal system. The recorded covenant shall state and acknowledge that future maintenance and/or repair of the private sewage disposal system may necessitate interruption in use of the private sewage disposal system and, therefore, any building(s) served by the private sewage disposal system may become non-habitable during any required future maintenance and/or repair. Said covenant shall be in a form acceptable to the City Attorney and approved by the Environmental Sustainability Department. **Please submit a certified copy issued by the City of Malibu Recorder.**
- 12) **OWTS Monitoring Plan:** A monitoring and maintenance plan must be submitted to the Environmental Health Administrator for approval. The plan must adhere to the recommendations of the OWTS designer and include a monitoring plan, maintenance schedule, sampling program and

corrective actions if the OWTS fails to function as designed or meet the prescribed standards outlined in the monitoring plan.

- 13) **Project Geologist/Geotechnical Consultant Approval:** Project Geologist/Geotechnical Consultant final approval of the Onsite Wastewater Treatment System plan shall be submitted to the Environmental Health Administrator.
- 14) **City of Malibu Geologist/Geotechnical Approval:** City of Malibu geotechnical staff final approval of the Onsite Wastewater Treatment System plan shall be submitted to the Environmental Health Administrator.
- 15) **City of Malibu Planning Approval:** City of Malibu Planning Department final approval of the OWTS plan shall be obtained.
- 16) **Environmental Health Final Review Fee:** A final fee in accordance with the adopted fee schedule at the time of final approval shall be paid to the City of Malibu for Environmental Health review of the OWTS design and system specifications.
- 17) **Operating Permit Application and Fee:** In accordance with Malibu Municipal Code, an application shall be made to the Environmental Health office for an Onsite Wastewater Treatment System operating permit. An operating permit fee in accordance with the adopted fee schedule at the time of final approval shall be submitted with the application.
- 18) **Waste Discharge Requirements:** Submit wastewater plans, and all necessary supporting forms and reports, to the Los Angeles Regional Water Quality Control Board (RWQCB), 320 W. 4th St., Los Angeles, CA 90013, (213) 576-6600, to assure compliance with the California Water Quality Control Plan, Los Angeles Region (Basin Plan). RWQCB Waste Discharge Requirements shall be obtained and submitted to the City of Malibu Environmental Health Administrator.

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If you have any questions regarding the above requirements, please contact the Environmental Health office at your earliest convenience.

cc: Environmental Health file  
Planning Department

MOTEL with RESTAURANT: 20 Rooms (N)  
229 Fixture Units (N)  
DESIGN FLOW: 4056 gal/d

GREASE INTERCEPTOR: (15,000 Gallon Total) Xerxes  
EQUILIZATION TANK: 3 compartment tank (N)  
4,700 Gallon - grease compartment  
5,200 Gallon - equalization compartment  
4,700 Gallon - denitrification compartment

TREATMENT TANK: 4-7,540 Gallon (total 30,160 Gallon) MicroSeptec  
ES 25 with UV disinfection (N)

DOSING TANK: 5,000 Gallon Xerxes (N)

ACTIVE: 1-2600 sq.ft Drainfield with Orenco air vent (N)

FUTURE: None

PERC RATE: Sand Category (1.56 gpcfd)

DESIGNER: John Yaroslaski (RCE 60149)

REFERENCE: Ensitu Engineering, Inc. - OMTS Design Report dated 9-12-14; 3-3-15; 2-25-16; Revised Report dated 7-26-18 GeoConcepts - Geotechnical Report dated 2-27-12; 12-4-14; 6-16-15; Revised report dated 6-20-18, 2-21-19

NOTES:

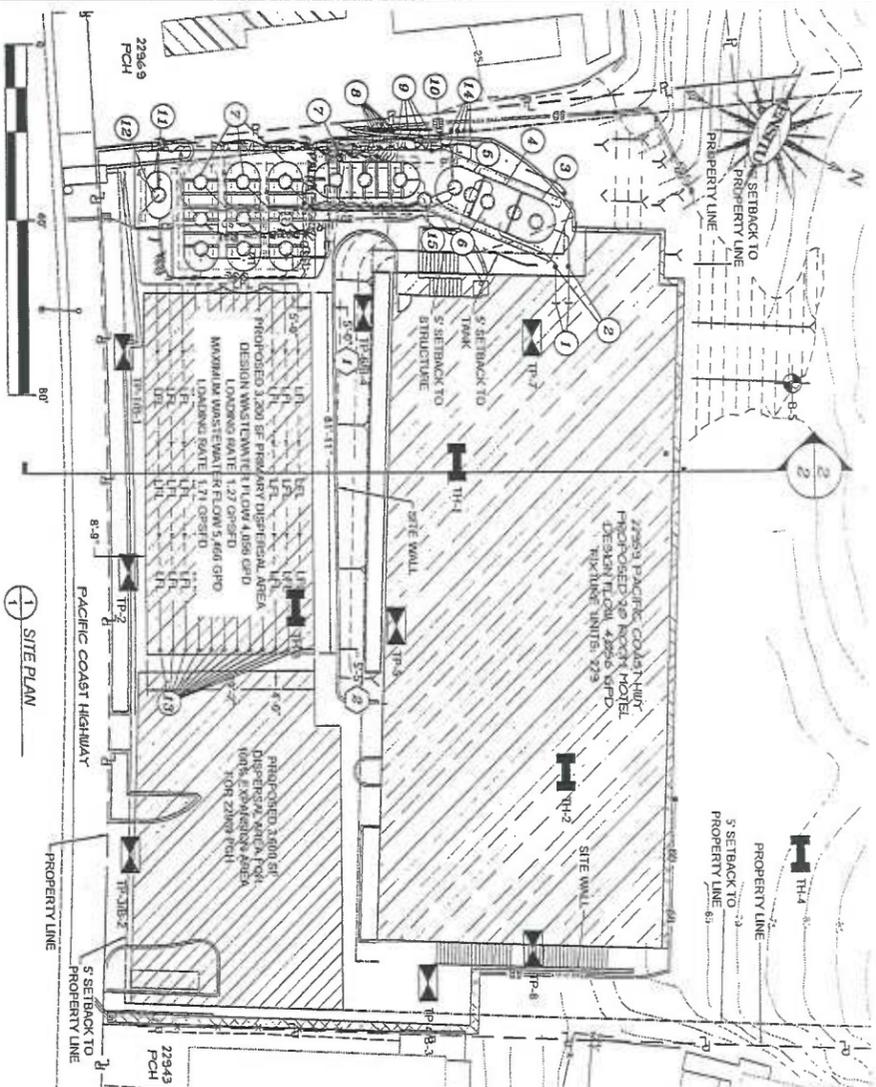
- This conformance review is for a new motel and new advanced onsite wastewater treatment system (OMTS). The new OMTS shown conforms to the requirements of the City of Malibu Municipal Code (MMC) and the Local Coastal Program (LCP).
- This conformance review relates only to the minimum requirements of the MMC, and the LCP, and does not include an evaluation of any geological or other potential problems, which may require an alternative method of wastewater treatment.
- This conformance review is valid for one year, or until MMC, and/or LCP, and/or Administrative Policy changes render it noncomplying.
- The OMTS must be maintained in accordance with the Monitoring Plan contained in the OMTS final design report by Ensitu Engineering dated 2-21-19.

CITY OF MALIBU  
ENVIRONMENTAL SUSTAINABILITY DEPT.  
ENVIRONMENTAL HEALTH

CONFORMANCE REVIEW

SIGNATURE: *John N. Yaroslaski* DATE: 3-29-19

THIS IS NOT AN APPROVAL. FINAL APPROVAL IS REQUIRED PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMITS.



SCALE: 1" = 40'-0"

Use	Description	Type	Per Capita Flow	Capita Flow	Number	Flow Per Use	Design Assumptions	Design Flow	Design Flow	Design Flow
1	Hotel and Restaurant	Hotel and Restaurant	50 gpd/occupant	(1)	10 bed space	1,500	700 gpd/occupant	7,000 gpd	7,000 gpd	7,000 gpd
2	Cooking for Hotel	Food Prep	10 gpd/employee	(1)	50 People	500	100 gpd/employee	5,000 gpd	5,000 gpd	5,000 gpd
3	Pool Spa and Hot Air	Pool	20 gpd/employee	(1)	50 Employees	1,000	200 gpd/employee	10,000 gpd	10,000 gpd	10,000 gpd
4	Club Spa and Hot Air	Club Spa	21 gpd/employee	(1)	50 People	1,050	210 gpd/employee	10,500 gpd	10,500 gpd	10,500 gpd
5	Hotel Operations	Cooking, Dishwashing, Housekeeping, Maintenance, Storage, Mail	10 gpd/employee	(1)	90 Employees	900	200 gpd/employee	18,000 gpd	18,000 gpd	18,000 gpd
Total Peak and Design Flow							43,550.00	Weighted Average	110	6.97
Expected Average Flow							21,744.00	Weighted Average	110	6.97

Item	Qty	Description	MFG/PART NUMBER
1	2	CONNECTION TO EXISTING GRAVITY SEWER LINE#4	
2	2	GRAVITY CLEAN-OUT#1	
3	1	GREASE INTERCEPTOR 4700 GALLON FIRST COMPARTMENT OF 15000 GALLON XERXES TANK	XERXES
4	1	EQUALIZATION TANK 5200 GALLON SECOND COMPARTMENT OF 15000 GALLON XERXES TANK	XERXES
5	1	ANOXIC TANK 4700 GALLON THIRD COMPARTMENT OF 15000 GALLON XERXES TANK	XERXES
6	1	SOLID HANDLING DUXEY PUMP SYSTEM#18	TUDOR
7	1	TREATMENT TANK#18	MICROSEPTEC
8	4	REMOVE TREATMENT CONTROL UNIT DEGRADED COMMUNICATIONS AND POWER AS OUTLINED IN MANUFACTURER INSTALLATION GUIDELINES#18	MICROSEPTEC
9	2	CONTROL LINE FILTERED COMMUNICATION AND MANUFACTURER INSTALLATION GUIDELINES#18	GEORLOW
10	1	DOSING TANK 6000 GALLON FIBERGLASS#18	XERXES
11	1	DUXEY PUMP SYSTEM#18	ORNOCO
12	1	VENT PIPING SYSTEM#18	ORNOCO
13	1	VENT PIPING SYSTEM#18	ORNOCO
14	1	VENT PIPING SYSTEM#18	ORNOCO
15	1	VENT PIPING SYSTEM#18	ORNOCO

Tag	Description	Specification
GSL	PROPOSED GRAVITY SEWER LINE	4" SCH40 PIP
REL	PROPOSED RIGID EFFLUENT LINE	4" SCH40 PIP
PAL	PROPOSED AIR VENT LINE	4" SCH40 PIP
PAL	PROPOSED AIR COMPRESSION LINE	1/2" SCH40 PIP
SDF	PROPOSED SUBSURFACE FURISH	1/2" SCH40 PIP

FINAL FOR APPROVAL  
ISSUED  
2/19/2019

JOHN N. YAROSLASKI  
PRINCIPAL ENGINEER

PROJECT SCHEMATIC  
NO SCALE

Project Engineer: John N Yaroslaski PE # 60149  
 DPC NAME: P:\498-01 Bakim Motel, 22959 Pacific Coast Highway\Engineering\Cad Design\498-01-100 Bakim Motel, 22959 Pacific Coast Highway PFCR\498-01-100 Bakim Motel, 22959 Pacific Coast Highway PFCR-04.dwg  
 CREATED: Thursday, February 21, 2019 8:58:18 AM  
 MOD. TIME: Thursday, February 21, 2019 2:24:41 PM  
 PLOT TIME: Thursday, February 21, 2019 2:28:12 PM

22959 PACIFIC COAST HIGHWAY AOWTS  
 CONFORMANCE REVIEW PLANS  
 PW-SITE PLAN AND TABLES 11X17  
 MALIBU, CALIFORNIA

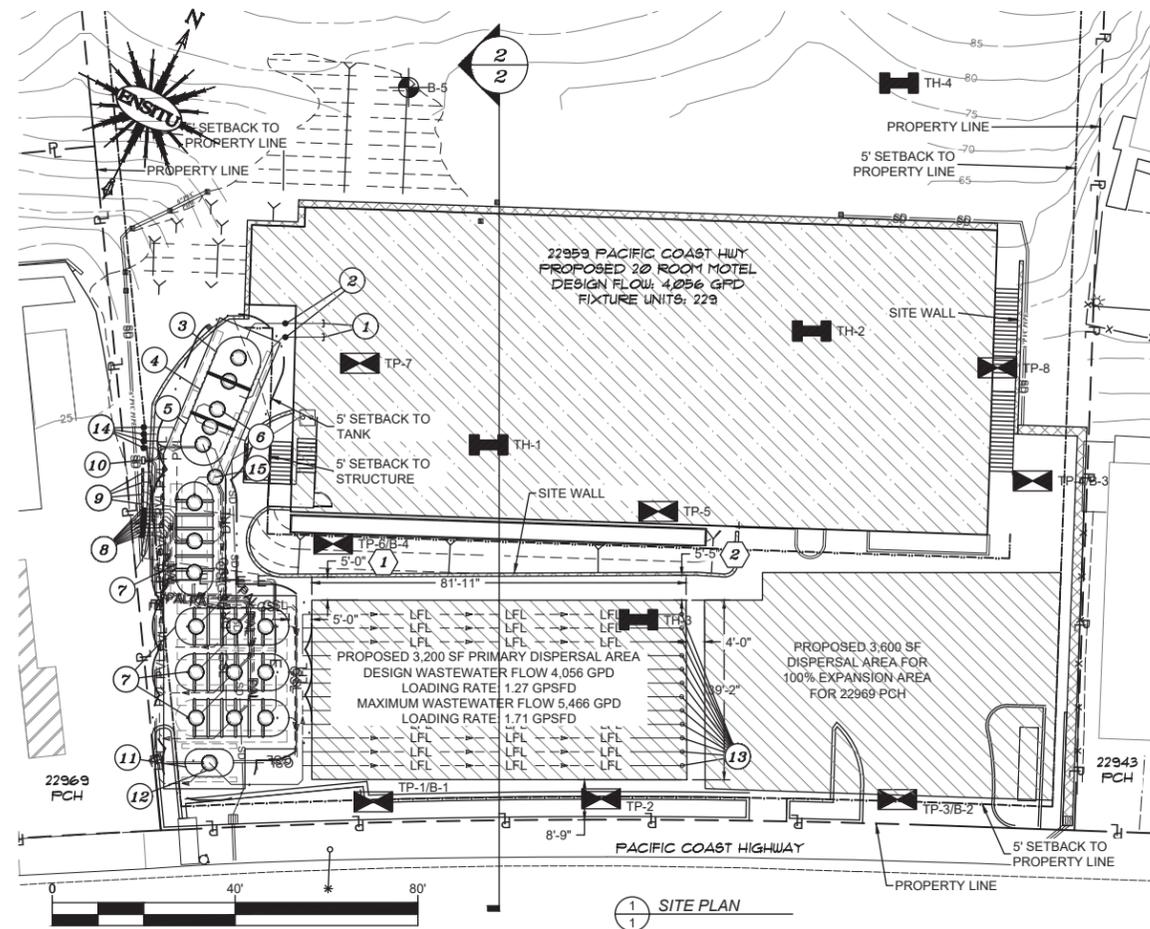
DATE: 2/19/2019  
 DRAWN BY: JNY  
 CHECKED BY: JNY  
 JOB NO. 498-01  
 SHEET 1 OF 2

REVISIONS

NO.	DATE	BY

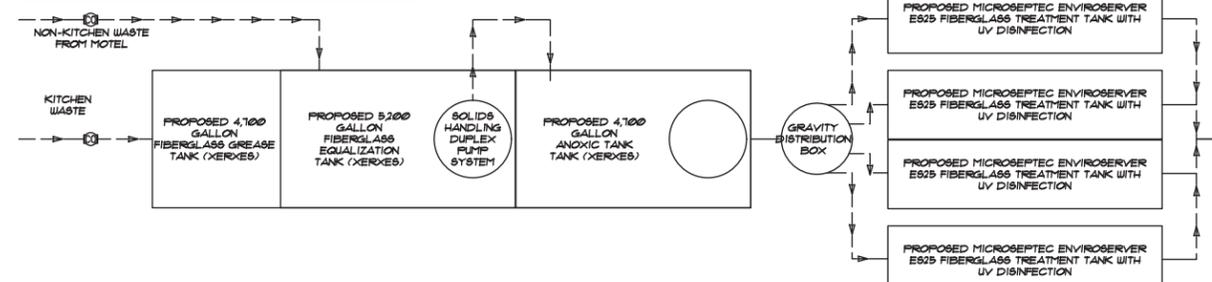
ENSITU ENGINEERING, INC. 780 MONTEREY AVE., STE. B  
 MALIBU, CA 90265  
 Tel: 805.772.0150  
 Fax: 805.772.0615  
 ENR@ensitu.com

"Dedicated to achieving higher standards in onsite and decentralized wastewater systems."



SCALE: 1" = 40'-0"

Design Assumptions		OWTS Capacity (Design and Maximum)						
[1] City of Malibu, "Plumbing Code of the City of Malibu," City of Malibu, Malibu, 2011.	20 rooms	Grease Interceptor	Xerxes 15,000 gallon tank 1st compartment					
	1.5 beds/room	Equalization Tank	Xerxes 15,000 gallon tank 2nd compartment					
	30 beds	Anoxic Tank	Xerxes 15,000 gallon tank 3rd compartment					
	1.75 Guests per Bed							
	53 Guests							
Commercial Uses Wastewater Flow and Strength Calculations								
Use	Description	Type	Per Capita Flow	Rational Flow Per Capita Flow	Number	Flow Per Use gal/day	mg/L BOD <sub>5</sub>	lb/day BOD <sub>5</sub>
1	Bed and Breakfast Room	Motel no Kitchen Waste	50 gal/bed space	[1]	30 bed space	1,500	220	2.76
2	Cooking for Hotel	Food Prep	10 gal/person	[1] Difference Between Motel With and Without Kitchen Waste	53 People	530	600	2.66
3	Pool Use	Pool	20 gal/employee	[1]	3 Employee	60	300	0.16
4	Gym, Spa, and Mini-Bar	Club Use	22 gal/person	[2] Assume County Club	53 People	1,166	300	2.92
3	Hotel Operations	Concierge, Bellman, Housekeepers, Maintenance, Manager, Staff	10 gal/employee	[1]	9 Employee	90	300	0.23
Total Peak and Design Flow						4,056.00	Weighted Average	
Expected Average Flow						2,704.00	mg/L BOD <sub>5</sub>	310
							lb/day BOD <sub>5</sub>	10.50
								6.99
SETBACK REDUCTIONS								
COMPONENT	SITE ELEMENT	REQUIRED	ACTUAL					
1	DISPERSAL FIELD	SITE WALL	8'	5'-0"				
2	DISPERSAL FIELD	SITE WALL	8'	5'-5"				



- GENERAL NOTES:
- PRIOR TO COMMENCING WORK TO ABANDON, REMOVE, OR REPLACE EXISTING ONSITE WASTEWATER TREATMENT SYSTEM (OWTS) COMPONENTS AN "OWTS ABANDONMENT PERMIT" SHALL BE OBTAINED FROM THE CITY OF MALIBU. ALL WORK PERFORMED IN THE OWTS ABANDONMENT, REMOVAL OR REPLACEMENT AREA SHALL BE PERFORMED IN STRICT ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL AND OCCUPATIONAL SAFETY AND HEALTH REGULATORY REQUIREMENTS. THE OBTAINMENT OF ANY SUCH REQUIRED PERMITS OR APPROVALS FOR THIS SCOPE OF WORK SHALL BE THE RESPONSIBILITY OF THE APPLICANT AND THEIR AGENTS.
  - EXISTING OWTS COMPONENTS SHALL BE ABANDONED THE EXISTING SEPTIC TANK, AND SEEPAGE PIT SHALL BE PROPERLY ABANDONED PURSUANT TO CITY OF MALIBU ORDINANCE 435, SECTION 15.40.170 C, AND SECTION 15.40.170 D, TITLE 28 OF THE LOS ANGELES COUNTY CODE, INCORPORATING THE MOST CURRENT CALIFORNIA PLUMBING CODE, LOCAL PLUMBING CODE, AND POLICIES. METHOD OF ABANDONMENT SHALL BE DETERMINED BY THE ENGINEER AND/OR THE OWNER'S REPRESENTATIVE.
  - SEWER PIPE SHALL BE BEDDED IN ACCORDANCE WITH SPECIFICATIONS AND TITLE 28 OF THE LOS ANGELES COUNTY CODE, INCORPORATING THE MOST CURRENT CALIFORNIA PLUMBING CODE, LOCAL PLUMBING CODE, AND ORDINANCES.
  - SYSTEM COMPONENTS AND APPURTENANCES (INCLUDING CLEAN-OUTS, VENTS, BACKWATER VALVES, ETC.) SHALL BE INSTALLED IN ACCORDANCE WITH TITLE 28 OF THE LOS ANGELES COUNTY CODE, INCORPORATING THE MOST CURRENT CALIFORNIA PLUMBING CODE, LOCAL PLUMBING CODE, AND POLICIES.
  - ELECTRICAL COMPONENTS AND APPURTENANCES SHALL BE INSTALLED IN ACCORDANCE WITH TITLE 27 OF THE LOS ANGELES COUNTY CODE, INCORPORATING THE MOST CURRENT CALIFORNIA ELECTRICAL CODE, LOCAL ELECTRICAL CODE, AND ORDINANCES.
  - A REGISTERED GEOTECHNICAL ENGINEER, UNDER THE DIRECTION OF THE OWNER, SHALL DETERMINE IF THE WASTEWATER LOADING RATE WILL CAUSE THE EXISTING SLOPE TO BECOME UNSTABLE. ENSITU ENGINEERING INC., IS NOT A GEOTECHNICAL ENGINEERING FIRM, THEREFORE, WE CAN NOT PREDICT AND/OR DETERMINE THE STABILITY OF THE EXISTING SLOPE.
  - THE PROJECT ENGINEERING GEOLOGIST SHALL OBSERVE THE INSTALLATION OF THE TANK AND DISPERSAL SYSTEM COMPONENTS OF THE AOWTS (INCLUDING BUT NOT LIMITED TO: (A) TANK EXCAVATION, BEDDING, AND BACKFILL (B) SEEPAGE PITS EXCAVATION, CONSTRUCTION, AND BACKFILL (C) SUBSURFACE DISPERSAL SYSTEM BEDDING, FILL MATERIAL, CONSTRUCTION, AND BACKFILL) AND PROVIDE THE CITY INSPECTOR WITH A FIELD MEMORANDUM(S) DOCUMENTING AND VERIFYING THAT THE TANK AND DISPERSAL SYSTEM WAS INSTALLED PER APPROVED AOWTS PLANS.
  - LEACH FIELDS AND DISPERSAL SYSTEMS DESIGNATED AS SAND CATEGORY: ANY REMAINING FILL MATERIAL AND ANY BEACH SAND SEDIMENT THAT MIGHT HAVE REDUCED PERMEABILITY FROM EXISTING LEACH FIELD OPERATIONS ENCOUNTERED BELOW THE BOTTOM OF THE PROPOSED LEACH FIELD OR ANY MATERIAL ENCOUNTERED IN THE CONSTRUCTION OF THE LEACH FIELD THAT IS NOT CATEGORIZED AS BEACH SAND DEPOSITS SHALL BE EXCAVATED TO THE LEVEL OF THE NATIVE BEACH SAND DEPOSITS AND REPLACED WITH DOUBLE-WASHED SAND. THE PROJECT ENGINEERING GEOLOGIST SHALL OBSERVE THE EXCAVATION OF THE LEACH FIELD AND CONFIRM IN WRITING THAT ALL THE DELETERIOUS FILL AND NON-BEACH SAND MATERIALS BELOW THE LEACH FIELD HAVE BEEN REMOVED AND REPLACED WITH CLEAN SAND AND THE LEACH FIELD WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVED OWTS PLANS.
  - SUBSURFACE DRIP LINE SHALL BE PLACED IN UNCOMPACTED NATIVE SOILS RIPPED AND TILLED A MINIMUM OF 18 INCHES. SOIL SHALL BE AMENDED TO BE 30% SAND, 30% MUD, 40% NATIVE OR LANDSCAPE DESIGNER SHALL BE CONTACTED TO ADVISE CONTRACTOR ON TYPE OF TOPSOIL TO IMPORT FOR MINIMUM BURIAL DEPTH. DISPERSAL FIELD SHALL BE PLANTED AND ESTABLISHED PRIOR TO OCCUPANCY (ENGINEER TO VERIFY)
  - ALL DIMENSIONS AND GRADES SHALL BE VERIFIED BY CONTRACTOR PRIOR TO SYSTEM INSTALLATION. BUILDING SEWER DEPTH OR CONNECTION POINT WAS NOT PROVIDED AND SHALL BE DETERMINED BY CONTRACTOR PRIOR TO CONSTRUCTION
  - CONTRACTOR TO VERIFY DEPTH AND LOCATION OF BUILDING SEWER CONNECTION, MINIMUM 2% SLOPE FROM STRUCTURE TO CONNECTION POINT.
  - ONSITE WASTEWATER TREATMENT SYSTEM SHALL BE VENTED IN ACCORDANCE WITH TITLE 28 OF THE LOS ANGELES COUNTY CODE, INCORPORATING THE MOST CURRENT CALIFORNIA PLUMBING CODE, LOCAL PLUMBING CODE, AND POLICIES.
  - THE OWTS IS SITED AS FAR LANDWARD AS FEASIBLE.

EQUIPMENT SCHEDULE			
ITEM	QTY	DESCRIPTION	MFG/PART NUMBER
1	2	CONNECTION TO EXISTING GRAVITY SEWER LINES <sup>[1]</sup>	
2	2	GRAVITY CLEAN-OUT <sup>[1]</sup>	
3	1	GREASE INTERCEPTOR 4,700 GALLON FIRST COMPARTMENT OF 15,000 GALLON XERXES TANK	XERXES
4	1	EQUALIZATION TANK 5,240 GALLON SECOND COMPARTMENT OF 15,000 GALLON XERXES TANK*	XERXES
5	1	ANOXIC TANK 4,700 GALLON THIRD COMPARTMENT OF 15,000 GALLON XERXES TANK	XERXES
6	1	SOLIDS HANDLING DUPLEX PUMP SYSTEM <sup>[2]</sup>	TSURUMI
7	2	TREATMENT TANK <sup>[2]</sup>	MICROSEPTEC ES25
8	4	AIR COMPRESSOR <sup>[2]</sup>	MICROSEPTEC
9	2	REMOTE TELEMETRY CONTROL UNIT DEDICATED COMMUNICATION AND POWER AS OUTLINED IN MANUFACTURER INSTALLATION GUIDELINES <sup>[2]</sup>	MICROSEPTEC
10	1	CONTROL UNIT DEDICATED COMMUNICATION AND POWER AS OUTLINED IN MANUFACTURER INSTALLATION GUIDELINES <sup>[2]</sup>	GEOFLOW
11	1	DOSING TANK (5,000 GALLON, FIBERGLASS)*	XERXES
12	1	DUPLEX PUMP SYSTEM <sup>[2]</sup>	ORENCO
13	12	DISPERSAL FIELD CLEANOUTS	
14	2	VENT ASSEMBLY <sup>[2]</sup>	ORENCO
[1]	ALL PLUMBING APPURTENANCES AND WORK SHALL COMPLY WITH CURRENT LOCAL, COUNTY, AND STATE PLUMBING CODES. APPURTENANCES AND WORK INCLUDE, BUT ARE NOT LIMITED TO: CONNECTION TO BUILDING PLUMBING, VENTILATION, ISOLATION, BACKWATER VALVES, CLEANOUTS, AND FITTINGS.		
[2]	ALL ELECTRICAL APPURTENANCES INCLUDING BUT NOT LIMITED TO: CONDUIT, CONDUCTOR, CONTROL PANELS, CONTACTORS, FLOATS, PUMPS, DISCONNECTS, AND COMMUNICATION DEVICES SHALL COMPLY WITH CURRENT LOCAL, COUNTY, AND STATE ELECTRICAL CODE AND CURRENT NATIONAL ELECTRIC CODE CONDUIT AND CONDUCTOR RUNS AND SIZING SHOWN ON PLAN ARE FOR ALIGNMENT AND COST ESTIMATION. ELECTRICAL CONTRACTOR SHALL SPECIFY ALL ELECTRICAL APPURTENANCES. CONTROL AND POWER CONDUCTORS SHALL BE PLACED IN SEPARATE CONDUIT		

PIPING SCHEDULE		
TAG	DESCRIPTION	SPECIFICATION
GSL	PROPOSED GRAVITY SEWER LINE	4" SCH40 PVC
PEL	PROPOSED PUMPED EFFLUENT LINE	2" SCH80 PVC
PVL	PROPOSED AIR VENT LINE	4" SCH40 PVC
PAL	PROPOSED AIR COMPRESSOR LINE	1" SCH80 PVC
SDF	PROPOSED SUBSURFACE FLUSH	1/2" SCH80 PVC

**FINAL FOR APPROVAL ISSUED 2/19/2019**

DATE: 2/19/2019  
 DESIGNED BY: JNY  
 DRAWN BY: JNY  
 CHECKED BY: JNY  
 JOB NO. 498-01  
 SHEET 1 OF 2  
**JOHN N. YAROSLASKI**  
 PRINCIPAL ENGINEER

Project: Engineer: John N. Yaroslaski, P.E. 60149  
 22959 Pacific Coast Highway, Malibu, CA 90263  
 COMMUNITY MAP: Thursday, February 21, 2019 2:24:41 PM  
 MOD. TIME: Thursday, February 21, 2019 2:24:41 PM  
 PLOT TIME: Thursday, February 21, 2019 2:26:12 PM

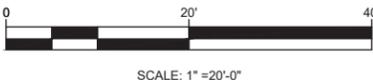
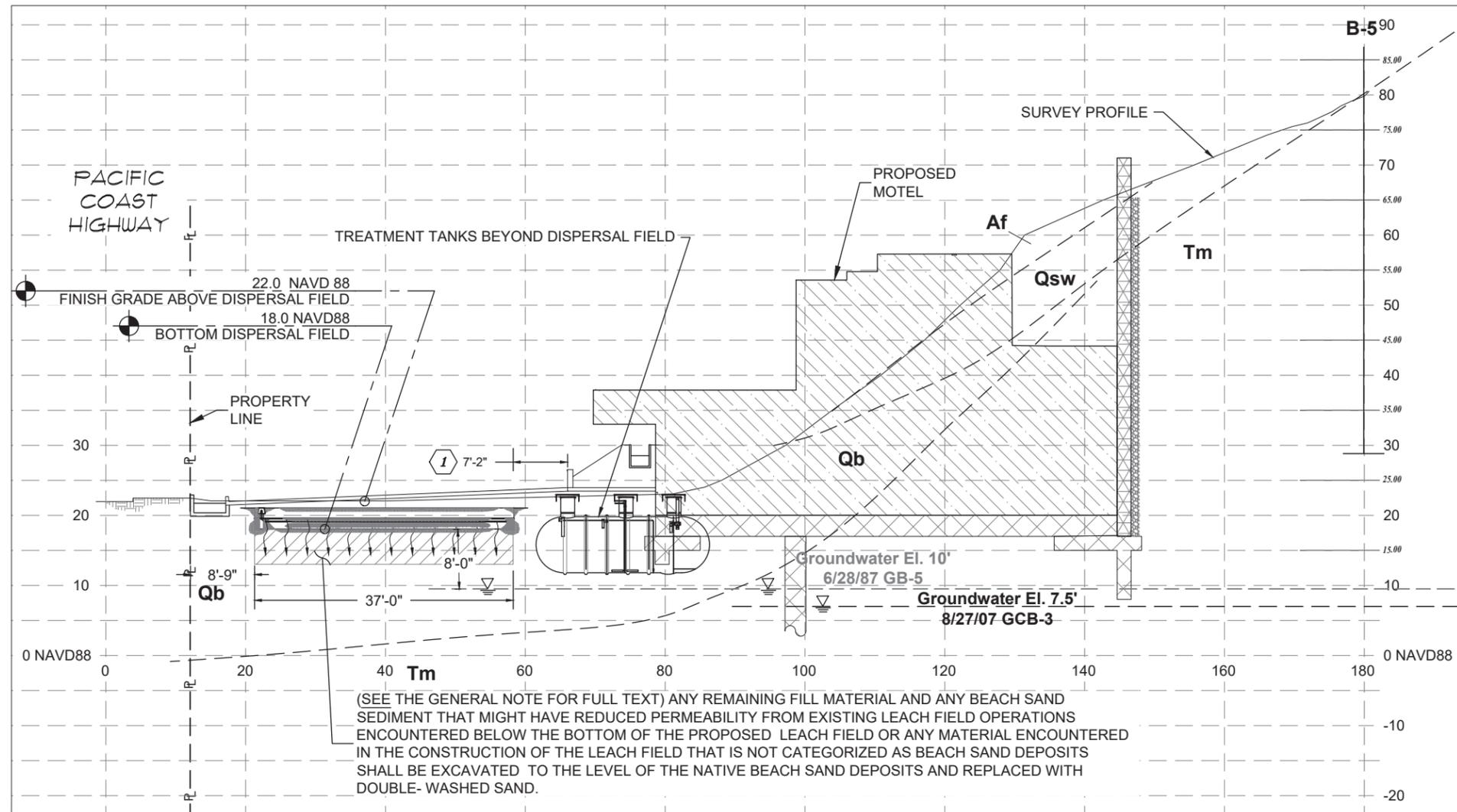
REGISTERED PROFESSIONAL ENGINEER  
 JOHN N. YAROSLASKI  
 CIVIL  
 STATE OF CALIFORNIA  
 60149  
 EXPIRES: 02/20/2021

22959 PACIFIC COAST HIGHWAY AOWTS  
 CONFORMANCE REVIEW PLANS  
 PW-SITE PLAN AND TABLES 11X17  
 MALIBU, CALIFORNIA

ENSITU ENGINEERING, INC.  
 780 MONTEREY AVE., STE. B  
 MALIBU, CA 90263  
 Tel: 805.772.0100  
 Fax: 805.772.0100  
 ENSITU@ensitu.com

REVISIONS

NO.	DATE	BY



(SEE THE GENERAL NOTE FOR FULL TEXT) ANY REMAINING FILL MATERIAL AND ANY BEACH SAND SEDIMENT THAT MIGHT HAVE REDUCED PERMEABILITY FROM EXISTING LEACH FIELD OPERATIONS ENCOUNTERED BELOW THE BOTTOM OF THE PROPOSED LEACH FIELD OR ANY MATERIAL ENCOUNTERED IN THE CONSTRUCTION OF THE LEACH FIELD THAT IS NOT CATEGORIZED AS BEACH SAND DEPOSITS SHALL BE EXCAVATED TO THE LEVEL OF THE NATIVE BEACH SAND DEPOSITS AND REPLACED WITH DOUBLE- WASHED SAND.

