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08-AFC-13C
DATE 5-26-11
RECD. 5-27-11

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Our File No.: 0000354112

May 26, 2011

Via FedEx

Casey W. Weaver, CEG
Engineering Geologist
California Energy Commission
1516 Ninth Street, MS-46
Sacramento, CA 95814

Re: Calico Solar Project Amendment, Docket Number 08-AFC-13C - Geotechnical Report and Boring Map

Dear Mr. Weaver:

Enclosed for docketing, please find the following:

- Two (2) bound copies of the Geotechnical Engineering Report prepared by Terracon Consultants, Inc. for Tessera Solar, dated January 4, 2010
- Two (2) color copies of a map depicting previous and current boring layouts; and
- Two (2) CDs containing electronic versions of the two documents above.

We will transmit copies to the POS distribution list upon acknowledgement of your receipt of the enclosures.

Sincerely yours,

Doug Larson
Senior Paralegal

Enclosures

Boston
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Hong Kong
London
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Geotechnical Engineering Report

Solar One

Pisgah, California

January 4, 2010

Terracon Project No. 60095029

Prepared for:
Tessera Solar
Phoenix, Arizona

Prepared by:
Terracon Consultants, Inc.
Irvine, California

Terracon

January 4, 2010

Tessera Solar
4800 N. Scottsdale Road, Suite 5500
Scottsdale, Arizona 85251
Phoenix, AZ 85016

Attn: Mr. Robert Byall
PH: 602.773.4537
FAX: 602.421.5519
email: bob.byall@tesserasolar.com

Re: Geotechnical Engineering Report
Solar One Project
Pisgah, California
Terracon Project No. 60095029

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. These services were performed in general accordance with our proposal number D6009028, dated June 3, 2009. This geotechnical engineering report presents the results of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Jinny Park
Senior Staff Engineer

Paul J. "Jeff" Ernst, P.E., G.E.
Office Manger

REGISTERED PROFESSIONAL ENGINEER
PAUL J. ERNST
GE 2317
EXP. 3/31/11
GEOTECHNICAL
STATE OF CALIFORNIA

60095029 Solar One Geotech Report.doc

Copies to: Addressee (1 via email, 3 via mail)

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GEOTECHNICAL ENGINEERING REPORT
SOLAR ONE PROJECT
PISGAH, CALIFORNIA

Terracon Project No. 60095029
January 4, 2010

EXECUTIVE SUMMARY

This geotechnical executive summary should be used in conjunction with the entire report for design and/or construction purposes. It should be recognized that specific details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled General Comments should be read for an understanding of the report limitations.

A geotechnical exploration has been performed for the Solar One Project located approximately 35 miles east of Barstow in the Pisgah area of San Bernardino County, California. Terracon's geotechnical scope of work included the advancement of 32 test borings and 14 test pits to approximate depths of 8 to 51½ feet below existing site grades. It should be noted that the numbering of the test borings and test pits were based off the BLM permit and included two long trenches across mapped earthquake fault (Alquist Priolo) zones. The fault trenches were not part of this scope of investigation and as such Trench 2 and Trench 22 were not excavated. Two of the test pits were advanced in locations determined by a URS geo-archeologist (TP-050 and TP-051). Proposed boring B-021 was also not advanced as a result of its proposed location between a utility easement and private property without right of entry. Terracon was unable to access proposed boring B-043 with a 4x4 rig and, therefore, did not advance a boring at this location. B-030 was depicted in the same location as B-031 on the permit and therefore only B-031 was excavated.

Based on the information obtained from our subsurface exploration, the site is suitable for development of the proposed project. The following geotechnical considerations were identified:

Site Soils: The site surface soils consisted of silty sands, poorly graded sands with silt and gravel and poorly graded sands in Zone 1 to the maximum depth explored, 51 ½ feet bgs. Zone 2, a smaller area east of Hector Road, consisted of fat clays to the maximum depth explored in this area, 26½ feet bgs. Groundwater was not encountered in any test boring at the time of drilling. On-site soils (excluding the fat clays) are suitable for use as engineered fill beneath foundations and floor slabs, pavements, and backfill.

Foundations: The SunCatcher^{TM} units (the main feature at the site) are proposed to be supported by driven pipe piles, consisting of a 3/8"-thick, hollow steel pipe that is vibrated into the ground. The proposed bridge that crosses over the existing BNSF railroad will most likely be supported by driven piles. Any light-weight buildings at the site may be supported by shallow spread footings or mat foundations bearing on approved undisturbed soils. Pole mounted equipment may be supported by drilled shaft foundations.

Floor Slabs: The on-site surface and near surface soils over most of the site are expected to exhibit low expansion potentials when compacted and subjected to light loading conditions such as those imposed by floor slabs. Construction of floor slabs directly on compacted fills composed of approved non-expansive on-site soils or approved imported soils are considered acceptable for the project.

Pavement Sections: Automobile parking areas – 3” AC over 3” ABC or 5.5” PCC over 4” ABC; truck drives and drive lanes – 4” AC over 4” ABC or 6” PCC over 6” ABC.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during construction

GEOTECHNICAL ENGINEERING REPORT
SOLAR ONE PROJECT
PISGAH, CALIFORNIA

Terracon Project No. 60095029
January 4, 2010

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services performed for the proposed Solar One Project to be located approximately 35 miles east of Barstow in the Pisgah area of San Bernardino County, California. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- earthwork
- seismic considerations
- lateral earth pressure
- groundwater conditions
- foundation design and construction
- floor slab design and construction
- pavement design and construction

Our geotechnical engineering scope of work for this project included the following field exploration.

SUBSURFACE EXPLORATION		
Exploration Type	**Quantity**	**Depth**
Test Boring	32	12½ to 51½ feet
Test Pit	14	8 to 14 feet
Field Soil Resistivity Test	9	1 foot
Seismic Shear Wave Test	3	1 foot (interpretation to 100 feet)

Logs of the borings along with a Site Plan (Exhibit 1) and Boring Location diagram (Exhibit 2) are included in Appendix A of this report. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included in Appendix B of this report. Descriptions of the field exploration and laboratory testing are included in their respective appendices.

2.0 PROJECT INFORMATION

2.1 Project Description

ITEM	DESCRIPTION
Site layout	Refer to the Site Plan (Exhibit 1) and Boring Location Diagram (Exhibit 2 in Appendix A)
Structures	SunCatcher^{TM} Differentiators (solar dishes) – Founded on two-foot diameter driven pipe foundations with 3/8”-thick walls Bridge over railroad, approximately 30-feet wide Maintenance & storage buildings – slab-on-grade foundation.
Maximum loads	SunCatchers^{TM}: Overturning Moment – 252 kip·ft Torsion – 15.5 kip/ft Dead Load – 7.2 tons Factored Dead Load + Wind Load – 15.1 tons Seismic Overturning Moment – 230 kip·ft
Maximum allowable settlement	1-inch (assumed)
Traffic loading	Assumed Traffic Index = 5.0 for Light Automobile Parking Assumed Traffic Index = 7.0 for Heavy Parking and Drive Areas

2.2 Site Location and Description

ITEM	DESCRIPTION
Location	Approximately 35 miles east of Barstow in the Pisgah area of San Bernardino County, California
Section, Township, Range	T8N R5E Sections 1,2,8-15; T8N R6E Sections 4-6,7-9,17,18, T9N R5E Sections 35,36; T9N R6E Sections 31-33 (San Bernardino Meridian)
Existing site features (site interior)	Native desert bisected by an east-west trending railroad line, a Southern California Edison (SCE) electrical substation in the southeastern portion of the site, two SCE and Southern California Gas Company natural gas substations along the southern boundary of the site, and several natural gas utility lines trending east-west through the southern portion of the site.
Surrounding developments	North: Undeveloped native desert and hills. East: Undeveloped native desert with one apparent residence. West: Undeveloped native desert. South: Interstate 40 and National Trails Highway (Route 66), beyond which is undeveloped native desert.
Current ground cover	Light to moderate growth of grass, weeds, and cacti.

Existing topography	The site slopes gently approximately 1.4% to the southwest north of the existing railroad tracks, and even gentler, roughly 0.3%, to the northwest south of the tracks. The site generally drains to the west.

3.0 SUBSURFACE CONDITIONS

According to Mr. Jim Shearer, Biologist for the California Bureau of Land Management, the site has been undeveloped native desert and cattle graze land. The existing railroad was constructed between the years of 2002 and 2005. The Pacific Gas & Electric gas pipelines were constructed in the 1950s and the Mohave gas pipeline was constructed in 1986.

3.1 Site Geology

The site is situated within the south central portion of the Mojave Desert Geomorphic Province in Southern California. Geologic structures within the Mojave Desert tend to consist of isolated mountain ranges separated by vast expanses of desert plains, with a predominate northwest-southeast faulting trend, with a secondary trend of east-west (parallel to the Transverse Ranges Province). Principal bounding faults include the San Andreas Fault to the southwest and the Garlock Fault to the north.[1, 2]

Surficial geologic units mapped at the site[3] consist mainly of alluvium of Holocene to Pleistocene age. The southeastern portion of thee site consists of basalt lava flow deposits from the Pisgah Crater. Rock outcrops in the northern portion of the site consist of Miocene volcanic rock.

Two Alquist-Priolo Earthquake Fault Zones intercept the site, one along the westerly edge of the property, and one in the east-central portion of the site. It should be noted that fault trenches to evaluate the location and activity levels of the faults were not within the scope of this investigation.

3.2 Soil Conservation Service - Soil Maps

The soils in the vicinity of the site have not been surveyed and classified by the U.S. Soil Conservation Service. The online soil survey indicated that a survey of the area of interest had not yet been completed.

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[1] Harden, D. R., "*California Geology, Second Edition*," Pearson Prentice Hall, 2004.

[2] Norris, R. M. and Webb, R. W., *"Geology of California, Second Edition,"* John Wiley & Sons, Inc., 1990.

[3] Shawn Biehler, R.W. Tang, D.A. Ponce, H.W. Oliver, 1988, *Bouger Gravity Map of the San Bernadino Quadrangle, California*, California Division of Mines and Geology.

3.3 Typical Subsurface Profile

Specific conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs included in Appendix A of this report. Based on the results of the borings, subsurface conditions on the project site were generalized into two major "zones" as follows:

Description	Approximate Depth to Bottom of Stratum (feet)	Material Encountered	Consistency/Density
Zone 1	0 to 51½	Silty sand, poorly graded sand with silt and gravel, and poorly graded sand. The gravel and cobble content varied as did the sand with varying amounts of silt and gravel.	Loose to Very Dense
Zone 2	0 to 2	Silty sand with gravel	Loose
	2 to 26½	Fat clay	Stiff to Very Stiff

Zone 1 includes over 90 percent of the project site and represents the typical conditions encountered within the project. Zone 2 is a comparatively small area near Hector Road in the southwest corner of the site. **The approximate boundaries of Zone 1 and 2 are depicted on Exhibit 2. These boundaries of the zone are estimated and should be verified in the field during construction.**

The silty sand and sand with silt soils in Zone 1 were non-plastic. The fat clay soils in Zone 2 had high plasticities with medium to high expansion potentials. The approximate locations of these zones are depicted on Exhibit 2.

Laboratory tests were conducted on selected soil samples and the test results are presented in Appendix B.

3.4 Field Soil Resistivity Test Results

Field resistivity testing was performed using a Nilsson Model 400 soil resistance meter and in general accordance with ASTM G57-95a. Tests were conducted by driving five test rods up to 12 inches deep into the ground and recording measurements using a uniform distance of 2, 4, 8, 16 and 20 feet in the same line. The testing was performed at nine boring/test pit locations (B-003, B-014, B-025, B-029, B-033, B-043, TP-044, and B-048) around the site. Test results and the field reports are enclosed in Appendix C. The test results indicate soil resistivity readings ranging from 0 to 1.7×10^9 ohm-cm.

3.5 Thermal Resistivity Test Results

Soil thermal resistivity was determined for selected soils samples. We recommend that the thermal resistivity results be discussed with an electrical design team to determine the influence on cable type and backfill materials. Typically, a resistivity value of less than 200 ºC-cm/Watt is considered acceptable for standard cable design without a need for engineered backfill. However, the design value is based on data obtained from multiple tests. The test results are presented in Appendix B.

3.6 Seismic Shear Wave Tests

In order to determine the Site Class of the project site, as outlined in the 2006 International Building Code (IBC), three geophysical surveys were conducted on the project site. The survey consisted of three 600-foot long seismic lines with 24 equally spaced geophones along each line. One line was located in the northwest portion of the project site (near B-005), the second line was located in the south-central portion of the project site (near B-031), and the last line was located in the northeast corner of the project site (near TP-044).

In each survey, seven sets of background micro-tremor data were collected. The data sets were processed using computer program SeisOpt®-Remi™ to determine the shear wave velocity profile of the upper 100 feet of the soil. Based on this profile, the average shear wave velocity of the upper 100-foot soil was calculated to range from 1,313 ft/s to 2,018 ft/s. In accordance with Section 1613.5.2, Site Class Definitions of the 2006 IBC, these values classify the project site as Site Class C.

The p-f image with dispersion modeling picks, modeled dispersion curves, and shear wave velocity profiles of the upper 100 feet of soil are shown on Exhibits 3 through 8.

3.7 Groundwater

Groundwater was not observed in any test boring or test pit at the time of field exploration. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations. Groundwater conditions can change with varying seasonal and weather conditions, and other factors.

Based upon review of State of California's Groundwater Bulletin 118 for the South Lahontan Hydrologic Region, Lower Mojave River Valley Groundwater Basin, regional groundwater predominates in water bearing Pliocene and younger alluvial fan deposits and an overlying Pleistocene and younger river channel and floodplain deposits. According to the bulletin, regional groundwater was encountered at estimated depths ranging from approximately 50 to 80 feet below the existing ground surface.

Zones of perched and/or trapped groundwater may also occur at times in the subsurface soils overlying bedrock, on top of the bedrock surface or within permeable fractures in the bedrock materials. The location and amount of perched water is dependent upon several factors, including hydrologic conditions, type of site development, irrigation demands on or adjacent to the site, fluctuations in water features, seasonal and weather conditions.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings and test pits provided that the findings and recommendations presented herein are incorporated into project design and construction.

The vast majority of the site is underlain by silty sands and poorly graded sand with varying amounts of gravel. However, clayey soils were encountered in an area in the southwest portion of the site (borings B-005 through B-008) near Hector Road (Zone 2 discussed herein). Foundation design parameters for the SunCatcher^{TM} units have been developed for each of these two major soil types. No building structures are planned in the areas underlain by clayey soils (Zone2) at this time. If the proposed layout of the solar development changes and lightly loaded buildings are planned near Hector Road, we would be pleased to discuss other construction alternatives with you upon request.

It appears that the majority of the on-site soils will be suitable for use as engineered fill beneath foundations, and pavements. Imported soils which may be required for the project must have potential expansion values in the “very low” range and they should satisfy the requirements contained in this report for low volume change soils.

Geotechnical engineering recommendations for foundation systems and other earth connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of field and laboratory testing (which are presented in Appendices A and B), engineering analyses, and our current understanding of the proposed project.

4.2 Earthwork

The following presents recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations, slabs and pavements are contingent upon following the recommendations outlined in this section. All grading for each building structure should incorporate the limits of the proposed structure plus a minimum of five feet beyond proposed perimeter building walls and any exterior columns.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

No grading plans were reviewed as part of the scope of work for this report. Terracon should be retained to evaluate the grading plans as they are developed, and to provide updated recommendations based on review of those plans.

4.2.1 Site Preparation

Strip and remove existing vegetation, debris, and other deleterious materials from proposed building and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

Stripped materials consisting of vegetation and organic materials should be wasted from the site, or used to revegetate landscaped areas or exposed slopes after completion of grading operations. If it is necessary to dispose of organic materials on-site, they should be placed in non-structural areas, and in fill sections not exceeding 5 feet in height.

If fill is placed in areas of the site where existing slopes are steeper than 5:1 (horizontal:vertical), the area should be benched to reduce the potential for slippage between existing slopes and fills. Benches should be wide enough to accommodate compaction and earth moving equipment, and to allow placement of horizontal lifts of fill.

4.2.2 Subgrade Preparation

Subsequent to the surface clearing, grubbing and fill removal efforts, the exposed subgrade soils beneath proposed structures (not including SunCatcher^{TM} units), exterior slabs, and pavement areas should be prepared to a minimum depth of 10 inches. Subgrade preparation should generally include some form of scarification (or removal), moisture conditioning, and compaction. The moisture content and compaction of subgrade soils should be maintained until slab or pavement construction. In the area of the SunCatcher^{TM} units, the surface should be stripped of any existing vegetation, scattered trash and debris, and other deleterious materials.

Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of ten inches, conditioned to near optimum moisture content, and compacted.

Areas of loose soils may be encountered at foundation bearing depth after excavation is completed for footings. When such conditions exist beneath planned footing areas, the subgrade soils should be surficially compacted prior to placement of the foundation system. If sufficient compaction can not be achieved in-place, the loose soils should be removed and replaced as engineered fill. For placement of engineered fill below footings, the excavation should be widened laterally, at least eight inches for each foot of fill placed below footing base elevations.

Large cobbles or boulder sized materials may be encountered beneath footing areas. Such conditions could create point loads on the bottom of footings, increasing the potential for differential foundation movement. If such conditions are encountered in the footing excavations, the cobbles and/or boulders should be removed and be replaced with engineered fill, conditioned to near optimum moisture content and compacted.

Subgrade soils beneath interior and exterior slabs, and beneath pavements should be scarified, moisture conditioned and compacted to a minimum depth of ten inches. The moisture content and compaction of subgrade soils should be maintained until slab or pavement construction.

4.2.3 Fill Materials and Placement

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than six inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site soils or approved imported materials may be used as fill material for the following:

- general site grading
- foundation areas
- interior floor slab areas
- exterior slab areas
- pavement areas
- foundation backfill

Imported soils for use as fill material within proposed building and structure areas should conform to low volume change materials as indicated in the following specifications:

Gradation	**Percent Finer by Weight (ASTM C 136)**
6"	100
3”	70-100
No. 4 Sieve	50-100
No. 200 Sieve	59 (max)

■ Liquid Limit	30 (max)
■ Plasticity Index	15 (max)
■ Maximum Expansion Index*	20 (max)

*ASTM D 4829

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed ten inches loose thickness.

4.2.4 Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location	Per the Standard Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction (% over optimum)	
		Minimum	Maximum
On-site granular or approved imported fill soils:			
Beneath foundations:	90	0%	+4%
Beneath slabs:	90	0%	+4%
Beneath asphalt pavements:	95	0%	+4%
Beneath concrete pavements:	95	0%	+4%
Aggregate base (beneath slabs)	95	-3%	+3%
Aggregate base (beneath pavements)	95	-3%	+3%
Miscellaneous backfill	90	0%	+4%

4.2.5 Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately five percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

Downspouts, roof drains or scuppers should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems should not be installed within five feet of foundation walls. Landscaped irrigation adjacent to the foundation systems should be minimized or eliminated.

4.2.6 Corrosion Potential

Results of soluble sulfate testing indicate that ASTM Type I/II Portland cement is suitable for all concrete on and below grade. Foundation concrete should be designed for low to moderate sulfate exposure in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

Laboratory test results indicate that on-site soils have resistivities ranging from 360 to 8,000 ohm-centimeters, and pH values ranging from 8.16 to 8.93. These values should be used to determine potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Refer to Summary of Laboratory Results contained in Appendix B for the complete results of the various corrosivity testing conducted on the site soils in conjunction with this geotechnical exploration.

4.2.7 Construction Considerations

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

Some additional effort may be necessary to extract boulder sized materials, particularly in deep narrow excavations such as utility trenches. Consideration should be given to obtaining a unit price for difficult excavation in the contract documents for the project.

Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively stable. However, the stability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unstable conditions develop, workability may be improved by scarifying and drying. During and after periods of heavy rain, overexcavation of wet zones and replacement with granular materials may be necessary. Lightweight excavation equipment may be required to reduce subgrade pumping.

The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

4.3 Foundations

Where applicable, structures can be supported by driven pile foundations or spread footings. It is our understanding that the SunCatcher^{TM} units are planned to be supported on driven pipe pile foundations. The bridge crossing the railroad tracks should be supported on a driven pile foundation system. Any light weight building structures may be supported by spread footings. Design recommendations for foundations for the proposed structures and related structural elements are presented in the following paragraphs.

4.3.1 SunCatcher™ Foundation Design Recommendations

DESCRIPTION	VALUE
Foundation Type	Driven pipe piles
Structures	SunCatcher™ solar dishes
Bearing Material	Undisturbed soils below surface clearing and grubbing efforts

Foundations for the SunCatchers™ will consist of a driven pipe pile foundation. The controlling factor to consider during design will be the amount of lateral support the foundation element can transfer to the surrounding soil.

Recommended soil parameters for lateral load analysis of driven pipe pile foundations have been developed for use in LPILE or COM624 computer programs. Engineering properties have been estimated as outlined below:

Zone 1:

Lateral Load Analysis
Estimated Engineering Properties of Soils

Top Depth	Unit Weight (pcf)	USCS Soil Type	Internal Friction ϕ	Modulus of Subgrade Reaction K_s (pci)[1]
Bottom Depth				
2	115	SM	28º	90[2]
5				
5	110	SP-SM	32º	225[2]
15				

[1] Note: These values are based upon parameters for LPILE or COM624P analyses.

[2] Note: This value increases linearly with depth an amount equal to the modulus and is independent of shaft diameter.

Zone 2:

Lateral Load Analysis
Estimated Engineering Properties of Soils

Top Depth	Unit Weight (pcf)	USCS Soil Type	Cohesion (psf)	ε_{50}
Bottom Depth				
2	100	CH	750	0.010
15				

Based on these soil parameters, L-Pile analyses were conducted for a 24-inch ⅜-inch wall steel pipe pile. These values are preliminary and will change if the diameter of the foundation element or wall thickness for the steel pipe piles varies from what was used in the analysis.

Zone 1:

L-PILE ANALYSES RESULTS		
Foundation Element	**Depth of Installation (ft)**	**Pile Head Deflection Required to obtain 252 kip-ft of Moment in the Pile (in)**
⅜" Wall, 24" OD Steel Pipe Pile	12	1¼
	14	¾
	16	½

Zone 2:

L-PILE ANALYSES RESULTS		
Foundation Element	**Depth of Installation (ft)**	**Pile Head Deflection Required to obtain 252 kip-ft of Moment in the Pile (in)**
⅜" Wall, 24" OD Steel Pipe Pile	14	>1½
	16	1
	18	¾
	20	¾
	22	½

4.3.2 Preliminary Bridge Foundation Design Recommendations

DESCRIPTION	VALUE
Foundation Type	Driven Piles
Structures	Proposed bridge crossing over railroad

The following preliminary geotechnical design recommendations are for driven pile foundations at the proposed bridge abutment and pier locations. As we understand it, the bridge will consist of two abutments placed within proposed fill slopes, and two piers positioned on each side of the existing railroad and will provide a means for crossing the railroad tracks during and after construction of the solar field. Design information regarding the bridge abutments and piers have been provided by Tessera Solar.

Preliminary Design recommendations are based on:

- Preliminary design drawings prepared by URS

- Design information provided by Tessera Solar
- Subsurface information obtained by Terracon

The recommendations in this section are considered preliminary in nature and need to be further refined as the bridge designs become finalized. The preliminary design drawings indicate that the abutments will be supported on a pile group having 2 rows with 8 piles in each row. The interior row of piles will be installed at a batter. The piers are shown to be supported on a pile group having 6 rows with 7 piles in each row, per pier. Crash walls are also proposed on the interior of the piers, adjacent to the railroad.

A driven pile foundation system has been analyzed for support of the proposed bridge abutments and piers, based upon the geotechnical data gathered from the borings. Driven pile capacities for compressive loads have been developed for the project based upon the procedures outlined in Section 4.5 of AASHTO Standard Specifications for Highway Bridges, 17th Edition (2002) and the computer program AllPile.

The results of our analyses for selected driven piles are shown below. The pile spacing is unknown a this time; however, if the pile spacing is greater than 3 pile diameters, no reduction in capacity is needed to account for group effects. Otherwise, a reduction in capacity will need to be accounted for.

Pile Type	Location	Applicable Borings	Pile Length	Allowable Capacity (tons)
HP 10x57	North of Railroad	B-009	50	61
	South of Railroad	B-011	50	41
HP 12x63	North of Railroad	B-009	50	81
	South of Railroad	B-011	50	52
HP 14x89	North of Railroad	B-009	50	104
	South of Railroad	B-011	50	68

An aggressive subsurface environment where corrosion can deteriorate the piles over their design life can generally identified by soil resistivity and pH tests. According to the FHWA-HI-97-013 Manual, Design and Construction of Driven Pile Foundations (1998), a pH value less than 4.5 or resistivity less than 2000 ohms-cm should be treated as an aggressive environment. If resistivity results are between 2000 and 5000 ohms-cm then chloride ion and sulfate ion content tests should be performed. If these tests indicate chloride ion content greater than 100 parts per million (ppm) or sulfate ion content greater than 200 ppm, then the soil should be classified as aggressive. Resistivity values greater than 5000 ohms-cm are considered non-aggressive.