SETBACK REDUCTIONS				
	COMPONENT	SITE ELEMENT	REQUIRED	ACTUAL
1	DISPERSAL FIELD	SITE WALL	8'	5'-0"
2	DISPERSAL FIELD	SITE WALL	8'	5'-5"

LEGEND	
	B-XX BORING LOCATION
	TH-X TEST HOLE LOCATION
	TP-X TEST PIT LOCATION
	TP-X/B-X TEST PIT LOCATION / BORING LOCATION
	PROPOSED DISPERSAL FIELD
	FUTURE/EXPANSION DISPERSAL FIELD
	STRUCTURES
	SITE WALL
	HARDSCAPE

Project Engineer: John N. Yevlinskiy PE # 60149  
 Date: 2/19/2019  
 Mod. Time: Thursday, February 21, 2019 2:24:41 PM  
 Plot Time: Thursday, February 21, 2019 2:26:14 PM

22959 Pacific Coast Highway AOWTS  
 CONFORMANCE REVIEW PLANS  
 PW-FIELD SECTION 11x17  
 MALIBU, CALIFORNIA

Project: 22959 Pacific Coast Highway AOWTS  
 Date: 2/19/2019  
 Mod. Time: Thursday, February 21, 2019 2:24:41 PM  
 Plot Time: Thursday, February 21, 2019 2:26:14 PM

DATE: 2/19/2019  
 DESIGNED BY: JNY  
 DRAWN BY: JNY  
 CHECKED BY: JNY

Project: 22959 Pacific Coast Highway AOWTS  
 Date: 2/19/2019  
 Mod. Time: Thursday, February 21, 2019 2:24:41 PM  
 Plot Time: Thursday, February 21, 2019 2:26:14 PM

Project: 22959 Pacific Coast Highway AOWTS  
 Date: 2/19/2019  
 Mod. Time: Thursday, February 21, 2019 2:24:41 PM  
 Plot Time: Thursday, February 21, 2019 2:26:14 PM

JOB NO.  
498-01

SHEET  
2 OF 2

Project: 22959 Pacific Coast Highway AOWTS  
 Date: 2/19/2019  
 Mod. Time: Thursday, February 21, 2019 2:24:41 PM  
 Plot Time: Thursday, February 21, 2019 2:26:14 PM



ENGINEERING INC  
www.ensitu.com

Ensitu Engineering Inc.  
7475 Carmelita Ave  
Atascadero, CA 93422  
tel: 805.772.0150  
fax: 805.772.0813

## Flow and Waste Strength Calculations

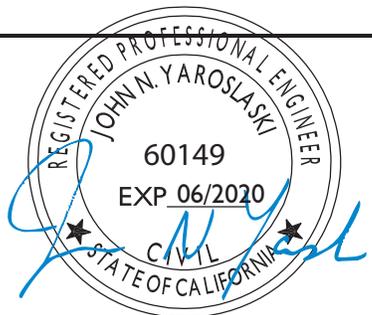
Project:	498-01.100 Hakim Motel	Designed By:	JNY	Design Date:	19-Feb-19
Address:	22959 Pacific Coast Highway	Checked By:	JNY	Check Date:	19-Feb-19

### Design Assumptions

[1] City of Malibu, "Plumbing Code of the City of Malibu," City of Malibu, Malibu, 2011.	20	rooms
	1.5	beds/room
	30	beds
	1.75	Guests per Bed
	53	Guests

### Commercial Uses Wastewater Flow and Strength Calculations

Use	Description	Type	Per Capita Flow	Rational For Per Capita Flow	Number	Flow Per Use gal/day	mg/L BOD <sub>5</sub>	
							mg/L BOD <sub>5</sub>	lb/day BOD <sub>5</sub>
1	Bed and Breakfast Room	Motel no Kitchen Waste	50 gal/bed space	[1]	30 bed space	1,500	220	2.76
2	Cooking for Hotel	Food Prep	10 gal/person	[1] Difference Between Motel With and Without Kitchen Waste	53 People	530	600	2.66
			20 gal/employee	[1]	3 Employee	60	300	0.16
3	Pool Use	Pool	10 gal/person	[1]	53 People	530	300	1.33
			20 gal/employee	[1]	6 Employee	120	300	0.31
4	Gym, Spa, and Mini-Bar	Club Use	22 gal/person	[2] Assume County Club	53 People	1,166	300	2.92
			20 gal/employee	[1]	3 Employee	60	300	0.16
3	Hotel Operations	Concierge, Bellman, Housekeepers, Maintenance, Manager, Staff	10 gal/employee	[1]	9 Employee	90	300	0.23
Total Peak and Design Flow						4,056.00	Weighted Average	
							mg/L BOD <sub>5</sub>	lb/day BOD <sub>5</sub>
							310	10.50
Expected Average Flow      Peaking Factor 1.5						2,704.00	310	6.99





ENGINEERING INC  
[www.ensitu.com](http://www.ensitu.com)

Ensitu Engineering Inc.  
 7475 Carmelita Ave  
 Atascadero, CA 93422  
 tel: 805.772.0150  
 fax: 805.772.0813

## MicroSepTec Design

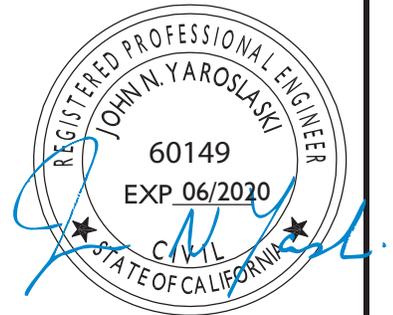
Project: 498-01.100 Hakim Motel  
 Address: 22959 Pacific Coast Highway

Designed By: JNY  
 Checked By: JNY

Design Date: February 19, 2019  
 Check Date: February 19, 2019

### Commercial MicroSepTec Design

Design Flow	4,056.00	gpd
Design Influent BOD	310	mg/L
Design Effluent BOD	20	mg/L
Design Organic Loading BOD	9.82	lb BOD <sub>5</sub>
MicroSepTec ES25 Base Organic Removal <sup>1</sup>	4.17	lb BOD <sub>5</sub>
Minimum Number of MicroSepTec ES25 Required	3.00	units
Design Number of MicroSepTec ES25 Required	4.00	units
Design Organic Removal	16.68	lb BOD <sub>5</sub>
Maximum Effluent Flow	6892	gpd



### <sup>1</sup>MST Organic Removal Base

Model	Waste Flow (gpd)	Waste Strength (mg/L BOD <sup>5</sup> )		Organic Removal (lbBOD <sub>5</sub> )
		influent	Effluent	
MicroSepTec ES6	600	220	20	1.00
MicroSepTec ES12	1200	220	20	2.00
MicroSepTec ES25	2500	220	20	4.17

## Sand Category



ENGINEERING INC

www.ensitu.com

Ensitu Engineering Inc.  
780 Monterey Ave Suite B  
Morro Bay, CA 93442  
tel: 805.772.0150  
fax: 805.772.0813

# Leaching Field Design Calculations Sand Category

Project: 498-01.100 Hakim Motel  
Address: 22959 Pacific Coast Highway

JNY  
JNY

Des Date: 19-Feb-19  
Ch Date: 19-Feb-19

**Equations and Variables:**  
**Septic Tank Size Calculations**  
 $V_{ST} = Q_p \times 1.5$  where  $Q_p \leq 1500 \text{gpd}$  eq.1  
 $V_{ST} = Q_p \times 0.75 + 1125$  where  $Q_p > 1500 \text{gpd}$  eq.2  
where:  
 $V_{ST}$  = septic tank volume, gallons  
 $Q_p$  = peak flow, gpd

**Equations and Variables:**  
**Sand Category Leaching Field Calculations**  
 $A_M = \frac{Q_p}{L_M}$   
 $A_{PR} = \frac{Q_p}{L_p}$   
where:  
 $L_M$  = maximum leaching bed loading rate,  $\frac{\text{gallons}}{\text{ft}^2 \times \text{day}}$ , gpsfd  
= 2 gpsfd  
 $L_p$  = preferred leaching bed loading rate, gpsfd  
= 1.65 gpsfd  
 $A_M$  = minimum leaching bed size,  $\text{ft}^2$   
 $A_p$  = preferred leaching bed size,  $\text{ft}^2$

Septic Tank (ST) Calculations		
Peak Flow	4,056.00	gpd
Septic Tank Volume	4167	gal
Leaching Field Calculations		
Max Sand Category Loading Rate, $L_M$	2.00	gpsfd
Preferred Sand Category Loading Rate (LCP Chapter 18.7.O), $L_p$	1.75	gpsfd
Minimum Square Feet of Leaching Area Required, $A_M$	2028	$\text{ft}^2$
Preferred Square Feet of Leaching Area Required, $A_p$	2318	$\text{ft}^2$
Actual Calculated Leaching Area, $A_T$	2600	$\text{ft}^2$
Actual Loading Rate, $L_A$	1.56	gpsfd
Maximum Wastewater Calculations Leaching		
Max Sand Category Loading Rate, $L_M$	2.00	gpsfd
Design Leaching Area Required, $A_T$	2600	$\text{ft}^2$
Max Flow, $Q_M$	5200.0	gpd





Ensitu Engineering Inc.  
 7475 Carmelita Ave  
 Atascadero, CA 93422  
 tel: 805.772.0150

# Design Summary Table

[www.ensitu.com](http://www.ensitu.com)

fax: 805.772.0813

Project: 498-01.100 Hakim Motel Address: 22959 Pacific Coast Highway	Designed By: JNY Checked By: JNY	Design Date: February 19, 2019 Check Date: February 19, 2019
---	-------------------------------------	---

### OWTS Capacity (Design and Maximum)

Component	Description	Size/Capacity	Design Capacity	Max Capacity
Grease Interceptor	Xerxes 15,000 gallon tank 1st compartment	4,700 gallons	530 gpd	2,350 gpd
Equalization Tank	Xerxes 15,000 gallon tank 2nd compartment	5,200 gallons	1,200 gpd one-day peak	2,500 gpd one-day peak
Anoxic Tank	Xerxes 15,000 gallon tank 3rd compartment	4,700 gallons	3-4 times daily flow	3-4 times daily flow
Tankage	4-MicroSepTec ES25 in Parallel	30,160 gallons	229 fixture units	1,200 fixture units
Treatment	4-MicroSepTec ES25 in Parallel	16.68 lb BOD <sub>5</sub>	4,056 gpd at 310 mg/L BOD <sub>5</sub> (9.82 lb BOD <sub>5</sub> )	6,892 gpd at 310 mg/L BOD <sub>5</sub>
Disinfection	4-MicroSepTec ES25 in Parallel	10,000 gpd	4,056 gpd	10,000 gpd
Dispersal	2,600 ft <sup>2</sup> pressure dispersal field (Sand Category)	2,502 gpd	4056 gpd at 1.56 gpsfd	5200 gpd at 2 gpsfd





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# Fixtuer Unit Count

**Project:** 498-01 Hakim Motel  
: 22959 Pacific Coast Hwy

**Designed By:** JNY  
**Checked By:** JNY

**Des Date:** February 19, 2019  
**Ch Date:** February 19, 2019

Type of Plumbing Fixture	MAIN LEVEL		UPPER LEVEL		ROOF LEVEL		Existin g Fixtue s "A"	+	Propose d Fixtues "B"	=	Total Fixtures ="(A + B)"	x	Unit Value "C"	=	Total Existing Fixture Units "A x C"	Total Future Fixture Units "(A + B) x C"
	EX	PRO	EX	PRO	EX	PRO										
Bathtub or Combination Bath/Shower				1				+	1	=	1	x	2	=		2
Bidet(s)								+		=		x	2	=		
Bar Sink		1				1		+	2	=	2	x	1	=		2
Clothes Washer		1						+	1	=	1	x	3	=		3
Dishwasher		1						+	1	=	1	x	2	=		2
Laundry Sink		2		1				+	3	=	3	x	2	=		6
Lavatory (Wash Basin)		15		10				+	25	=	25	x	1	=		25
Kitchen Sink		2				1		+	3	=	3	x	2	=		6
Shower (Single Head)		10		10				+	20	=	20	x	2	=		40
Water Closet (Flush Toilet)		13		10				+	23	=	23	x	6	=		138
Addtl. Shower Head				1				+	1	=	1	x	1	=		1
Urinal		2						+	2	=	2	x	2	=		4
<b>Fixture Units Summary</b>																
Total Proposed Fixture Units												229				
Total Fixture Units												229				

### Fixture Count Certification

ENSITU ENGINEERING INC. ("EEI") Certifies the fixture count worksheet based on the Floor Plans provided by the Client. EEI assumes the floor plans provided are the most accurate and representative. If changes are made to the floor plans or errors are found in the floor plan it is the responsibility of the client to inform EEI.

Note:

- In completing this form, a room is considered a bedroom if it provides privacy, has an associated closet, and is in close proximity to a bathroom with bathtub and/or shower fixtures.
- EEI considers any sink in close proximity to a stove or a sink in a designated kitchen a kitchen sink. If the sink does not meet these criteria it will be considered a bar sink.
- For plumbing fixtures not shown in this table EEI used Malibu Plumbing Code (MPC) Table 7-3

ENSITU ENGINEERING INC.

Date 02/19/2019 By John N Yaroslask PE





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## Required (Minimum) Septic Tank Volume

**Project:** 498-01 Hakim Motel  
: 22959 Pacific Coast Hwy

**Designed By:** JNY  
**Checked By:** JNY

**Des Date:** February 19, 2019  
**Ch Date:** February 19, 2019

Total Bedrooms	Total Fixture Units	Minimum Septic Tank Size (gal)
1 to 6	33	1500
	34 to 45	2000
	46 to 55	2250
	56 to 60	2500
	61 to 70	2750
	71 to 80	3000
	81 to 90	3250
	91 to 100	3500

Septic Tank (ST) Calculations		
Total Proposed Fixture Units	229	
Total Fixture Units	229	
Minimum Septic Tank Size based on F	6725	gal
Design Tank Capacity	30160	gal

For extra bedroom, 150 gallons (568 liters) each.  
For extra dwelling units over 10, 250 gallons (946 liters) each  
For every one (1) FU greater than 100 total FUs, increase septic tank capacity by 25 gallons (Based on Table K-2, Malibu Plumbing Code)





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## Maximum Fixtures Based on Design Tankage

**Project:** 498-01 Hakim Motel  
: 22959 Pacific Coast Hwy

**Designed By:** JNY  
**Checked By:** JNY

**Des Date:** February 19, 2019  
**Ch Date:** February 19, 2019

Total Bedrooms	Total Fixture Units	Minimum Septic Tank Size (gal)
1 to 6	33	1500
	34 to 45	2000
	46 to 55	2250
	56 to 60	2500
	61 to 70	2750
	71 to 80	3000
	81 to 90	3250
	91 to 100	3500

Max Fixture Count Calculations	
Design Tank Capacity	30160 gal
Maximum Fixtures	1200

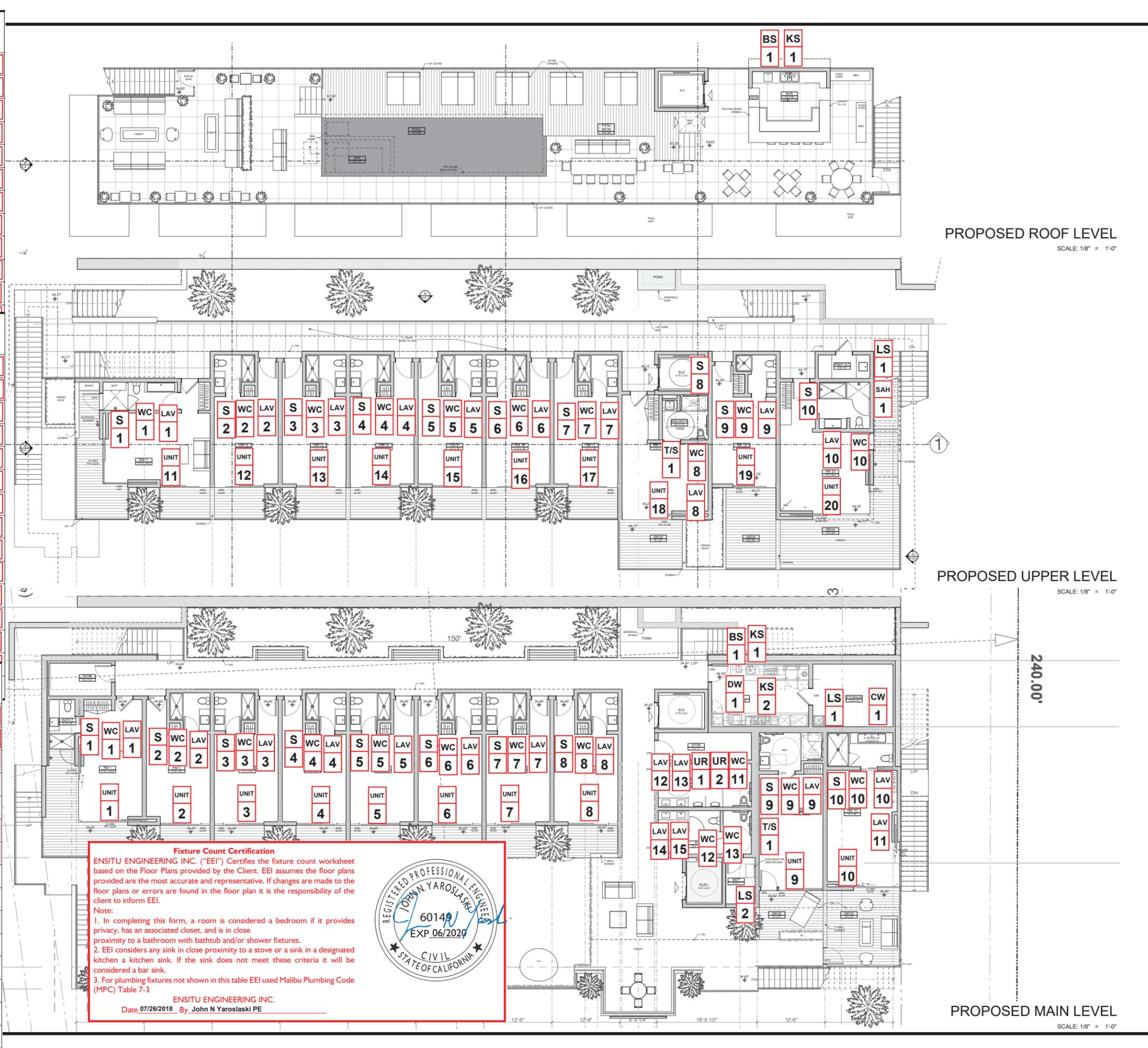
For extra bedroom, 150 gallons (568 liters) each.  
For extra dwelling units over 10, 250 gallons (946 liters) each  
For every one (1) FU greater than 100 total FUs, increase septic tank capacity by 25 gallons (Based on Table K-2, Malibu Plumbing Code)



Type of Plumbing Fixture	Fixtures
Bathtub or Combination Bath/Shower	
Bidet	
Bar Sink	1
Clothes Washer	
Dishwasher	
Laundry Sink	
Lavatory (Wash Basin)	
Kitchen Sink	1
Shower (Single Head)	
Water Closet (Flush Toilet)	

Type of Plumbing Fixture	Fixtures
Bathtub or Combination Bath/Shower	1
Bidet	
Bar Sink	
Clothes Washer	
Dishwasher	
Laundry Sink	1
Lavatory (Wash Basin)	10
Kitchen Sink	
Shower (Single Head)	10
Water Closet (Flush Toilet)	10
SHOWER ADDTL. HEAD	1
MOTEL UNITS	10

Type of Plumbing Fixture	Fixtures
Bathtub or Combination Bath/Shower	
Bidet	
Bar Sink	1
Clothes Washer	1
Dishwasher	1
Laundry Sink	2
Lavatory (Wash Basin)	15
Kitchen Sink	2
Shower (Single Head)	10
Water Closet (Flush Toilet)	13
URINAL	2
UNITS	10



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MARK	DATE	DESCRIPTION

**MALIBU MOTEL**  
22959 PACIFIC COAST HIGHWAY

SHEET TITLE  
**PROPOSED FLOOR PLANS**

DRAWING NO.  
**A-1.2**

PLOT DATE: 4/27/18  
SCALE  
DRAWN BY

October 16, 2018

Project 2506

Surfrider Plaza LLC  
1541 Ocean Avenue  
Santa Monica, CA 90401

Subject: **SUPPLEMENTAL REPORT No. 5**  
22959 Pacific Coast Highway  
Malibu, California

References:

- 1) Geotechnical Review Sheet by Cotton, Shires and Associates, Inc. and GeoDynamics, Inc. for the City of Malibu, Department of Building and Safety, dated August 6, 2018.
- 2) Update reports by GeoConcepts, Inc. covering the subject site, dated November 3, 2009 and June 20, 2018.
- 3) Preliminary Geologic and Geotechnical Engineering reports by GeoConcepts, Inc. covering the subject site, dated June 4, 2003 and December 4, 2014.
- 4) Supplemental reports by GeoConcepts, Inc. covering the subject site, dated April 27, 2012, June 27, 2012, February 26, 2015, May 29, 2015, September 21, 2015, and April 28, 2016.
- 5) Septic supplemental report by GeoConcepts, Inc. covering the subject site, dated June 16, 2015.

Dear Mr. Hakim:

Pursuant to your request, presented herein is a response to Reference 1. A copy of the review sheet is attached. To facilitate the review, the following responses are provided per the review letter:

Review Comment Responses:

Item 1: The previously proposed development included a two-story retail structure with subterranean parking constructed into the hillside and a one-story retail structure near

Pacific Coast Highway. A new onsite wastewater treatment system (OWTS) comprised of septic tanks and leach fields located in the parking lot between the two structures. A rear retaining wall over 70 feet high was required to support the three-level retain structure.

The currently propose development has been reduced in size to comprise a two-story hotel structure with subterranean parking. The location of the structure has moved approximately 20 feet south (towards Pacific Coast Highway). Therefore the proposed rear retaining wall has been reduced to a high of approximately 50 feet. The proposed leach fields have been moved closer to Pacific Coast Highway as well. In order to reduce wall heights, a 1.5:1 (horizontal:vertical) cut slope is proposed above the northwest portion of the proposed hotel.

Item 2: The attached Cross Sections A-A' and B-B' have been updated to reflect the currently proposed development. Cross Section C-C' and D-D' have been provided to illustrate the proposed driveway tunnel.

Item 3 The proposed cut slopes have been designed to allow for a drainage swale behind the retaining wall. As shown on Cross Section B-B' the proposed 1.5:1 (horizontal:vertical) cut slope is parallel to the existing slope face. A 2:1 slope would not catch at the top. Since only a thin layer of fill and colluvium will be removed, the proposed 1.5:1 (horizontal:vertical) cut slope will not reduce the surficial stability of the slope.

Item 4: It is recommended that all foundations be embedded into bedrock. Conventional foundations that require deepening into bedrock where the contact between the soil and bedrock is sloping should be designed creep loads.

Item 5: The shoring piles may proportioned per the Pile Capacity Chart in Reference No. 2 above.

The shoring design pressure has been revised based on the revised shoring heights and analysis within Reference No. 2.

Item 6: Based on the dense nature of the sand deposits ( $N_{160} > 15$ ), significant liquefaction lateral spreading displacements are not likely (Revised Multilinear Regression Equations for Predication of Lateral Spread Displacement, Youd, T. Leslie, et.al. 2002). Therefore, the pile that penetrate the beach deposits do not need to be designed for lateral pressures from lateral spreading.

Item 7: Acknowledged.

Item 8: The restrained portions of the retaining walls should be designed for the at-rest pressure of 101 pcf for the walls supporting 2:1 (H:V) slopes and 141 for pcf for walls supporting 1.5:1 (H:V) slopes. Restrained walls supporting beach deposits should be designed for 60 pcf.

Item 9: Concrete paving shall have a minimum thickness of 5 inches and shall be underlain by 4 inches of aggregate base. A subgrade modulus of 120 pounds per cubic inch may be assumed for design of concrete paving. Slabs on grade should be reinforced

with minimum #4 reinforcing bars, placed at (16) inches on center each way. These recommendations are considered as minimum unless superceded by the structural engineer. For standard crack control maximum expansion joint spacing of 15 feet should not be exceeded. Lesser spacings would provide greater crack control. Joints at curves and angle points are recommended.

Item 10: Wedge analysis of the slope wash is attached herein. The analysis calculated factors of safety higher than 1.5 and 1.0 for static and pseudostatic conditions. The recommended wall design pressures are adequate to resist downward creep of the slope wash materials.

Item 11: Acknowledged.

Building Plan Check Stage Review Comment Responses:

Item 1: The previous freeboard recommendation was four feet. Cross Sections A-A' and B-B' show four feet of freeboard on the retaining wall. The 15 foot slope setback is shown on the Cross Sections as well. In addition, a debris fence was recommended on the slope above the wall. The proposed debris fence is shown on the attached Geologic Map and on Cross Sections A-A' and B-B'. A detail for a Geobrug SL debris fence is attached.

Items 2 through 12: Acknowledged.

Should you have any questions regarding this report, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted,  
GeoConcepts, Inc.



Scott J. Walter  
Project Engineer  
GE 2476  
MAB/SJW: 2506-14

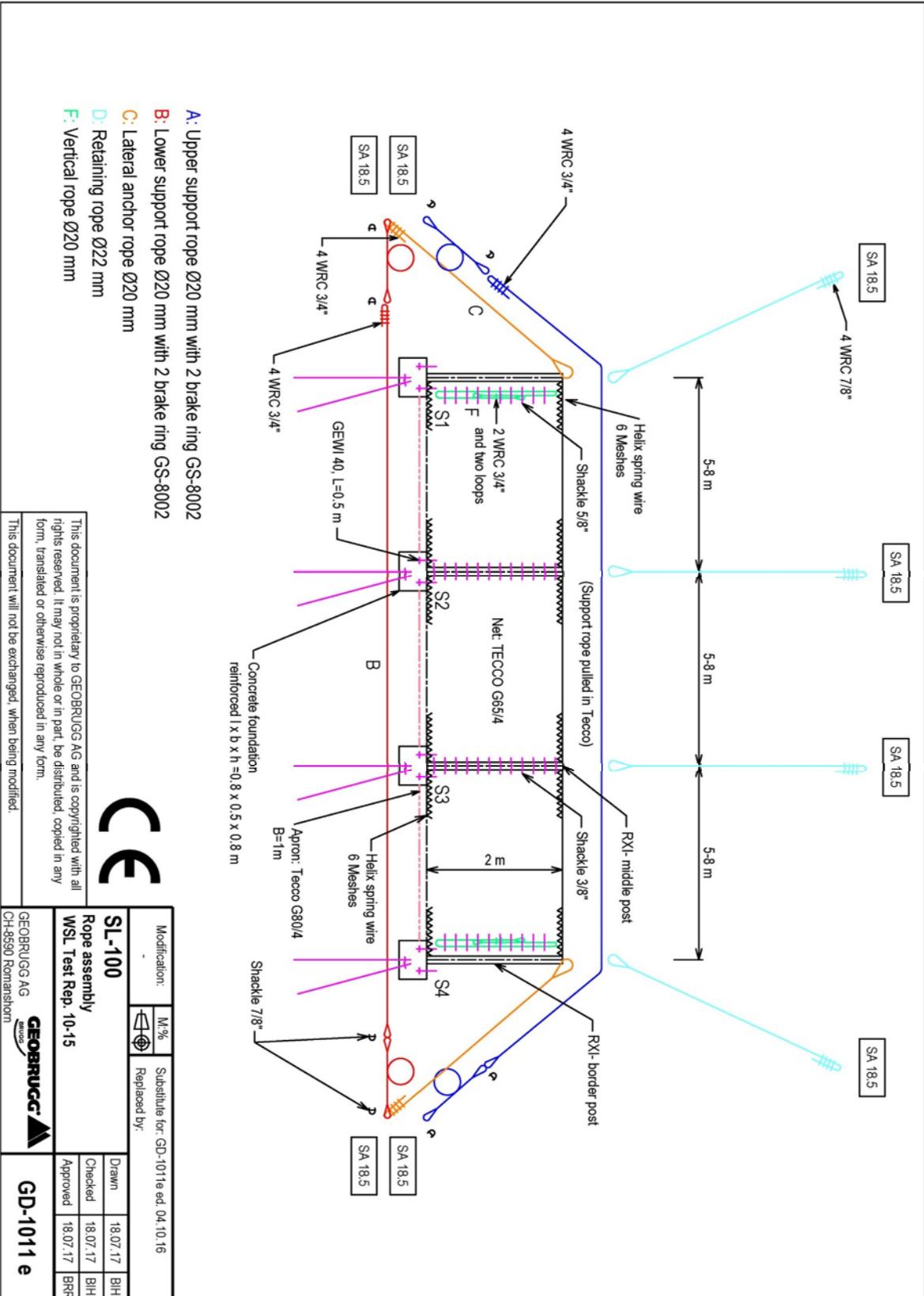


Mark A. Barrett  
Project Geologist  
CEG 2088

Enclosures: Geologic Map (In Pocket)  
Cross Sections (In Pocket)  
Geobrug SL Detail  
Geotechnical Review Sheet by the City of Malibu

Distribution: (1) Addressee  
(2) Joseph Lezama, Burdge and Associates

<b>2506-14 WEDGE STABILITY ANALYSIS A-A'</b>									
Seismic Coef.=		0.35							
Slice #	Phi	cohesion	density	length	angle	H1	H2	Hz	Area
1.0	35.0	350.0	130.0	21.0	32.0	2.0	4.0	18.0	54.0
2.0	35.0	350.0	130.0	23.0	32.0	4.0	6.0	19.0	95.0
3.0	35.0	350.0	130.0	25.0	32.0	6.0	6.0	21.0	126.0
4.0	35.0	350.0	130.0	34.0	32.0	6.0	5.0	30.0	165.0
5.0	35.0	350.0	130.0	17.0	32.0	5.0	9.0	14.0	98.0
6.0	35.0	350.0	130.0	15.0	32.0	9.0	12.0	13.0	136.5
Slice #	weight	driving	normal	resisting	seismic driving	seismic normal	seismic resisting		
1.0	7.0	3.7	6.0	11.5	5.8	4.7	10.6		
2.0	12.4	6.5	10.5	15.4	10.2	8.2	13.8		
3.0	16.4	8.7	13.9	18.5	13.5	10.9	16.3		
4.0	21.5	11.4	18.2	24.6	17.7	14.2	21.9		
5.0	12.7	6.8	10.8	13.5	10.5	8.4	11.9		
6.0	17.7	9.4	15.0	15.8	14.7	11.8	13.5		
	Static Analysis				Seismic Analysis				
	TOTAL DRIVING=		46.5	kips	TOTAL DRIVING=		72.5	kips	
	TOTAL RESISTING=		99.3	kips	TOTAL RESISTING=		87.9	kips	
	FACTOR OF SAFETY =		2.14		FACTOR OF SAFETY=		1.21		
	Unbalanced force=		-29.62	kips	Unbalanced force=		-8.19	kips	



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Modification:	M: %	Substitute for: GD-1011e ed. 04.10.16	Replaced by:
<b>SL-100</b>			
<b>Rope assembly</b>			
<b>WSL Test Rep. 10-15</b>			
Drawn	18.07.17	BH	
Checked	18.07.17	BH	
Approved	18.07.17	BRR	
<b>GD-1011 e</b>			

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Design Maps Detailed Report



**Design Maps Detailed Report**

ASCE 7-10 Standard (34.03747°N, 118.67687°W)

Site Class D – “Stiff Soil”, Risk Category I/II/III

**Section 11.4.1 – Mapped Acceleration Parameters**

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain  $S_s$ ) and 1.3 (to obtain  $S_1$ ). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From [Figure 22-1](#) <sup>[1]</sup>

$$S_s = 2.290 \text{ g}$$

From [Figure 22-2](#) <sup>[2]</sup>

$$S_1 = 0.827 \text{ g}$$

**Section 11.4.2 – Site Class**

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
Any profile with more than 10 ft of soil having the characteristics:			
<ul style="list-style-type: none"> <li>• Plasticity index <math>PI &gt; 20</math>,</li> <li>• Moisture content <math>w \geq 40\%</math>, and</li> <li>• Undrained shear strength <math>\bar{s}_u &lt; 500</math> psf</li> </ul>			
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft<sup>2</sup> = 0.0479 kN/m<sup>2</sup>