Preliminary corrosion testing was conducted on one selected sample retrieved from boring B-009, with the results presented in the table below. Based on the FHWA (1998) corrosion criteria and the preliminary test results, the subsurface materials at the bridge location may be considered non-aggressive; however, additional corrosion testing should be conducted to confirm these results.

Boring	Sample Depth (feet)	pH	Chlorides (ppm)	Sulfates (ppm)	Resistivity (ohms-cm)
B-009	0 to 5	8.18	61	1	5,900

4.3.2.1 Driven Pile Construction Recommendations

The most effective means of verifying pile capacities for either tension or axial loads is through pile load tests. Preliminary foundation design can be based upon calculated capacities utilizing soil strength criteria determined from the field and laboratory testing conducted during exploration.

Lateral resistance to horizontal forces can be enhanced by battered piles. The vertical and horizontal components of the load will depend on the batter inclinations. Batters should not exceed 1:4 (horizontal:vertical).

The contractor should select a driving hammer and cushion combination which is capable of installing the selected piling without overstressing the pile material. The contractor should submit the pile driving plan and the pile hammer-cushion combination to the engineer for evaluation of the driving stresses in advance of pile installation.

Some ground heave may be experienced as a result of pile driving at each site. Therefore, it is recommended that the top elevations of the initial piles driven be surveyed. If any heave is noted after the driving of subsequent piles, the piles should be redriven to their original top elevation. This problem can be particularly acute in pile groups.

All piles should be provided with driving shoes to protect the pile tip from damage when penetrating the dense granular soils. A representative of the geotechnical engineer should observe pile driving operations on a full-time basis. Each pile should be observed and checked for buckling, crimping and alignment in addition to recording penetration resistance, depth of embedment, and general pile driving operations.

4.3.3 Spread Footing Design Recommendations (Zone 1)

DESCRIPTION	VALUE
Foundation Type	Conventional Shallow Spread Footing
Structure	Light-weight Buildings
Bearing Material	Undisturbed Soils
Allowable Bearing Pressure	2,000 psf
Minimum Width for Continuous and Column Footings	16 inches and 24 inches, respectively
Minimum Embedment Depth Below Finished Grade	2 feet
Total Allowable Settlement	1-inch (assumed)
Estimated Differential Settlement	½ to ¾ inch over 100 feet

The allowable foundation bearing pressures apply to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

The general bearing capacity equation developed by Terzaghi was used to obtain the ultimate bearing pressure for the value provided in the table above.

Footings should be proportioned to reduce differential foundation movement. Proportioning on the basis of equal total settlement is recommended; however, proportioning to relative constant dead-load pressure will also reduce differential settlement between adjacent footings. Additional foundation movements could occur if water from any source infiltrates the foundation soils; therefore, proper drainage should be provided in the final design and during construction.

The above recommendations pertain to shallow slab-on-grade foundations in Zone 1. If buildings are planned in the area of Zone 2 (where expansive soils are present), then Terracon should be consulted and modified recommendations should be prepared.

4.3.3.1 Spread Footing Construction Considerations

For shallow spread footings bearing on undisturbed soil, the foundation excavations must be observed by a geotechnical engineer or a qualified representative to evaluate the bearing conditions prior to the placement of reinforcing steel and concrete. If undesirable (e.g., soft, loose, water softened, low density) materials are encountered in the foundation excavations, the excavations should be deepened to extend completely through the undesirable bearing materials. A lean concrete (slurry ABC with a minimum cement content of 2 sacks per cubic yard) material may be used as backfill to obtain a shallow, uniform footing depth for those foundation excavations that have been deepened. Alternatively, for the case where only a minor amount (i.e., less than six inches in thickness) of soft, loose, or disturbed soil is encountered at the base of a foundation excavation, the bottom could be mechanically compacted (hand tamped) to densify and improve this limited thickness of unsuitable soil, with the approval of the geotechnical engineer.

Foundations should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. The use of joints at openings or other discontinuities in masonry walls is recommended.

4.4 Seismic Considerations

DESCRIPTION	VALUE
2006 International Building Code Site Classification (IBC) [1]	C
Site Latitude	N 34° 48’ 56”
Site Longitude	W 116° 25’ 40”
S_s Spectral Acceleration for a Short Period	1.18
S_s Spectral Acceleration for a 1-Second Period	0.40
F_a Site Coefficient for a Short Period	1.0
F_v Site Coefficient for a 1-Second Period	1.4

[1] Note: In general accordance with the *2006 International Building Code,* Table 1613.5.2. IBC Site Class is based on seismic shear wave tests.

4.5 Floor Slab

4.5.1 Design Recommendations (Zone 1)

DESCRIPTION	VALUE
Interior floor system	Slab-on-grade concrete.
Floor slab support	On-site soils or approved imported soils placed and compacted in accordance with Earthwork section of this report.

Provided they are relatively lightly loaded (<100 psf), construction of floor slabs directly on firm, undisturbed soils or compacted fills composed of on-site granular soils are considered acceptable for the project. Where buildings are planned, the on-site soils, on most of the site, generally have no to low plasticity and low expansive potential under light loading conditions such as those imposed by floor slabs.

In areas of exposed concrete, control joints should be saw cut into the slab after concrete placement in accordance with ACI Design Manual, Section 302.1R-37 8.3.12 (tooled control joints are not recommended). Additionally, dowels should be placed at the location of proposed construction joints. To control the width of cracking (should it occur) continuous slab reinforcement should be considered in exposed concrete slabs.

Positive separations and/or isolation joints should be provided between slabs and all foundations, columns or utility lines to allow independent movement. Interior trench backfill placed beneath slabs should be compacted in accordance with recommendations outlined in the Earthwork section of this report. Other design and construction considerations, as outlined in the ACI Design Manual, Section 302.1R are recommended.

The above recommendations pertain to lightly loaded floor slabs in Zone 1. If buildings are planned in the area of Zone 2 (where expansive soils are present) or heavier floor slabs are anticipated, then Terracon should be consulted and modified recommendations should be prepared.

4.6 Lateral Earth Pressures

4.6.1 Design Recommendations

The lateral earth pressure recommendations herein are applicable to the design of rigid retaining walls subject to slight rotation, such as cantilever, or gravity type concrete walls, with a level ground surface behind the wall. These recommendations are not applicable to the design of modular block - geogrid reinforced backfill walls. Recommendations covering these types of wall systems are beyond the scope of services for this assignment. However, we would be pleased to develop recommendations for the design of such wall systems upon request.

ITEM	VALUE[1]
Active Case	40 psf/ft
Passive Case	300 psf/ft
At-Rest Case	40 psf/ft
Coefficient of Base Friction or Adhesion at Base of Footing	0.35[2] psf

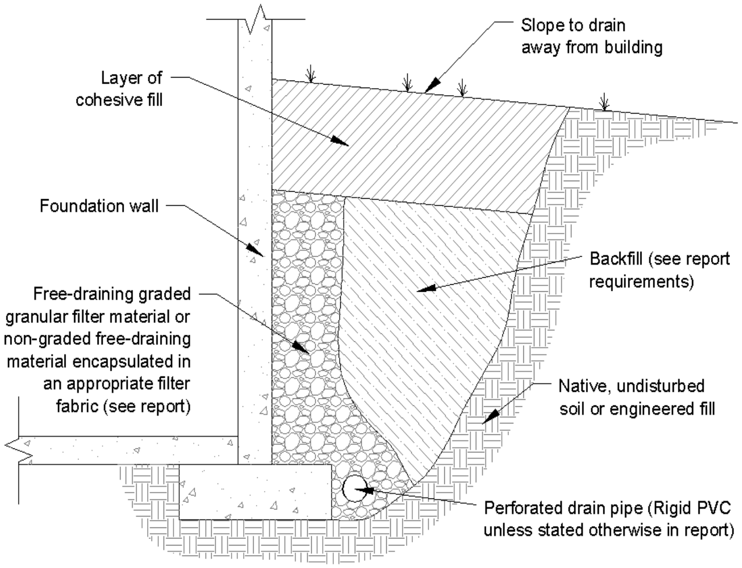
[1] Note: The values are based on the on-site soils used as backfill.

[2] Note: The coefficient of base friction should be reduced to 0.30 when used in conjunction with passive pressure.

Fill against foundation and retaining walls should be compacted to densities specified in the Earthwork section of this report. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors.

4.6.2 Construction Considerations

To control the water level behind walls, we recommend a perimeter drain be installed at the foundation level as shown on the adjacent conceptual sketch and described in the following notes.



- Free-draining granular backfill in this case should consist of ASTM D448 No. 57 Stone or other coarse granular material with less than 5 percent passing the No. 200 sieve. The free-draining material should be encapsulated in a filter fabric.
- Perforated pipe should be rigid PVC, sized to transport the expected water.
- Drainage pipe could be omitted if weep holes that are hydraulically connected to the granular drainage material are installed through the face of the wall, and the discharge water is conveyed away from the wall or other structures.
- Exterior ground surface should consist of a 12 inch clay cap sloped to drain from walls.
- The clay cap can be replaced by a pavement section

4.7 Pavements

4.7.1 Design Recommendations

A design R-Value of 50 was used to calculate the asphaltic concrete pavement thickness sections and a modulus of subgrade reaction value (k) of 175 pounds per cubic inch (pci) was used in calculating the Portland cement concrete pavement sections. R-value testing should be completed prior to pavement construction to verify the design R-value.

Assuming the pavement subgrades will be prepared as recommended within this report, the following pavement sections should be considered minimums for this project for the traffic indices assumed in the table below. As more specific traffic information becomes available, we should be contacted to reevaluate the pavement calculations.

	Recommended Pavement Section Thickness (inches)*	
	Light (Automobile) Parking Assumed Traffic Index (TI) = 5.0	**Heavy Parking and Drive Areas Assumed TI = 7.0**
Section I Portland Cement Concrete (4,000 psi, Air Entrained)	5.5" Concrete 4.0" Class II Aggregate Base	6.0" Concrete 6.0" Class II Aggregate Base
Section II Asphaltic Concrete	3" Asphaltic Concrete over 3" Class II Aggregate Base	4" Asphaltic Concrete over 4" Class II Aggregate Base

* All materials should meet the CALTRANS Standard Specifications for Highway Construction.

These pavement sections are considered minimal sections based upon the expected traffic and the existing subgrade conditions. However, they are expected to function with periodic maintenance and overlays if good drainage is provided and maintained.

All concrete for rigid pavements should have a minimum 28-day compressive strength of 4,000 psi (i.e. MAG AA or equivalent), and be placed with a maximum slump of four inches. Although not required for structural support, the base course layer is recommended to help reduce potentials for slab curl, shrinkage cracking, and subgrade "pumping" through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

4.7.2 Construction Considerations

Materials and construction of pavements for the project should be in accordance with the requirements and specifications of the State of California Department of Transportation, or other approved local governing specifications.

Base course or pavement materials should not be placed when the surface is wet. Surface drainage should be provided away from the edge of paved areas to minimize lateral moisture transmission into the subgrade.