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**Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake ( $MCE_R$ ) Spectral Response Acceleration Parameters**

Table 11.4-1: Site Coefficient  $F_s$

Site Class	Mapped $MCE_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of  $S_s$

**For Site Class = D and  $S_s = 2.290$  g,  $F_s = 1.000$**

Table 11.4-2: Site Coefficient  $F_v$

Site Class	Mapped $MCE_R$ Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of  $S_1$

**For Site Class = D and  $S_1 = 0.827$  g,  $F_v = 1.500$**

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Design Maps Detailed Report

**Equation (11.4-1):**  $S_{MS} = F_a S_S = 1.000 \times 2.290 = 2.290 \text{ g}$

**Equation (11.4-2):**  $S_{M1} = F_v S_1 = 1.500 \times 0.827 = 1.240 \text{ g}$

**Section 11.4.4 — Design Spectral Acceleration Parameters**

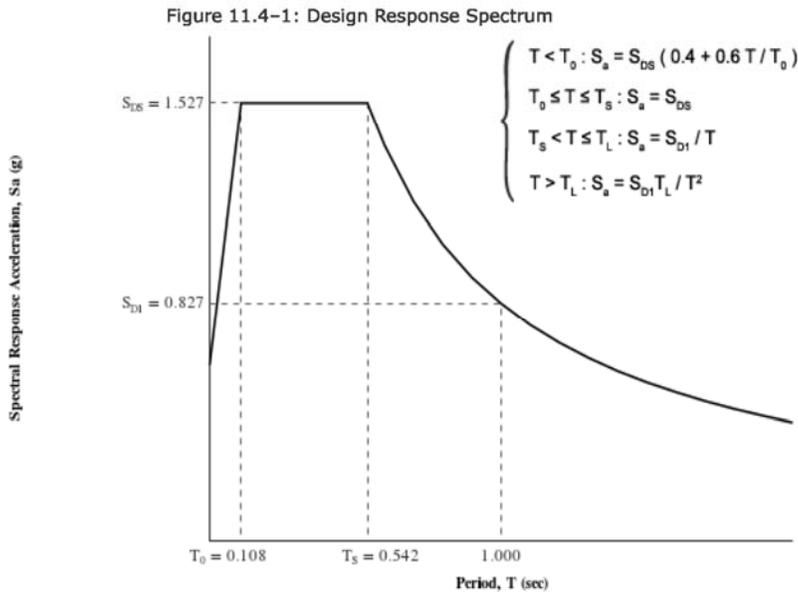
**Equation (11.4-3):**  $S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 2.290 = 1.527 \text{ g}$

**Equation (11.4-4):**  $S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 1.240 = 0.827 \text{ g}$

**Section 11.4.5 — Design Response Spectrum**

From [Figure 22-12](#) <sup>[3]</sup>

$T_L = 0 \text{ seconds}$

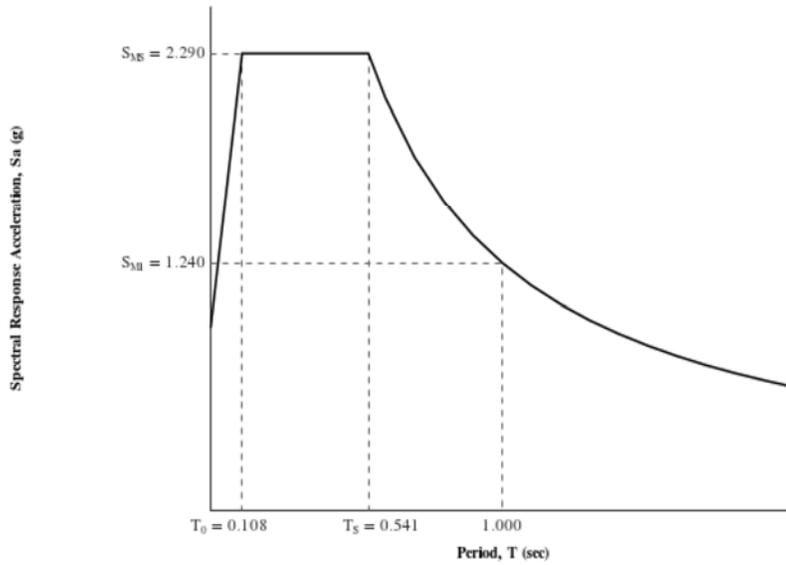


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### Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE<sub>R</sub>) Response Spectrum

The MCE<sub>R</sub> Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



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Design Maps Detailed Report

**Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F**

From **Figure 22-7** <sup>[4]</sup>

$$PGA = 0.955$$

**Equation (11.8-1):**

$$PGA_M = F_{PGA}PGA = 1.000 \times 0.955 = 0.955 \text{ g}$$

Table 11.8-1: Site Coefficient  $F_{PGA}$

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of PGA

**For Site Class = D and PGA = 0.955 g,  $F_{PGA} = 1.000$**

**Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)**

From **Figure 22-17** <sup>[5]</sup>

$$C_{RS} = 0.869$$

From **Figure 22-18** <sup>[6]</sup>

$$C_{R1} = 0.877$$

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Design Maps Detailed Report

**Section 11.6 – Seismic Design Category**

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF $S_{DS}$	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

**For Risk Category = I and  $S_{DS} = 1.527 g$ , Seismic Design Category = D**

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF $S_{D1}$	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D

**For Risk Category = I and  $S_{D1} = 0.827 g$ , Seismic Design Category = D**

Note: When  $S_1$  is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ “the more severe design category in accordance with Table 11.6-1 or 11.6-2” = E

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

**References**

1. Figure 22-1: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-1.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf)
2. Figure 22-2: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-2.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf)
3. Figure 22-12: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-12.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf)
4. Figure 22-7: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-7.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf)
5. Figure 22-17: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-17.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf)
6. Figure 22-18: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-18.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf)



# City of Malibu

23825 Stuart Ranch Road • Malibu, California 90265-4861  
(310) 456-2489 • Fax (310) 317-1950 • www.malibucity.org

## GEOTECHNICAL REVIEW SHEET

<u>Project Information</u>		Review Log #:	3701
<b>Date:</b>	August 6, 2018	<b>Planning #:</b>	CDP 09-067
<b>Site Address:</b>	22959 Pacific Coast Highway	<b>BPC/GPC #:</b>	
<b>Lot/Tract/PM #:</b>	n/a	<b>Planner:</b>	Adrian Fernandez
<b>Applicant/Contact:</b>	Joseph Lezama, joseph@buaia		
<b>Contact Phone #:</b>	310-456-5905		
<b>Project Type:</b>	<b>Revised project:</b> New three-level Malibu Inn Motel, grading, retaining walls with soldier piles and tie-backs, subterranean parking, new onsite wastewater treatment system (OWTS)		

<u>Submittal Information</u>	
<b>Consultant(s) / Report Date(s):</b> <i>(Current submittal(s) in Bold.)</i>	GeoConcepts, Inc. (Barrett, CEG 2088; Walter, RGE 2476): <b>6-20-18</b> , 4-28-16, 9-21-15, 5-29-15, 2-26-15, 12-4-14 GeoConcepts, Inc. (Barrett, CEG 2088): 6-16-15 GeoConcepts, Inc. (Lee, CEG 2545; Haddad, RCE 69169): 6-27-12 GeoConcepts, Inc. (Sousa, CEG 1315; Walter, RGE 2476): 4-27-12, 2-27-12, 6-4-03 GeoConcepts, Inc. (Sousa, CEG 1315): 11-3-09 EnSitu Engineering, Inc. (Yaroslawski, RCE 60149): 2-25-16, 3-3-15, 9-12-14
	<b>Building Plans prepared by Burdge &amp; Associates Architects dated June 8, 2018.</b> <b>Grading plans prepared by GeoWorks, Inc. dated May 8, 2018.</b> <b>Final OWTS plans prepared by EnSitu Engineering, Inc. dated May 30, 2018.</b>
<b>Previous Reviews:</b>	None; Ref: Environmental Health Review Sheet dated June 25, 2018; Ref: 5-31-16 (for new commercial development), Environmental Health Review Sheet dated April 19, 2016, 4-8-16, 7-24-15, Environmental Health Review Sheet dated April 3, 2015, 4-1-15, 1-28-15, 7-24-12, 6-4-12, 12-2-09, Geology Review Referral Sheet dated 11-5-09

<u>Review Findings</u>	
<b><u>Coastal Development Permit Review</u></b>	
<input type="checkbox"/>	The motel development project is <b>APPROVED</b> from a geotechnical perspective.
<input checked="" type="checkbox"/>	The motel development project is <b>NOT APPROVED</b> from a geotechnical perspective. The listed 'Review Comments' shall be addressed prior to approval.
<b><u>Building/Grading Plan-Check Review</u></b>	
<input checked="" type="checkbox"/>	<b>Awaiting Building plan check submittal.</b> Please respond to the listed 'Building Plan-Check Stage Review Comments' AND review and incorporate the attached 'Geotechnical Notes for Building Plan Check' into the plans.

<input type="checkbox"/>	<b>APPROVED</b> from a geotechnical perspective. Please review the attached 'Geotechnical Notes for Building Plan Check' and incorporate into Building Plan-Check submittals.
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**Remarks**

The referenced update geotechnical report, Building Plans, Grading Plans, and OWTS plan were reviewed by the City from a geotechnical perspective. The revised project includes constructing a 7,703 square foot three-level motel with 20 lodging units, 46 parking spaces with 24 extra with stacked parking system, grading (11,752 yards of cut under structure: 837 yards of cut and 319 yards of fill non-exempt; and 12,270 yards of export), rear yard retaining walls with tie-back stabilization/soldier piles, terraces and landscaping on the rear-yard ascending slope, and a new onsite wastewater treatment system (OWTS) in the front parking area consisting of a treatment tank system and a new 2,600 square foot leach field with a design peak flow of 4,056 GPD and a design loading rate of 1.36 GPSFD with 100% expansion. A 3,600 square foot expansion dispersal field serving the Malibu Inn property at 22969 Pacific Coast Highway is proposed in the front parking area immediately east of the leach field for the proposed project.

**Review Comments:**

1. The Project Geotechnical Consultant shall provide a discussion of the changes in the proposed development based on the revised plans for the motel.
2. Please update the cross-sections to show the proposed grades on the three levels of the motel based on the current grading plans. They do not appear to match. Provide additional recommendations, as appropriate.
3. The Consultant recommends on page 4 that, "*Cut slopes shall not exceed a gradient of 1.5:1 (horizontal to vertical).*" As per Section 3304.1.1 of the California Building Code (CBC), cut slopes shall not exceed 2:1 (horizontal to vertical). Please provide justification for any proposed cut slope at gradients steeper than 2(h):1(v).
4. The Consultant appropriately recommends that all friction piles be designed to resist creep forces acting on the portion of the pile in contact with the beach deposits above the bedrock. Please clarify if these creep forces also act on deepened footings extending into bedrock.
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6. Pile foundations in liquefiable soils should be designed for lateral pressures due to lateral spreading as discussed in the April 26, 2016 report by the Consultant.
7. As per the plans, access to the site is from the adjacent property. Granting access from the adjacent property owner (recording of an easement) is a pre-requisite to establish the feasibility of the project.
8. The Consultant indicates on page 11 that, "*Basement walls and other walls where horizontal movement is restricted at the top or not allowed to deflect shall be designed for at-rest pressure.*" No recommendations for at-rest pressure are provided. Please provide recommendations for at-rest pressure to be used in the design of basement retaining walls.
9. Please provide recommendations for slab-on-grade subject to traffic loads.

10. Cross-Sections A-A' and B-B' show a wedge of slope wash behind the northern retaining wall. The Consultant should discuss and evaluate the potential for lateral pressure on the retaining wall due to the downward creep of the slope wash materials.
11. Please provide copies of all responses to the Environmental Health Review Sheet dated 6-25-18 for review.

**Building/Grading Plan-Check Stage Review Comments:**

1. Please show the freeboard (12' according to the previous recommendations by the Consultant) on the rear yard retaining wall on the plans, and include a detail for the debris fences on the ascending slope on the building and grading plans.
2. The freeboard on the rear yard retaining wall will be designed to provide the Code-required setbacks from ascending slopes. The freeboard should be designed as an impact wall with a minimum equivalent fluid pressure of 125 pcf, based on the Consultant's recommendations.
3. The proposed location and extent (vertical and horizontal) of the impact fence should be depicted on the grading plans and cross-sections. Specifications for the installation of the fence should be provided by the manufacturer and incorporated, as appropriate, with the project documents. Details of the fence installation at the eastern and western property lines should be designed and outlined to prevent debris deflecting into adjacent properties.
4. Based on assumptions by the Consultant in calculating the lateral spreading resistance, pile spacing should not exceed two times the diameter of piles.
5. *Please provide to the City an as-built geotechnical report documenting the installation of the pile and soldier pile foundation elements for the motel and retaining walls. The report should document total depth, depth into bedrock, depth to groundwater, and include a map with the final locations of the piles. Please include this comment as a note on the Building plans.*
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7. The following note must appear on the foundation plans: *"Tests shall be performed prior to pouring foundations to evaluate corrosivity of the supporting soils. Foundation plans should be reviewed by the Civil or Structural Engineer and revised, if necessary."*
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9. The grading plans need to include specific details for tiebacks including unbonded, bonded, and minimum lengths, bar type and size, and procedures for proof and performance testing. The proof and performance testing should be under the observation of the project geotechnical consultant, who must document the results and submit the observations to the City for review and state that the tiebacks were installed per the approved plans and specifications.
10. Prior to final approval of the project, an as-built report documenting the installation of the retaining wall tie-back systems shall be prepared by the Project Geotechnical Consultant. The report shall include, as a minimum, the locations and details of the installations such as tieback lengths, dates of installation, and test results of tension capacities. The report shall include a statement that the retaining walls and tie-back systems were installed under the observation of the geologist and geotechnical engineer of record and that the installations conformed to the approved plan and specifications. Any modifications to the plans

necessary for the conditions encountered during the construction must be documented in the final report. Please include this comment as a note on the plans.

- 11. A letter should be provided by the Project Structural Engineer indicating that they are aware of the anticipated displacements associated with the installation of the soil nail walls and, given the potential for some slope displacement, the proposed design is adequate to provide slope support required by the CBC (e.g., safeguard against major structural failures and loss of life).
- 12. Two sets of final grading, retaining wall, soldier pile, tie-back, and motel plans (**APPROVED BY BUILDING AND SAFETY**) incorporating the Project Geotechnical Consultant's recommendations and items in this review sheet must be **reviewed and wet stamped and manually signed by the Project Engineering Geologist and Project Geotechnical Engineer**. City geotechnical staff will review the plans for conformance with the Project Geotechnical Consultants' recommendations and items in this review sheet over the counter at City Hall.

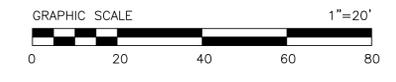
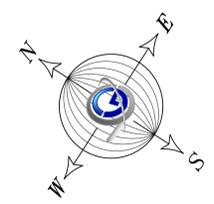
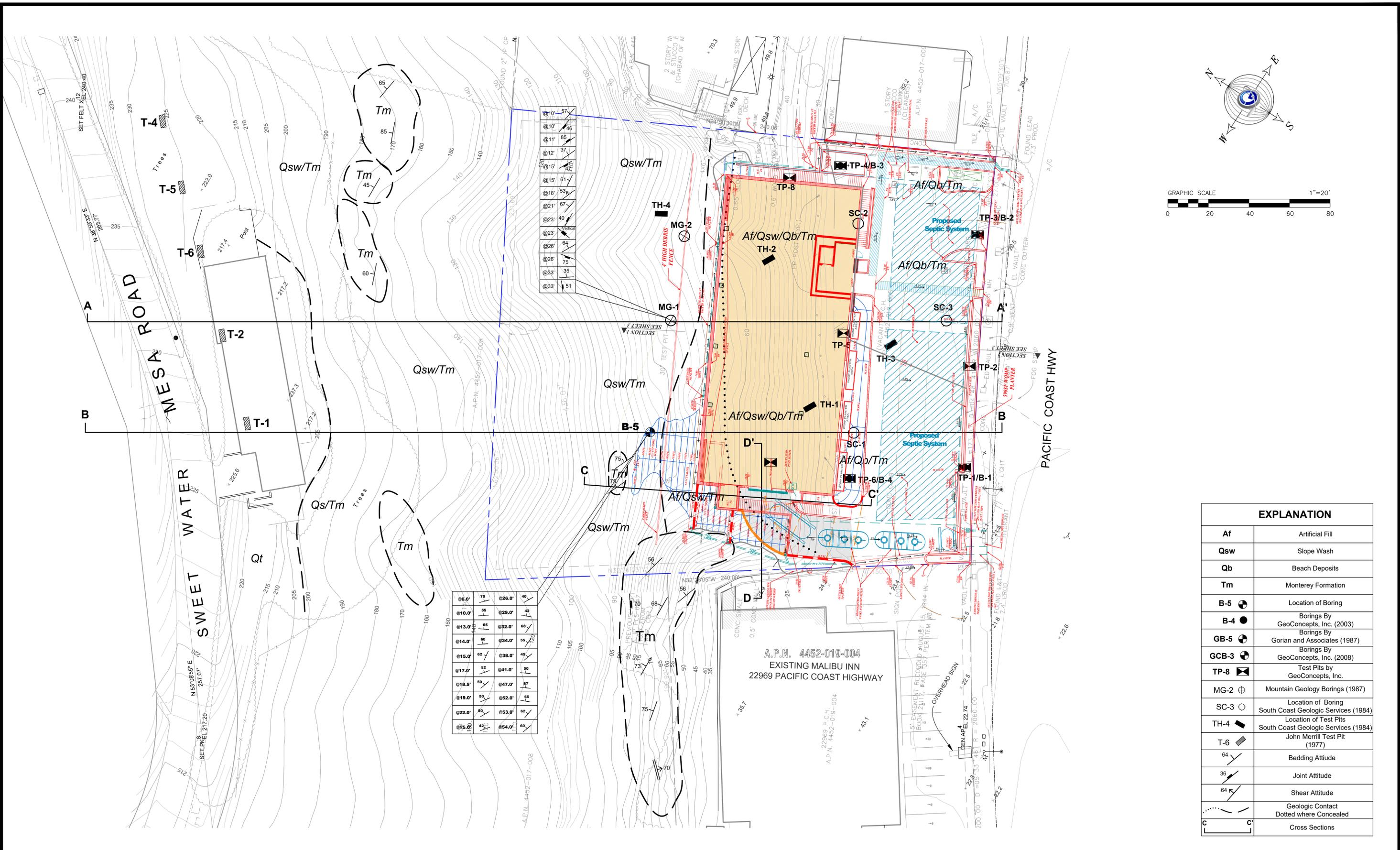
Please direct questions regarding this review sheet to City Geotechnical staff listed below.

Geotechnical Engineering Review by: Ali A. Haq Date: 8/6/2018  
 Ali Abdel-Haq, G.E. #2308, Exp. 12-31-19  
 Geotechnical Engineering Reviewer (805-496-1222)  
 Email: [ali@geodynamics-inc.com](mailto:ali@geodynamics-inc.com)

Engineering Geology Review by: Christopher Dean Date: 8/6/18  
 Christopher Dean, C.E.G. #1751, Exp. 9-30-18  
 Engineering Geology Reviewer (310-456-2489, x306)  
 Email: [cdean@malibucity.org](mailto:cdean@malibucity.org)

*This review sheet was prepared by representatives of Cotton, Shires and Associates, Inc. and GeoDynamics, Inc., contracted through Cotton, Shires and Associates, Inc., as an agent of the City of Malibu.*



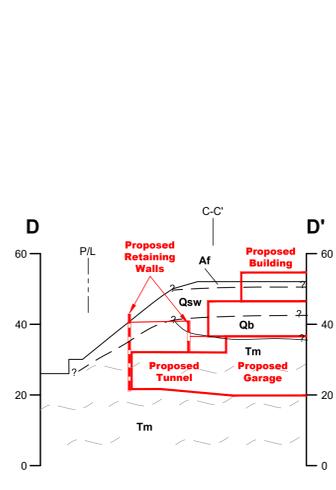
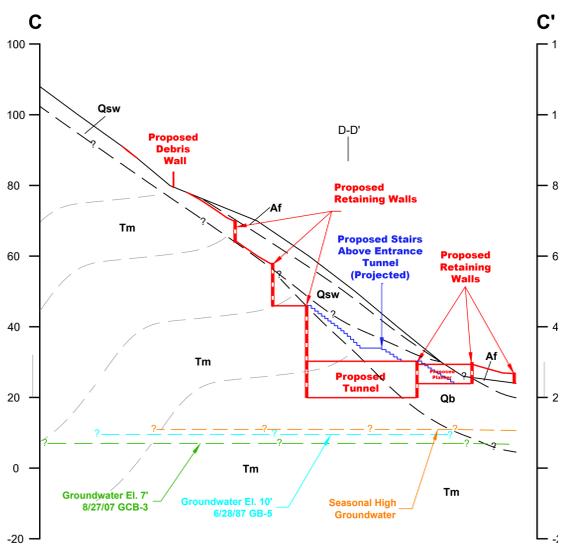
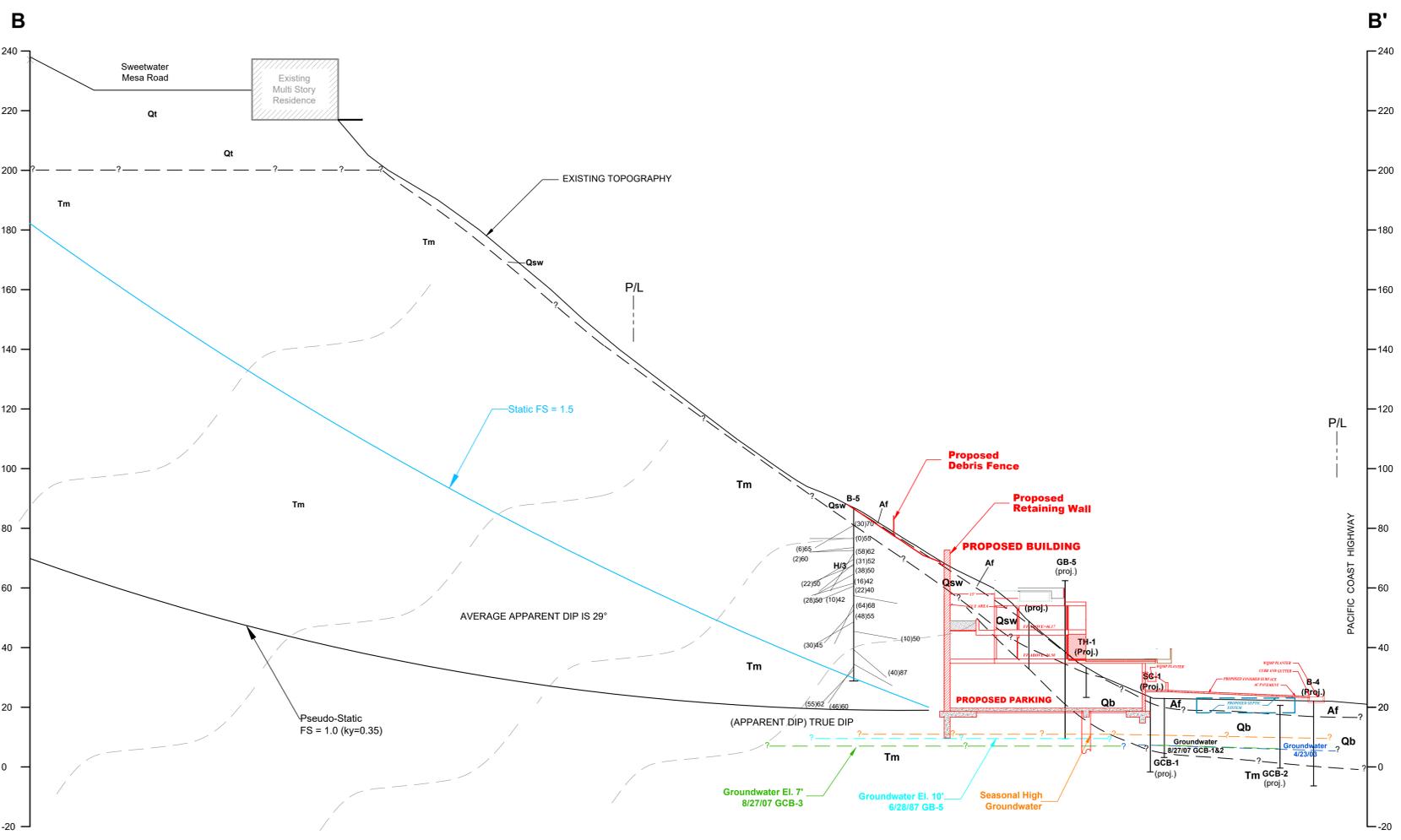
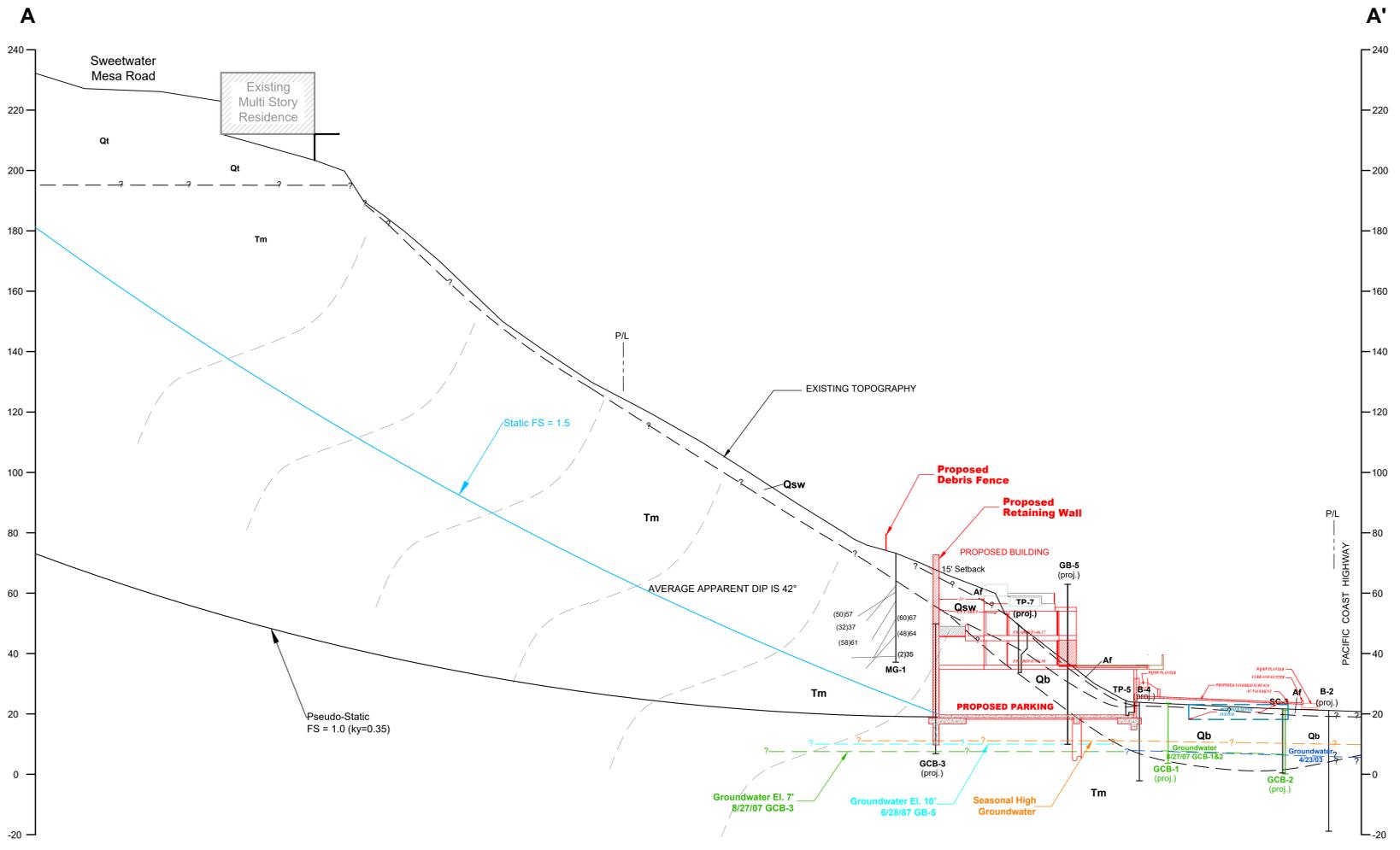


@6.0'	70	@26.0'	40
@10.0'	55	@29.0'	42
@13.0'	65	@32.0'	68
@14.0'	60	@34.0'	55
@15.0'	62	@38.0'	45
@17.0'	52	@41.0'	50
@18.5'	60	@47.0'	57
@19.0'	50	@52.0'	58
@22.0'	50	@53.0'	52
@25.0'	42	@54.0'	60

@10'	57
@11'	46
@12'	37
@15'	42
@15'	61
@18'	53
@21'	67
@23'	40
@23'	64
@26'	75
@33'	35
@33'	51

EXPLANATION	
Af	Artificial Fill
Qsw	Slope Wash
Qb	Beach Deposits
Tm	Monterey Formation
B-5	Location of Boring
B-4	Borings By GeoConcepts, Inc. (2003)
GB-5	Borings By Gorian and Associates (1987)
GCB-3	Borings By GeoConcepts, Inc. (2008)
TP-8	Test Pits by GeoConcepts, Inc.
MG-2	Mountain Geology Borings (1987)
SC-3	Location of Boring South Coast Geologic Services (1984)
TH-4	Location of Test Pits South Coast Geologic Services (1984)
T-6	John Merrill Test Pit (1977)
64	Bedding Attitude
36	Joint Attitude
64	Shear Attitude
- - -	Geologic Contact Dotted where Concealed
A-A'	Cross Sections

<p>14428 Hamlin Street, Suite 200, Van Nuys, CA 91401 Ph (818) 994-8895   Fax (818) 994-8599   www.GeoConceptsInc.com</p>	<p>Description: <b>Geologic Map</b></p> <p>Base Map Provided By: <b>GeoWorks, Inc.</b></p>	<p>Project Address: <b>22969 Pacific Coast Highway Malibu, California</b></p>	<p>Date: <b>Oct. 2018</b></p> <p>Scale: <b>1" = 20'</b></p> <p>Job No. <b>2506-14</b></p>
	<p>22969 P.C.H. EXISTING MALIBU INN 22969 PACIFIC COAST HIGHWAY</p> <p>A.P.N. 4452-019-004</p>		





# City of Malibu

23825 Stuart Ranch Road • Malibu, California 90265-4861  
(310) 456-2489 • Fax (310) 317-1950 • www.malibucity.org

## GEOTECHNICAL REVIEW SHEET

### Project Information

**Date:** August 6, 2018  
**Site Address:** 22959 Pacific Coast Highway  
**Lot/Tract/PM #:** n/a  
**Applicant/Contact:** Joseph Lezama, joseph@buaia  
**Contact Phone #:** 310-456-5905      **Fax#:**  
**Project Type:** **Revised project:** New three-level Malibu Inn Motel, grading, retaining walls with soldier piles and tie-backs, subterranean parking, new onsite wastewater treatment system (OWTS)

**Review Log #:** 3701  
**Planning #:** CDP 09-067  
**BPC/GPC #:**  
**Planner:** Adrian Fernandez

### Submittal Information

**Consultant(s) / Report Date(s):** GeoConcepts, Inc. (Barrett, CEG 2088; Walter, RGE 2476): **6-20-18**,  
*(Current submittal(s) in Bold.)* 4-28-16, 9-21-15, 5-29-15, 2-26-15, 12-4-14  
GeoConcepts, Inc. (Barrett, CEG 2088): 6-16-15  
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2-27-12, 6-4-03  
GeoConcepts, Inc. (Sousa, CEG 1315): 11-3-09  
EnSitu Engineering, Inc. (Yaroslaski, RCE 60149): 2-25-16, 3-3-15, 9-12-14

**Building Plans prepared by Burdge & Associates Architects dated June 8, 2018.**

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### Review Findings

#### Coastal Development Permit Review

- The motel development project is **APPROVED** from a geotechnical perspective.
- The motel development project is **NOT APPROVED** from a geotechnical perspective. The listed 'Review Comments' shall be addressed prior to approval.

#### Building/Grading Plan-Check Review

- Awaiting Building plan check submittal. Please respond to the listed 'Building Plan-Check Stage Review Comments' AND review and incorporate the attached 'Geotechnical Notes for Building Plan Check' into the plans.

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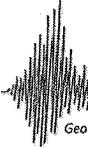
Geotechnical Engineering Review by: Ali A. Haq . 8/6/2018  
 Ali Abdel-Haq, G.E. #2308, Exp. 12-31-19 Date  
 Geotechnical Engineering Reviewer (805-496-1222)  
 Email: [ali@geodynamics-inc.com](mailto:ali@geodynamics-inc.com)

Engineering Geology Review by: Christopher Dean 8/6/18  
 Christopher Dean, C.E.G. #1751, Exp. 9-30-18 Date  
 Engineering Geology Reviewer (310-456-2489, x306)  
 Email: [cdean@malibucity.org](mailto:cdean@malibucity.org)

*This review sheet was prepared by representatives of Cotton, Shires and Associates, Inc. and GeoDynamics, Inc., contracted through Cotton, Shires and Associates, Inc., as an agent of the City of Malibu.*



**COTTON, SHIRES AND ASSOCIATES, INC.**  
CONSULTING ENGINEERS AND GEOLOGISTS



**GeoDynamics, Inc.**  
Applied Earth Sciences  
Geotechnical Engineering & Engineering Geology Consultants



# City of Malibu

- GEOTECHNICAL -

## NOTES FOR BUILDING PLAN-CHECK

The following standard items should be incorporated into Building Plan-Check submittals, as appropriate:

1. One set of grading, retaining wall, OWTS, soldier pile, and office building plans, incorporating the Geotechnical Consultant's recommendations and items in this review sheet, must be submitted to City geotechnical staff for review. **Additional review comments may be raised at that time that may require a response.**
  2. Show the name, address, and phone number of the Geotechnical Consultant(s) on the cover sheet of the Building and grading Plans.
  3. Include the following note on the Foundation Plans: *"All foundation excavations must be observed and approved by the Geotechnical Consultant prior to placement of reinforcing steel."*
  4. Include the following note on Grading and Foundation Plans: *"Subgrade soils shall be tested for Expansion Index prior to pouring footings or slabs; Foundation Plans shall be reviewed and revised by the Geotechnical Consultant, as appropriate."*
  5. The Foundation Plans for the proposed structures shall clearly depict the embedment material and minimum depth of embedment for the foundations in accordance with the Geotechnical Consultant's recommendations.
  6. Show the onsite wastewater treatment system on the grading and building plans.
  7. Please contact the Building and Safety Department regarding the submittal requirements for a grading and drainage plan review.
- results of all density tests as well as a map depicting the limits of fill, locations of all density tests, locations and elevations of all removal bottoms, locations and elevations of all keyways and back drains, and locations and elevations of all retaining wall backdrains and outlets. Geologic conditions exposed during grading must be depicted on an as-built geologic map. This comment must be included as a note on the grading plans.

### Retaining Walls (As Applicable)

1. Show retaining wall backdrain and backfill design, as recommended by the Geotechnical Consultant, on the Plans.
2. Retaining walls separate from a residence require separate permits. Contact the Building and Safety Department for permit information. One set of retaining wall plans shall be submitted to the City for review by City geotechnical staff. Additional concerns may be raised at that time which may require a response by the Project Geotechnical Consultant and applicant.

### Grading Plans (as Applicable)

1. Grading Plans shall clearly depict the limits and depths of overexcavation, as applicable.
2. Prior to final approval of the project, an as-built compaction report prepared by the Project Geotechnical Consultant must be submitted to the City for review. The report must include the



# City of Malibu

23825 Stuart Ranch Road  
 Malibu, California 90265  
 (310) 456-2489 Fax (310) 317-1950

## GEOTECHNICAL REVIEW FIXED FEE FORM

PROJECT OWNER/APPLICANT: Joseph Lezama  
 PROJECT ADDRESS: 22959 Pacific Coast Highway  
 GEOTECHNICAL LOG NO: 3701  
 PLANNING NO: CDP 09-067  
 PLAN CHECK NO: \_\_\_\_\_

ITEM	STATUS	DATE	DEPOSIT	CHARGE	BALANCE	COMMENTS
FIXED FEE BY: Joseph Lezama		6/12/2018	\$4,375.00	\$0.00	\$0.00	<b>Fixed Fee</b>
Initial Review, CDP 09-067, revised project, new Motel	Response Required	8/6/2018		\$0.00	\$0.00	Items to address
Second review						
Additional Reviews: Time & Material			X	X	X	
Supplemental Deposit						
Fourth review						
Applicant Paid Balance Due						
Fifth review						
Applicant Paid Balance Due						
					\$0.00	
REFUND DUE APPLICANT						REFUND # _____
BALANCE DUE CITY OF MALIBU					\$ -	

**NOTE:**

The Fixed Fee incorporates the initial and one subsequent geotechnical review. Subsequent reviews will be performed in accordance with the City's time and materials rate of \$207.00 per hour.



June 20, 2018

Project 2506

Surfrider Plaza LLC  
1541 Ocean Avenue  
Santa Monica, CA 90401

Subject: **UPDATE REPORT**  
22959 Pacific Coast Highway  
Malibu, California

References:

- 1) Preliminary Geologic and Geotechnical Engineering report by GeoConcepts, Inc. covering the subject site, dated December 4, 2014
- 2) Supplemental Reports by GeoConcepts, Inc. covering the subject site, dated February 26, 2015, May 29, 2015, September 21, 2015 and April 28, 2016.
- 3) Septic Supplemental Report No.1 by GeoConcepts, Inc. covering the subject site, dated June 16, 2015.
- 4) Private Sewage Disposal System (OWTS) report by GeoConcepts, Inc. covering the subject site, February 27, 2012.

Dear Mr. Hakim:

Pursuant to your request, presented herein is a geologic and geotechnical update report to address the currently proposed development. Currently it is proposed to develop the subject site with a new two-story hotel with a pool and deck on the roof and subterranean parking. Final grading and structural plans have not been prepared and await the updated recommendations provided herein. These plans should be reviewed by GeoConcepts, Inc. to ensure that updated recommendations have been followed.

GeoConcepts, Inc. explored the site for a proposed commercial development in 2003. They logged four borings and eight test pits. They incorporated data from previous onsite investigations. Mountain Geology, Inc. logged two borings in 1987. South Coast Geologic Services logged four test pits in 1983 and three borings in 1984 and presented them in a report in 1984. John Merrill logged six test pits in 1977 on the lot above (3556 Sweetwater Mesa Road). Locations of the previous explorations have been shown on the attached Geologic Map. GeoConcepts, Inc. prepared an update report in 2009. They provided a private sewage disposal system report in 2012.

In 2014, the previous data along with data from a new onsite boring was utilized by GeoConcepts, Inc. to prepare a report for a proposed retail development. Recommendations to support the proposed structures on bedrock were provided. The report was reviewed by the City of Malibu. GeoConcepts, Inc. provided four supplemental reports in response to City of Malibu Geotechnical review between February 2015 and April 2016. The proposed commercial development project was approved from a geotechnical perspective in the Coastal Development Permit review stage on May 31, 2016.

Due to the length of time since the previous site exploration, a site visit was performed by the undersigned geologist to observe the current site conditions. During the site visit, no significant geologic changes were observed on the subject property. The subsurface conditions encountered during the previous exploration remain applicable. Based on the current development plans, previous exploration and laboratory testing, the following updated design recommendations are provided. The recommendations presented within the referenced reports, which are not superseded herein, remain applicable.

### **RECOMMENDATIONS**

1. The proposed hotel structure should be supported on foundations embedded into bedrock.
2. The ascending slope above the proposed structure is mantled by soil material over bedrock. Previous surficial slope stability analyses provided in Reference 5 indicate the slope is not surficially stable. To protect the proposed development from potential surficial instabilities it is recommended that debris fences (such as Geobrugg SL shallow landslide barrier) be installed on the ascending slope above the subject site. In addition, the recommended freeboard on the rear wall should be of sufficient height to provide a 15 foot wide setback. The recommended mitigation will mitigate the potential impact of surficial instabilities from impacting the proposed structure as much as possible provided the mitigations measures and recommendations herein and within the references are followed and maintained.
3. The soils chemistry results should be incorporated into the design of the proposed project.
4. The property owner shall maintain the site as outlined in the Drainage and Maintenance Section.

### **Building Setbacks**

The construction of buildings and structures on or adjacent to slopes steeper than 3:1 (horizontal to vertical) in gradient shall be setback from the slopes in accordance with the requirements of the applicable governmental agency.

In general, all foundations on or adjacent to a descending slope shall be located a distance of one-third of the vertical height of the slope ( $H/3$ ) to provide vertical and lateral support for the foundation. This distance is measured horizontally from the face of the foundation to the face of the bearing material. This horizontal distance does not need to exceed 40 feet. Where the slope is steeper than 1:1 (horizontal to vertical), the required setback shall be measured from an imaginary plane at 45 degrees to the horizontal, projected upward from the toe of the slope.

In general, buildings and structures on or adjacent to an ascending slope shall be located a distance of one-half of the vertical height of the slope ( $H/2$ ) to provide sufficient protection from slope drainage, erosion, and shallow failures. This distance is measured horizontally from the face of the building/structure to the toe of the slope. This horizontal distance does not need to exceed 15 feet. Where the slope is steeper than 1:1 (horizontal to vertical), the toe is considered to be at the intersection of a horizontal plane from the top of the foundation and an imaginary plane tangent to the slope at 45 degrees to the horizontal.

The construction of swimming pools on or adjacent to slopes shall maintain setback distances equal to one-half of the setback distances for buildings and foundations. Swimming pools on or adjacent to a descending slope shall be located a distance of one-sixth of the vertical height of the slope ( $H/6$ ). This horizontal distance does not need to exceed 20 feet. Swimming pools on or adjacent to an ascending slope shall be located a distance of one-fourth of the vertical height of the slope ( $H/4$ ). This horizontal distance does not need to exceed ( $7\frac{1}{2}$ ) feet.

### **Drainage and Maintenance**

Maintenance of properties must be performed to minimize the chance of serious damage and/or instability to improvements. Most problems are associated with or triggered by water. Therefore, a comprehensive drainage system should be designed and incorporated into the final plans. In addition, pad areas should be maintained and planted in a way that will allow this drainage system to function as intended. The property owner shall be fully responsible for dampness or water accumulation caused by alteration in grading, irrigation or installation of improper drainage system, and failure to maintain drain systems. The following are specific drainage, maintenance, and landscaping recommendations. Reductions in these recommendations will reduce their effectiveness and may lead to damage and/or instability to the improvements. It is the responsibility of the property owner to ensure that improvements, structures and drainage devices are maintained in accordance with the following recommendations and the requirements of all applicable government agencies.

#### **Drainage**

Positive pad drainage should be incorporated into the final plans. The pad should slope away from the footings at a minimum five percent slope for a horizontal distance of ten feet. In areas where there is insufficient space for the recommended ten foot horizontal distance concrete or other impermeable surface should be provided for a minimum of three feet adjacent the structure. Pad drainage should be at a minimum of two percent slope where water flow over lawn or other planted areas. Drainage swales should be provided with area drains about every fifteen feet. Area drains should be provided in the rear and side yards to collect drainage. All drainage from the pad should be directed so that water does not pond adjacent to the foundations or flow toward them. Roof gutters and downspouts are required for the proposed structures and should be connected into a buried area drain system. All drainage from the site should be collected and directed via non-erosive devices to a location approved by the building official. Area drains, subdrains, weep holes, roof gutters and downspouts should be inspected periodically to ensure that they are not clogged with debris or damaged. If they are clogged or damaged, they should be cleaned out or repaired.

### Landscaping (Planting)

The property owner is advised not to develop planter areas between patios, sidewalk and structures. Planters placed immediately adjacent to the structures are not recommended. If planters are proposed immediately adjacent to structures, impervious above-grade or below-grade planter boxes with solid bottoms and drainage pipes away from the structure are suggested. All slopes should be maintained with a dense growth of plants, ground-covering vegetation, shrubs and trees that possess dense, deep root structures and require a minimum of irrigation. Plants surrounding the development should be of a variety that requires a minimum of watering. It is recommended that a landscape architect be consulted regarding planting adjacent to improvements. It will be the responsibility of the property owner to maintain the planting. Alterations of planting schemes should be reviewed by the landscape architect.

### Irrigation

An adequate irrigation system is required to sustain landscaping. Over-watering resulting in runoff and/or ground saturation must be avoided. Irrigation systems must be adjusted to account for natural rainfall conditions. Any leaks or defective sprinklers must be repaired immediately. To mitigate erosion and saturation, automatic sprinkling systems must be adjusted for rainy seasons. A landscape architect should be consulted to determine the best times for landscape watering and the proper usage.

### Pools/Plumbing

Leakage from a swimming pool or plumbing can produce a perched groundwater condition that may cause instability or damage to improvements. Therefore, all plumbing should be leak-free.

### **Grading and Earthwork**

Proposed grading will consist of 1.5:1 (horizontal:vertical) cut slope, retaining wall excavations, and retaining wall backfill.

#### Hillside Grading

1. Prior to commencement of work, a pre-grading meeting shall be held. Participants at this meeting will be the contractor, the owner or his representative, and the soils engineer. The purpose of this meeting is to avoid any misunderstanding of any recommendations set forth in this report that could cause delays in the project.
2. Prior to the commencement of grading a surveyor should be retained to layout the proposed grading. This should, as a minimum, consist of locating all proposed keys, tops of cuts, toe of fills, stability fills, setbacks, easements and areas requiring over excavation of the cut portions of any building pads. All staking shall be setback from the proposed grading area at least five feet (5'). Line and grade verification is not provided by GeoConcepts, Inc.
3. Cut slopes shall not exceed a gradient of 1.5:1 (horizontal:vertical).
4. The Engineering Geologist should observe all cut slopes.

If any conditions such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes, or areas of unstable material are encountered during grading, these conditions should be analyzed by the Engineering Geologist and Geotechnical Engineer.

5. During the inclement part of the year, or during periods when rain is threatening, all fill that has been spread and awaits compaction shall be compacted before stopping work for the day or before stopping because of inclement weather. These fills, once compacted, shall have the surfaces sloped to drain to an area where water can be removed.

Work may start again, after the rainy period, once the site has been reviewed by the soils engineer and he has given his authorization to resume. Loose materials not compacted prior to the rain shall be removed and aerated so that the moisture content of these fills will be within (3) percent of the optimum moisture content.

Surface materials previously compacted before the rain shall be scarified, brought to the proper moisture content and re-compacted prior to placing additional fill, if deemed necessary by the Soils Engineer.

## **Foundations**

It is recommended that the proposed structure be founded into bedrock.

The minimum continuous footing size is 18 inches wide and 24 inches deep into the bedrock, measured from the lowest adjacent grade. Continuous footings may be proportioned, using a bearing value of 6000 pounds per square foot. Column footings placed into the bedrock may be proportioned, using a bearing value of 8000 pounds per square foot, and should be a minimum of 2 feet in width and 24 inches deep, below the lowest adjacent grade.

All continuous footings shall be reinforced with a minimum of 4 #5 bars, two placed near the top and two near the bottom. Reinforcing recommendations are minimums and may be revised by the structural engineer.

The bearing values given above are net bearing values; the weight of concrete below grade may be neglected. These bearing values may be increased by one-third (1/3) for temporary loads, such as, wind and seismic forces.

The minimum pile diameter is 24 inches. Friction piles should extend into the bedrock a minimum of 10 feet. The friction piles may be proportioned using the attached Pile Capacity Chart. All friction piles shall be considered fixed 5 feet into bedrock. All friction piles should be designed to resist a creep force of 1000 pounds per lineal foot for each foot of shaft exposed to the beach deposits above the bedrock.

Lateral loads may be resisted by friction at the base of the foundations and by passive resistance within the bedrock. A coefficient of friction of 0.4 may be used between the foundations and the bedrock. The passive resistance may be assumed to act as a fluid with a density of 600 pounds per square foot, with a maximum earth pressure of 6000 pounds per square foot. When combining passive and friction for resistance of lateral loads, the passive component should be reduced by one-third.

All footing excavation depths will be measured from the lowest adjacent grade of recommended bearing material. Footing depths will not be measured from any proposed elevations or grades. Any foundation excavations that are not the recommended depth into the recommended bearing materials will not be acceptable to this office.

### **Settlement**

Settlement of continuous footings is anticipated to be on the order of 1/8 inches. Isolated footings should have a settlement of 1/4 inches. Differential settlement between the two foundation unit types is not expected to exceed 1/2 inches.

### **Expansive Soils**

Expansive soils were not encountered on the subject property that are anticipated to adversely affect the proposed development. Expansive soils can be a problem, as variation in moisture content will cause a volume change in the soil. Expansive soils heave when moisture is introduced and contract as they dry. During inclement weather and/or excessive landscape watering, moisture infiltrates the soil and causes the soil to heave (expansion). When drying occurs the soils will shrink (contraction).

Repeated cycles of expansion and contraction of soils can cause pavement, concrete slabs on grade and foundations to crack. This movement can also result in misalignment of doors and windows. To reduce the effect of expansive soils, foundation systems are usually deepened and/or provided with additional reinforcement design by the structural engineer. Planning of yard improvements should take into consideration maintaining uniform moisture conditions around structures. Soils should be kept moist, but water should not be allowed to pond. These designs are intended to reduce, but will not eliminate deflection and cracking and do not guarantee or warrant that cracking will not occur.

### **Excavations**

Excavations ranging in vertical height up to 58 feet will be required for the retaining wall excavation. Conventional excavation equipment may be used to make these excavations. Excavations should expose bedrock. This should be verified by the project geotechnical engineer during construction so that modifications can be made if variations in the soil occur.

#### Temporary Shoring

The following information on the design and installation of the shoring is as complete as possible at this time. It is suggested that a review of the final shoring plans and specifications be made by this office prior to bidding or negotiating with a shoring contractor be made.

One method of shoring would consist of steel soldier piles, placed in drilled holes and backfilled with concrete. The soldier piles may be designed as cantilevers or laterally braced utilizing drilled tie-back anchors or raker braces.

## Soldier Piles

Drilled cast-in-place soldier piles should be placed no closer than two diameters on center. The minimum diameter of the piles is 18 inches. Structural concrete should be used for the soldier piles below the excavation; lean-mix concrete may be employed above that level. As an alternative, lean-mix concrete may be used throughout the pile where the reinforcing consists of a wideflange section. The slurry must be of sufficient strength to impart the lateral bearing pressure developed by the wideflange section to the earth materials. For design purposes, an allowable passive value for the earth materials below the bottom plane of excavation, may be assumed to be 700 pounds per square foot per foot. To develop the full lateral value, provisions should be implemented to assure firm contact between the soldier piles and the undisturbed earth materials.

The frictional resistance between the soldier piles and retained earth material may be used to resist the vertical component of the anchor load. The coefficient of friction may be taken as 0.4 based on uniform contact between the steel beam and lean-mix concrete and retained earth. The portion of soldier piles below the plane of excavation may also be employed to resist the downward loads. The downward capacity may be determined using a frictional resistance of 700 pounds per square foot. The minimum depth of embedment for shoring piles is five feet below the bottom of the footing excavation, or seven feet below the bottom of excavated plane, whichever is deeper.

Casing may be required should caving be experienced in the saturated earth materials. If casing is used, extreme care should be employed so that the pile is not pulled apart as the casing is withdrawn. At no time should the distance between the surface of the concrete and the bottom of the casing be less than five feet.

Groundwater was encountered during exploration. Therefore, it is anticipated that the proposed piles will encounter water. Piles placed below the water level will require the use of a tremie to place the concrete into the bottom of the hole. A tremie shall consist of a water-tight tube having a diameter of not less than ten inches with a hopper at the top. The tube shall be equipped with a device that will close the discharge end and prevent water from entering the tube while it is being charged with concrete. The tremie shall be supported so as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be closed at the start of the work to prevent water entering the tube and shall be entirely sealed at all times, except when the concrete is being placed. The tremie tube shall be kept full of concrete. The flow shall be continuous until the work is completed and the resulting concrete seal shall be monolithic and homogeneous. The tip of the tremie tube shall always be kept about five feet below the surface of the concrete and definite steps and safeguards should be taken to insure that the tip of the tremie tube is never raised above the surface of the concrete.

A special concrete mix should be used for concrete to be placed below water. The design shall provide for concrete with a strength of 1,000 psi over the initial job specification. An admixture that reduces the problem of segregation of paste/aggregates and dilution of paste shall be included. The slump shall be commensurate to any research report for the admixture, provided that it shall also be the minimum for a reasonable consistency for placing when water is present.

## Lagging

It is anticipated that lagging will be required for the soil and fill. To develop the full lateral support, provisions should be implemented to assure firm contact between the lagging and the undisturbed earth materials. The slurry must be of sufficient strength to impart the lateral bearing pressure developed by the lagging to the earth materials. It is recommended that the lagging and slurry backfill be installed the same day as excavation.

If the clear spacing between soldier piles does not exceed four feet, lagging between soldier piles could possibly be omitted within the bedrock. It is recommended that the exposed earth materials be observed by the soils engineer to verify the cohesive nature of the soils and the area where lagging may be omitted.

Soldier piles and anchors should be designed for the full anticipated pressures. Due to arching in the earth materials, the pressure on the lagging will be less. It is recommended that the lagging be designed for the full design pressure but may be limited to a maximum of 400 pounds per square foot.

## Lateral Pressures

A triangular distribution of lateral earth pressure should be utilized for the design of cantilevered shoring system. A trapezoidal distribution of lateral earth pressure would be appropriate where shoring is to be restrained at the top by bracing or tie backs. Equivalent fluid pressures for the design of cantilevered and restrained shoring are presented in the following table:

Height of Shoring (feet)	Cantilever Shoring System Equivalent Fluid Pressure (pcf) Triangular Distribution of Pressure	Restrained Shoring System Lateral Earth Pressure (psf) Trapezoidal Distribution of Pressure
35 feet	35 pcf	27H psf

Where a combination of sloped embankment and shoring is utilized, the pressure will be greater and must be determined for each combination. Additional active pressures should be applied where the shoring will be surcharged by adjacent traffic or structures.

## Tied-Back Anchors

Tie-back anchors may be used to resist lateral loads. Friction anchors consisting of high stress thread bars are recommended. For design purposes, it may be assumed that the active wedge adjacent to the shoring is defined by a plane drawn 35 degrees with the vertical through the bottom plane of the excavation. Friction anchors should extend a minimum of 20 feet beyond the potentially active wedge and to greater lengths if necessary to develop the desired capacities.

Drilled friction anchors may be designed for a skin friction of 500 pounds per square foot. Pressure grouted anchor may be designed for a skin friction of 3,000 pounds per square foot. Where belled anchors are utilized, the capacity of belled anchors may be designed by assuming the diameter of the bonded zone is equivalent to the diameter of the bell. Only the frictional resistance developed beyond the active wedge would be effective in resisting lateral loads. Anchors should be placed at least 6 feet on center to be considered isolated.

It is recommended that at least three of the initial anchors have their capacities tested to 200 percent of their design capacities for a 24-hour period to verify their design capacity. The total deflection during the 24-hour 200 percent test should not exceed 12 inches. During the 24-hour tests, the anchor deflection should not exceed (0.75) inches measured after the 200 percent test load is applied.

All anchors should be tested to at least 150 percent of design load. The total deflection during this test should not exceed 12 inches. The rate of creep under the 150 percent test load should not exceed (0.1) inch over a 15 minute period in order for the anchor to be approved for the design loading.

After a satisfactory test, each anchor should be locked-off at the design load. This should be verified by rechecking the load in the anchor. The load should be within ten percent of the design load. Where satisfactory tests are not attained, the anchor diameter and/or length should be increased or additional anchors be installed until satisfactory test results are obtained. The installation and testing of the anchors should be observed by a representative of this firm. Minor caving during drilling of the anchors should be anticipated.

### Raker Braces

The proposed soldier piles may be laterally supported by raker braces supported by temporary footings, or dead-men. Temporary footings inclined at an angle of 45 degrees to the horizontal may be designed for an allowable bearing value of 2500 psf in bedrock. To utilize this allowable bearing pressure, the inclined footings should be a minimum of 24 inches in width, and should be embedded a minimum of 24 inches below the lowest adjacent grade. An increase of 300 pounds per square foot may be utilized for each additional foot of width.

### Deflection

It is difficult to accurately predict the amount of deflection of a shored embankment. It should be realized that some deflection will occur. It is estimated that the deflection could be on the order of one-half inch at the top of the shored embankment. If greater deflection occurs during construction, additional bracing may be necessary to minimize settlement of adjacent buildings and utilities in adjacent streets and alleys. If desired to reduce the deflection, a greater active pressure could be used in the shoring design. Where internal bracing is used, the rakers should be tightly wedged to minimize deflection. The proper installation of the raker braces and the wedging will be critical to the performance of the shoring.

### Monitoring

Because of the depth of the excavation, some mean of monitoring the performance of the shoring system is suggested. The monitoring should consist of periodic surveying of the lateral and vertical locations of the tops of all soldier piles and the lateral movement along the entire lengths of selected soldier piles. Also, some means of periodically checking the load on selected anchors will be necessary, where applicable.

### Shoring Observations

It is critical that the installation of shoring is observed by a representative of this office. Many building officials require that shoring installation should be performed during the continuous

observations of the geotechnical engineer. The observations are made so that modifications of the recommendations can be made if variations in the earth material or groundwater conditions occur. Also the observations will allow for a report to be prepared on the installation of shoring for the use of the local building official.

### **Excavations Maintenance – Erosion Control**

The following recommendations should be considered a part of the excavation/erosion control plan for the subject site and are intended to supplement, but not supersede nor limit the erosion control plans produced by the Project Civil Engineer and/or Qualified SWPPP Developer. These recommendations should be implemented during periods required by the Building Code (typically between the months of October and April) or at any time of the year prior to a predicted rain event. Consideration should also be given to potential local sources of water/runoff such as existing drainage pipes or irrigation systems that remain in operation during construction activities.

#### Open Excavations:

All open excavations shall be protected from inclement weather, including areas above and at the toe of the excavation. This is required to keep the excavations from becoming saturated. Saturation of the excavation may result in a relaxation of the soils which may result in failures. Water/runoff should be diverted away from the excavation and not be allowed to flow over the excavation in a concentrated manner.

#### Hillside Excavations:

All hillside excavations shall be protected during inclement weather and should extend beyond the edges of the excavations in all directions. Plastic sheeting along with stakes, ropes and sandbags may be used to provide protection of the excavations. Water/runoff should be diverted away from the excavation and not be allowed to flow over the excavation.

The project Civil Engineer should provide a plan depicting the required limits of erosion control. Slopes around an open excavation should be trimmed to slope away from the open excavation so that water/runoff will not drain into the excavation. Any trees or planters that might cause failures around an open excavation shall be anchored safely. After the inclement weather has ceased, the excavations shall be reviewed by the project geotechnical engineer and geologist for safety prior to recommencement of work.

#### Open Trenches/Foundation Excavations:

No water should be allowed to pond adjacent to or flow into open trenches. All open trenches shall be covered with plastic sheeting that is anchored with sandbags. Areas around the trenches should be sloped away from the trenches to prevent water runoff from flowing into or ponding adjacent to the trenches.

After the inclement weather has ceased, the excavations shall be reviewed by the project geotechnical engineer and geologist for safety prior to recommencement of work. Foundation excavations that remain open during inclement weather shall be reviewed by the project geotechnical engineer and geologist prior to the placement of steel and concrete to ensure that proper embedment and contact with the bearing material have been maintained.

### Open Pile/Caisson Excavations:

All pile/caisson excavations should be reviewed and poured prior to the onset of inclement weather. It is not recommended that any pile/caisson excavations remain open through any inclement weather. However, if it is necessary to leave pile/caisson excavations open during inclement weather, all water and runoff shall be diverted away from and prevented from entering the pile/caisson excavations. Pile/caisson excavations that remain open during inclement weather shall be reviewed by the project geotechnical engineer and geologist prior to the placement of steel and concrete to ensure that proper embedment has been maintained. The base of all end-bearing caissons shall be re-cleaned to ensure contact with the proper bearing material. All stockpiled cuttings from the pile borings shall be removed.

### Grading In Progress:

During the inclement time of the year, or during periods prior to the onset of rain, all fill that has been spread and is awaiting compaction shall be compacted before stopping work for the day or before stopping work because of inclement weather. These fills, once compacted, shall have the surface sloped to drain to one area where water may be removed.

Additionally, it is suggested that all stock-piled fill materials be covered with plastic sheeting. This action will reduce the potential for the moisture content of the fill from becoming too high for compaction. If the fill stockpile is not covered during inclement weather, then aerating the fill to reduce the moisture content would be required. This action is generally very time consuming and may result in construction delays.

Work may recommence, after the rain event, once the site has been reviewed by the project geotechnical engineer.

### **Retaining Walls**

Cantilever retaining walls should be designed to resist an active earth pressure such as that exerted by compacted backfill. Retaining walls up to 54 feet in height may be designed per the following table. The 'active' pressure assumes that the wall will be allowed to deflect 0.01H to 0.02H. Basement walls and other walls where horizontal movement is restricted at the top or not allowed to deflect shall be designed for at-rest pressure.

Surface Slope of Retained Material Horizontal to Vertical	Active Equivalent Fluid Weight p.c.f.
2 to 1	50
1½ to 1	80

In addition to lateral earth pressure, these retaining walls should be designed to resist the surcharge imposed by the proposed structures, footings, any adjacent buildings, or by adjacent traffic surcharge, per the attached figures 11 and 12 obtained from the Naval Facilities Engineering Command, Design Manual 7.02 (Foundation and Earth Structures, pages 74 and 75).

The wall pressure stated assumes that the wall has been backfilled as outlined below with a permanent drainage system. Proper compaction of the backfill is recommended to provide lateral support to adjacent properties. Even with proper compaction of required backfill, settlement of the backfill may occur. Accordingly, utility lines, footings, slabs, or falsework should be planned and designed to accommodate potential settlement.

Walls to be backfilled must be reviewed by the project Geotechnical Engineer prior to commencement of the backfilling operation.

1. Adequate permanent drainage is required behind the wall to minimize the buildup of hydrostatic pressures. A perforated pipe, with perforations placed down, shall be installed at the base of the wall footing. The pipe shall be encased in at least one foot of three-quarter inch (3/4") gravel. The pipe shall exit from behind the retaining wall and drain to a location approved by the architect or civil engineer.

When space does not permit the installation of standard pipe and gravel drainage system, i.e. walls adjacent the property line, a flat drainage product is acceptable subject to approval of the governing agency. It is recommended that a drainage composite geotextile (such as MiraDrain / QuickDrain) be placed at the base of the proposed retaining wall. The drainage composite geotextile will provide comparable drainage to the conventional four inch perforated pipe encased in gravel per Code Sections 1805.4.2 and 1805.4.3

If a drainage system is not provided the walls should be designed to resist an external hydrostatic pressure due to water in addition to the lateral earth pressure in Retaining Wall section. The entire wall should be design for full hydrostatic pressure based on a water level at the ground surface. In addition, floors would need to be designed for hydrostatic uplift and waterproofed.

2. A continuous vertical drain, consisting of a gravel blanket six inches thick or geotextile vertical drainage system, shall be placed along the back side of the wall to within two feet of the ground surface.
3. Water and moisture affecting retaining walls is a common post-construction complaint. Poorly applied or omitted waterproofing can lead to standing water inside the building or efflorescence on the wall.

It is recommended that the retaining walls be waterproofed. Waterproofing design and inspection of installation is not the responsibility of the geotechnical engineer. GeoConcepts, Inc. does not practice in the field of water and moisture vapor transmission evaluation/mitigation. Therefore, we recommend that a qualified person/firm be engaged/consulted to evaluate the general and specific water and moisture vapor transmission paths and any impact on the proposed development. This person/firm should provide recommendations for mitigation of potential adverse impact of water and moisture vapor transmission on various components of the structure as deemed necessary. The actual waterproofing design shall be provided by the architect, structural engineer or contractor with experience in waterproofing.

4. After the wall backdrain system has been placed and the waterproofing installed, fill may be placed, if sufficient room allows, in layers not exceeding four inches in thickness and compacted to 90 percent of the maximum density, as determined by ASTM D 1557. Where cohesionless soil having less than 15 percent finer than (0.005) millimeters is used for fill, the fill material shall be compacted to a minimum of 95 percent of the maximum dry density.

5. Where space does not permit compaction of material behind the wall (<24 inches wide), a granular backfill shall be used. This granular backfill shall consist of one-half inch to three-quarter inch crushed rock and should be densified by tamping into place. The crushed rock backfill should not exceed a depth of ten feet.
6. All granular free-draining wall backfills shall be capped with a clayey compacted soil within the upper two feet of the wall backfill. This compacted material should start below the required wall freeboard.
7. A concrete-lined swale drain should be placed behind any retaining wall that can intercept surface runoff from upslope areas. This surface runoff shall be transferred to an area approved by the building official.

### Lateral Earth Pressure Due to Earth Motion

Retaining walls should be designed to resist an active earth pressure due to earth motion, if required by the building official, distributed as a triangle pressure. Retaining walls up to 54 feet in height may be designed per the following table. The seismic equivalent fluid pressure is in addition to static earth pressures.

The seismic loading is based on a horizontal acceleration coefficient of  $\frac{1}{2}$  of  $\frac{2}{3} PGA_M = 0.245$ .

Surface Slope of Retained Material Horizontal to Vertical	Seismically Induced Earth Pressure - Equivalent Fluid Weight p.c.f.
2 to 1	51
1½ to 1	61

### Raised Floors

Raised floor type construction typically results in a lowered grade beneath the residence relative to the exterior grade. The lowered grade often leads to moisture problems under the residence. Surface water/moisture can seep through or migrate beneath footings and pond beneath the residence. The larger the grade differential between the exterior and interior the more likely moisture can seep beneath the residence. Soils with clay or silt are most commonly associated with this type of problem. Prolonged moisture under the residence can lead to growth of fungus, rotting of wood framing elements and/or mold growth.