Preventative maintenance should be planned and provided for through an on-going pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

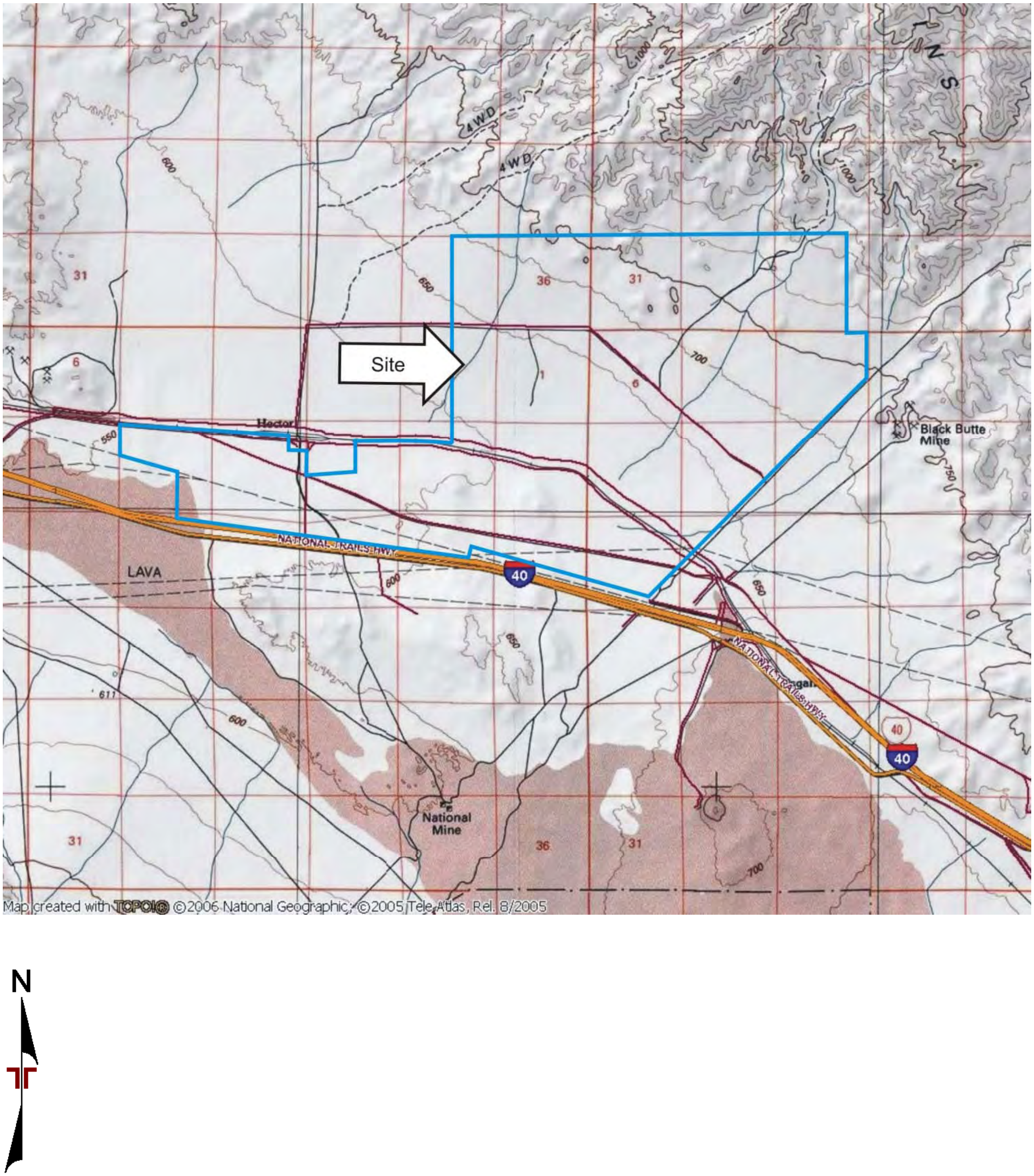
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION



Map created with TOPO!® ©2006 National Geographic; ©2005 Tele Atlas, Rel. 8/2005

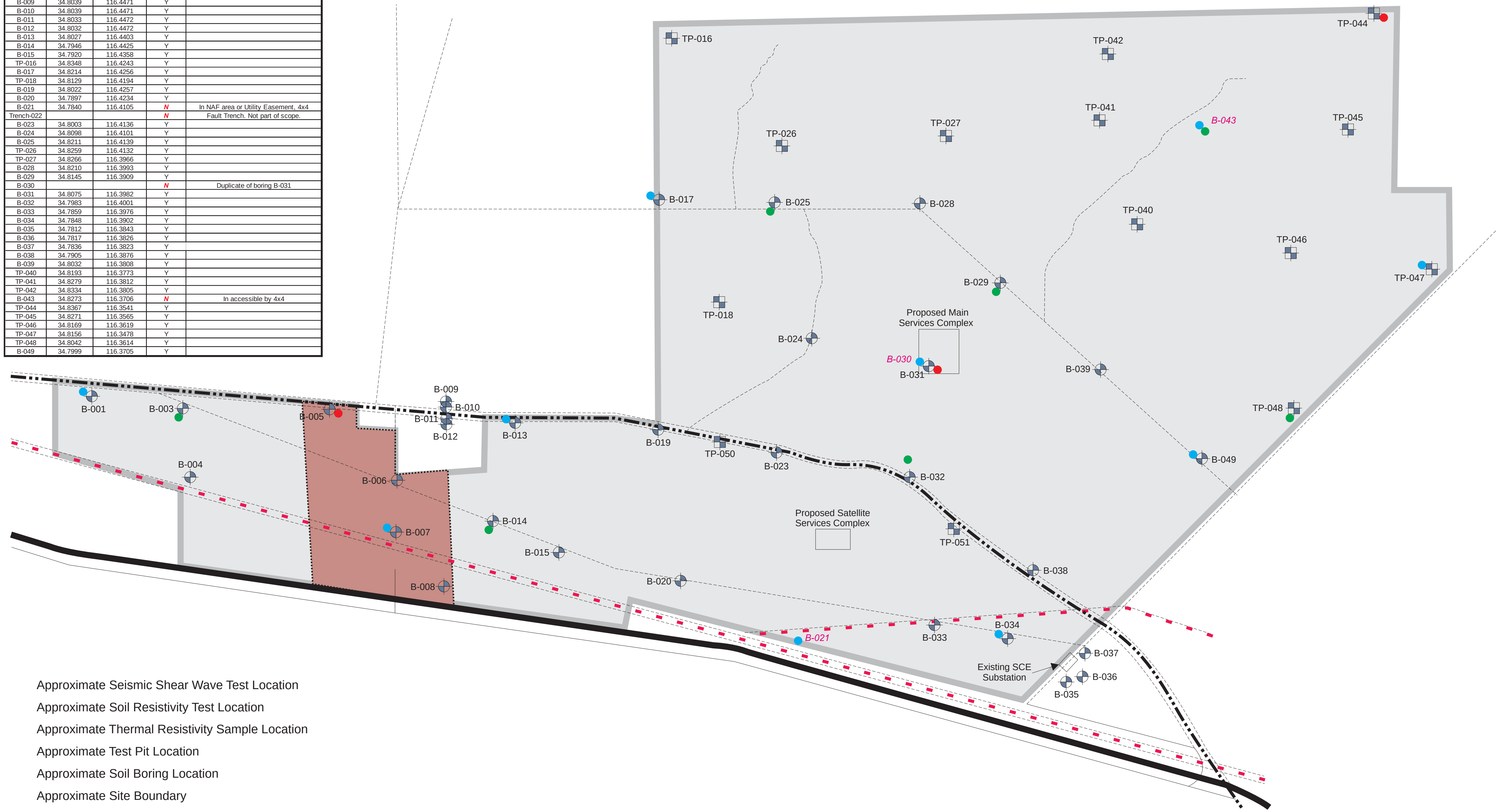
DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: JP	Project No. 60095029	**Terracon** Consulting Engineers & Scientists 16662 Millikan Avenue Irvine, California 92606 PH. (949) 660-9718 FAX. (949) 660-9732	SITE VICINITY MAP Solar One Project Pisgah, California
Drawn by: JP	Scale: See scale bar		
Checked by: PJE	File Name: Exhibit A-1		
Approved by: PJE	Date: 12/10/2009		

Exhibit No.

1

Field Exploration Point	Approximate Latitude (degrees)	Approximate Longitude (degrees)	Completed	Issues
B-001	34.8049	116.4836	Y	
Trench-002			***N***	Fault Trench. Not part of scope.
B-003	34.8051	116.4746	Y	
B-004	34.7982	116.4735	Y	
B-005	34.8039	116.4592	Y	
B-006	34.7979	116.4524	Y	
B-007	34.7936	116.4525	Y	
B-008	34.7890	116.4475	Y	
B-009	34.8039	116.4471	Y	
B-010	34.8039	116.4471	Y	
B-011	34.8033	116.4472	Y	
B-012	34.8032	116.4472	Y	
B-013	34.8027	116.4403	Y	
B-014	34.7946	116.4425	Y	
B-015	34.7920	116.4358	Y	
TP-016	34.8348	116.4243	Y	
B-017	34.8214	116.4256	Y	
TP-018	34.8129	116.4194	Y	
B-019	34.8022	116.4257	Y	
B-020	34.7897	116.4234	Y	
B-021	34.7840	116.4105	***N***	In NAF area or Utility Easement, 4x4
Trench-022			***N***	Fault Trench. Not part of scope.
B-023	34.8003	116.4136	Y	
B-024	34.8098	116.4101	Y	
B-025	34.8211	116.4139	Y	
TP-026	34.8259	116.4132	Y	
TP-027	34.8266	116.3966	Y	
B-028	34.8210	116.3993	Y	
B-029	34.8145	116.3909	Y	
B-030			***N***	Duplicate of boring B-031
B-031	34.8075	116.3982	Y	
B-032	34.7983	116.4001	Y	
B-033	34.7859	116.3976	Y	
B-034	34.7848	116.3902	Y	
B-035	34.7812	116.3843	Y	
B-036	34.7817	116.3826	Y	
B-037	34.7836	116.3823	Y	
B-038	34.7905	116.3876	Y	
B-039	34.8032	116.3808	Y	
TP-040	34.8193	116.3773	Y	
TP-041	34.8279	116.3812	Y	
TP-042	34.8334	116.3805	Y	
B-043	34.8273	116.3706	***N***	In accessible by 4x4
TP-044	34.8367	116.3541	Y	
TP-045	34.8271	116.3565	Y	
TP-046	34.8169	116.3619	Y	
TP-047	34.8156	116.3478	Y	
TP-048	34.8042	116.3614	Y	
B-049	34.7999	116.3705	Y	



LEGEND

● Approximate Seismic Shear Wave Test Location

● Approximate Soil Resistivity Test Location

● Approximate Thermal Resistivity Sample Location

⊞ Approximate Test Pit Location

⊕ Approximate Soil Boring Location

▬ Approximate Site Boundary

▬ Interstate 40

▬ · · Existing Railroad

- - - Existing Unpaved Road

— Existing Paved Road

▬ ▬ Existing Gas Pipeline(s)

▨ Approximate Limits of Zone 1 (see text of report for explanation)

▨ Approximate Limits of Zone 2 (see text of report for explanation)

0 0.5 1.0
Approximate Scale (miles)

Diagram is for general location only,
and is not intended for construction purposes.

Exhibit 2 - Site Plan and Boring/Test Pit Locations

Preliminary Geotechnical Investigation
Solar One Project
Pisgah, California

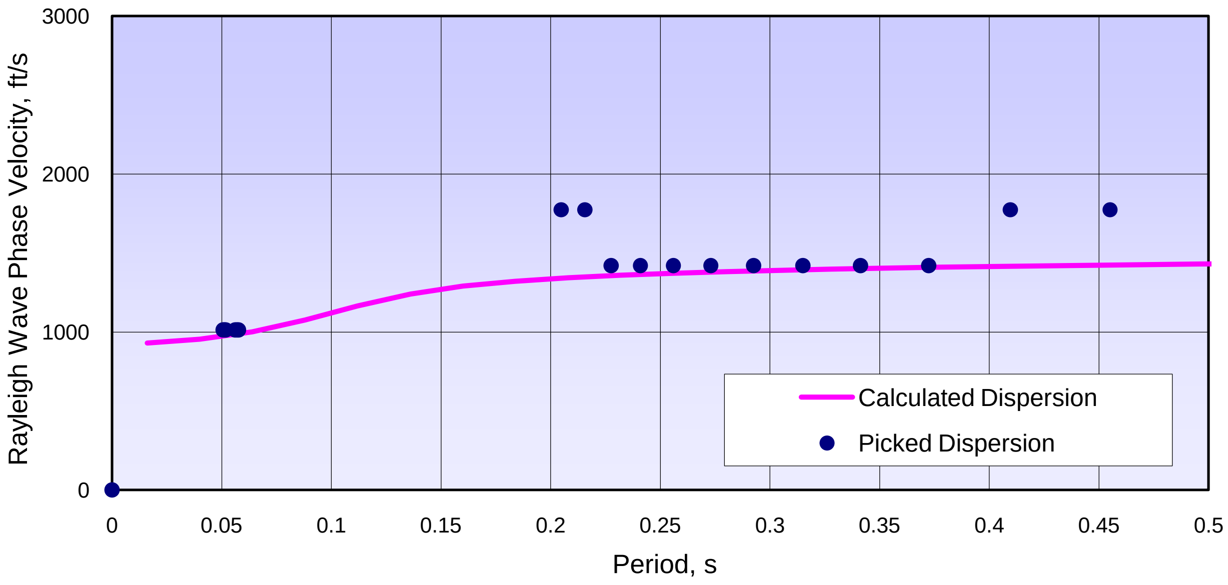
Project Manager: JP
Designed by: MLS
Drawn by: MLS

Terracon
16662 Millikan Avenue
Irvine, California 92606

Project #: 60095029
File Name: Exhibit 2.cdr
Date: 12/10/2009

Stirling Energy System
Calico - Solar One B-005
Terracon Project No. 60095029

Dispersion Curve Showing Picks and Fit



p-f Image with Dispersion Modeling Picks

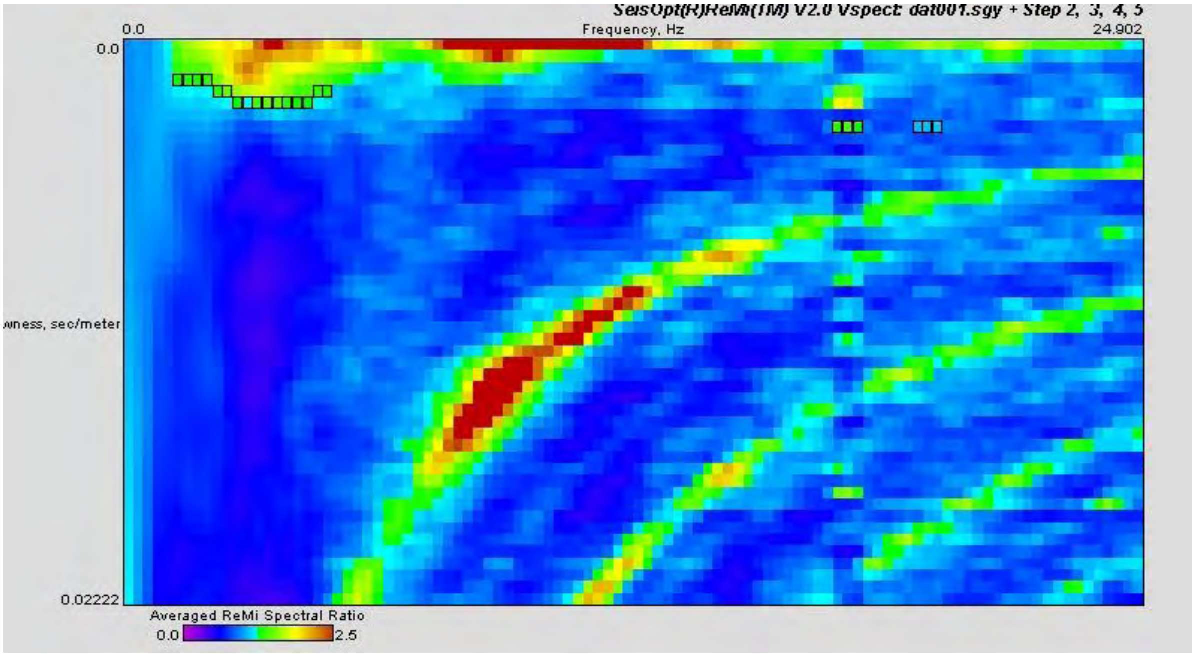


Exhibit 3

Stirling Energy System
Calico - Solar One B-005
Terracon Project No. 60095029

Shear-Wave Velocity Profile from SeisOpt ReMi Software Analysis

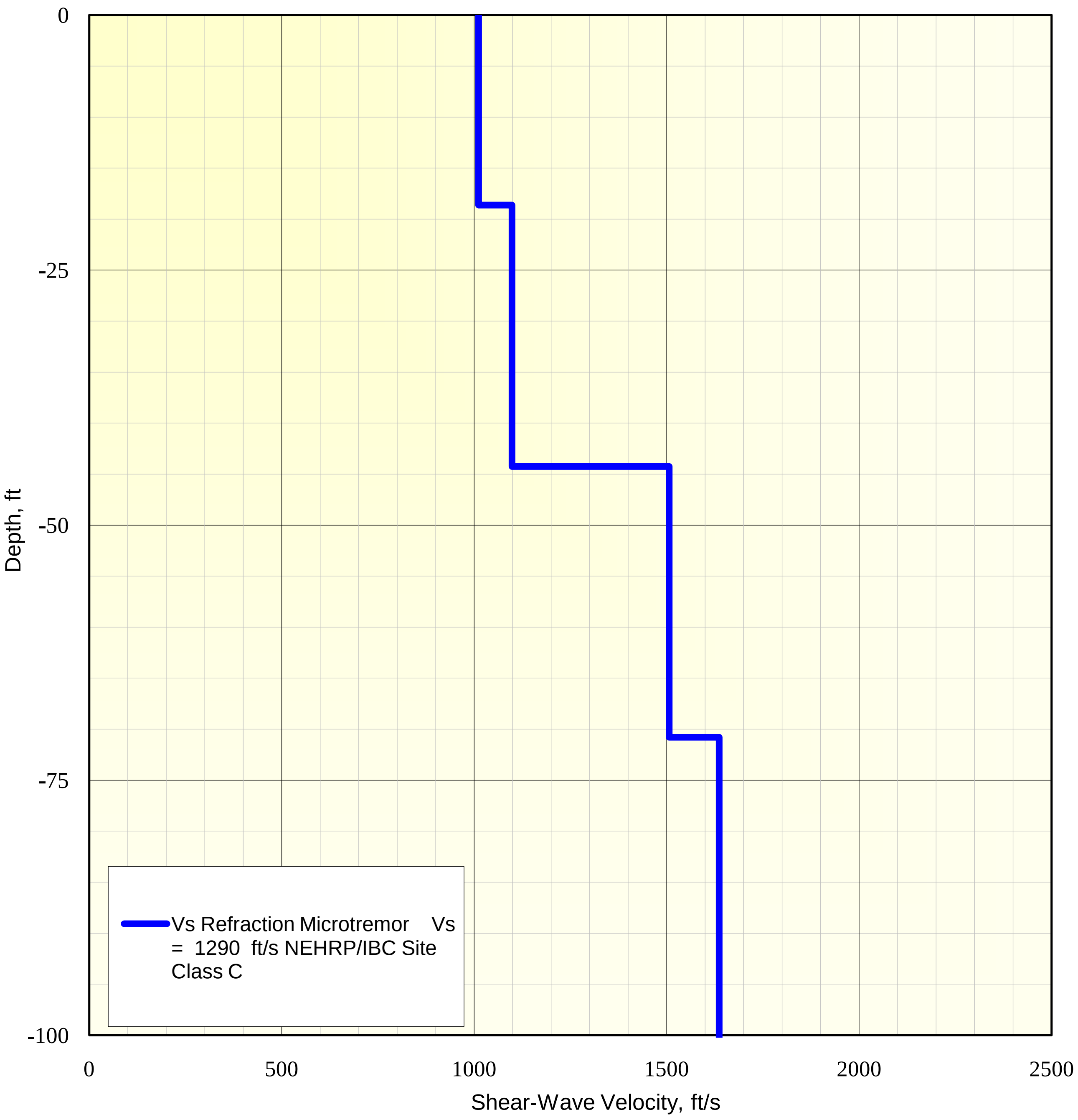
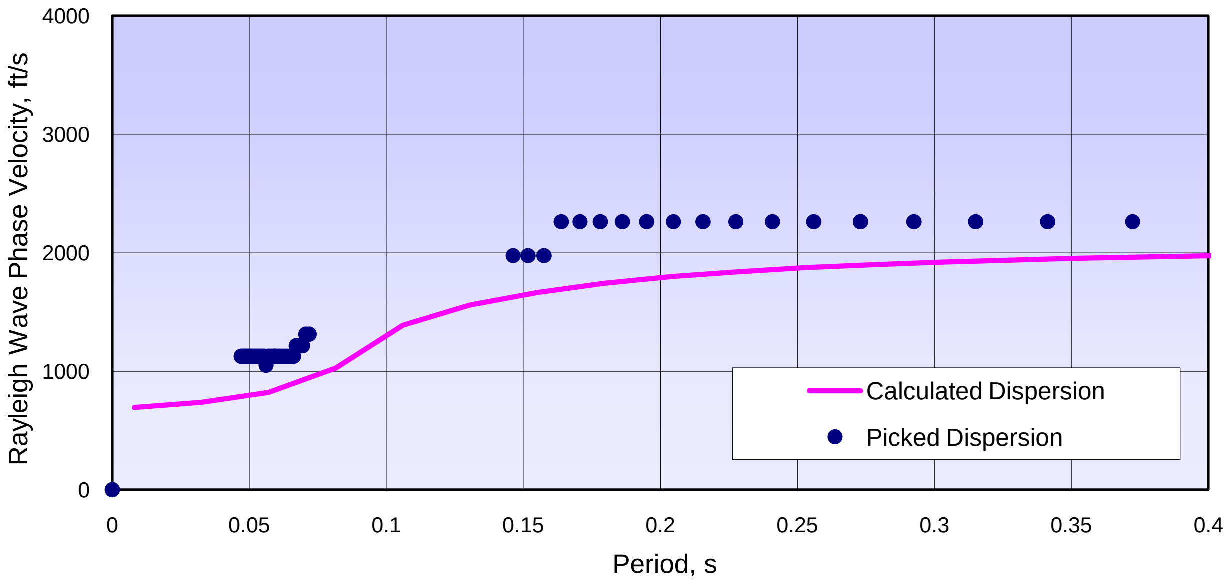