To minimize the potential of water/moisture seeps under the residence the following measures are recommended, such as, but not limited to positive drainage away from foundations, waterproofing the foundations, sealing utility line penetrations through the foundations, compaction of trench backfill placement, foundation drains and planter drains. Subdrains placed directly adjacent the footing stemwalls are beneficial but will generally not completely eliminate water/moisture seeps under the residence. Planter drains which are located away from the footings and extend deeper than the footings are generally more effective. Other methods may also be employed such as placement of a vapor barrier and lightly reinforced concrete slab over the earth in the lowered grade areas. The slab should be sloped to drain to area drains.

Adequate ventilation of the subfloor area is critical in preventing high under floor moisture conditions. Consideration should be given to providing more than the minimum Code-required amount of vent space. Larger homes may require mechanical ventilation.

Irrigation for landscaping around the residence can be a contributing factor to moisture intrusion beneath the residence, especially where drainage and/or ventilation is insufficient. In addition to proper drainage and ventilation, the maintenance and proper use of irrigation systems should also be considered to avoid over-irrigation, which may result in runoff and/or ground saturation. Irrigation systems should be adjusted to account for seasonal rainfall conditions and inclement weather. Drought resistant landscaping should be considered to minimize water usage. Damaged or defective irrigation systems should be repaired or replaced to avoid concentrated runoff and/or ground saturation. A landscape professional should be consulted to determine the best landscaping and proper irrigation for your site.

### **Slabs on Grade**

Slabs on grade should be reinforced with minimum #4 reinforcing bars, placed at 16 inches on center each way and supported on compacted fill or bedrock. Provisions for cracks should be incorporated into the design and construction of the foundation system, slabs, and proposed floor coverings. Concrete slabs should have sufficient control joints spaced at a maximum of approximately eight feet. These recommendations are considered minimums unless superseded by the project structural engineer.

It is recommended that a vapor retarder/waterproofing be placed below the concrete slab on grade. Vapor/moisture transmission through slabs does occur and can impact various components of the structure.

Vapor retarder/waterproofing design and inspection of installation is not the responsibility of the geotechnical engineer (most often the responsibility of the architect). GeoConcepts, Inc. does not practice in the field of water and moisture vapor transmission evaluation/mitigation. Therefore, we recommend that a qualified person/firm be engaged/consulted to evaluate the general and specific water and moisture vapor transmission paths and any impact on the proposed development. This person/firm should provide recommendations for mitigation of potential adverse impact of water and moisture vapor transmission on various components of the structure as deemed necessary. The actual waterproofing design shall be provided by the architect, structural engineer or contractor with experience in waterproofing

In order to promote good building practices and alert the rest of the design/construction team of some of the appropriate standards and expert recommendations pertaining to vapor barriers/retarders, the waterproofing designer should consider recommending and citing specific performance characteristics. The following paragraph includes some of the standards and expert recommendations and should be considered for use waterproofing designer own recommendations:

*Vapor barrier shall consist of a minimum 15 mil extruded polyolefin plastic (no recycled content or woven materials permitted). Permeance as tested before and after mandatory conditions (ASTM E 1745 Section 7.1 and Sub-Paragraph 7.1.1-7.1.5): less than 0.01 perms [grains/(ft<sup>2</sup>-hr-inHg)] and comply with the ASTM E 1745 Class A requirements. Install vapor barrier according to ASTM E1643, including proper perimeter seal. Basis of design: Stego Wrap Vapor Barrier 15*

*mil and Stego Crete Claw Tape (perimeter seal tape). Approved Alternatives: Vaporguard by Reef Industries, Sundance 15 mil Vapor Barrier by Sundance Inc.*

### **Decking**

Exterior decking slabs on grade should be reinforced with minimum #4 reinforcing bars, placed at 16 inches on center each way and supported on compacted fill or bedrock. Provisions for cracks should be incorporated into the design and construction of the decking. Concrete slabs should have sufficient control joints spaced at a maximum of approximately 8 feet. Decking planned adjacent to lawns, planters or adjacent to descending slopes should be provided with a 12-inch thickened edge. The deck reinforcement should be bent down into the edge. These recommendations are considered minimums unless superseded by the project structural engineer.

### **Slough Protection**

The ascending slope above the proposed structure is mantled by soil material over bedrock. Previous surficial slope stability analyses provided in Reference 5 indicate the slope is not surficially stable. To protect the proposed development from potential surficial instabilities it is recommended that debris fences (such as Geobrugg SL shallow landslide barrier) be installed on the ascending slope above the subject site. In addition, the recommended freeboard on the rear wall should be of sufficient height to provide a 15 foot wide setback. The recommended mitigation will mitigate the potential impact of surficial instabilities from impacting the proposed structure as much as possible provided the mitigations measures and recommendations herein and within the references are followed and maintained.

The sloughed materials behind these walls must be cleaned out each time deposition occurs, to allow them to function as envisioned.

Some surficial erosion/surficial slope failures may occur during inclement weather. In order to mitigate this possible occurrence from impacting improvements all slopes should be planted and maintained as described in the Drainage and Maintenance section. In addition, deep-rooted shrubs should be planted in staggered rows that do not exceed 10 feet on center over the slope face.

### **Onsite Wastewater Treatment System (OWTS)**

An OWTS utilizing a septic tank and leach lines is geologically feasible within the beach deposits as noted on the Geologic Map. The proposed leach field should be placed into the beach deposits in conformance with the controlling governing agency. The OWTS plans by Ensitu Engineering were reviewed. The plans are similar to those utilized in the previous OWTS report by GeoConcepts, Inc. (Reference 7). The findings and recommendations from the previous report continue to apply.

## **REVIEWS**

### **Plan Review and Plan Notes**

The final grading, building, and/or structural plans shall be reviewed and approved by the consultants to ensure that all recommendations are incorporated into the design or shown as notes on the plan.

The final plans should reflect the following:

1. The Preliminary Geologic and Geotechnical Engineering Investigation by GeoConcepts, Inc. is a part of the plans.
2. Plans must be reviewed and signed by GeoConcepts, Inc.
3. The project geotechnical engineer and/or geologist must review all grading.
4. The project geotechnical engineer and/or geologist shall review all foundations.
5. All onsite wastewater treatment systems (OWTS) shall be field reviewed, logged and approved by GeoConcepts, Inc.

### **Construction Review**

Reviews will be required to verify all geologic and geotechnical work. It is required that all footing excavations, seepage pits, and grading be reviewed by this office. This office should be notified at least **two working days** in advance of any field reviews so that staff personnel may be made available.

The property owner should take an active role in project safety by assigning responsibility and authority to individuals qualified in appropriate construction safety principles and practices. Generally, site safety should be assigned to the general contractor or construction manager that is in control of the site and has the required expertise, which includes but not limited to construction means, methods and safety precautions.

## **LIMITATIONS**

### **General**

This report is intended to be used only in its entirety. No portion or section of the report, by itself, is designed to completely represent any aspect of the project described herein. If any reader requires additional information or has questions regarding this report, GeoConcepts, Inc. should be contacted.

Subsurface conditions were interpreted on the basis of our field explorations and past experience. Although, between exploratory excavations, subsurface earth materials may vary in type, strength and many other properties from those interpreted. The findings, conclusions and recommendations presented herein are for the soil conditions encountered in the specific locations. Earth materials and conditions immediately adjacent to, or beneath those observed

may have different characteristics, such as, earth type, physical properties and strength. Other soil conditions due to non-uniformity of the soil conditions or manmade alterations may be revealed during construction. If subsurface conditions differ from those encountered in the described exploration, this office should be advised immediately so that further recommendations may be made if required. If it is desired to minimize the possibility of such changes, additional explorations and testing can/should be performed.

Findings, conclusions and recommendations presented herein are based on experience and background. Therefore, findings, conclusions and recommendations are professional opinions and are not meant to indicate a control of nature.

This preliminary report provides information regarding the findings on the subject property. It is not designed to provide a guarantee that the site will be free of hazards in the future, such as but not limited to, landslides, slippage, liquefaction, expansive soils, differential settlement, debris flows, seepage, concentrated drainage or flooding. It may not be possible to eliminate all hazards, but homeowners must maintain their property and improve deficiencies to minimize these hazards.

**This report may not be copied. If you wish to purchase additional copies, you may order them from this office.**

### **111 Statement**

It is the finding of this corporation, based upon the subsurface data, that the proposed project will be safe from landslide, settlement, or slippage and will not adversely affect adjacent property, provided this corporation's recommendations and those of the City of Malibu and the Building Code are followed and maintained.

### **CONSTRUCTION NOTICE**

Construction can be challenging. GeoConcepts, Inc. has provided this report to advise you of the general site conditions, geotechnical feasibility of the proposed project, and overall site stability. It must be understood that the professional opinions provided herein are based upon subsurface data, laboratory testing, analyses, and interpretation thereof. Recommendations contained herein are based upon surface reconnaissance and minimum subsurface explorations deemed suitable by your consultants.

Although quantities for foundation concrete and steel may be estimated based on the findings provided in this report, provision should be made for possible changes in quantities during construction. If it is desired to minimize the possibility of such changes, additional exploration and testing should be considered. However, you must be aware that depths and magnitudes will most likely vary between explorations given in the report.

Should you have any questions regarding this report, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted,  
GeoConcepts, Inc.



Scott J. Walter  
Project Engineer  
GE 2476  
SJW/MAB: 2506-13



Mark A. Barrett  
Project Geologist  
CEG 2088

Enclosures:      Geologic Map (In Pocket)  
                         Cross Sections A-A' and B-B' (In Pocket)  
                         Engineering Analyses  
                         Slope Stability Analyses

Distribution:      (1) Addressee  
                         (2) Burdge and Associates

## Bearing Capacity of Pad Footings

<b>BEARING CAPACITY ANALYSIS</b>	
CALCULATE THE ULTIMATE AND ALLOWABLE BEARING CAPACITIES OF THE BEARING MATERIAL LISTED BELOW USING HANSEN'S METHOD. (REFERENCE: J. BOWLES, <i>FOUNDATION ANALYSIS AND DESIGN</i> , 1988, p. 188-194).	
<b>CALCULATION PARAMETERS</b>	
EARTH MATERIAL: Bedrock	EMBEDMENT DEPTH: 2 feet
SHEAR DIAGRAM: 0	PAD LENGTH: 2 feet
COHESION: 800 psf	PAD WIDTH: 2 feet
PHI ANGLE: 35 degrees	SLOPE ANGLE: 0 degrees
DENSITY: 115 pcf	PAD INCLINATION: 0 degrees
SAFETY FACTOR: 5	
FOOTING TYPE: P Pad	
<b>CALCULATED RESULTS</b>	
HANSEN'S SHAPE, DEPTH, AND INCLINATION FACTORS	
Nq = 33.30	Dq = 1.25
Nc = 46.12	Gc = 1.00
Ny = 33.92	Bc = 1.00
Sc = 1.72	Iq = 1.00
Sq = 1.70	Ic = 1.00
Dc = 1.40	Bq = 1.00
	Sy = 0.60
	Dy = 1.00
	Iy = 1.00
	Gy = 1.00
	Gq = 1.00
	By = 1.00
CALCULATED ULTIMATE BEARING CAPACITY (Qult)	107,626.6 pounds
ALLOWABLE BEARING CAPACITY (Qa = Qult / fs)	21,525.3 pounds
PERCENT INCREASE FOR EMBEDMENT DEPTH	7.1%

## Bearing Capacity of Strip Footings

<b>BEARING CAPACITY ANALYSIS</b>	
CALCULATE THE ULTIMATE AND ALLOWABLE BEARING CAPACITIES OF THE BEARING MATERIAL LISTED BELOW USING HANSEN'S METHOD. (REFERENCE: J. BOWLES, <i>FOUNDATION ANALYSIS AND DESIGN</i> , 1988, p. 188-194).	
<b>CALCULATION PARAMETERS</b>	
EARTH MATERIAL: Bedrock	EMBEDMENT DEPTH: 2 feet
SHEAR DIAGRAM: 0	FOOTING LENGTH: 100 feet
COHESION: 800 psf	FOOTING WIDTH: 2 feet
PHI ANGLE: 35 degrees	SLOPE ANGLE: 0 degrees
DENSITY: 115 pcf	FOOTING INCLINATION: 0 degrees
SAFETY FACTOR: 5	
FOOTING TYPE: S Strip	
<b>CALCULATED RESULTS</b>	
HANSEN'S SHAPE, DEPTH, AND INCLINATION FACTORS	
Nq = 33.30	Dq = 1.25
Nc = 46.12	Gc = 1.00
Ny = 33.92	Bc = 1.00
Sc = 1.01	Iq = 1.00
Sq = 1.01	Ic = 1.00
Dc = 1.40	Bq = 1.00
	Sy = 0.99
	Dy = 1.00
	Iy = 1.00
	Gy = 1.00
	Gq = 1.00
	By = 1.00
CALCULATED ULTIMATE BEARING CAPACITY (Qult)	66,016.7 pounds
ALLOWABLE BEARING CAPACITY (Qa = Qult / fs)	13,203.3 pounds
PERCENT INCREASE FOR EMBEDMENT DEPTH	6.9%

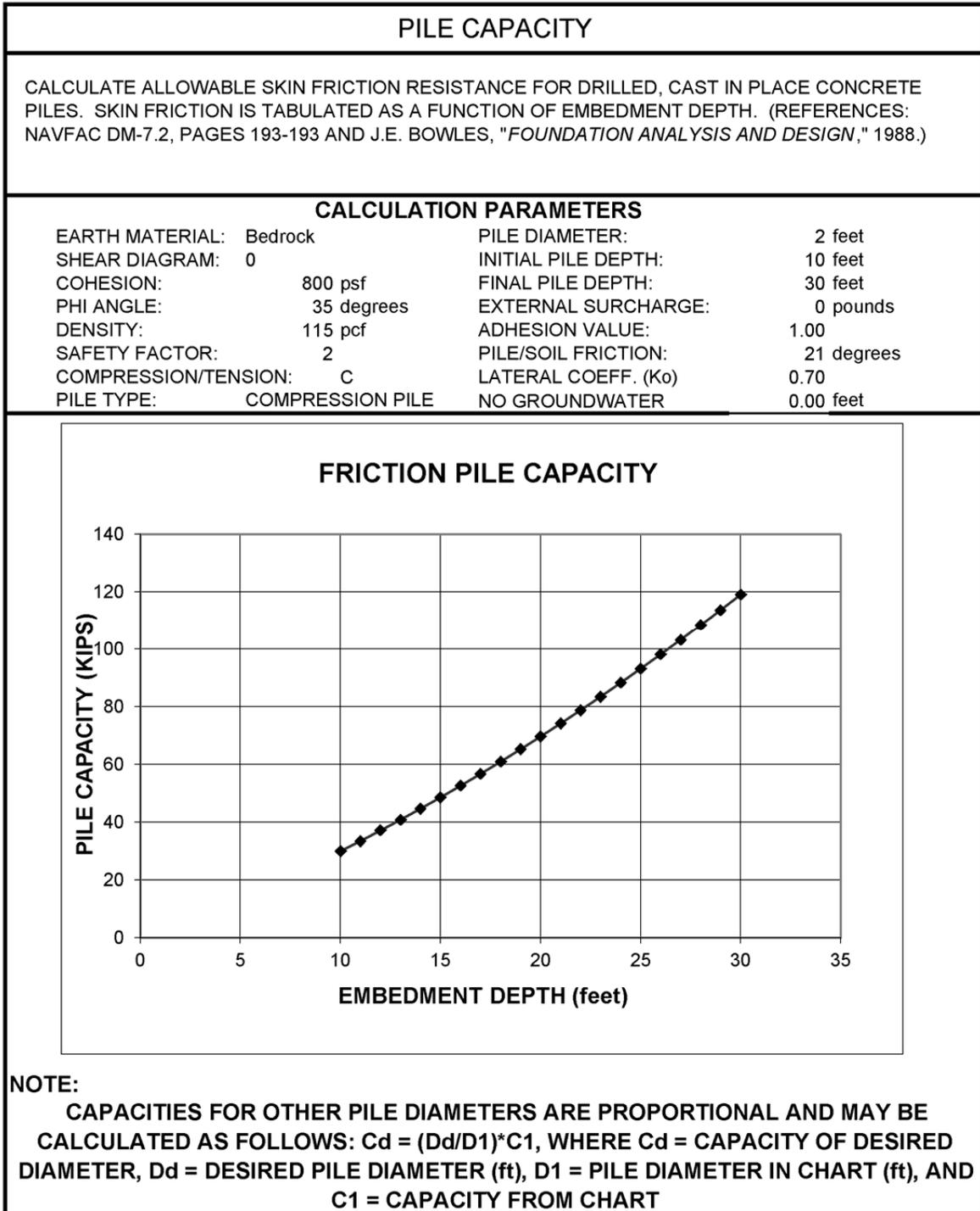
## Passive Pressure of Conventional Footings

PASSIVE EARTH PRESSURE			
USE RANKINE'S METHOD TO CALCULATE THE PASSIVE EARTH PRESSURE. USE THE PROCEDURE IN NAVFAC DM-7, 1982, (p 7.2-21, Figure 2).			
CALCULATION PARAMETERS			
EARTH MATERIAL: Bedrock		SAFETY FACTOR (fs):	1.5
SHEAR DIAGRAM: 0		INITIAL SEARCH DEPTH:	1
COHESION: 800 psf		FINAL SEARCH DEPTH:	5
PHI ANGLE: 35 degrees		LIMIT PASSIVE (Y OR N):	Y
DENSITY: 115 pcf		MAXIMUM PASSIVE:	100,000.0 pounds
		Cd (C/fs):	533.3 psf
		PhiD = atan(tan(phi)/fs) =	25.0 degrees
FOOTING DEPTH (feet)	TOTAL PASSIVE FORCE Pp (pounds)	PASSIVE EARTH PRESSURE AT DEPTH - SigmaP (psf)	INCREASE IN PASSIVE EARTH PRESSURE WITH EMBEDMENT DEPTH (psf/f)
1	1,816.9	1,958.7	1,958.7
2	3,917.4	2,242.3	283.6
3	6,301.5	2,525.9	283.6
4	8,969.2	2,809.5	283.6
5	11,920.5	3,093.1	283.6

## Passive Pressure of Piles

<b>PASSIVE PRESSURE-TRIAL WEDGE</b>						
CALCULATE THE PASSIVE EARTH PRESSURE USING THE TRIAL WEDGE METHOD. BOTH COHESIVE AND FRICTIONAL RESISTANCE ARE ASSUMED ALONG THE BASE AND SIDES OF THE PASSIVE FAILURE WEDGE. THE LATERAL EARTH PRESSURE ON THE SIDES OF THE WEDGE IS THE AT-REST PRESSURE $K_0$ ( $K_0 = 1 - \sin(\phi)$ ).						
<b>CALCULATION PARAMETERS</b>						
EARTH MATERIAL:	Bedrock	SAFETY FACTOR (fs):	3			
SHEAR DIAGRAM:	0	SLOPE ANGLE:	0 degrees			
COHESION:	800 psf	Cd Base (C/fs):	266.7 psf			
PHI ANGLE:	35 degrees	PhiD = atan(tan(phi)fs) =	13.1 degrees			
DENSITY:	115 pcf	INITIAL SEARCH DEPTH:	1 feet			
<b>PASSIVE WEDGE BOUNDARY CONDITIONS</b>			FINAL SEARCH DEPTH:	21 feet		
WEDGE WIDTH:	1 feet	POINT SURCHARGE:	0			
COHESION:	400 psf	Cd Sides (C/fs):	133.3 psf			
PHI ANGLE:	17 degrees	PhiD = atan(tan(phi)/fs) =	5.8 degrees			
TRIAL DEPTH* (feet)	CRITICAL FAILURE ANGLE** (degrees)	TOTAL EXTERNAL SURCHARGE (kips)	WEIGHT TRIAL WEDGE (kips)	TOTAL PASSIVE FORCE (pounds)	PASSIVE FORCE AT DEPTH (plf)	CHANGE Pp PER DEPTH INCREASE (plf)
1	41	0.0	0.07	1,027.7	2,055.3	2,055.3
2	42	0.0	0.26	2,739.4	2,739.4	684.1
3	43	0.0	0.55	5,132.0	3,421.3	681.9
4	44	0.0	0.95	8,201.2	4,100.6	679.2
5	45	0.0	1.44	11,946.9	4,778.7	678.2
6	45	0.0	2.07	16,365.9	5,455.3	676.6
7	45	0.0	2.82	21,462.0	6,132.0	676.7
8	45	0.0	3.68	27,235.0	6,808.7	676.8
9	45	0.0	4.66	33,684.9	7,485.5	676.8
10	45	0.0	5.75	40,811.9	8,162.4	676.8
11	45	0.0	6.96	48,615.8	8,839.2	676.9
12	45	0.0	8.28	57,096.7	9,516.1	676.9
13	45	0.0	9.72	66,254.6	10,193.0	676.9
14	45	0.0	11.27	76,089.4	10,869.9	676.9
15	45	0.0	12.94	86,601.2	11,546.8	676.9
16	45	0.0	14.72	97,790.0	12,223.7	676.9
17	45	0.0	16.62	109,655.7	12,900.7	676.9
18	45	0.0	18.63	122,198.5	13,577.6	676.9
19	45	0.0	20.76	135,418.1	14,254.5	676.9
20	45	0.0	23.00	149,314.8	14,931.5	676.9
21	45	0.0	25.36	163,888.4	15,608.4	676.9
* NUMBER TRIAL WEDGES ANALYZED PER FOOT OF EMBEDMENT DEPTH =					45	TRIALS
** ANGLES ARE MEASURED FROM THE HORIZONTAL (NEGATIVE ANGLES ARE DOWNWARD TOWARD THE SLOPE)						
<b>CONCLUSIONS: CALCULATIONS INDICATE THAT THE ALLOWABLE PASSIVE EARTH PRESSURE MAY BE COMPUTED PER THE ABOVE TABLE.</b>						

## Pile Capacity of 2 Foot Diameter Piles



## Maximum Vertical Cut Height

TEMPORARY EXCAVATION HEIGHT	
CALCULATE THE HEIGHT TO WHICH TEMPORARY EXCAVATIONS ARE STABLE (NEGATIVE THRUST). THE EXCAVATION HEIGHT AND BACKSLOPE AND SURCHARGE CONDITIONS ARE LISTED BELOW. ASSUME THE EARTH MATERIAL IS SATURATED WITH NO EXCESS HYDROSTATIC PRESSURE.	
CALCULATION PARAMETERS	
EARTH MATERIAL: Bedrock	WALL HEIGHT: 58 feet
SHEAR DIAGRAM: 0	BACKSLOPE ANGLE: 33 degrees
COHESION: 800 psf	SURCHARGE: 0 pounds
PHI ANGLE: 35 degrees	SURCHARGE TYPE: U Uniform
DENSITY: 115 pcf	INITIAL FAILURE ANGLE: 20 degrees
SAFETY FACTOR: 1.25	FINAL FAILURE ANGLE: 70 degrees
WALL FRICTION: 0 degrees	INITIAL TENSION CRACK: 4 feet
CD (C/FS): 640.0 psf	FINAL TENSION CRACK: 30 feet
PHID = ATAN(TAN(PHI)/FS) =	29.3 degrees
CALCULATED RESULTS	
CRITICAL FAILURE ANGLE	56 degrees
AREA OF TRIAL FAILURE WEDGE	73.3 square feet
TOTAL EXTERNAL SURCHARGE	0.0 pounds
WEIGHT OF TRIAL FAILURE WEDGE	8433.5 pounds
NUMBER OF TRIAL WEDGES ANALYZED	53703 trials
LENGTH OF FAILURE PLANE	7.2 feet
DEPTH OF TENSION CRACK	16.7 feet
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	4.0 feet
<b>CALCULATED HORIZONTAL THRUST</b>	<b>-222.8 pounds</b>
<b>CALCULATED EQUIVALENT FLUID PRESSURE</b>	<b>-1.1 pcf</b>
<b>MAXIMUM HEIGHT OF TEMPORARY EXCAVATION</b>	<b>20.0 feet</b>

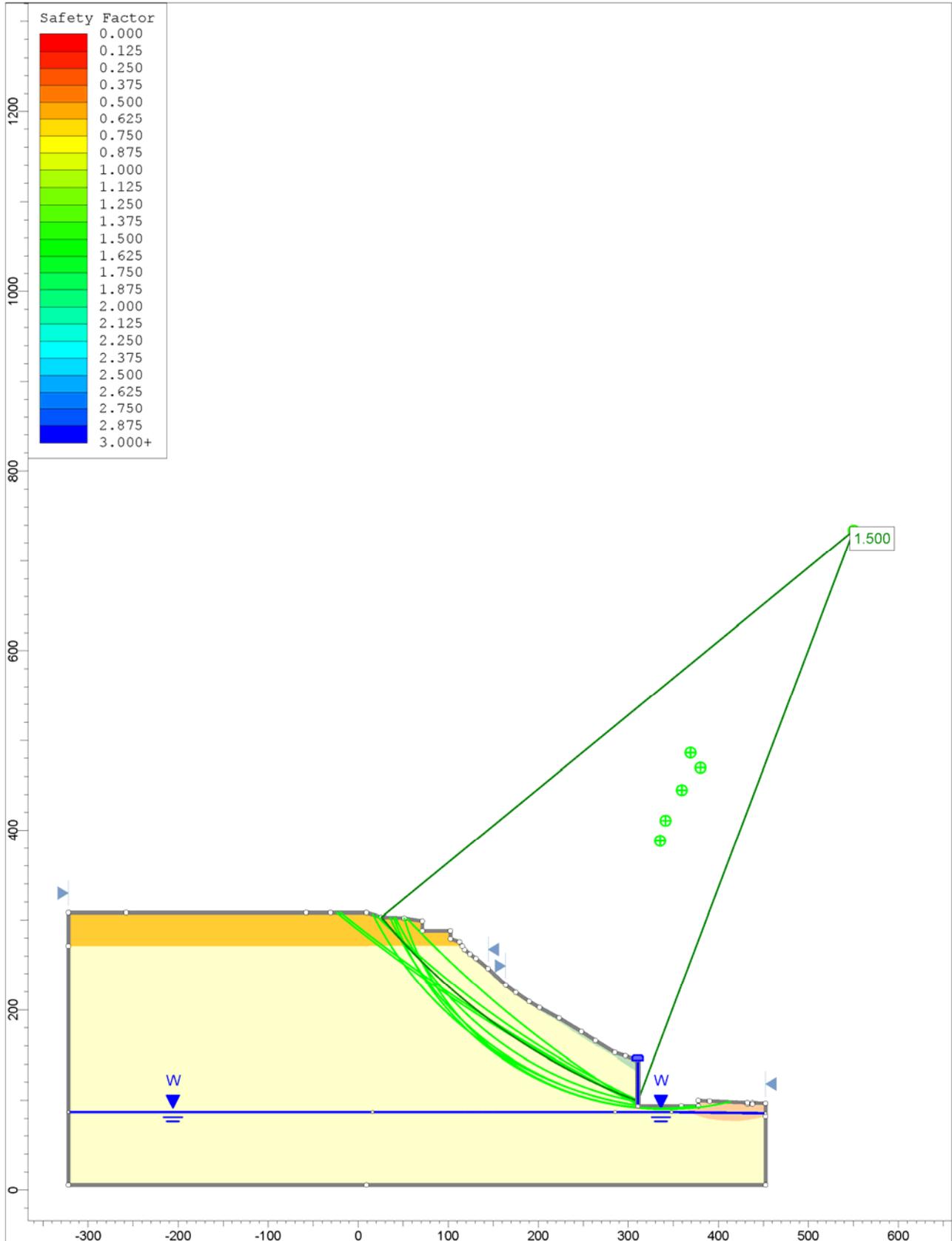
## Shoring Piles (58 Feet High with 2:1 Backslope)

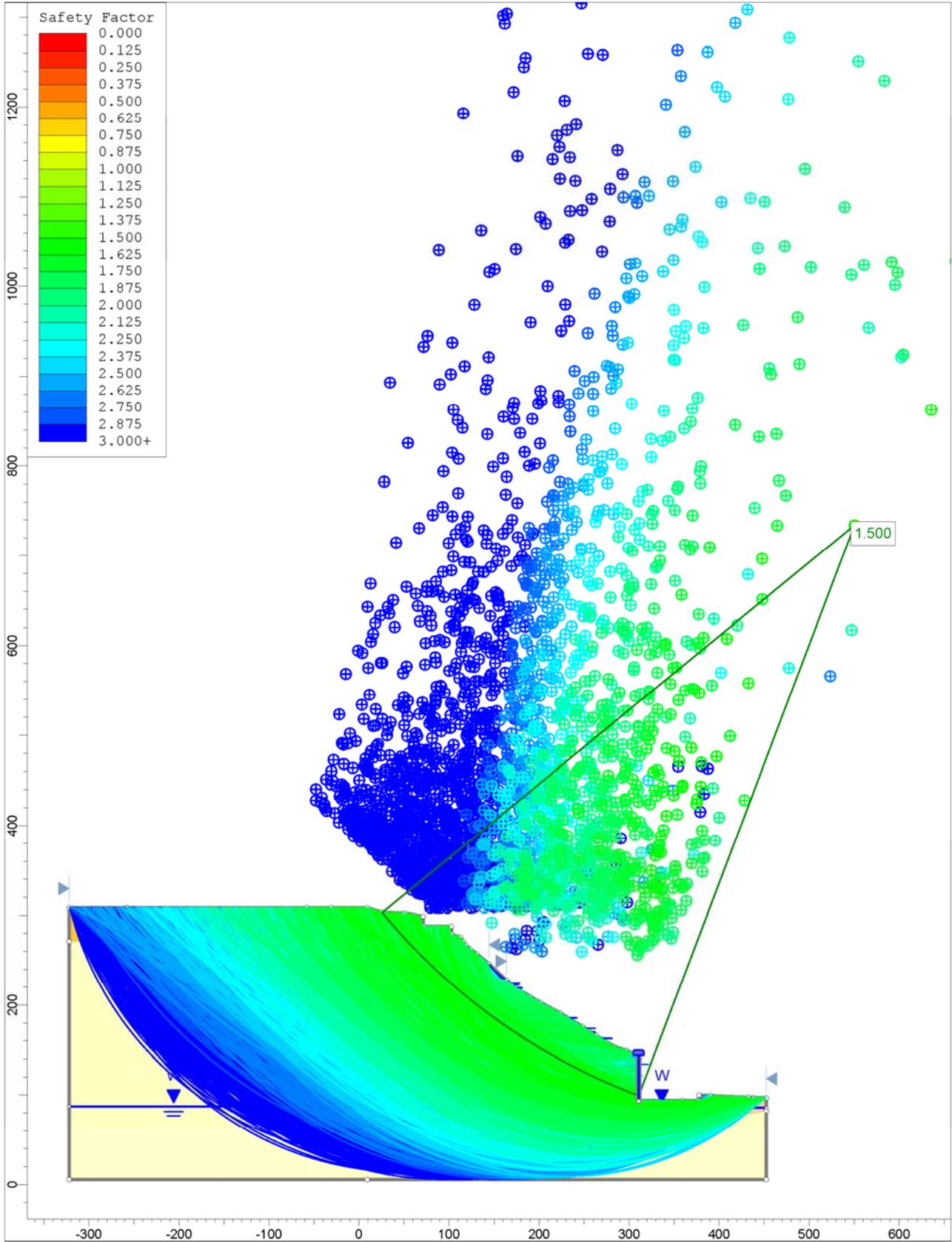
SHORING PILE	
CALCULATE THE DESIGN MINIMUM EQUIVALENT FLUID PRESSURE (EFP) FOR PROPOSED RETAINING WALLS. THE WALL HEIGHT AND BACKSLOPE AND SURCHARGE CONDITIONS ARE LISTED BELOW. ASSUME THE BACKFILL IS SATURATED WITH NO EXCESS HYDROSTATIC PRESSURE. THE MONONOBE-OKABE METHOD USED TO CALCULATE SEISMIC FORCES.	
CALCULATION PARAMETERS	
EARTH MATERIAL: Bedrock	RETAINED LENGTH 58 feet
SHEAR DIAGRAM: 0	BACKSLOPE ANGLE: 27 degrees
COHESION: 800 psf	SURCHARGE: 0 pounds
PHI ANGLE: 35 degrees	SURCHARGE TYPE: U Uniform
DENSITY 115 pcf	INITIAL FAILURE ANGLE: 40 degrees
SAFETY FACTOR: 1.25	FINAL FAILURE ANGLE: 70 degrees
PILE FRICTION 0 degrees	INITIAL TENSION CRACK: 5 feet
CD (C/FS): 640.0 psf	FINAL TENSION CRACK: 40 feet
PHID = $ATAN(TAN(PHI)/FS)$ = 29.3 degrees	
HORIZONTAL PSEUDO STATIC SEISMIC COEFFICIENT ( $k_h$ )	0 %g
VERTICAL PSEUDO STATIC SEISMIC COEFFICIENT ( $k_v$ )	0 %g
CALCULATED RESULTS	
CRITICAL FAILURE ANGLE	55 degrees
AREA OF TRIAL FAILURE WEDGE	1585.1 square feet
TOTAL EXTERNAL SURCHARGE	0.0 pounds
WEIGHT OF TRIAL FAILURE WEDGE	182286.7 pounds
NUMBER OF TRIAL WEDGES ANALYZED	1116 trials
LENGTH OF FAILURE PLANE	69.7 feet
DEPTH OF TENSION CRACK	21.3 feet
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	40.0 feet
<b>CALCULATED THRUST ON PILE</b>	<b>44670.9 pounds</b>
<b>CALCULATED EQUIVALENT FLUID PRESSURE</b>	<b>26.6 pcf</b>
<b>DESIGN EQUIVALENT FLUID PRESSURE</b>	<b>pcf</b>