Exhibit 4

Stirling Energy System
Calico - Solar One B-031
Terracon Project No. 60095029

Dispersion Curve Showing Picks and Fit



p-f Image with Dispersion Modeling Picks

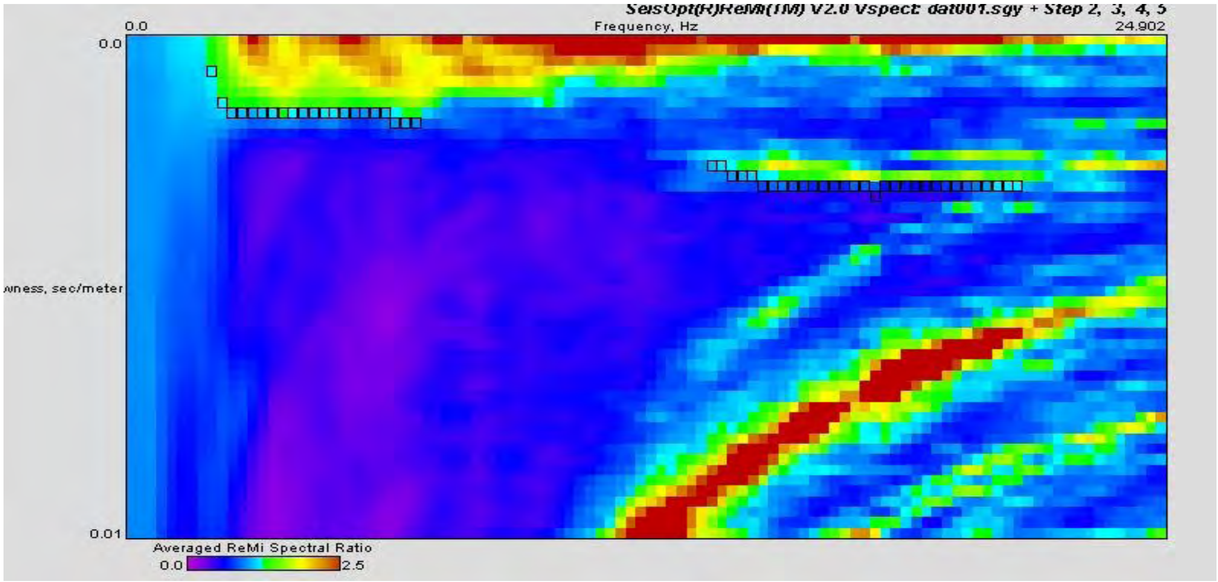


Exhibit 5

Stirling Energy System
Calico - Solar One B-031
Terracon Project No. 60095029

Shear-Wave Velocity Profile from SeisOpt ReMi Software Analysis

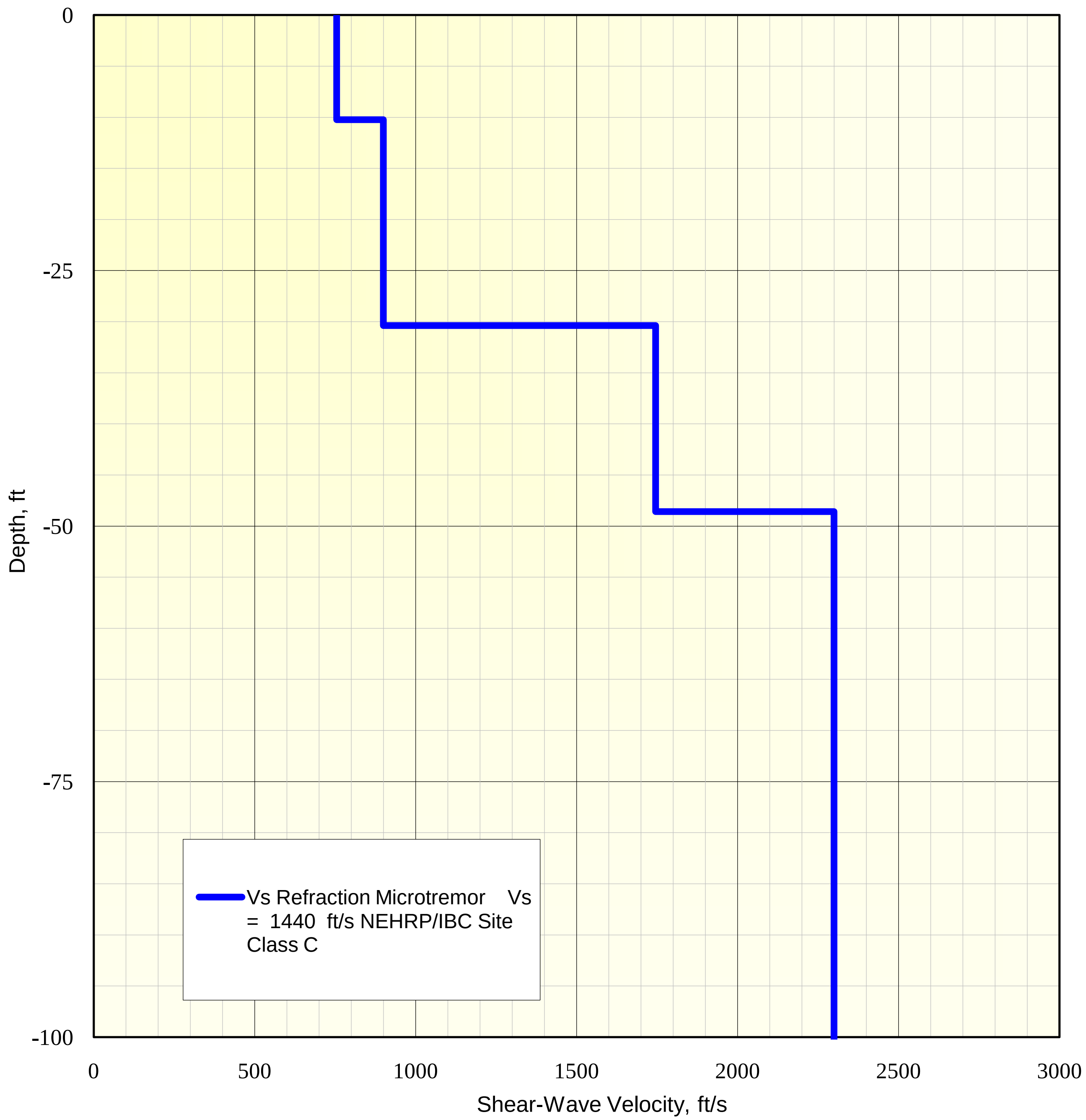
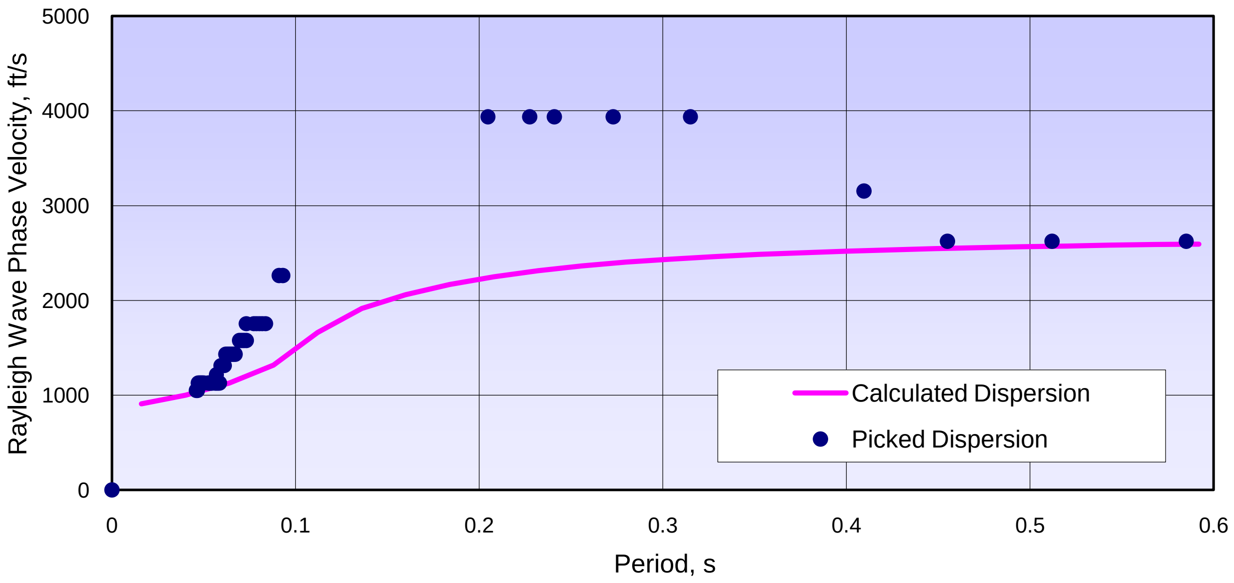


Exhibit 6

Stirling Energy System
Calico - Solar One T-044
Terracon Project No. 60095029

Dispersion Curve Showing Picks and Fit



p-f Image with Dispersion Modeling Picks

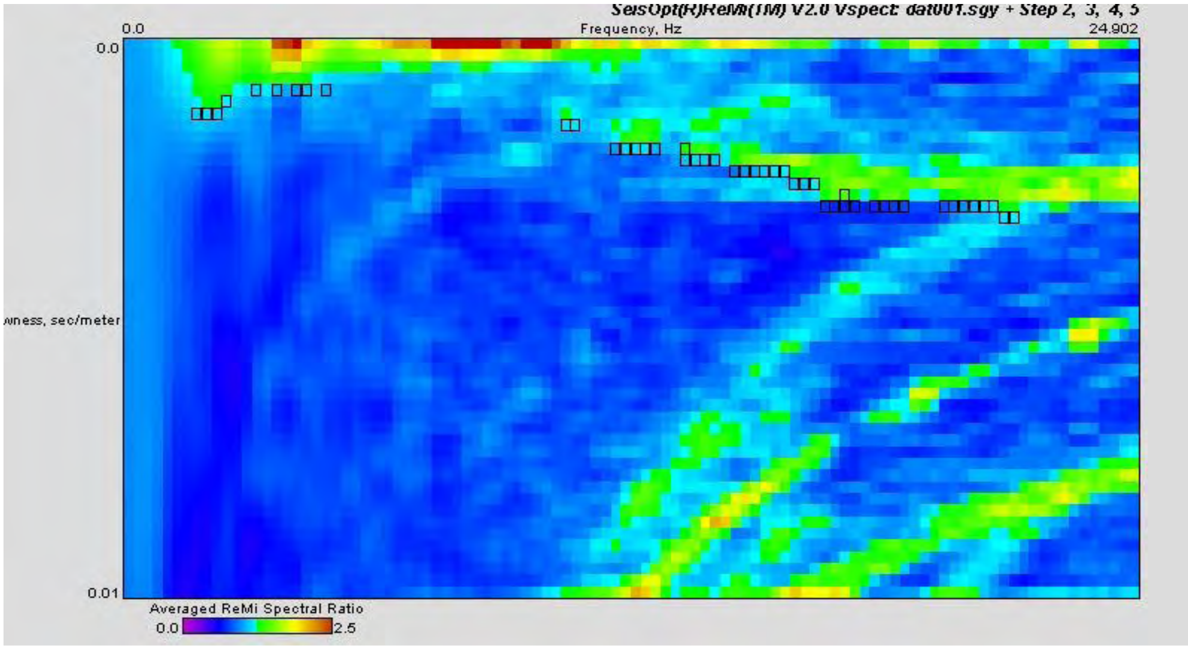


Exhibit 7

Stirling Energy System
Calico - Solar One T-044
Terracon Project No. 60095029

Shear-Wave Velocity Profile from SeisOpt ReMi Software Analysis

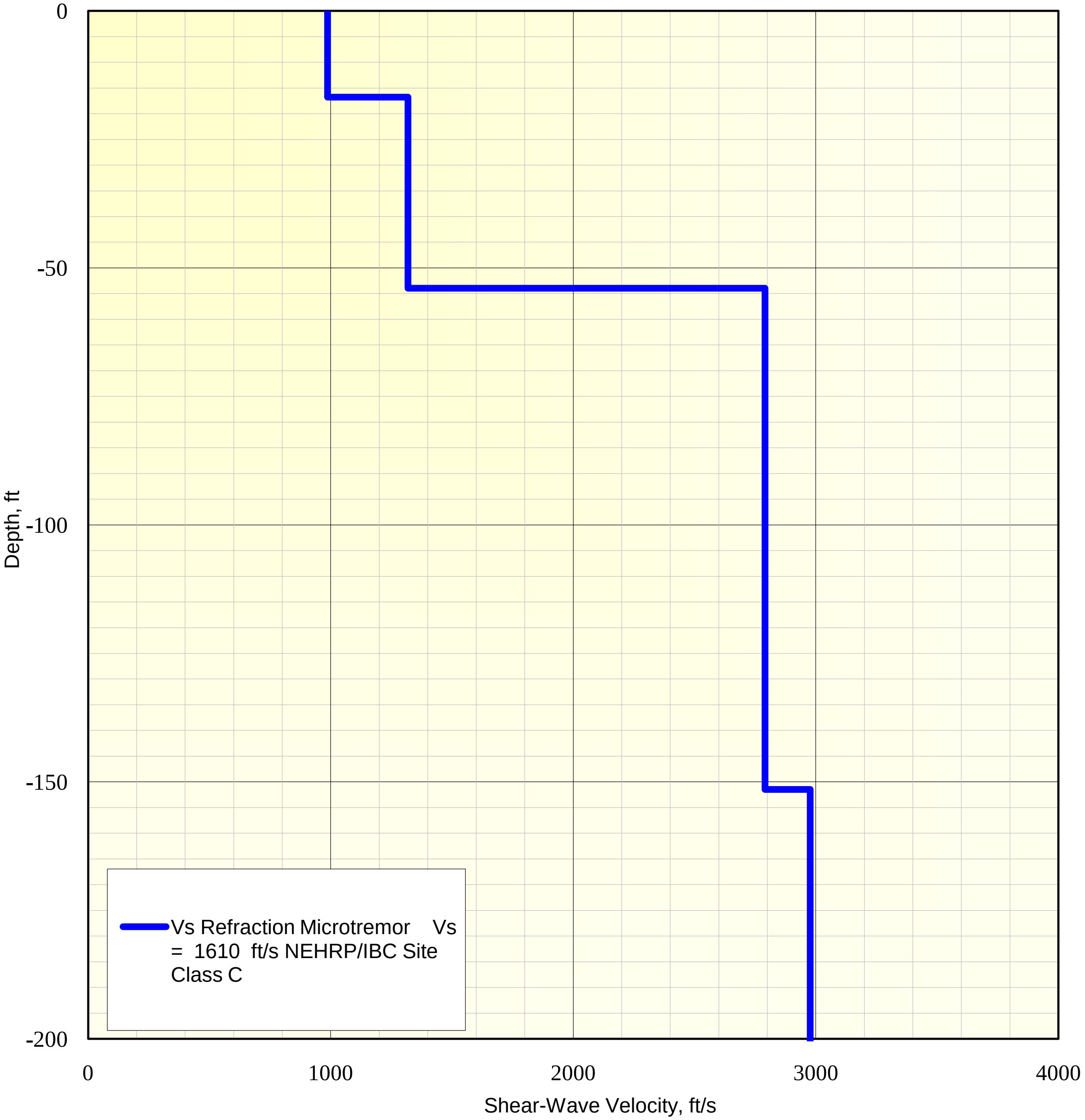


Exhibit 8

LOG OF BORING NO. B-001

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 1807 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
▨	**SILTY SAND** Beige, medium dense with fine to medium grained sand, some coarse grained sand, and fine gravel.	2	SM	↕	BS							
	3 1804											
▨	**POORLY GRADED SAND WITH SILT** Beige, medium dense to dense, with fine to medium grained sand, some coarse grained sand and trace fine gravel.	4	SP-SM	⧗	RS		55	3	93			
		6	SP-SM	⧗	RS		79	3	96			
		8										
		10	SP-SM	⧗	RS		73	7	98			
		12										
		14										
		16	SP-SM	⧗	RS		65	11	92			
		18										
		20	SP-SM	⧗	RS		79	8	103			
		22										
		24										
	26 1781		SP-SM	⧓	SPT		50/5"	5				
	Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			Terracon	BORING STARTED		10-5-09
WL	∇ NE	▼		BORING COMPLETED		10-5-09
WL	▼	∇		RIG	CME-75	FOREMAN JP
WL						JOB # 60095029

LOG OF BORING NO. B-003

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

DESCRIPTION

Approx. Surface Elev.: 1824 ft

Depth	Description	Elev.
1.5	**SILTY SAND** Beige, loose with fine to coarse grained sand and some sub-angular fine gravel.	1822.5
7.5	**POORLY GRADED SAND** Beige, medium dense to very dense with fine to coarse grained sand.	1816.5
9.5	**SILTY SAND** Beige, dense with fine to coarse grained sand and trace sub-angular fine gravel.	1814.5
14.5	**SANDY SILT** Beige, hard with fine grained sand.	1809.5
20	**POORLY GRADED SAND WITH SILT** Beige, very dense with fine to coarse grained sand.	1804
26.5	**SANDY SILT** Beige, hard with fine grained sand.	1797.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.	USCS SYMBOL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX
	SM	SPT		8				
2	SP	RS		34	4	99		
4	SP	SPT		65				
	SP	RS		50/5"	2	112		
6	SP	SPT		55				
8	SM	RS		78	10	99		
10	SM	SPT		23	4	109		
	ML	RS		80				
12	ML	SPT		53				
14	ML	SPT		26				
16	SP-SM	RS		50/5"	3	112		
18								
20	ML	RS		50/4"	3	107		
22								
24								
26	ML	SPT		54	14			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-5-09
BORING COMPLETED			10-5-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-004

Page 1 of 1

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

Approx. Surface Elev.: 1830 ft

Depth, ft	DESCRIPTION	Elev., ft
4.5	**SILTY SAND WITH GRAVEL** Beige, loose with fine to coarse grained sand and some sub-angular fine gravel.	1825.5
10	**POORLY GRADED SAND** Beige, medium dense to very dense with fine to coarse grained sand. Calcium carbonate observed around 8 feet bgs.	1820
11.5	**SILTY SAND WITH GRAVEL** Beige, dense with fine to coarse grained sand and some sub-angular fine gravel.	1818.5
14.5	**POORLY GRADED SAND** Beige, dense to very dense with fine to coarse grained sand.	1815.5
25.5	**POORLY GRADED SAND WITH SILT AND GRAVEL** Beige, very dense with fine to coarse grained sand and some sub-angular gravel.	1804.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

USCS SYMBOL	SAMPLE				TESTS			
		TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
SM	⧗	RS		31	6	115		
SP	⧗	RS		32	5	113		
SP	⧗	RS		32	7	117		
SM	⧗	RS		61	10	113		
SP-SM	⧗	RS		50/6"	11	101		
SP-SM	⧗	RS		50/2"	11	108		
SP-SM	⋈	SPT		50/6"				

DEPTH, ft.: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-5-09
BORING COMPLETED			10-5-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-005

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG | DESCRIPTION

Approx. Surface Elev.: 1852 ft

SILTY SAND WITH GRAVEL Beige, loose with fine to coarse grained sand and some sub-angular fine gravel.

2.5 — 1849.5

FAT CLAY Red-brown, stiff with low to medium plasticity fines.
Calcium Carbonate observed around 3 feet bgs.
Contains fine grained sand and is very stiff.

Trace fine sub-angular gravel observed around 15 feet bgs.

26.5 — 1825.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

USCS SYMBOL	SAMPLE: TYPE	SAMPLE: RECOVERY (in)	SAMPLE: BLOWS/FT.	TESTS: WATER CONTENT, %	TESTS: DRY DENSITY pcf	TESTS: LIQUID LIMIT	TESTS: PLASTICITY INDEX
SM	SPT		13				
SM	RS		21	22	96		
CH	SPT		14				
CH	RS		32	27	92	58	31
CH	SPT		10				
CH	RS		38	27	98		
CH	SPT		14				
CH	RS		42	27	96		
CH	SPT						
CH	SPT						
CH	RS		29	26	95		
CH	RS		36	28	97		
CH	SPT		20	29			

DEPTH, ft.: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-5-09
BORING COMPLETED			10-5-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-006

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 1878 ft	
⁘	**SILTY SAND WITH GRAVEL** Beige, loose with fine to coarse grained sand and some sub-angular fine gravel.	
2.5		1875.5
▨	**FAT CLAY** Red-brown, stiff to very stiff with low to medium plasticity fines.	
26.5		1851.5
	Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.	

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	SM	⧗	SPT		47					
2	SM	⧖	RS		50/5"	4	105			
4	CH	⧗	SPT		35					
6	CH	⧖	RS		38	12				
	CH	⧗	SPT		33					
8	CH	⧖	RS		45	23	90			
10	CH	⧗	SPT		26					
12	CH	⧖	RS		65	26	98			
	CH	⧗	SPT		19					
14	CH	⧗	SPT		30					
16	CH	⧖	RS		54	24	101			
18										
20	CH	⧖	RS		42	25	94			
22										
24										
26	CH	↕	BS		22	24				

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-5-09
BORING COMPLETED			10-5-09
RIG	CME-75	FOREMAN	JP
		JOB #	60095029

LOG OF BORING NO. B-007

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 1895 ft

Depth (ft)	Description	Elev. (ft)
0 – 2.5	**SILTY SAND WITH GRAVEL** Beige, loose with fine to coarse grained sand and some sub-angular fine gravel.	1892.5
2.5 – 6	**CLAYEY SAND** Red-brown, medium dense with fine to medium grained sand. Lightly cemented.	1889
6 – 26.5	**FAT CLAY** Red-brown, stiff to hard with low to medium plasticity fines and trace fine to medium grained sand. Crystalline mica observed at 10 feet bgs. Increasingly plastic.	1868.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.	USCS SYMBOL	SAMPLE TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
	SM	SPT		16				
2	SM	RS		29	3			
4	SC	SPT		25				
	SC	RS		43	24	93		
6	CH	SPT		25				
8	CH	RS		46	29	84		
10	CH	SPT		25				
	CH	RS		50	27	97	69	41
12	CH	SPT		22				
14	CH	SPT		60				
16	CH	RS		50/5"	22	104		
18								
20	CH	RS		73	23	105		
22								
24								
26	CH	SPT		37	26			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	10-5-09
BORING COMPLETED	10-5-09
RIG CME-75	FOREMAN JP
	JOB # 60095029

LOG OF BORING NO. B-008

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CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG | DESCRIPTION

Approx. Surface Elev.: 1921 ft

Graphic log	Depth, ft.	Description	Elev., ft
⁙	2.5	**SILTY SAND WITH GRAVEL** Beige, loose with fine to coarse grained sand and some sub-angular fine gravel.	1918.5
▨	26.5	**FAT CLAY** Red-brown, very stiff to hard with low to medium plasticity fines.	1894.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26

USCS SYMBOL	SAMPLE				TESTS			
		TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
SM	⧖	RS		37	22	95		
CH	⧖	RS		40	22	99	66	38
CH	⧖	RS		44	27	96		
CH	⧖	RS		51	30	92		
CH	⧖	RS		47	26	98		
CH	⧖	RS		50/6"	26	100		
CH	⧗	SPT		23	27			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-6-09
BORING COMPLETED			10-6-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-009

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CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 1882 ft

POORLY GRADED SAND Beige, medium dense with fine to coarse grained sand and some fine sub-angular gravel.

5 — 1877

POORLY GRADED SAND WITH SILT AND GRAVEL Beige to light-brown, dense with fine grained sand and some fine sub-angular gravel.
Very dense with calcium carbonate observed around 8 feet bgs.

Dense with decreased gravel size around 10 feet bgs..

Increased fines around 16 feet bgs.

29 — 1853

SILT Beige, hard with fine grained sand and coarse sub-angular gravel.

Continued Next Page

USCS SYMBOL	SAMPLE TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
SP	BS						
SP	RS		28	1	114		
SP-SM	RS		71	3	119		
SP-SM	RS		50/5"	3	122		
SP-SM	RS		71	5	115		
SP-SM	RS		90	3	102		
SP-SM	RS		50/5"	4	111		
SP-SM	RS		70	10			
ML	RS		50/6"	13	90		

DEPTH, ft.: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-8-09
BORING COMPLETED			10-8-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-009

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX
SILT Beige, hard with fine grained sand and coarse sub-angular gravel. No gravel observed in 35 foot sample.	34									
	36	ML	⧗	RS		46	13			
37 — 1845										
POORLY GRADED SAND WITH SILT AND GRAVEL Beige to light-brown, dense to very dense with fine grained sand and some fine sub-angular gravel.	38									
	40	SP-SM	⧗	RS		50/5"	19	83		
	42									
	44									
	46	SP-SM	⧗	RS		56	11			
	48									
	50	SP-SM	⧓	SPT		50/4"	28	73		
51 — 1831										
Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-8-09
BORING COMPLETED			10-8-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-010

Page 1 of 1

CLIENT	
Stirling Energy Systems	
SITE	PROJECT
East of Barstow, California	**Solar One**

Approx. Surface Elev.: 1882 ft

POORLY GRADED SAND WITH SILT AND GRAVEL Beige to light-brown, dense with fine grained sand and some fine sub-angular gravel.

Increased gravel content around 10 feet bgs.

26.5 1855.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS			
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
2									
4	SP-SM	⧗	RS		41	1	95		
6	SP-SM	⧗	RS		50/6"	3	113		
8	SP-SM	○	NR		50/5"				
10	SP-SM	⧗	RS		50/2"	5	113		
12									
14									
16	SP-SM	⧗	RS		50/3"	2	122		
18									
20	SP-SM	⧗	RS		50/6"	4	118		
22									
24									
26	SP-SM	⧓	SPT		50/3"	11			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-8-09
BORING COMPLETED			10-8-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-011

Page 1 of 2

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

DESCRIPTION

Approx. Surface Elev.: 1883 ft

POORLY GRADED SAND Beige, medium dense with fine to medium grained sand.

Fine to coarse grained sand and trace sub-angular gravel.

4.5 1878.5

SILTY SAND Beige to light-brown, very dense with fine to coarse grained sand and trace sub-angular gravel.

No gravel observed at 8 feet bgs.

9.5 1873.5

POORLY GRADED SAND WITH SILT AND GRAVEL Beige, very dense with fine to coarse grained sand, some sub-angular gravel, and non-plastic fines.

Calcium carbonate observed at 20 feet bgs.

24 1859

SILTY SAND Beige to light-brown, very dense with fine to coarse grained sand and trace sub-angular gravel.

Continued Next Page

USCS SYMBOL	SAMPLE				TESTS			
		TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
SP	⧗	SPT		14				
SP	⧖	RS		47	2	115		
SP	⧗	SPT		41				
SM	⧖	RS		50/4"	4	114		
SM	⧗	SPT		50/5"				
SM	⧖	RS		50/5"	4	114		
SM	⧗	SPT		50/3"				
SP-SM	⧖	RS		50/3"	3	117		
SP-SM	⧗	SPT		50/6"				
SP-SM	⧗	SPT		77				
SP-SM	⧖	RS		50/6"	7	114		
SP-SM	⧖	RS		50/4"	5	107		
SM	⧗	SPT		50/6"	4	99		
SM	⧖	RS		50/5"	15	94		

DEPTH, ft.: 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-6-09
BORING COMPLETED			10-6-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-011

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	
	SILTY SAND Beige to light-brown, very dense with fine to coarse grained sand and trace sub-angular gravel.	34										
		36	SM	⧗	SPT		59	21				
		38										
		40	SM	⧖	RS		50/2"	14	103			
		42										
		44										
		46	SM	⧗	SPT		69	21				
		48										
		50	SM	⧖	RS		75	21	98			
	51.5 1831.5											
	Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-6-09
BORING COMPLETED			10-6-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-012

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

DESCRIPTION

Approx. Surface Elev.: 1883 ft

SILTY SAND Beige to light-brown, very dense with fine to coarse grained sand and trace sub-angular gravel.

6 1877

POORLY GRADED SAND WITH SILT AND GRAVEL Beige, very dense with fine to coarse grained sand, some sub-angular gravel, and non-plastic fines.

13.5 1869.5

POORLY GRADED SAND Beige, medium dense with fine to coarse grained sand.

15 1868

SILTY SAND Beige to light-brown, very dense with fine to coarse grained sand and trace sub-angular gravel.

26.5 1856.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	SM	⧗	SPT		19					
2	SM	⧗	RS		82	3	119			
4	SM	⧗	SPT		35					
	SM	⧗	RS		50/4"	4	120			
6	SP-SM	⧗	SPT		50/6"					
8	SP-SM	⧗	RS		50/6"	4	117			
10	SP-SM	⧗	SPT		50/6"					
	SP-SM	⧗	RS		50/6"	3	114			
12	SP-SM	⧗	SPT		72					
14	SP	⧗	SPT		77					
16	SM	⧗	RS		50/6"	3	112			
18										
20	SM	⧗	RS		50/2"	12	84			
22										
24										
26	SM	⧗	SPT		66	8				

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-5-09
BORING COMPLETED			10-5-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-013

Page 1 of 1

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 1903 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	POORLY GRADED SAND Beige, medium dense with fine to medium grained sand.		SP	⧗	RS		58	2	129			
			SP	⧗	RS		87	3	110			
	7 1896											
	POORLY GRADED SAND WITH SILT AND GRAVEL Beige, very dense with fine to coarse grained sand, some sub-angular gravel, and non-plastic fines.		SP-SM	⧗	RS		50/5"	2	115			
			SP-SM	⧗	RS		50/3"	5	108			
			SP-SM	⧗	RS		50/6"	2	106			
			SP-SM	⧗	RS		50/4"	4	112			
	22 1881											
	SILTY SAND Beige to light-brown, very dense with fine to coarse grained sand and trace sub-angular gravel.		SM	⧓	SPT		47	4				
	26.5 1876.5											
	Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft					
WL	▽ NE	▼	Terracon	BORING STARTED	10-5-09
WL	▼	▼		BORING COMPLETED	10-5-09
WL				RIG CME-75	FOREMAN MLS
					JOB # 60095029

LOG OF BORING NO. B-014

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CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG | DESCRIPTION

Approx. Surface Elev.: 1918 ft

SILTY SAND Beige to light-brown, medium dense with fine grained sand.