## Shoring Piles (58 Feet High with 1.5:1 Backslope)

SHORING PILE			
CALCULATE THE DESIGN MINIMUM EQUIVALENT FLUID PRESSURE (EFP) FOR PROPOSED RETAINING WALLS. THE WALL HEIGHT AND BACKSLOPE AND SURCHARGE CONDITIONS ARE LISTED BELOW. ASSUME THE BACKFILL IS SATURATED WITH NO EXCESS HYDROSTATIC PRESSURE. THE MONONOBEL-OKABE METHOD USED TO CALCULATE SEISMIC FORCES.			
CALCULATION PARAMETERS			
EARTH MATERIAL:	Bedrock	RETAINED LENGTH	58 feet
SHEAR DIAGRAM:	0	BACKSLOPE ANGLE:	33 degrees
COHESION:	800 psf	SURCHARGE:	0 pounds
PHI ANGLE:	35 degrees	SURCHARGE TYPE:	U Uniform
DENSITY	115 pcf	INITIAL FAILURE ANGLE:	40 degrees
SAFETY FACTOR:	1.25	FINAL FAILURE ANGLE:	70 degrees
PILE FRICTION	0 degrees	INITIAL TENSION CRACK:	5 feet
CD (C/FS):	640.0 psf	FINAL TENSION CRACK:	40 feet
PHID = ATAN(TAN(PHI)/FS) =	29.3 degrees		
HORIZONTAL PSEUDO STATIC SEISMIC COEFFICIENT (k <sub>h</sub> )	0 %g		
VERTICAL PSEUDO STATIC SEISMIC COEFFICIENT (k <sub>v</sub> )	0 %g		
CALCULATED RESULTS			
CRITICAL FAILURE ANGLE	56 degrees		
AREA OF TRIAL FAILURE WEDGE	1653.5 square feet		
TOTAL EXTERNAL SURCHARGE	0.0 pounds		
WEIGHT OF TRIAL FAILURE WEDGE	190149.9 pounds		
NUMBER OF TRIAL WEDGES ANALYZED	1116 trials		
LENGTH OF FAILURE PLANE	71.5 feet		
DEPTH OF TENSION CRACK	24.7 feet		
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	40.0 feet		
<b>CALCULATED THRUST ON PILE</b>	<b>51093.1 pounds</b>		
<b>CALCULATED EQUIVALENT FLUID PRESSURE</b>	<b>30.4 pcf</b>		
<b>DESIGN EQUIVALENT FLUID PRESSURE</b>	<b>pcf</b>		

# Static Slope Stability Analysis A-A'





## ***Slide Analysis Information***

### ***2506-13 Static Slope Stability Analysis A-A'***

#### ***Project Summary***

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- File Name: 2506-13 A-A'
- Slide Modeler Version: 6.039
- Project Title: 2506-13 Static Slope Stability Analysis A-A'
- Date Created: 6/14/2018, 4:34:20 PM

#### ***General Settings***

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- Units of Measurement: Imperial Units
- Time Units: days
- Permeability Units: feet/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

#### ***Analysis Options***

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##### **Analysis Methods Used**

- Spencer
  
- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check  $m\alpha < 0.2$ : Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

#### ***Groundwater Analysis***

---

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft<sup>3</sup>
- Advanced Groundwater Method: None

## Random Numbers

---

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

## Surface Options

---

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 5000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Invalid Surfaces
- Minimum Elevation: Not Defined
- Minimum Depth: Not Defined

## Material Properties

---

Property	BEDROCK	SLOPE WASH	BEACH DEPOSITS	TERRACE DEPOSITS
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	115	115		105
Saturated Unit Weight [lbs/ft3]	130	130		115
Cohesion [psf]	800	300	0	280
Friction Angle [deg]	35	35	30	27
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

## Support Properties

---

### Support 1

- Support Type: Micro-Pile
- Force Application: Active
- Out-of-Plane Spacing: 1 ft
- Pile Shear Strength: 60000 lb
- Force Direction: Parallel to Surface

## Global Minimums

---

### Method: spencer

- FS: 1.499840
- Center: 550.429, 733.995
- Radius: 678.797
- Left Slip Surface Endpoint: 25.921, 303.117
- Right Slip Surface Endpoint: 310.624, 98.969
- Left Slope Intercept: 25.921 303.117
- Right Slope Intercept: 310.624 144.477
- Resisting Moment=7.82021e+008 lb-ft
- Driving Moment=5.21402e+008 lb-ft
- Resisting Horizontal Force=955935 lb
- Driving Horizontal Force=637356 lb
- Total Slice Area=13240.5 ft<sup>2</sup>

## Valid / Invalid Surfaces

---

### Method: spencer

- Number of Valid Surfaces: 2830
- Number of Invalid Surfaces: 2170

#### Error Codes:

- Error Code -103 reported for 349 surfaces
- Error Code -105 reported for 2 surfaces
- Error Code -107 reported for 1 surface
- Error Code -108 reported for 34 surfaces
- Error Code -111 reported for 27 surfaces
- Error Code -112 reported for 2 surfaces
- Error Code -113 reported for 116 surfaces
- Error Code -114 reported for 1639 surfaces

#### Error Codes

*The following errors were encountered during the computation:*

- -103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
- -105 = More than two surface / slope intersections with no valid slip surface.
- -107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.

- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -111 = safety factor equation did not converge
- -112 = The coefficient M-Alpha =  $\cos(\alpha)(1+\tan(\alpha)\tan(\phi))/F < 0.2$  for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
- -113 = Surface intersects outside slope limits.
- -114 = Surface with Reverse Curvature.

**Slice Data**

• Global Minimum Query (spencer) - Safety Factor: 1.49984

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	13.9974	11718.8	TERRACE DEPOSITS	280	27	316.586	474.829	382.374	0	382.374
2	13.9974	34365.2	TERRACE DEPOSITS	280	27	621.479	932.119	1279.86	0	1279.86
3	11.1612	42269.2	BEDROCK	800	35	1436.07	2153.87	1933.53	0	1933.53
4	11.1612	49296.1	BEDROCK	800	35	1633.67	2450.25	2356.8	0	2356.8
5	11.1612	55987.8	BEDROCK	800	35	1831.86	2747.49	2781.3	0	2781.3
6	11.1612	69357.2	BEDROCK	800	35	2203.42	3304.77	3577.18	0	3577.18
7	11.1612	74573.9	BEDROCK	800	35	2384.55	3576.44	3965.17	0	3965.17
8	11.1612	74601.4	BEDROCK	800	35	2436.8	3654.81	4077.1	0	4077.1
9	11.1612	72581.5	BEDROCK	800	35	2434.19	3650.89	4071.49	0	4071.49
10	11.1612	72319.8	BEDROCK	800	35	2476.73	3714.7	4162.62	0	4162.62
11	11.1612	70470.2	BEDROCK	800	35	2474.53	3711.4	4157.91	0	4157.91
12	11.1612	67260.1	BEDROCK	800	35	2431.21	3646.43	4065.12	0	4065.12
13	11.1612	65528.5	BEDROCK	800	35	2427	3640.11	4056.09	0	4056.09
14	11.1612	65052.9	BEDROCK	800	35	2458.08	3686.72	4122.67	0	4122.67
15	11.1612	64925.7	BEDROCK	800	35	2499.31	3748.56	4210.98	0	4210.98
16	11.1612	65426	BEDROCK	800	35	2560.05	3839.66	4341.09	0	4341.09
17	11.1612	66020.7	BEDROCK	800	35	2624.69	3936.62	4479.56	0	4479.56
18	11.1612	65928.9	BEDROCK	800	35	2668.32	4002.05	4573.01	0	4573.01
19	11.1612	64847.4	BEDROCK	800	35	2679.71	4019.14	4597.4	0	4597.4
20	11.1612	63318.8	BEDROCK	800	35	2675.21	4012.39	4587.76	0	4587.76
21	11.1612	61101.2	BEDROCK	800	35	2645.71	3968.14	4524.57	0	4524.57
22	11.1612	58889.1	BEDROCK	800	35	2614.06	3920.67	4456.78	0	4456.78
23	11.1612	56707.6	BEDROCK	800	35	2581.17	3871.34	4386.33	0	4386.33
24	11.1612	57124.2	BEDROCK	800	35	2640	3959.58	4512.36	0	4512.36
25	11.1612	57524.9	BEDROCK	800	35	3111.88	4667.32	5523.1	0	5523.1

**Interslice Data**

• Global Minimum Query (spencer) - Safety Factor: 1.49984

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	25.9206	303.117	0	0	0
2	39.918	286.621	1873.12	1106.08	30.5619
3	53.9153	271.135	12987.6	7669.13	30.5617
4	65.0766	259.445	19552.1	11545.5	30.5618
5	76.2378	248.292	27591	16292.4	30.5617
6	87.399	237.64	36756.4	21704.6	30.5618
7	98.5602	227.458	48569.1	28679.9	30.5617
8	109.721	217.718	60557	35758.7	30.5617
9	120.883	208.395	71349.9	42131.9	30.5617
10	132.044	199.468	80509.4	47540.6	30.5617
11	143.205	190.917	88442.1	52224.8	30.5617
12	154.366	182.724	94868.5	56019.6	30.5617
13	165.528	174.874	99625.3	58828.5	30.5617
14	176.689	167.353	103026	60836.5	30.5617
15	187.85	160.147	105279	62166.9	30.5617
16	199.011	153.245	106429	62845.8	30.5616
17	210.172	146.636	106525	62902.8	30.5618
18	221.334	140.311	105546	62324.5	30.5617
19	232.495	134.259	103416	61066.6	30.5616
20	243.656	128.474	100082	59098.2	30.5618
21	254.817	122.948	95556.9	56426.1	30.5617
22	265.979	117.673	89873.4	53070	30.5617
23	277.14	112.643	83092.9	49066.2	30.5618
24	288.301	107.853	75275.8	44450.2	30.5618
25	299.462	103.296	66350	39179.5	30.5617
26	310.624	98.9688	0	0	0

**List Of Coordinates**

**Water Table**

X	Y
-321.893	87.1106
15.9537	87.1106
285.385	87.1106
348.015	87.1106
452.446	85.7871

**External Boundary**

X	Y
9.14954	308.222
-30.7823	308.222
-57.788	308.222
-257.791	308.222
-321.893	308.222
-321.893	271.171
-321.893	5.59665
9.14954	5.59665
452.446	5.59665
452.446	82.3877
452.446	96.7527
437.879	97.2588
437.879	95.8608
432.307	95.8608
432.307	97.4461
390.384	99.2265
377.797	99.8397
377.797	93.7155
358.863	93.7155
310.624	93.7155
310.624	131.261
310.624	144.477
308.49	144.477
296.823	149.183
285.048	152.884
263.541	165.885
247.97	175.885
223.249	190.885
201.367	202.633
189.91	209.317
175.008	219.294
163.819	227.511
144.281	245.99
130.818	257.209
124.183	262.136
118.045	267.239
115.58	271.085
112.53	275.844
102.566	279.188
102.566	288.059
71.1898	288.059
71.1898	298.949

51.1201	302.129
25.6214	303.129

**Material Boundary**

X	Y
-321.893	271.171
10.8721	271.171
45.1977	271.142
77.6765	271.116
106.145	271.092
113.315	271.092
115.58	271.085

**Material Boundary**

X	Y
118.045	267.239
119.214	265.415
120.06	264.094
135.161	250.445
144.821	241.454
149.959	236.672
153.162	233.937
161.621	226.717
182.454	211.601
201.093	199.891
205.417	197.174
213.463	192.122
235.078	178.553
267.005	158.6
287.817	145.982
306.866	133.645
310.624	131.261

**Material Boundary**

X	Y
358.863	93.7155
363.454	90.5443
371.526	85.7381
376.388	83.7667
380.688	82.0233

382.232	81.5792
388.846	79.6775
405.74	77.7554
420.64	77.1408
431.367	78.1596
440.188	79.8119
447.208	81.286
452.446	82.3877

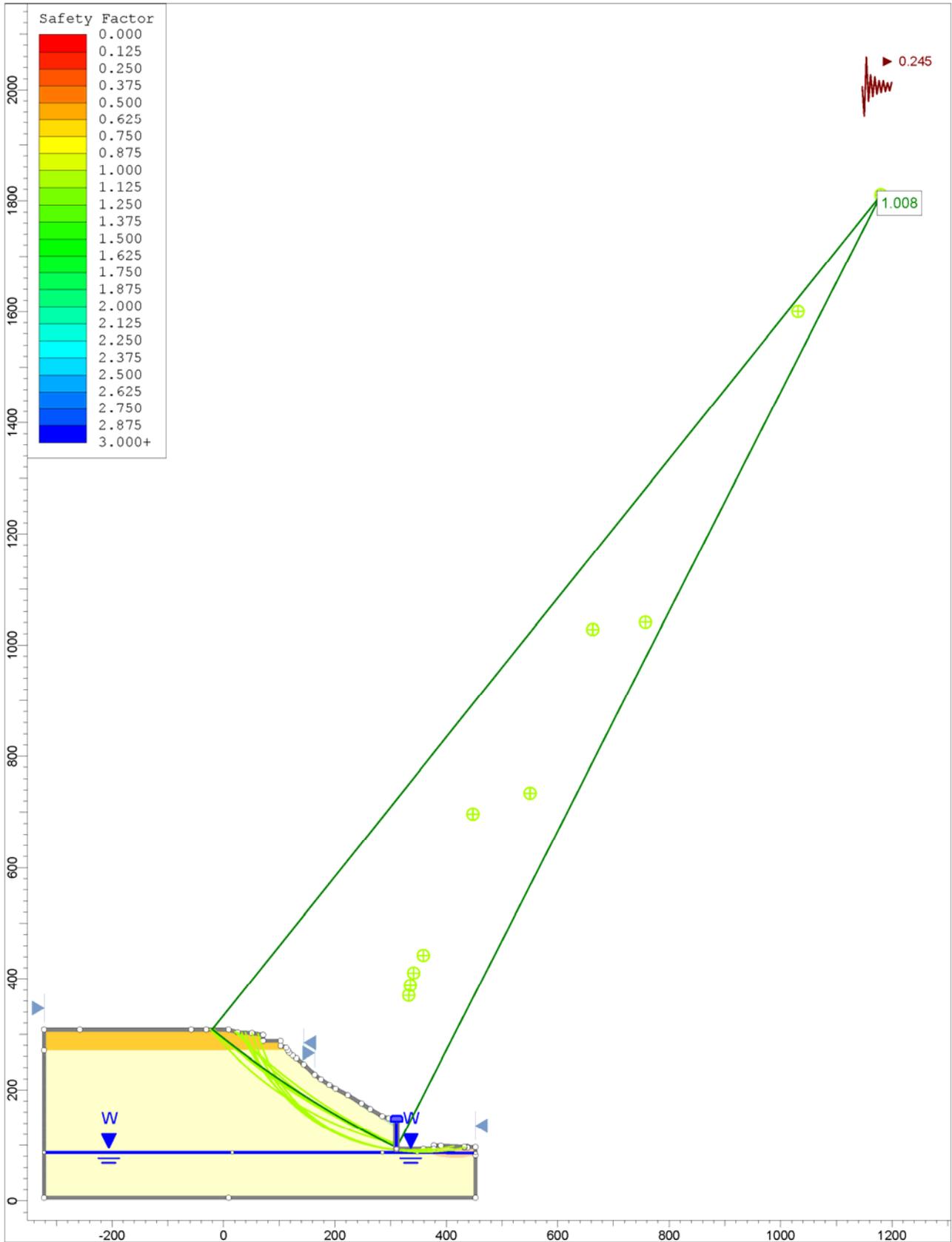
**Material Boundary**

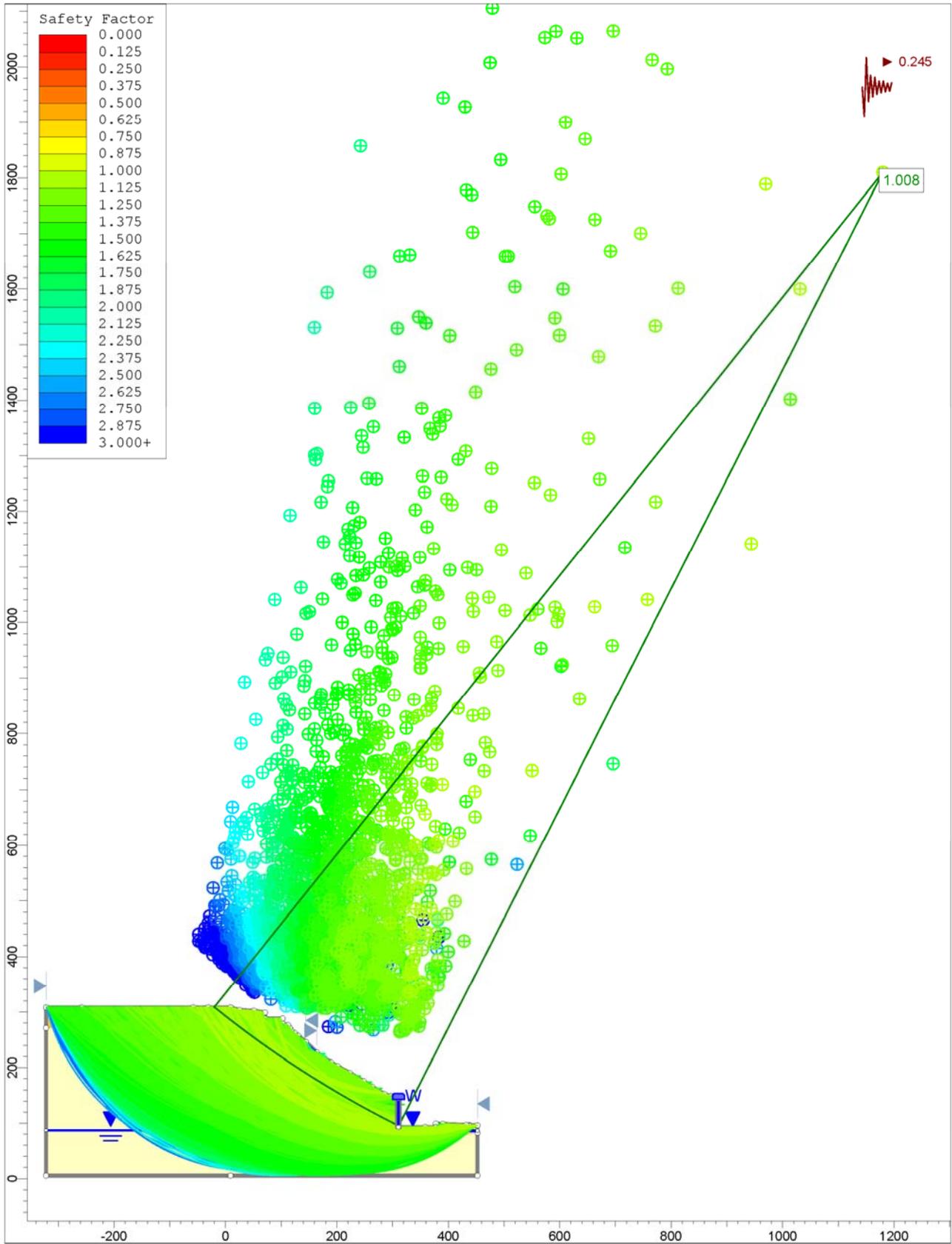
X	Y
-30.7823	291.932
-30.7823	308.222

**Material Boundary**

X	Y
-257.791	293.58
-257.791	308.222

# Pseudo-Static Slope Stability Analysis A-A'





## ***Slide Analysis Information***

### ***2506-13 Pseudo-Static Slope Stability Analysis A-A'***

#### ***Project Summary***

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- File Name: 2506-13 A-A'
- Slide Modeler Version: 6.039
- Project Title: 2506-13 Pseudo-Static Slope Stability Analysis A-A'
- Date Created: 6/14/2018, 4:34:20 PM

#### ***General Settings***

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- Units of Measurement: Imperial Units
- Time Units: days
- Permeability Units: feet/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

#### ***Analysis Options***

---

##### **Analysis Methods Used**

- Spencer
- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check  $m\alpha < 0.2$ : Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

#### ***Groundwater Analysis***

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- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft<sup>3</sup>
- Advanced Groundwater Method: None

## Random Numbers

---

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

## Surface Options

---

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 5000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Invalid Surfaces
- Minimum Elevation: Not Defined
- Minimum Depth: Not Defined

## Loading

---

- Seismic Load Coefficient (Horizontal): 0.245

## Material Properties

---

Property	BEDROCK	SLOPE WASH	BEACH DEPOSITS	TERRACE DEPOSITS
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	115	115		105
Saturated Unit Weight [lbs/ft3]	130	130		115
Cohesion [psf]	800	300	0	280
Friction Angle [deg]	35	35	30	27
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

## Support Properties

---

### Support 1

- Support Type: Micro-Pile
- Force Application: Active
- Out-of-Plane Spacing: 1 ft
- Pile Shear Strength: 130000 lb
- Force Direction: Parallel to Surface

## **Global Minimums**

---

### **Method: spencer**

- FS: 1.008160
- Center: 1180.154, 1810.278
- Radius: 1922.888
- Left Slip Surface Endpoint: -20.398, 308.222
- Right Slip Surface Endpoint: 310.624, 95.223
- Left Slope Intercept: -20.398 308.222
- Right Slope Intercept: 310.624 144.477
- Resisting Moment=2.20089e+009 lb-ft
- Driving Moment=2.18308e+009 lb-ft
- Resisting Horizontal Force=973385 lb
- Driving Horizontal Force=965508 lb
- Total Slice Area=15205.4 ft<sup>2</sup>

## **Valid / Invalid Surfaces**

---

### **Method: spencer**

- Number of Valid Surfaces: 2579
- Number of Invalid Surfaces: 2421

#### **Error Codes:**

- Error Code -103 reported for 349 surfaces
- Error Code -105 reported for 2 surfaces
- Error Code -107 reported for 2 surfaces
- Error Code -108 reported for 252 surfaces
- Error Code -111 reported for 61 surfaces
- Error Code -113 reported for 116 surfaces
- Error Code -114 reported for 1639 surfaces

#### **Error Codes**

*The following errors were encountered during the computation:*

- -103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
- -105 = More than two surface / slope intersections with no valid slip surface.
- -107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -111 = safety factor equation did not converge
- -113 = Surface intersects outside slope limits.
- -114 = Surface with Reverse Curvature.

**Slice Data**

• Global Minimum Query (spencer) - Safety Factor: 1.00816

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	11.9752	5968.7	TERRACE DEPOSITS	280	27	399.99	403.254	241.899	0	241.899
2	11.9752	17809.6	TERRACE DEPOSITS	280	27	661.631	667.03	759.59	0	759.59
3	11.9752	28798.8	TERRACE DEPOSITS	280	27	909.172	916.591	1249.38	0	1249.38
4	11.9752	36163.5	TERRACE DEPOSITS	280	27	1080.33	1089.14	1588.03	0	1588.03
5	13.4819	52535.9	BEDROCK	800	35	2222.96	2241.1	2058.11	0	2058.11
6	13.4819	67087.8	BEDROCK	800	35	2647.8	2669.41	2669.79	0	2669.79
7	13.4819	79800	BEDROCK	800	35	3031.28	3056.02	3221.93	0	3221.93
8	13.4819	80759.3	BEDROCK	800	35	3090.86	3116.08	3307.7	0	3307.7
9	13.4819	91518.7	BEDROCK	800	35	3432.28	3460.29	3799.29	0	3799.29
10	13.4819	99780.5	BEDROCK	800	35	3709.01	3739.28	4197.72	0	4197.72
11	13.4819	96000.1	BEDROCK	800	35	3638.14	3667.83	4095.68	0	4095.68
12	13.4819	90529.1	BEDROCK	800	35	3514.62	3543.3	3917.83	0	3917.83
13	13.4819	86895.5	BEDROCK	800	35	3442.76	3470.85	3814.36	0	3814.36
14	13.4819	80925.2	BEDROCK	800	35	3297.39	3324.3	3605.08	0	3605.08
15	13.4819	75946	BEDROCK	800	35	3178.51	3204.45	3433.91	0	3433.91
16	13.4819	74126.6	BEDROCK	800	35	3154.78	3180.52	3399.74	0	3399.74
17	13.4819	73525	BEDROCK	800	35	3168.41	3194.26	3419.36	0	3419.36
18	13.4819	74248.8	BEDROCK	800	35	3224.17	3250.48	3499.65	0	3499.65
19	13.4819	74967.4	BEDROCK	800	35	3280.61	3307.38	3580.91	0	3580.91
20	13.4819	74366.4	BEDROCK	800	35	3294.74	3321.63	3601.26	0	3601.26
21	13.4819	73191.9	BEDROCK	800	35	3289.75	3316.59	3594.06	0	3594.06
22	13.4819	71354.4	BEDROCK	800	35	3261.94	3288.56	3554.04	0	3554.04
23	13.4819	69846	BEDROCK	800	35	3244.17	3270.64	3528.43	0	3528.43
24	13.4819	70666.4	BEDROCK	800	35	3305.29	3332.26	3616.44	0	3616.44

25	13.4819	74001.8	BEDROCK	800	35	4475.22	4511.74	5300.92	0	5300.92
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**Interslice Data**

• Global Minimum Query (spencer) - Safety Factor: 1.00816

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	-20.398	308.222	0	0	0
2	-8.42277	298.728	-1032.42	-753.434	36.121
3	3.55245	289.388	2500.29	1824.65	36.121
4	15.5277	280.198	10146.6	7404.74	36.1211
5	27.5029	271.157	20424	14905	36.1212
6	40.9848	261.152	23908.9	17448.1	36.121
7	54.4668	251.328	30867	22526	36.1211
8	67.9487	241.681	40620.9	29644.2	36.1211
9	81.4306	232.208	50057.9	36531	36.121
10	94.9126	222.906	61533.5	44905.7	36.1211
11	108.395	213.773	74302.1	54223.9	36.1211
12	121.876	204.804	85491.8	62389.9	36.1211
13	135.358	195.998	94775.6	69164.9	36.121
14	148.84	187.352	102618	74887.9	36.121
15	162.322	178.862	108581	79239.7	36.121
16	175.804	170.528	112943	82422.9	36.121
17	189.286	162.346	116376	84928.3	36.121
18	202.768	154.315	119125	86934.4	36.121
19	216.25	146.431	121426	88613.8	36.1211
20	229.732	138.693	123260	89952.4	36.1211
21	243.214	131.099	124396	90781.2	36.1211
22	256.696	123.647	124746	91037	36.1212
23	270.178	116.335	124226	90656.8	36.121
24	283.66	109.162	122900	89689.3	36.121
25	297.142	102.125	121088	88367.4	36.1212
26	310.624	95.2226	0	0	0

**List Of Coordinates**

**Water Table**

X	Y
-321.893	87.1106

15.9537	87.1106
285.385	87.1106
348.015	87.1106
452.446	85.7871

**External Boundary**

X	Y
9.14954	308.222
-30.7823	308.222
-57.788	308.222
-257.791	308.222
-321.893	308.222
-321.893	271.171
-321.893	5.59665
9.14954	5.59665
452.446	5.59665
452.446	82.3877
452.446	96.7527
437.879	97.2588
437.879	95.8608
432.307	95.8608
432.307	97.4461
390.384	99.2265
377.797	99.8397
377.797	93.7155
358.863	93.7155
310.624	93.7155
310.624	131.261
310.624	144.477
308.49	144.477
296.823	149.183
285.048	152.884
263.541	165.885
247.97	175.885
223.249	190.885
201.367	202.633
189.91	209.317
175.008	219.294
163.819	227.511
144.281	245.99
130.818	257.209
124.183	262.136
118.045	267.239

115.58	271.085
112.53	275.844
102.566	279.188
102.566	288.059
71.1898	288.059
71.1898	298.949
51.1201	302.129
25.6214	303.129

**Material Boundary**

X	Y
-321.893	271.171
10.8721	271.171
45.1977	271.142
77.6765	271.116
106.145	271.092
113.315	271.092
115.58	271.085

**Material Boundary**

X	Y
118.045	267.239
119.214	265.415
120.06	264.094
135.161	250.445
144.821	241.454
149.959	236.672
153.162	233.937
161.621	226.717
182.454	211.601
201.093	199.891
205.417	197.174
213.463	192.122
235.078	178.553
267.005	158.6
287.817	145.982
306.866	133.645
310.624	131.261

**Material Boundary**

X	Y
358.863	93.7155
363.454	90.5443
371.526	85.7381
376.388	83.7667
380.688	82.0233
382.232	81.5792
388.846	79.6775
405.74	77.7554
420.64	77.1408
431.367	78.1596
440.188	79.8119
447.208	81.286
452.446	82.3877

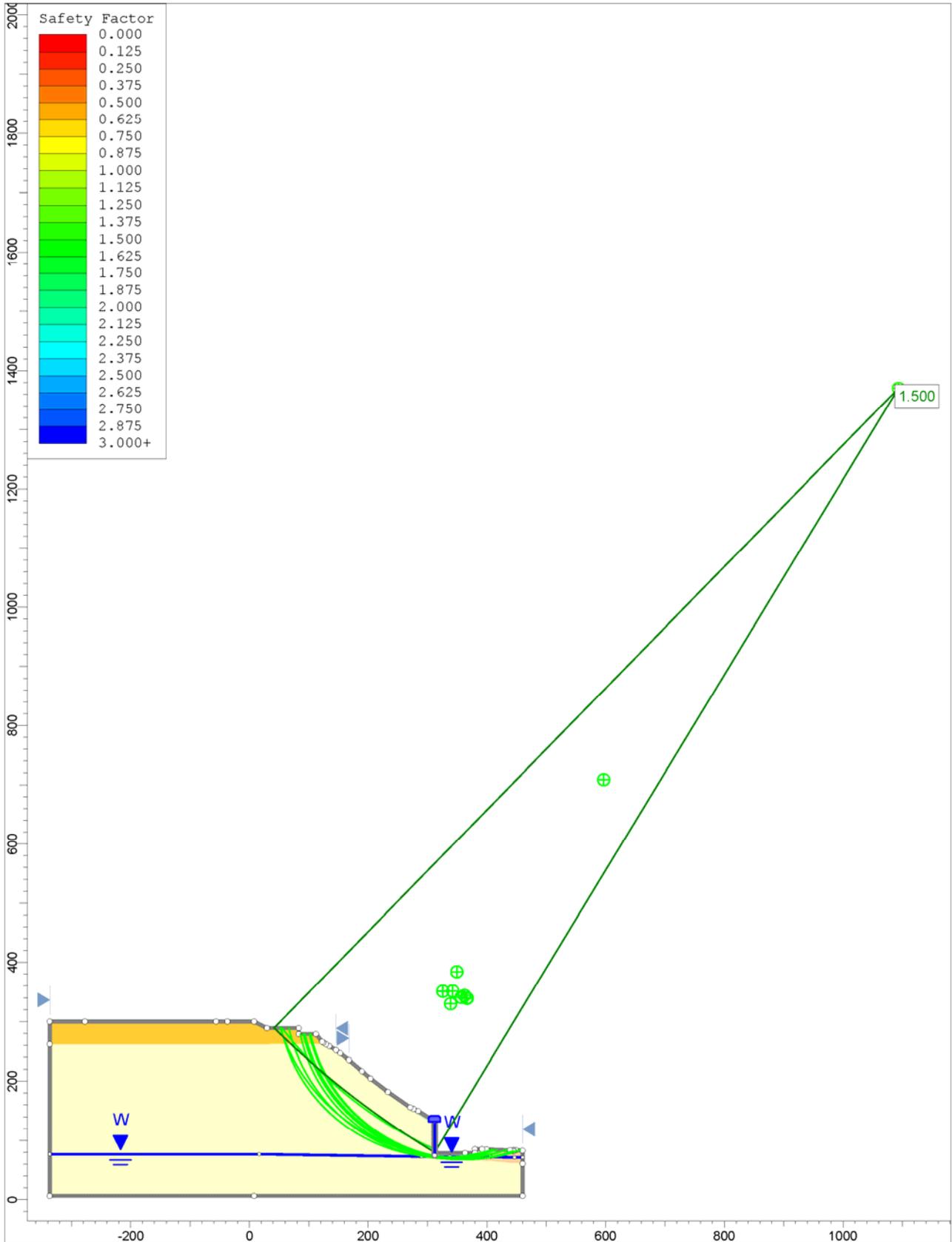
**Material Boundary**

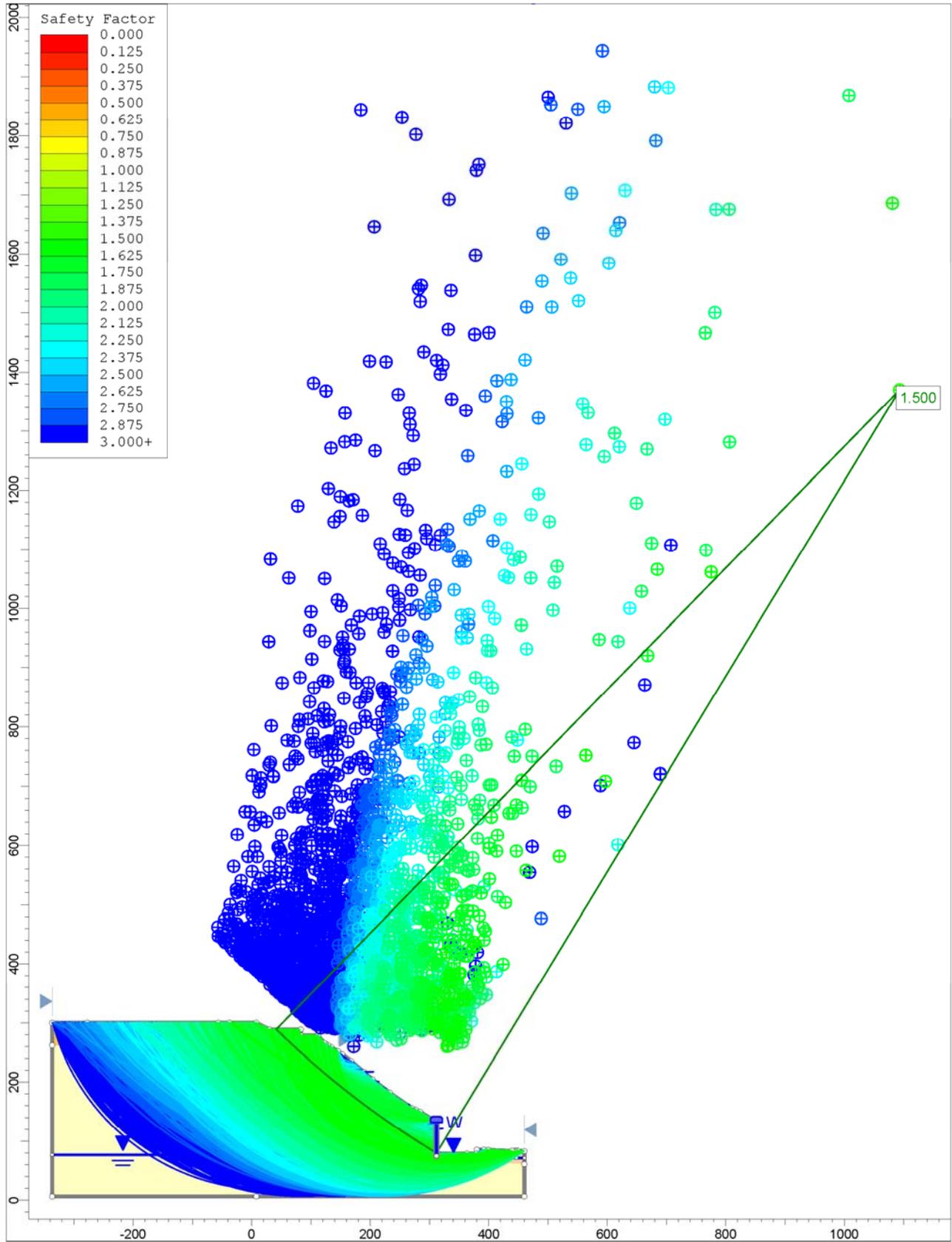
X	Y
-30.7823	291.932
-30.7823	308.222

**Material Boundary**

X	Y
-257.791	293.58
-257.791	308.222

# Static Slope Stability Analysis B-B'





## ***Slide Analysis Information***

### ***2506-13 Static Slope Stability Analysis B-B'***

#### ***Project Summary***

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- File Name: 2506-13 B-B'
- Slide Modeler Version: 6.039
- Project Title: 2506-13 Static Slope Stability Analysis B-B'
- Date Created: 6/14/2018, 4:34:20 PM

#### ***General Settings***

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- Units of Measurement: Imperial Units
- Time Units: days
- Permeability Units: feet/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

#### ***Analysis Options***

---

##### **Analysis Methods Used**

- Spencer
  
- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check  $m\alpha < 0.2$ : Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

#### ***Groundwater Analysis***

---

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft<sup>3</sup>
- Advanced Groundwater Method: None

## Random Numbers

---

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

## Surface Options

---

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 5000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Invalid Surfaces
- Minimum Elevation: Not Defined
- Minimum Depth: Not Defined

## Material Properties

---

Property	BEDROCK	SLOPE WASH	BEACH DEPOSITS	TERRACE DEPOSITS
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	115	115		105
Saturated Unit Weight [lbs/ft3]	130	130		115
Cohesion [psf]	800	300	0	280
Friction Angle [deg]	35	35	30	27
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

## Support Properties

---

### Support 1

- Support Type: Micro-Pile
- Force Application: Active
- Out-of-Plane Spacing: 1 ft
- Pile Shear Strength: 150000 lb
- Force Direction: Parallel to Surface

## Global Minimums

---

### Method: spencer

- FS: 1.499620
- Center: 1093.428, 1370.240
- Radius: 1508.854
- Left Slip Surface Endpoint: 41.376, 288.656
- Right Slip Surface Endpoint: 311.850, 79.591
- Left Slope Intercept: 41.376 288.656
- Right Slope Intercept: 311.850 132.736
- Resisting Moment=1.61161e+009 lb-ft
- Driving Moment=1.07468e+009 lb-ft
- Resisting Horizontal Force=855908 lb
- Driving Horizontal Force=570751 lb
- Total Slice Area=12667.7 ft<sup>2</sup>

## Valid / Invalid Surfaces

---

### Method: spencer

- Number of Valid Surfaces: 2841
- Number of Invalid Surfaces: 2159

#### Error Codes:

- Error Code -103 reported for 627 surfaces
- Error Code -107 reported for 1 surface
- Error Code -108 reported for 43 surfaces
- Error Code -111 reported for 34 surfaces
- Error Code -112 reported for 2 surfaces
- Error Code -113 reported for 61 surfaces
- Error Code -114 reported for 1391 surfaces

#### Error Codes

*The following errors were encountered during the computation:*

- -103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
- -107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

- -111 = safety factor equation did not converge
- -112 = The coefficient  $M\text{-Alpha} = \cos(\alpha)(1 + \tan(\alpha)\tan(\phi))/F < 0.2$  for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
- -113 = Surface intersects outside slope limits.
- -114 = Surface with Reverse Curvature.

**Slice Data**

• Global Minimum Query (spencer) - Safety Factor: 1.49962

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.41876	4491.13	TERRACE DEPOSITS	280	27	267.913	401.767	238.981	0	238.981
2	9.41876	13396.4	TERRACE DEPOSITS	280	27	458.956	688.26	801.254	0	801.254
3	9.41876	22149.6	TERRACE DEPOSITS	280	27	649.611	974.169	1362.38	0	1362.38
4	11.0099	37337.7	BEDROCK	800	35	1414.37	2121.02	1886.61	0	1886.61
5	11.0099	40875.2	BEDROCK	800	35	1515.24	2272.29	2102.65	0	2102.65
6	11.0099	50868	BEDROCK	800	35	1780.39	2669.91	2670.51	0	2670.51
7	11.0099	62843.3	BEDROCK	800	35	2101.46	3151.39	3358.14	0	3358.14
8	11.0099	64775.3	BEDROCK	800	35	2171.08	3255.8	3507.25	0	3507.25
9	11.0099	66176.2	BEDROCK	800	35	2228.02	3341.19	3629.2	0	3629.2
10	11.0099	69386.9	BEDROCK	800	35	2333.31	3499.08	3854.68	0	3854.68
11	11.0099	71293	BEDROCK	800	35	2405.82	3607.81	4009.97	0	4009.97
12	11.0099	71634	BEDROCK	800	35	2437.49	3655.31	4077.8	0	4077.8
13	11.0099	71042.6	BEDROCK	800	35	2444.15	3665.3	4092.07	0	4092.07
14	11.0099	69817.2	BEDROCK	800	35	2433.18	3648.85	4068.58	0	4068.58
15	11.0099	68318.6	BEDROCK	800	35	2414.04	3620.14	4027.58	0	4027.58
16	11.0099	66978	BEDROCK	800	35	2398.53	3596.88	3994.36	0	3994.36
17	11.0099	66250.2	BEDROCK	800	35	2399.63	3598.53	3996.72	0	3996.72
18	11.0099	65368.1	BEDROCK	800	35	2395.99	3593.07	3988.93	0	3988.93
19	11.0099	64935.9	BEDROCK	800	35	2404.89	3606.42	4007.99	0	4007.99
20	11.0099	64687.2	BEDROCK	800	35	2418.97	3627.53	4038.13	0	4038.13
21	11.0099	64260.3	BEDROCK	800	35	2427.74	3640.69	4056.94	0	4056.94
22	11.0099	64740.7	BEDROCK	800	35	2463.31	3694.03	4133.1	0	4133.1
23	11.0099	66981.7	BEDROCK	800	35	2552.05	3827.11	4323.15	0	4323.15
24	11.0099	67367.9	BEDROCK	800	35	2586.05	3878.09	4395.97	0	4395.97
25	11.0099	67342.3	BEDROCK	800	35	2936.46	4403.57	5146.43	0	5146.43

**Interslice Data**

• Global Minimum Query (spencer) - Safety Factor: 1.49962

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	41.376	288.656	0	0	0
2	50.7948	279.573	-345.73	-241.834	34.9723
3	60.2136	270.647	2496.32	1746.14	34.9722
4	69.6323	261.872	8349.8	5840.57	34.9723
5	80.6422	251.802	11818.8	8267.11	34.9723
6	91.6521	241.93	15941	11150.5	34.9722
7	102.662	232.25	22245	15560	34.9721
8	113.672	222.758	31051.3	21720	34.9723
9	124.682	213.448	39868.1	27887.2	34.9723
10	135.692	204.316	48548	33958.7	34.9723
11	146.702	195.358	57459.9	40192.4	34.9723
12	157.711	186.571	66284.2	46364.9	34.9723
13	168.721	177.95	74678.3	52236.5	34.9723
14	179.731	169.492	82455.9	57676.8	34.9723
15	190.741	161.193	89506.7	62608.7	34.9723
16	201.751	153.051	95798.4	67009.7	34.9723
17	212.761	145.061	101379	70913	34.9722
18	223.771	137.222	106366	74401.4	34.9722
19	234.781	129.529	110745	77464.3	34.9722
20	245.791	121.982	114593	80156.3	34.9723
21	256.8	114.576	117942	82498.5	34.9722
22	267.81	107.31	120767	84475.1	34.9723
23	278.82	100.18	123190	86169.7	34.9723
24	289.83	93.1854	125411	87723.2	34.9722
25	300.84	86.3232	127185	88964.3	34.9723
26	311.85	79.5915	0	0	0

**List Of Coordinates**

**Water Table**

X	Y
-336.577	76.6911
16.219	76.6911
289.311	72.7476
290.19	72.7476
337.574	72.7476
406.341	72.1426

446.631	71.3606
460.231	71.0967

**External Boundary**

X	Y
7.84613	299.813
-37.2578	299.813
-56.3832	299.813
-277.233	299.813
-336.577	299.813
-336.577	261.898
-336.577	6.30123
7.84613	6.30123
460.231	6.30123
460.231	60.7358
460.231	82.8067
448.754	83.7829
444.651	83.7829
444.651	81.6778
439.078	81.6778
439.078	83.284
399.604	84.9407
391.739	85.2708
379.875	85.2708
379.875	78.812
363.245	78.812
311.85	78.812
311.85	125.982
311.85	132.736
284.269	149.813
276.552	153.483
270.788	155.784
233.123	182.035
203.854	204.556
189.528	216.842
167.779	235.304
152.82	246.9
145.824	251.9
134.543	258.589
129.048	261.847
124.501	264.543
122.29	265.855
112.112	278.733

82.9309	278.733
82.9309	288.656
29.5123	288.656

**Material Boundary**

X	Y
-336.577	261.898
9.91462	261.898
34.3278	261.887
75.2372	261.869
120.812	261.849
126.131	261.847
127.101	261.847
129.048	261.847

**Material Boundary**

X	Y
124.501	264.543
127.101	261.847
127.391	261.546
147.355	247.353
162.035	236.159
198.168	206.057
240.859	174.854
267.003	156.372
281.666	146.2
299.213	134.265
311.85	125.982

**Material Boundary**

X	Y
363.245	78.812
367.942	75.5035
371.446	73.5655
379.989	69.9893
386.846	67.3775
392.8	66.2151
402.104	65.3781
413.497	64.5984
427.015	63.4026

444.487	61.8341
457.224	60.9455
460.231	60.7358

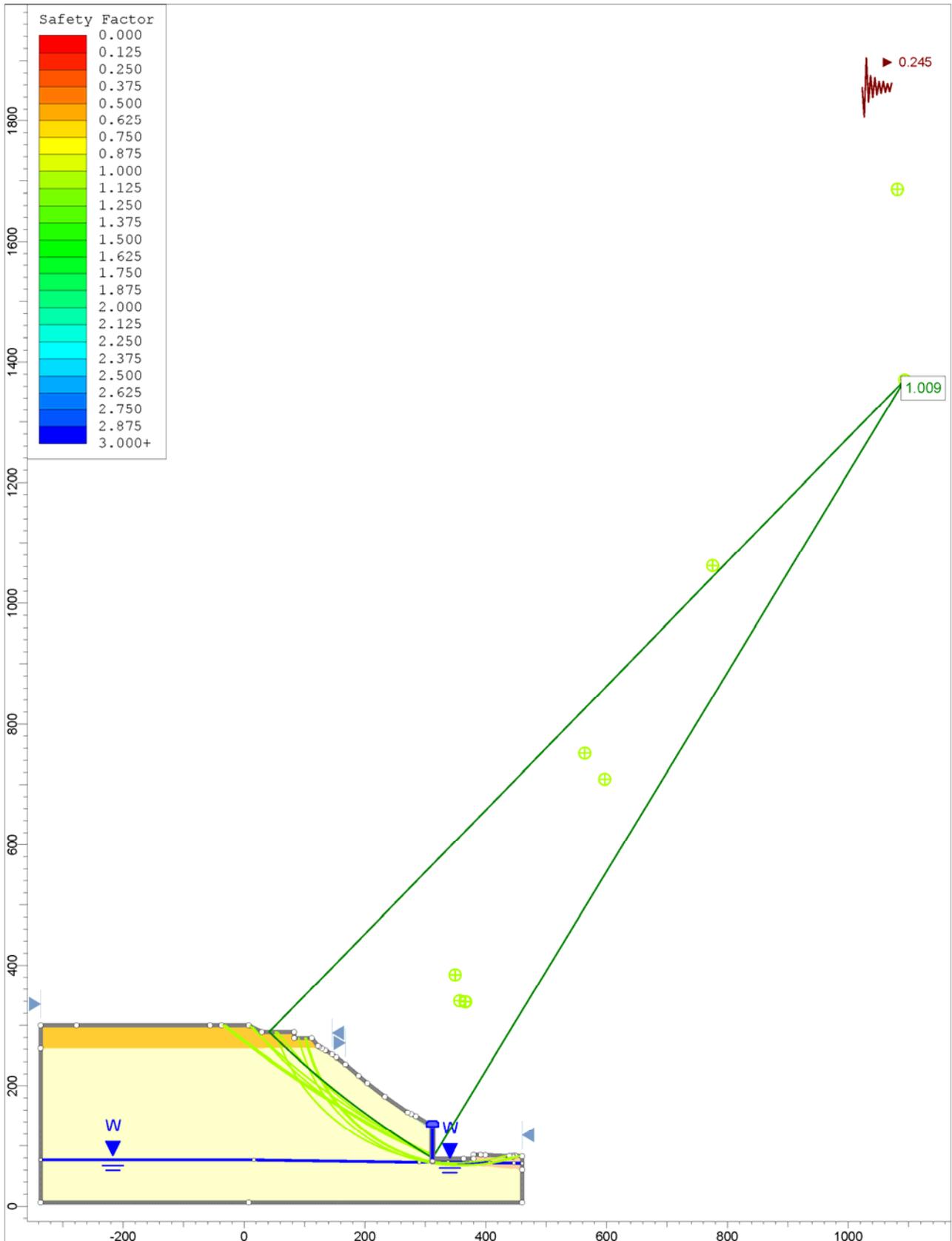
**Material Boundary**

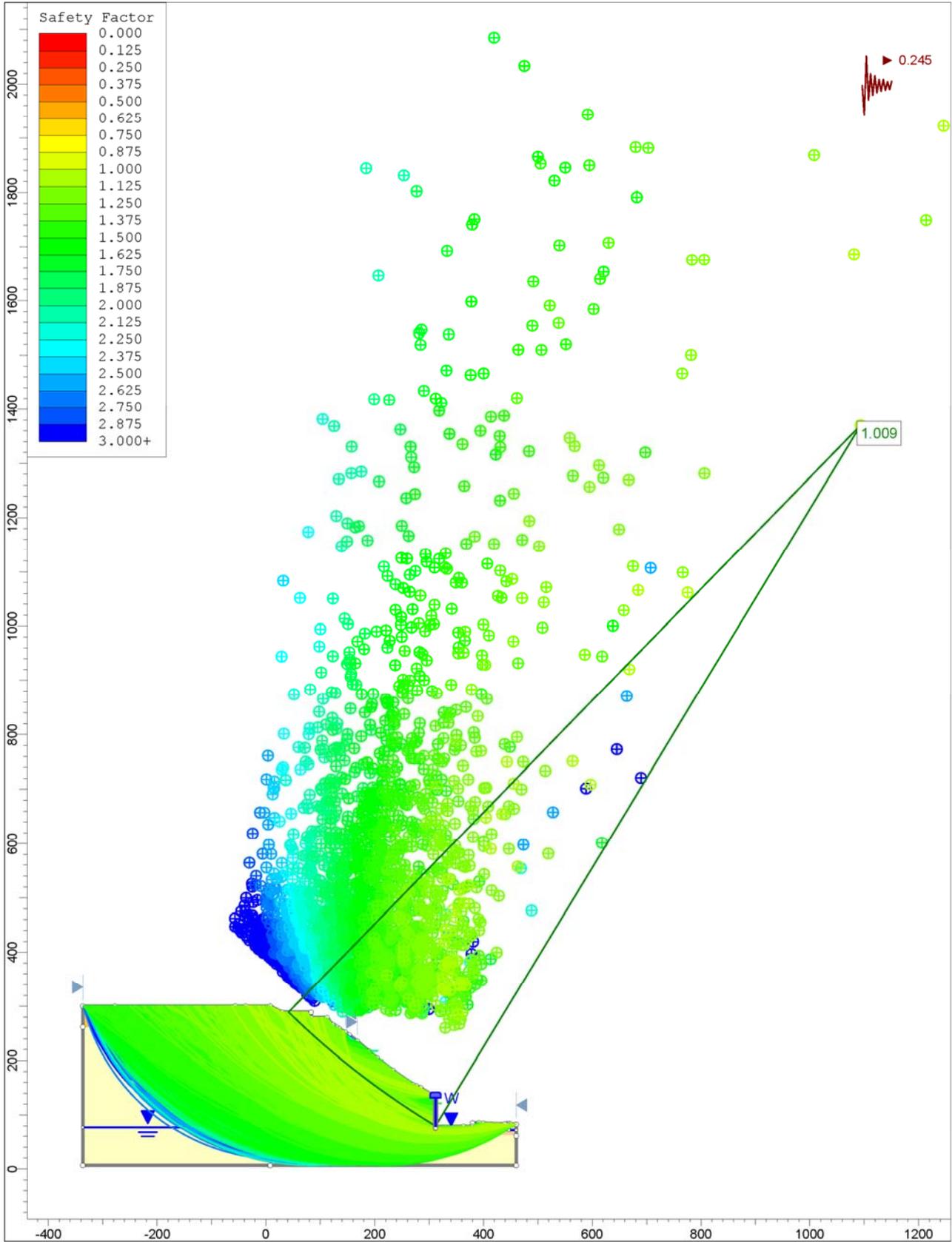
X	Y
-37.2578	275.55
-37.2578	299.813

**Material Boundary**

X	Y
-277.233	275.656
-277.233	299.813

# Pseudo-Static Slope Stability Analysis B-B'





## ***Slide Analysis Information***

### ***2506-13 Pseudo-Static Slope Stability Analysis B-B'***

#### ***Project Summary***

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- File Name: 2506-13 B-B'
- Slide Modeler Version: 6.039
- Project Title: 2506-13 Pseudo-Static Slope Stability Analysis B-B'
- Date Created: 6/14/2018, 4:34:20 PM

#### ***General Settings***

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- Units of Measurement: Imperial Units
- Time Units: days
- Permeability Units: feet/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

#### ***Analysis Options***

---

##### **Analysis Methods Used**

- Spencer
- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check  $m\alpha < 0.2$ : Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

#### ***Groundwater Analysis***

---

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft<sup>3</sup>
- Advanced Groundwater Method: None

## Random Numbers

---

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

## Surface Options

---

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 5000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Invalid Surfaces
- Minimum Elevation: Not Defined
- Minimum Depth: Not Defined

## Loading

---

- Seismic Load Coefficient (Horizontal): 0.245

## Material Properties

---

Property	BEDROCK	SLOPE WASH	BEACH DEPOSITS	TERRACE DEPOSITS
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	115	115		105
Saturated Unit Weight [lbs/ft3]	130	130		115
Cohesion [psf]	800	300	0	280
Friction Angle [deg]	35	35	30	27
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

## Support Properties

---

### Support 1

- Support Type: Micro-Pile
- Force Application: Active
- Out-of-Plane Spacing: 1 ft
- Pile Shear Strength: 220000 lb
- Force Direction: Parallel to Surface

## **Global Minimums**

---

### **Method: spencer**

- FS: 1.008510
- Center: 1093.428, 1370.240
- Radius: 1508.854
- Left Slip Surface Endpoint: 41.376, 288.656
- Right Slip Surface Endpoint: 311.850, 79.591
- Left Slope Intercept: 41.376 288.656
- Right Slope Intercept: 311.850 132.736
- Resisting Moment=1.39869e+009 lb-ft
- Driving Moment=1.38689e+009 lb-ft
- Resisting Horizontal Force=746707 lb
- Driving Horizontal Force=740408 lb
- Total Slice Area=12667.7 ft<sup>2</sup>

## **Valid / Invalid Surfaces**

---

### **Method: spencer**

- Number of Valid Surfaces: 2533
- Number of Invalid Surfaces: 2467

#### **Error Codes:**

- Error Code -103 reported for 627 surfaces
- Error Code -107 reported for 1 surface
- Error Code -108 reported for 313 surfaces
- Error Code -111 reported for 74 surfaces
- Error Code -113 reported for 61 surfaces
- Error Code -114 reported for 1391 surfaces

#### **Error Codes**

*The following errors were encountered during the computation:*

- -103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
- -107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -111 = safety factor equation did not converge
- -113 = Surface intersects outside slope limits.
- -114 = Surface with Reverse Curvature.

**Slice Data**

• Global Minimum Query (spencer) - Safety Factor: 1.00851

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	9.41876	4491.13	TERRACE DEPOSITS	280	27	375.87	379.069	194.434	0	194.434
2	9.41876	13396.4	TERRACE DEPOSITS	280	27	554.225	558.941	547.452	0	547.452
3	9.41876	22149.6	TERRACE DEPOSITS	280	27	736.513	742.781	908.259	0	908.259
4	11.0099	37337.7	BEDROCK	800	35	1784.06	1799.24	1427.06	0	1427.06
5	11.0099	40875.2	BEDROCK	800	35	1901.61	1917.79	1596.36	0	1596.36
6	11.0099	50868	BEDROCK	800	35	2199.58	2218.3	2025.54	0	2025.54
7	11.0099	62843.3	BEDROCK	800	35	2563.35	2585.16	2549.48	0	2549.48
8	11.0099	64775.3	BEDROCK	800	35	2654.16	2676.75	2680.28	0	2680.28
9	11.0099	66176.2	BEDROCK	800	35	2731.62	2754.87	2791.85	0	2791.85
10	11.0099	69386.9	BEDROCK	800	35	2863.88	2888.25	2982.33	0	2982.33
11	11.0099	71293	BEDROCK	800	35	2960.36	2985.55	3121.29	0	3121.29
12	11.0099	71634	BEDROCK	800	35	3011.09	3036.71	3194.35	0	3194.35
13	11.0099	71042.6	BEDROCK	800	35	3033.25	3059.06	3226.28	0	3226.28
14	11.0099	69817.2	BEDROCK	800	35	3034.81	3060.64	3228.53	0	3228.53
15	11.0099	68318.6	BEDROCK	800	35	3026.38	3052.13	3216.37	0	3216.37
16	11.0099	66978	BEDROCK	800	35	3021.57	3047.28	3209.44	0	3209.44
17	11.0099	66250.2	BEDROCK	800	35	3035.71	3061.54	3229.81	0	3229.81
18	11.0099	65368.1	BEDROCK	800	35	3043.95	3069.85	3241.69	0	3241.69
19	11.0099	64935.9	BEDROCK	800	35	3066.71	3092.81	3274.47	0	3274.47
20	11.0099	64687.2	BEDROCK	800	35	3095.47	3121.81	3315.89	0	3315.89
21	11.0099	64260.3	BEDROCK	800	35	3117.77	3144.3	3348.01	0	3348.01
22	11.0099	64740.7	BEDROCK	800	35	3172.15	3199.14	3426.32	0	3426.32
23	11.0099	66981.7	BEDROCK	800	35	3290.99	3319	3597.5	0	3597.5
24	11.0099	67367.9	BEDROCK	800	35	3344.04	3372.5	3673.91	0	3673.91
25	11.0099	67342.3	BEDROCK	800	35	5870.95	5920.91	7313.42	0	7313.42

**Interslice Data**

• Global Minimum Query (spencer) - Safety Factor: 1.00851

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	41.376	288.656	0	0	0
2	50.7948	279.573	-659.877	-550.453	39.834
3	60.2136	270.647	2309.89	1926.85	39.834
4	69.6323	261.872	8796.93	7338.18	39.834
5	80.6422	251.802	12750.2	10635.9	39.834
6	91.6521	241.93	17671	14740.7	39.834
7	102.662	232.25	25620.1	21371.6	39.834
8	113.672	222.758	37108.2	30954.7	39.834
9	124.682	213.448	48825.8	40729.3	39.834
10	135.692	204.316	60578.1	50532.7	39.834
11	146.702	195.358	72886.9	60800.4	39.834
12	157.711	186.571	85318.2	71170.3	39.834
13	168.721	177.95	97387.2	81237.9	39.834
14	179.731	169.492	108818	90773.3	39.834
15	190.741	161.193	119436	99630.5	39.834
16	201.751	153.051	129176	107755	39.8339
17	212.761	145.061	138093	115194	39.8341
18	223.771	137.222	146354	122085	39.8341
19	234.781	129.529	153925	128401	39.8342
20	245.791	121.982	160920	134235	39.8339
21	256.8	114.576	167380	139624	39.834
22	267.81	107.31	173262	144531	39.8341
23	278.82	100.18	178765	149121	39.834
24	289.83	93.1854	184250	153696	39.8339
25	300.84	86.3232	189295	157905	39.834
26	311.85	79.5915	0	0	0

**List Of Coordinates**

**Water Table**

X	Y
-336.577	76.6911
16.219	76.6911
289.311	72.7476
290.19	72.7476

337.574	72.7476
406.341	72.1426
446.631	71.3606
460.231	71.0967

### External Boundary

X	Y
7.84613	299.813
-37.2578	299.813
-56.3832	299.813
-277.233	299.813
-336.577	299.813
-336.577	261.898
-336.577	6.30123
7.84613	6.30123
460.231	6.30123
460.231	60.7358
460.231	82.8067
448.754	83.7829
444.651	83.7829
444.651	81.6778
439.078	81.6778
439.078	83.284
399.604	84.9407
391.739	85.2708
379.875	85.2708
379.875	78.812
363.245	78.812
311.85	78.812
311.85	125.982
311.85	132.736
284.269	149.813
276.552	153.483
270.788	155.784
233.123	182.035
203.854	204.556
189.528	216.842
167.779	235.304
152.82	246.9
145.824	251.9
134.543	258.589
129.048	261.847
124.501	264.543

122.29	265.855
112.112	278.733
82.9309	278.733
82.9309	288.656
29.5123	288.656

**Material Boundary**

X	Y
-336.577	261.898
9.91462	261.898
34.3278	261.887
75.2372	261.869
120.812	261.849
126.131	261.847
127.101	261.847
129.048	261.847

**Material Boundary**

X	Y
124.501	264.543
127.101	261.847
127.391	261.546
147.355	247.353
162.035	236.159
198.168	206.057
240.859	174.854
267.003	156.372
281.666	146.2
299.213	134.265
311.85	125.982

**Material Boundary**

X	Y
363.245	78.812
367.942	75.5035
371.446	73.5655
379.989	69.9893
386.846	67.3775
392.8	66.2151
402.104	65.3781

413.497	64.5984
427.015	63.4026
444.487	61.8341
457.224	60.9455
460.231	60.7358

**Material Boundary**

X	Y
-37.2578	275.55
-37.2578	299.813

**Material Boundary**

X	Y
-277.233	275.656
-277.233	299.813

### DATA FOR SEISMIC SLOPE DISPLACEMENT ANALYSES

**Project:** 2959 Pacific Coast Highway A-A'

<b>INPUT:</b>	Slide h (ft):	45.94	
	Slide Vs (ft/sec):	1200	For slide mass
	Depth to Rx (km):	0.01	(Rx=Vs>5000 ft/s)
	Site Vs(30) (m/s):	455	Material below slide
	Ave. Site Class:	C	
	Mean Magnitude:	6.76	
	Mean Dist. (km):	10.71	
	ky:	0.245	Insert from slope stability

Average Height Calculation Using CAD Data:		
Slide Mass Area =	15205.00	Insert from slope stability
Horiz.Length of Slide Mass =	331.00	Insert from slope stability
Average Slide H (ft) =	45.94	

Ts: 4h/Vs  
 Tm: Rathje et al. (2004)  
 PGV: Watson-Lamprey and Abrahamson (2006)  
 Duration: Bommer et al. (2009)

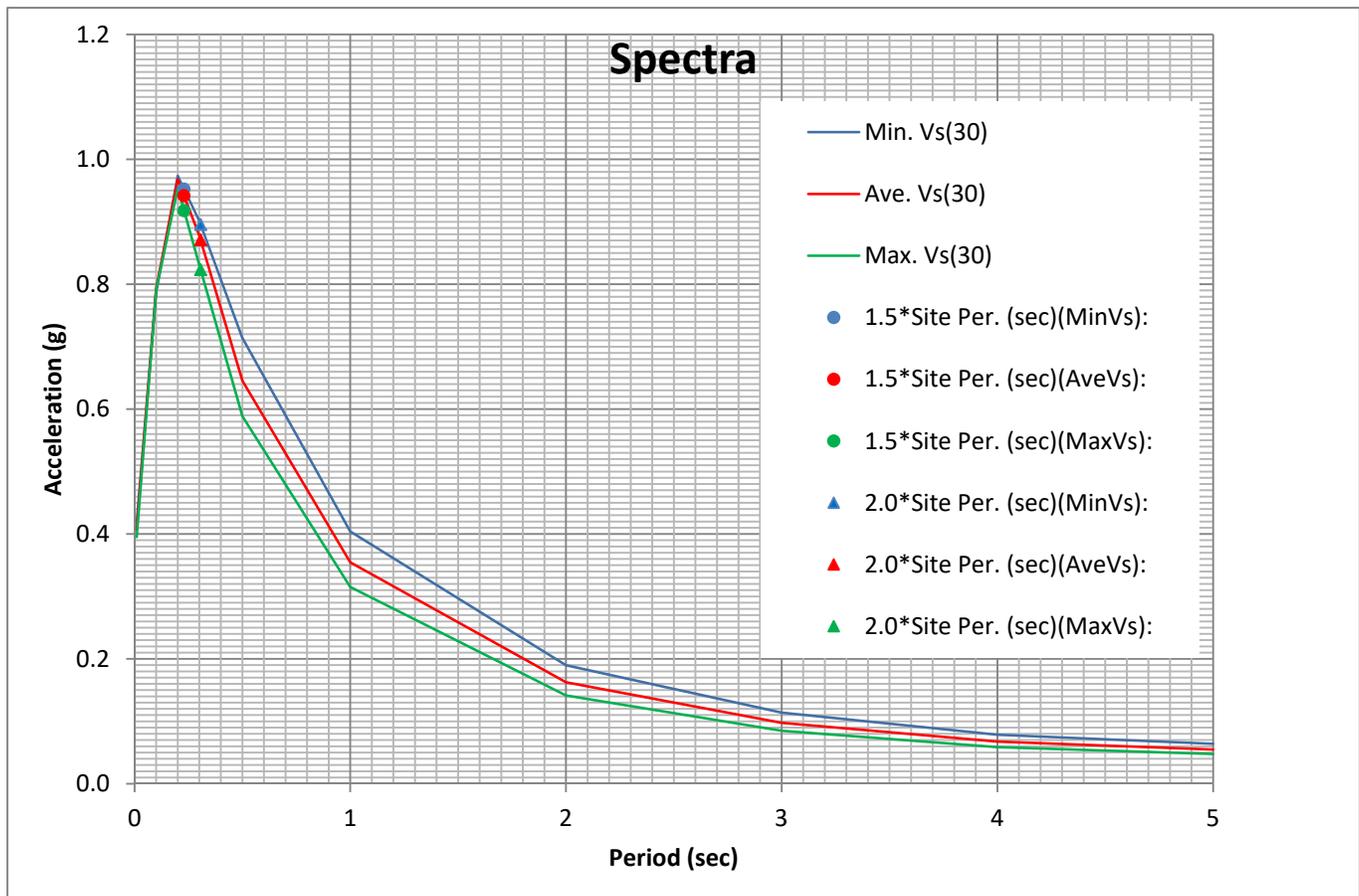
Based on Min. Vs(30)		Based on Ave. Vs(30)		Based on Max. Vs(30)	
Site Period, Ts (sec):	0.1531	Site Period, Ts (sec):	0.1531	Site Period, Ts (sec):	0.1531
1.5*Site Per. (sec)(MinVs):	0.2297	1.5*Site Per. (sec)(AveVs):	0.2297	1.5*Site Per. (sec)(MaxVs):	0.2297
2.0*Site Per. (sec)(MinVs):	0.3062	2.0*Site Per. (sec)(AveVs):	0.3062	2.0*Site Per. (sec)(MaxVs):	0.3062
EQ Mean Period, Tm (sec):	0.475	EQ Mean Period, Tm (sec):	0.475	EQ Mean Period, Tm (sec):	0.475
Ts/Tm:	0.32	Ts/Tm:	0.32	Ts/Tm:	0.32
Estimated PGV (cm/sec):	49.35	Estimated PGV (cm/sec):	44.63	Estimated PGV (cm/sec):	40.72
Duration (D5-D95) (sec):	12.9	Duration (D5-D95) (sec):	12.9	Duration (D5-D95) (sec):	12.9
Sa(1.5Ts) Min Vs(30)	0.9522	Sa(1.5Ts) Ave Vs(30)	0.9416	Sa(1.5Ts) Max Vs(30)	0.9177
Sa(2.0Ts) Min Vs(30)	0.8956	Sa(2.0Ts) Ave Vs(30)	0.8711	Sa(2.0Ts) Max Vs(30)	0.8233
Mean Mag at Site Per Min	6.76	Mean Mag at Site Per Ave	6.77	Mean Mag at Site Per Ave	6.78
Mean Dist at Site Per Min	10.71	Mean Dist at Site Per Ave	10.11	Mean Dist at Site Per Ave	9.71

Largest Sa(1.5Ts):	0.9522
Corresponding Sa(2.0Ts):	0.8956
Corresponding PGA:	0.4190
Corresponding PGV:	49.35
Corresponding Mean Mag:	6.76
Corresponding Mean Dist:	10.71

These values flow to input table at upper left and B&T, R&A, and S&R-M calculations on next pages.

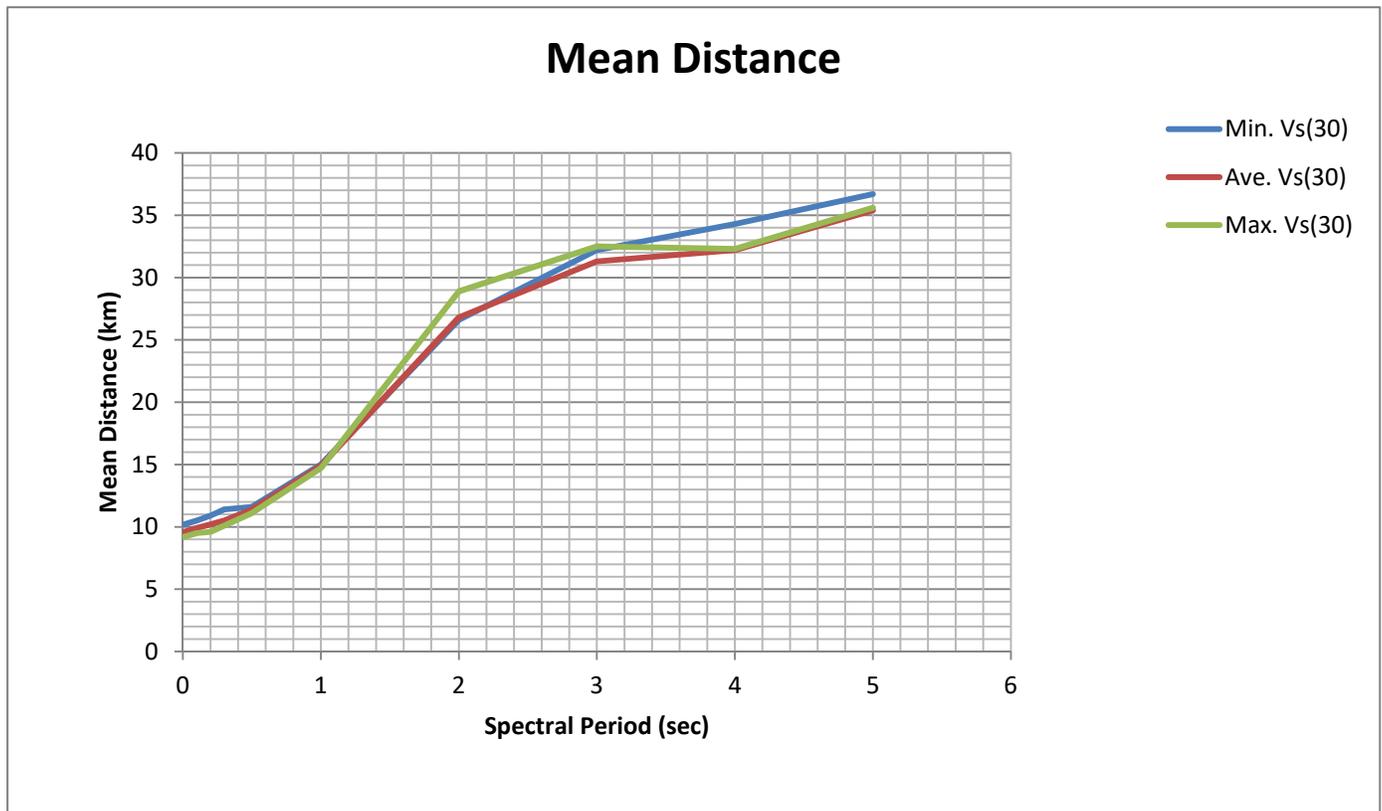
### 5-Percent Damped Spectra

$V_{S(30)}$	455	550	655
Period	Min. $V_{S(30)}$	Ave. $V_{S(30)}$	Max. $V_{S(30)}$
0.01	0.4190	0.4072	0.3952
0.1	0.7869	0.7930	0.7906
0.2	0.9736	0.9683	0.9543
0.3	0.9015	0.8784	0.8309
0.5	0.7139	0.6453	0.5887
1.0	0.4042	0.3546	0.3152
2.0	0.18990	0.16260	0.14134
3.0	0.11383	0.09754	0.08494
4.0	0.07863	0.06762	0.05871
5.0	0.06395	0.05488	0.04769



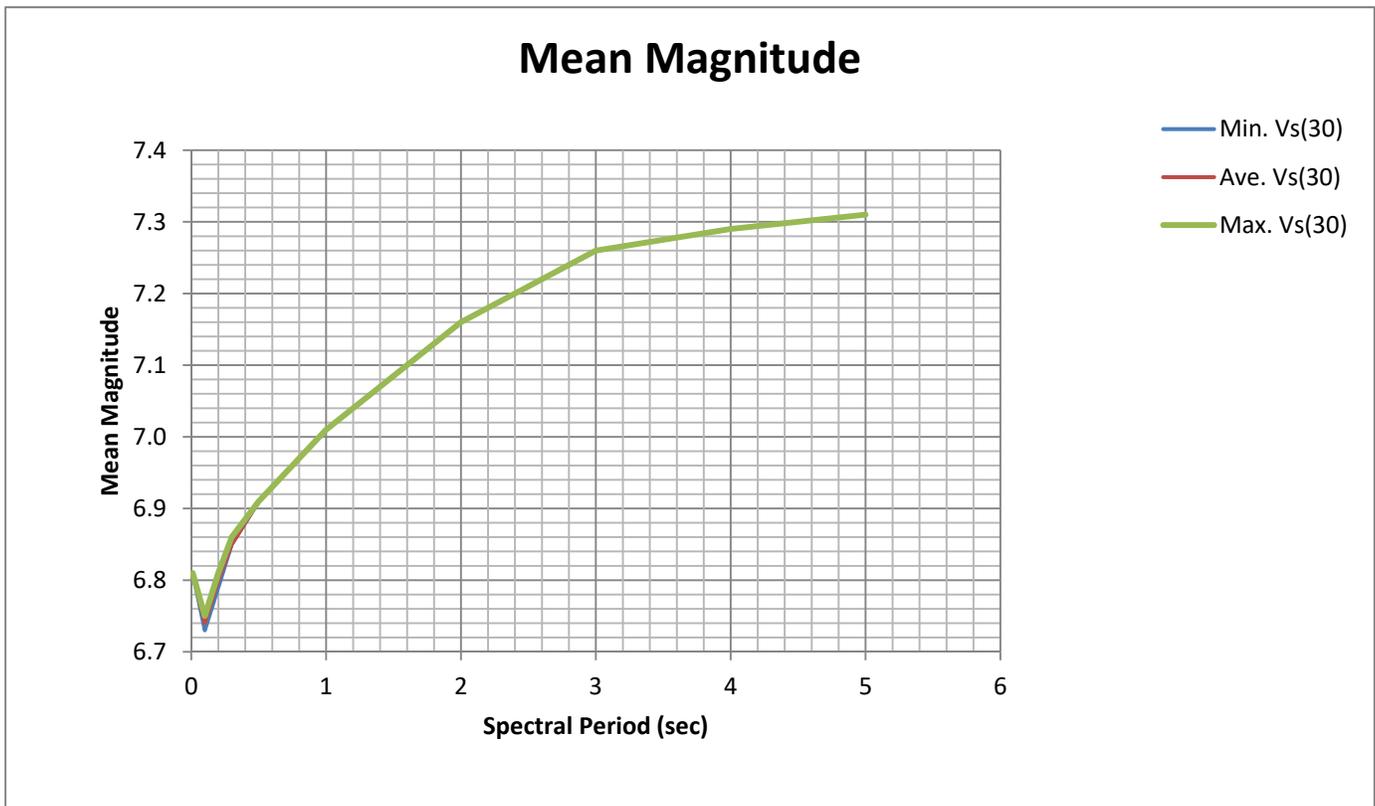
### Mean Distance (km)

Period	Min. $V_{S(30)}$	Ave. $V_{S(30)}$	Max. $V_{S(30)}$
0.01	10.2	9.6	9.2
0.1	10.5	9.9	9.5
0.2	10.9	10.2	9.6
0.3	11.4	10.5	10.1
0.5	11.6	11.4	11.1
1.0	15.0	14.9	14.7
2.0	26.6	26.8	28.9
3.0	32.2	31.3	32.5
4.0	34.3	32.2	32.3
5.0	36.7	35.4	35.6



### Mean Magnitude

Period	Min. $V_{s(30)}$	Ave. $V_{s(30)}$	Max. $V_{s(30)}$
0.01	6.81	6.81	6.81
0.1	6.73	6.74	6.75
0.2	6.79	6.80	6.81
0.3	6.85	6.85	6.86
0.5	6.91	6.91	6.91
1.0	7.01	7.01	7.01
2.0	7.16	7.16	7.16
3.0	7.26	7.26	7.26
4.0	7.29	7.29	7.29
5.0	7.31	7.31	7.31



**Average Seismic Displacement**

Seismic Displacement (Bray and Travararou) = 50% Probability of Exceedance (D2)	9.70 cm	3.82 inch
--	---------	-----------

1cm = 0.393701  
 in.



Highlight indicates < 1 cm was  
 estimated

Seismic Displacement (Rathje and Antonakos) = [kmax, k-velmax]	1.91 cm	0.75 inch
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Seismic Displacement (Song and Rodriguez-Marek) = 50% Probability of Exceedance (D2)	2.90 cm	1.14 inch
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Average Displacement (B&T and R&A) =	5.80 cm	2.29 inch
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Average Displacement (B&T, R&A, and S&R-A) =	4.84 cm	1.90 inch
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### DATA FOR SEISMIC SLOPE DISPLACEMENT ANALYSES

**Project:** 2959 Pacific Coast Highway B-B'

<b>INPUT:</b>	Slide h (ft):	46.75	
	Slide Vs (ft/sec):	1200	For slide mass
	Depth to Rx (km):	0.01	(Rx=Vs>5000 ft/s)
	Site Vs(30) (m/s):	455	Material below slide
	Ave. Site Class:	C	
	Mean Magnitude:	6.76	
	Mean Dist. (km):	10.72	
	ky:	0.245	Insert from slope stability

Average Height Calculation Using CAD Data:		
Slide Mass Area =	12668.00	Insert from slope stability
Horiz.Length of Slide Mass =	271.00	Insert from slope stability
Average Slide H (ft) =	46.75	

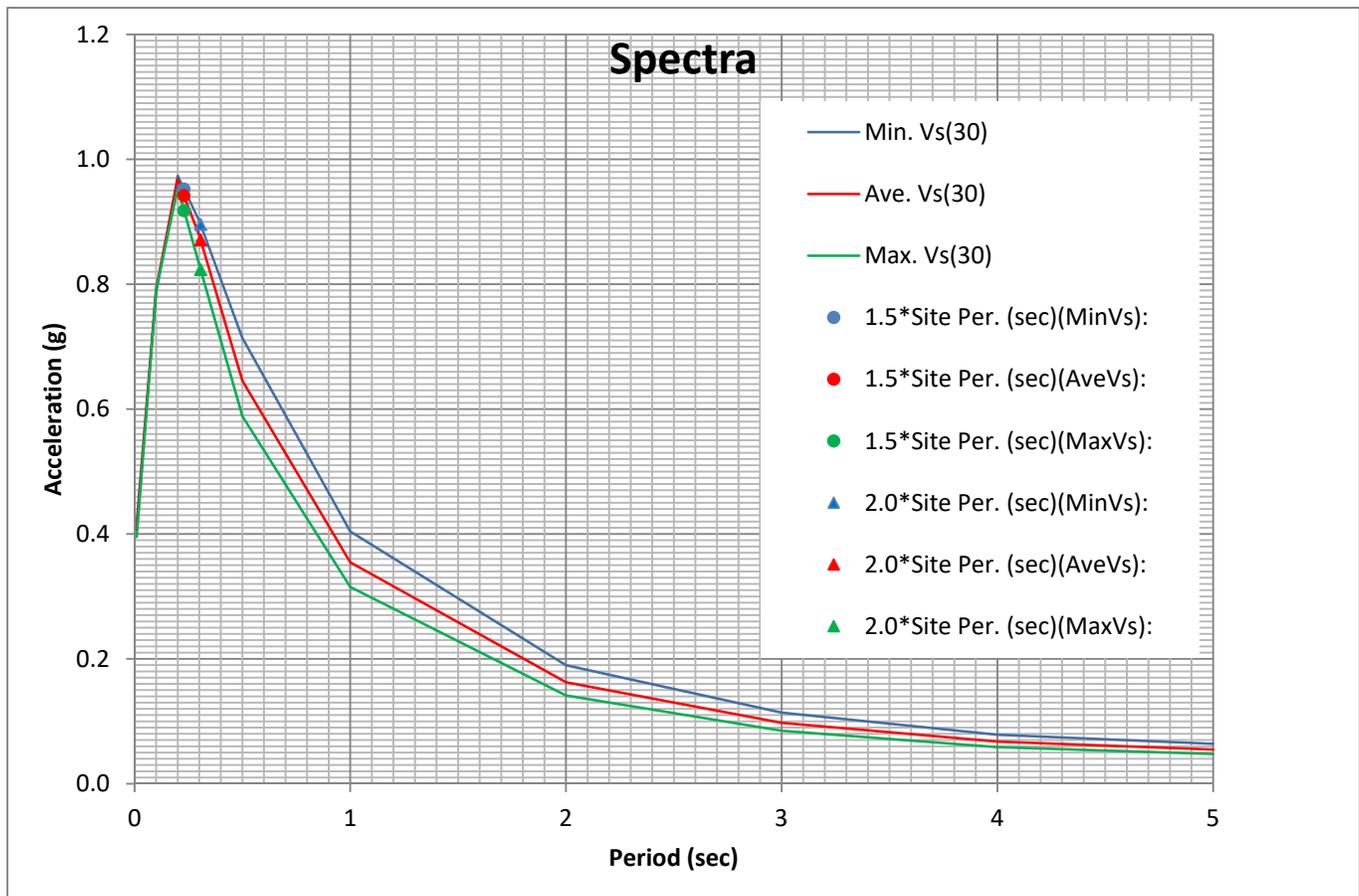
Ts: 4h/Vs  
 Tm: Rathje et al. (2004)  
 PGV: Watson-Lamprey and Abrahamson (2006)  
 Duration: Bommer et al. (2009)

Based on Min. Vs <sub>(30)</sub>		Based on Ave. Vs <sub>(30)</sub>		Based on Max. Vs <sub>(30)</sub>	
Site Period, Ts (sec):	0.1558	Site Period, Ts (sec):	0.1558	Site Period, Ts (sec):	0.1558
1.5*Site Per. (sec)(MinVs):	0.2337	1.5*Site Per. (sec)(AveVs):	0.2337	1.5*Site Per. (sec)(MaxVs):	0.2337
2.0*Site Per. (sec)(MinVs):	0.3116	2.0*Site Per. (sec)(AveVs):	0.3116	2.0*Site Per. (sec)(MaxVs):	0.3116
EQ Mean Period, Tm (sec):	0.475	EQ Mean Period, Tm (sec):	0.475	EQ Mean Period, Tm (sec):	0.475
Ts/Tm:	0.33	Ts/Tm:	0.33	Ts/Tm:	0.33
Estimated PGV (cm/sec):	49.35	Estimated PGV (cm/sec):	44.64	Estimated PGV (cm/sec):	40.72
Duration (D <sub>5</sub> -D <sub>95</sub> ) (sec):	13.0	Duration (D <sub>5</sub> -D <sub>95</sub> ) (sec):	13.0	Duration (D <sub>5</sub> -D <sub>95</sub> ) (sec):	13.0
Sa(1.5Ts) Min Vs <sub>(30)</sub>	0.9493	Sa(1.5Ts) Ave Vs <sub>(30)</sub>	0.9380	Sa(1.5Ts) Max Vs <sub>(30)</sub>	0.9127
Sa(2.0Ts) Min Vs <sub>(30)</sub>	0.8906	Sa(2.0Ts) Ave Vs <sub>(30)</sub>	0.8648	Sa(2.0Ts) Max Vs <sub>(30)</sub>	0.8168
Mean Mag at Site Per Min	6.76	Mean Mag at Site Per Ave	6.77	Mean Mag at Site Per Ave	6.78
Mean Dist at Site Per Min	10.72	Mean Dist at Site Per Ave	10.12	Mean Dist at Site Per Ave	9.72

Largest Sa(1.5Ts):	0.9493	These values flow to input table at upper left and B&T, R&A, and S&R-M calculations on next pages.
Corresponding Sa(2.0Ts):	0.8906	
Corresponding PGA:	0.4190	
Corresponding PGV:	49.35	
Corresponding Mean Mag:	6.76	
Corresponding Mean Dist:	10.72	

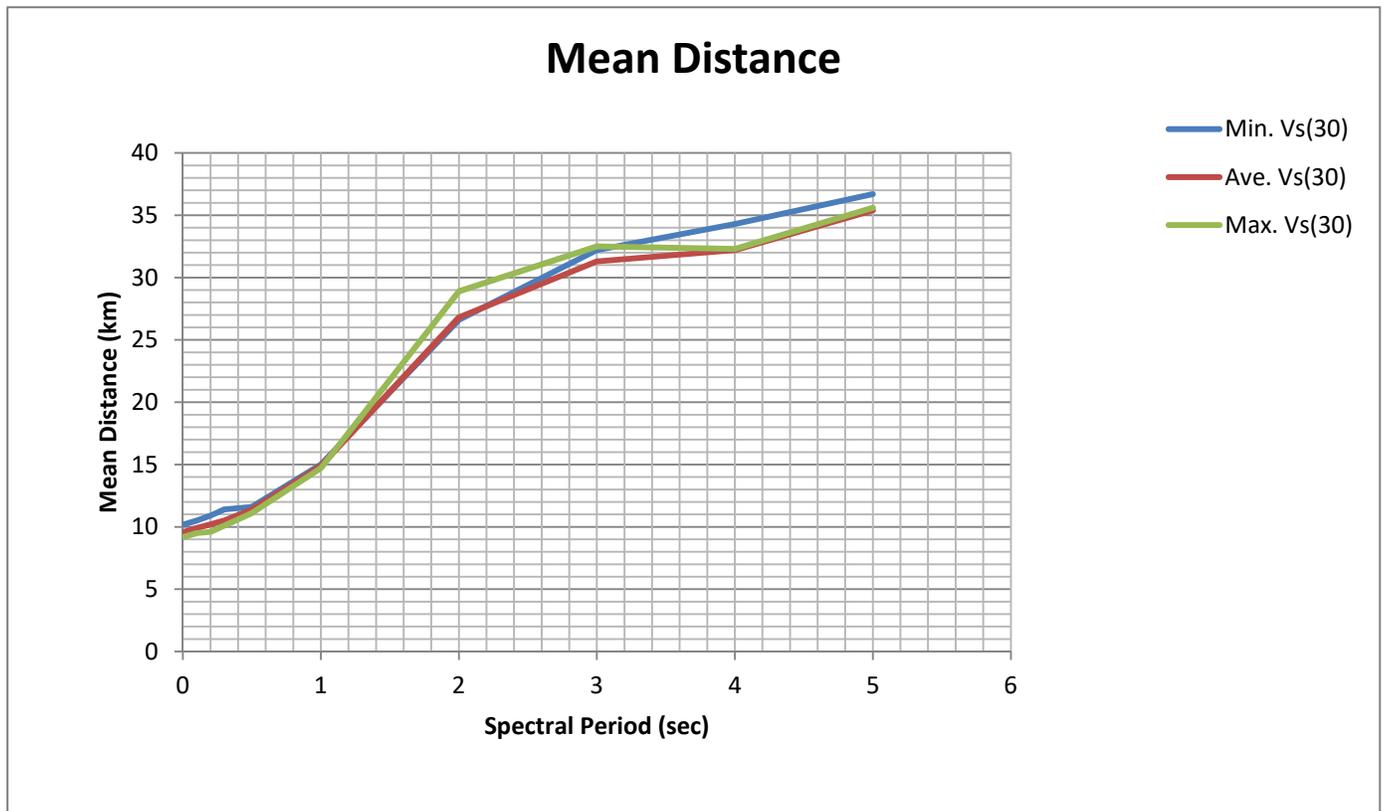
### 5-Percent Damped Spectra

$V_{S(30)}$	455	550	655
Period	Min. $V_{S(30)}$	Ave. $V_{S(30)}$	Max. $V_{S(30)}$
0.01	0.4190	0.4072	0.3952
0.1	0.7869	0.7930	0.7906
0.2	0.9736	0.9683	0.9543
0.3	0.9015	0.8784	0.8309
0.5	0.7139	0.6453	0.5887
1.0	0.4042	0.3546	0.3152
2.0	0.18990	0.16260	0.14134
3.0	0.11383	0.09754	0.08494
4.0	0.07863	0.06762	0.05871
5.0	0.06395	0.05488	0.04769



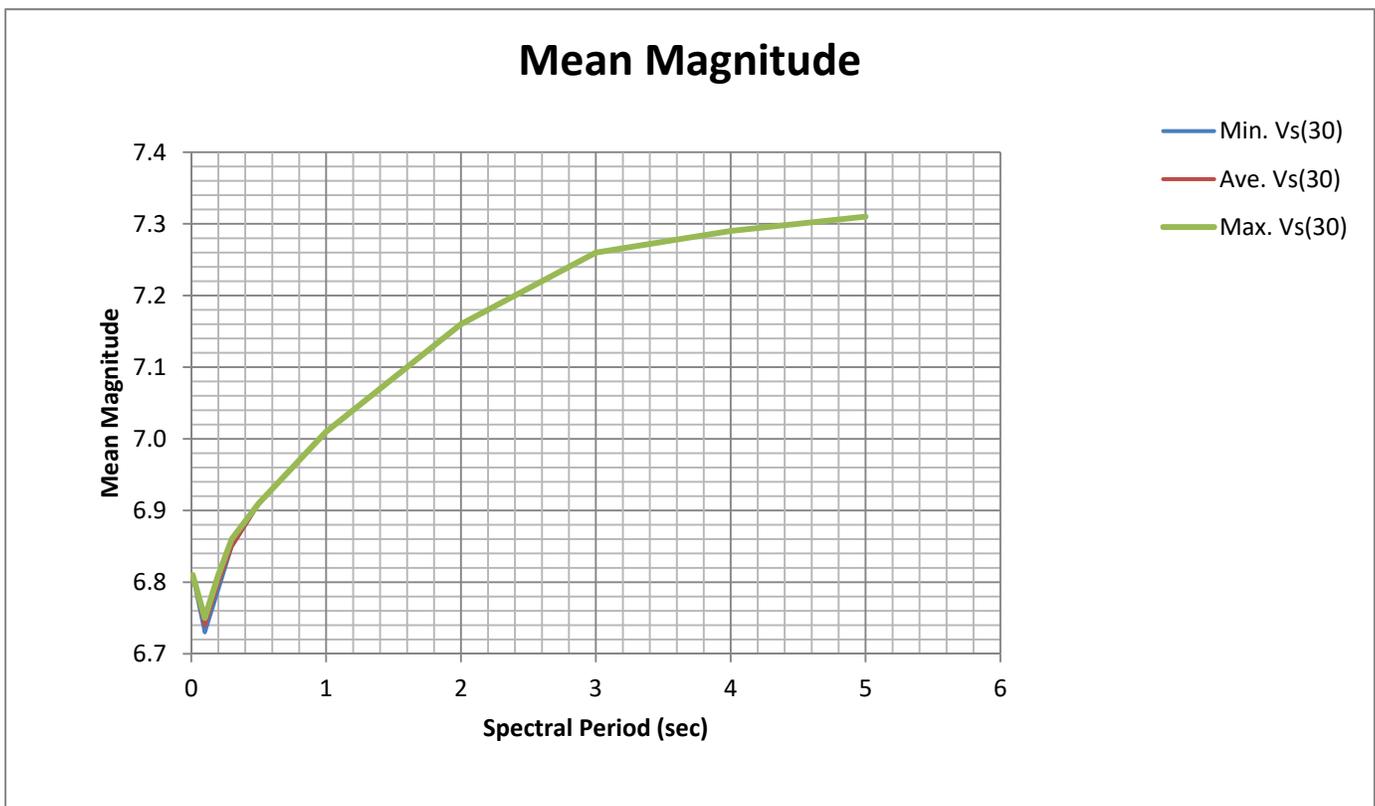
### Mean Distance (km)

Period	Min. $V_{S(30)}$	Ave. $V_{S(30)}$	Max. $V_{S(30)}$
0.01	10.2	9.6	9.2
0.1	10.5	9.9	9.5
0.2	10.9	10.2	9.6
0.3	11.4	10.5	10.1
0.5	11.6	11.4	11.1
1.0	15.0	14.9	14.7
2.0	26.6	26.8	28.9
3.0	32.2	31.3	32.5
4.0	34.3	32.2	32.3
5.0	36.7	35.4	35.6



### Mean Magnitude

Period	Min. $V_{s(30)}$	Ave. $V_{s(30)}$	Max. $V_{s(30)}$
0.01	6.81	6.81	6.81
0.1	6.73	6.74	6.75
0.2	6.79	6.80	6.81
0.3	6.85	6.85	6.86
0.5	6.91	6.91	6.91
1.0	7.01	7.01	7.01
2.0	7.16	7.16	7.16
3.0	7.26	7.26	7.26
4.0	7.29	7.29	7.29
5.0	7.31	7.31	7.31



**Average Seismic Displacement**

Seismic Displacement (Bray and Travararou) = 50% Probability of Exceedance (D2)	9.67 cm	3.81 inch
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1cm = 0.393701  
 in.



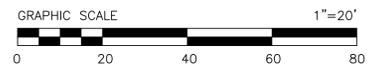
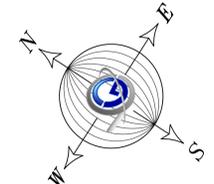
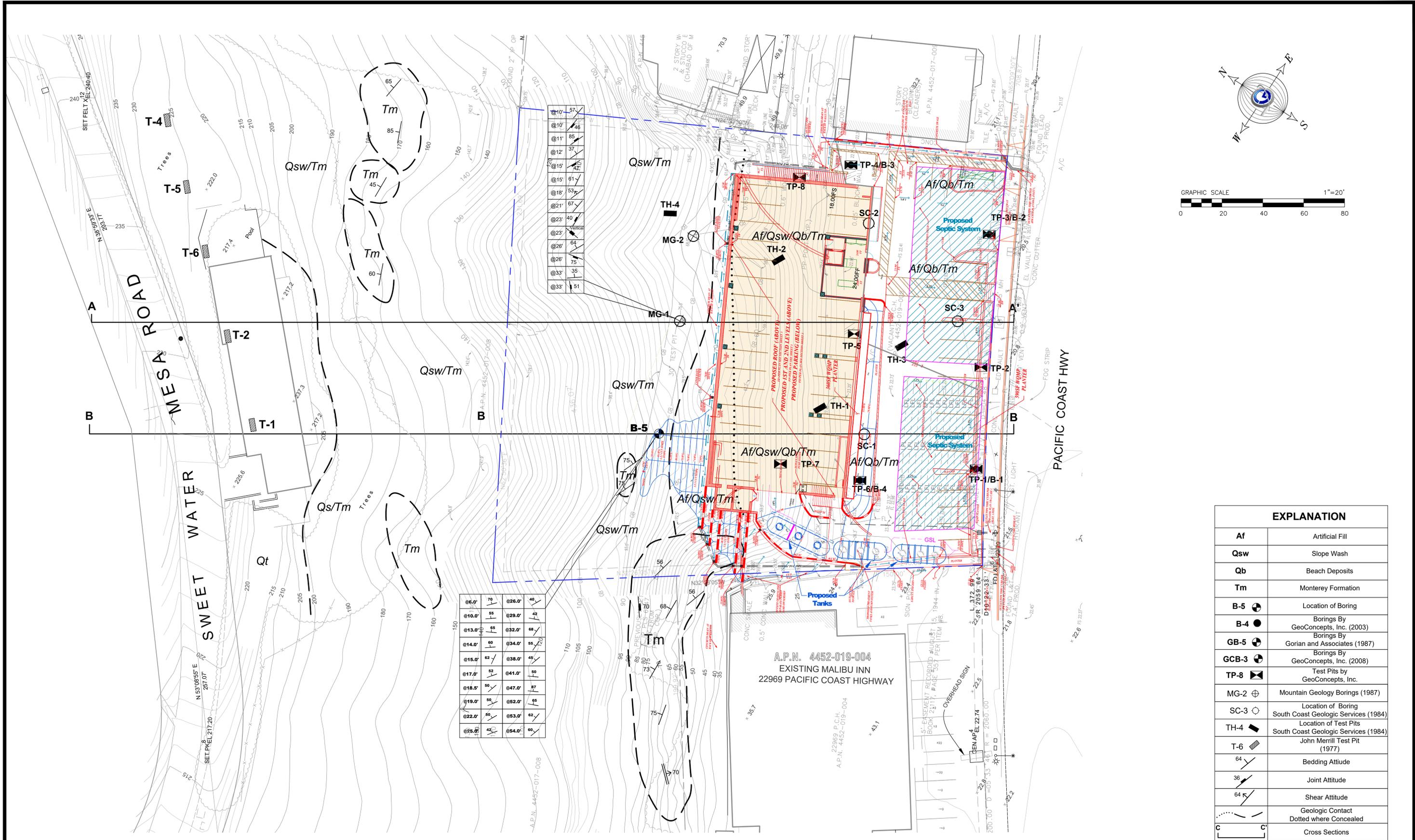
Highlight indicates < 1 cm was  
 estimated

Seismic Displacement (Rathje and Antonakos) = [kmax, k-velmax]	1.88 cm	0.74 inch
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Seismic Displacement (Song and Rodriguez-Marek) = 50% Probability of Exceedance (D2)	2.87 cm	1.13 inch
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Average Displacement (B&T and R&A) =	5.78 cm	2.27 inch
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Average Displacement (B&T, R&A, and S&R-A) =	4.81 cm	1.89 inch
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EXPLANATION	
Af	Artificial Fill
Qsw	Slope Wash
Qb	Beach Deposits
Tm	Monterey Formation
B-5	Location of Boring
B-4	Borings By GeoConcepts, Inc. (2003)
GB-5	Borings By Gorian and Associates (1987)
GCB-3	Borings By GeoConcepts, Inc. (2008)
TP-8	Test Pits by GeoConcepts, Inc.
MG-2	Mountain Geology Borings (1987)
SC-3	Location of Boring South Coast Geologic Services (1984)
TH-4	Location of Test Pits South Coast Geologic Services (1984)
T-6	John Merrill Test Pit (1977)
64	Bedding Attitude
36	Joint Attitude
64	Shear Attitude
- - -	Geologic Contact Dotted where Concealed
A-A'	Cross Sections

@6.0'	70	@26.0'	40
@10.0'	55	@29.0'	42
@13.0'	65	@32.0'	68
@14.0'	60	@34.0'	55
@15.0'	62	@38.0'	45
@17.0'	52	@41.0'	50
@18.5'	50	@47.0'	57
@19.0'	50	@52.0'	58
@22.0'	50	@53.0'	52
@25.0'	42	@54.0'	60

**GeoConcepts** INC  
 Geology - Geotechnical Engineering  
 14428 Hamlin Street, Suite 200, Van Nuys, CA 91401  
 Ph (818) 994-8895 | Fax (818) 994-8599 | www.GeoConceptsInc.com

Description: **Geologic Map**  
 Base Map Provided By: **GeoWorks, Inc.**

Project Address: **22959 Pacific Coast Highway  
 Malibu, California**  
 Date: **June 2018**  
 Scale: **1" = 20'**  
 Job No. **2506-13**