4.5 — 1913.5

POORLY GRADED SAND WITH SILT AND GRAVEL Beige, medium dense with fine to medium grained sand.

Red-brown.

Calcium carbonate observed around 11 feet bgs.

Increased silt content and trace gravel.

26.5 — 1891.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26

USCS SYMBOL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX
SM	BS						
SM	RS		30	7	107		
SP-SM	RS		82	5	111		
SP-SM	RS		84	5	118		
SP-SM	RS		50/4"	5	116		
SP-SM	RS		50/6"	5	112		
SP-SM	RS		50/6"	9	105		
SP-SM	SPT		85	5			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▽
WL		

Terracon

BORING STARTED			10-6-09
BORING COMPLETED			10-6-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-015

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 1948 ft

Depth, ft.	Description	Elev.
4.5	**POORLY GRADED SAND** Beige, medium dense with fine to coarse grained sand.	1943.5
9.5	**POORLY GRADED SAND WITH SILT** Beige, medium dense with fine grained sand. Trace sub-angular gravel and calcium carbonate observed around 8 feet bgs.	1938.5
26.5	**SILTY SAND** Beige to light-brown, very dense with fine grained sand.	1921.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

USCS SYMBOL	SAMPLE				TESTS				
		TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
SP	⧖	RS		40	4	111			
SP-SM	⧖	RS		50/4"	18	86			
SP-SM	⧖	RS		50/4"	9	105			
SM	⧖	RS		50/5"	9	101			
SM	⧖	RS		50/5"	7	103			
SM	⧖	RS		50/5"	25	84			
SM	⧗	SPT		32	18				

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-6-09
BORING COMPLETED			10-6-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-017

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 2122 ft

DESCRIPTION	Depth, ft.	Elev., ft
POORLY GRADED SAND WITH SILT AND GRAVEL Beige, medium dense with fine to medium grained sand.	4.5	2117.5
POORLY GRADED SAND WITH GRAVEL Beige, dense with fine to coarse grained sand. Decreased gravel content. Very dense with an increased gravel content.	24	2098
SILTY SAND Beige to light-brown, dense with fine grained sand and trace sub-angular gravel.	26.5	2095.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

USCS SYMBOL	SAMPLE				TESTS			
		TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
SP-SM		RS		37	1	118		
SP		RS		38	1	114		
SP		RS		47	1	112		
SP		RS		55	1			
SP		RS		50/3"	1	116		
SP		RS		50/6"	1	125		
SM		SPT		90	1			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-8-09
BORING COMPLETED			10-8-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-019

Page 1 of 1

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

GRAPHIC LOG — DESCRIPTION

Approx. Surface Elev.: 1943 ft

Depth	Description	Elev.
	SILTY SAND Beige to light-brown, very dense with fine grained sand.	
7.5		1935.5
	POORLY GRADED SAND WITH SILT Beige, medium dense with fine grained sand.	
9.5		1933.5
	POORLY GRADED SAND Beige, very dense with fine to coarse grained sand.	
11		1932
	POORLY GRADED SAND WITH SILT Beige, dense with fine grained sand.	
26		1917
	Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.	

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	SM	⧗	RS		64	9	112			
	SM	⧗	RS		54	5	113			
	SP-SM	⧗	RS		43	3	113			
	SP	⧗	RS		50/3"	2	112			
	SP-SM	⧗	RS		50/6"	4	101			
	SP-SM	⧗	RS		50/6"	3	109			
	SP-SM	○	NR		50/5"					

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-6-09
BORING COMPLETED			10-6-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

BOREHOLE 2000 60095029 BORING LOGS.GPJ TERR2000.GDT 12/11/09

LOG OF BORING NO. B-020

Page 1 of 1

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

Approx. Surface Elev.: 2039 ft

Depth	DESCRIPTION	Elev.
	SILTY SAND Beige, medium dense with fine grained sand.	
2.5		2036.5
	POORLY GRADED SAND WITH GRAVEL Beige, medium dense with fine to medium grained sand and some sub-angular gravel.	
4.5		2034.5
	SILTY SAND WITH GRAVEL Beige to light-brown, dense with fine to coarse grained sand and some sub-angular gravel.	
12		2027
	POORLY GRADED SAND WITH SILT AND GRAVEL Red-brown, dense with fine to coarse grained sand.	
19		2020
	SILTY SAND WITH GRAVEL Red-brown, very dense with fine grained sand and some sub-angular gravel. No gravel around 25 feet bgs.	
26.5		2012.5
	Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.	

DEPTH, ft.	USCS SYMBOL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX
	SM	BS						
	SP	RS		52	1	98		
	SM	RS		49	6	123		
	SM	RS		55	11	104		
	SP-SM	RS		50/5"	7	104		
	SP-SM	RS		78	7	114		
	SM	RS		50/6"	7	101		
	SM	SPT		30				

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

BORING STARTED			10-22-09
BORING COMPLETED			10-22-09
RIG	B-53	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-023

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 1986 ft

SILTY SAND Beige, medium dense with fine to coarse grained sand and some sub-angular gravel.

4.5 — 1981.5

POORLY GRADED SAND WITH SILT Beige, very dense with fine grained sand and some sub-angular gravel.

9.5 — 1976.5

SILTY SAND WITH GRAVEL Beige, very dense with fine grained sand.

Contains some sub-angular gravel.

19 — 1967

POORLY GRADED SAND WITH SILT Beige, very dense with fine grained sand.

25.5 — 1960.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

USCS SYMBOL	SAMPLE TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
SM	RS		42	3	115		
SP-SM	RS		74	3	120		
SP-SM	RS		41	3	113		
SM	RS		62	3	117		
SM	RS		50/5"	4	111		
SP-SM	RS		50/3"				
SP-SM	SPT		50/4"	2			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-6-09
BORING COMPLETED			10-6-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-024

Page 1 of 1

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

Approx. Surface Elev.: 2046 ft

DESCRIPTION	Depth, ft.	Elev.
POORLY GRADED SAND WITH GRAVEL Beige to light-brown, dense with fine to medium grained sand. Less gravel.	7	2039
POORLY GRADED SAND WITH SILT AND GRAVEL Beige, dense to very dense with fine to coarse grained sand, some sub-angular gravel, and non-plastic fines. Fine to coarse grained sand with increased gravel. Increased silt content.	26.5	2019.5
Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.		

USCS SYMBOL	SAMPLE	TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
SP	⧗	RS		56	2	127		
SP	⧗	RS		42	2	117		
SP-SM	⧗	RS		42	1	117		
SP-SM	⧗	RS		56	2	119		
SP-SM	⧗	RS		50/5"	1	120		
SP-SM	⧗	RS		50/4"	3	118		
SP-SM	⧓	SPT		50/5"	1			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

BORING STARTED			10-8-09
BORING COMPLETED			10-8-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-025

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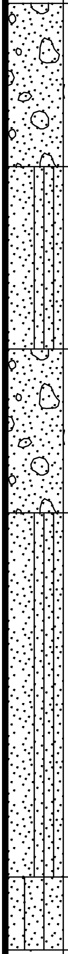
CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG | DESCRIPTION | DEPTH, ft.

Approx. Surface Elev.: 2164 ft



POORLY GRADED SAND WITH GRAVEL
Beige, dense with fine to coarse grained sand and some sub-angular gravel.

4.5 — 2159.5

POORLY GRADED SAND WITH SILT AND GRAVEL Beige, dense to very dense with fine to coarse grained sand, some sub-angular gravel, and non-plastic fines.

9.5 — 2154.5

POORLY GRADED SAND WITH GRAVEL
Beige, very dense with fine to coarse grained sand and some sub-angular gravel.

14 — 2150

POORLY GRADED SAND WITH SILT AND GRAVEL Beige, dense to very dense with fine to coarse grained sand, some sub-angular gravel, and non-plastic fines.

24 — 2140

SILTY SAND WITH GRAVEL Beige, very dense with fine grained sand and some sub-angular gravel.
Increased fines and less gravel.

26 — 2138

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26

USCS SYMBOL	SAMPLE				TESTS			
		TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
SP	⧖	RS		65	2	127		
SP-SM	⧖	RS		67	1			
SP-SM	⧖	RS		88	2	127		
SP	⧖	RS		50	2	119		
SP-SM	⧖	RS		50/6"	1			
SP-SM	⧖	RS		50/5"	1	116		
SM	⧓	SPT		50/6"	2			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	10-8-09
BORING COMPLETED	10-8-09
RIG CME-75	FOREMAN MLS
	JOB # 60095029

LOG OF BORING NO. B-028

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 2209 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX
POORLY GRADED SAND WITH SILT AND GRAVEL Beige, dense with fine to coarse grained sand.		SP-SM	RS		44	1	85		
4.5 — 2204.5									
SILTY SAND Beige, dense with fine grained sand and trace sub-angular gravel.		SM	RS		37	1			
7.5 — 2201.5									
POORLY GRADED SAND WITH GRAVEL Beige, very dense with fine to coarse grained sand and some sub-angular gravel.		SP	RS		68				
		SP	RS		71	1	122		
		SP	RS		61	1	120		
		SP	RS		67	1	122		
24 — 2185									
POORLY GRADED SAND WITH SILT AND GRAVEL Beige, dense with fine to coarse grained sand, some sub-angular gravel, and non-plastic fines.		SP-SM	SPT		78	1			
26.5 — 2182.5									

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-7-09
BORING COMPLETED			10-7-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-029

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 2188 ft

DEPTH, ft.	DESCRIPTION	Elev.
0–7	**POORLY GRADED SAND WITH GRAVEL** Beige to light-brown, medium dense with fine to medium grained sand.	2181
7–25	**POORLY GRADED SAND WITH SILT AND GRAVEL** Beige, dense to very dense with fine to coarse grained sand, some sub-angular gravel, and non-plastic fines. Fine grained sand and decreased gravel.	2163
25–26	**SILTY SAND** Beige, very dense with fine grained sand.	2162

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS			
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
0	SP	↕	BS						
3	SP	⧗	RS		43	1	122		
5.5	SP	○	NR		55	2	100		
8	SP-SM	⧗	RS		70	1	117		
10.5	SP-SM	⧗	RS		50/6"	2	124		
15.5	SP-SM	⧗	RS		50/6"	2	147		
20.5	SP-SM	⧗	RS		50/6"	3	117		
25.5	SM	⧓	SPT		50/2"	2			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	∇
WL		

Terracon

BORING STARTED			10-7-09
BORING COMPLETED			10-7-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-031

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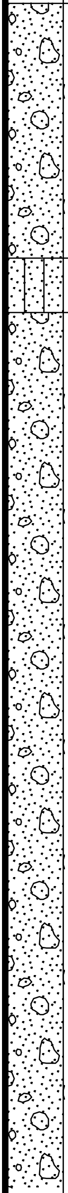
CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG



DESCRIPTION

Approx. Surface Elev.: 2077 ft

POORLY GRADED SAND WITH GRAVEL
Beige to light-brown, medium dense with fine to medium grained sand.

7 Increased fines and gravel size. 2070

SILTY SAND WITH GRAVEL Beige, dense with fine grained sand and some sub-angular gravel.
8.5 2068.5

POORLY GRADED SAND WITH GRAVEL
Beige to light-brown, medium dense to very dense with fine to medium grained sand and sub-angular gravel.

Continued Next Page

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	SP	⧗	RS		32	1	113			
	SP	⧗	RS		37	2	109			
	SM	⧗	RS		28	3	109			
	SP	⧗	RS		44	2	112			
	SP	⧗	RS		53	2	121			
	SP	⧗	RS		65	1	111			
	SP	○	NR		50/6"					
	SP	○	NR		50/5"					

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	∇
WL		

Terracon

BORING STARTED			10-22-09
BORING COMPLETED			10-22-09
RIG	B-53	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-031

Page 2 of 2

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

POORLY GRADED SAND WITH GRAVEL
Beige to light-brown, medium dense to very dense with fine to medium grained sand and sub-angular gravel.

51 2026

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
34										
36	SP	○	NR		50/5"					
38										
40	SP	⧗	RS		50/5"	2	123			
42										
44										
46	SP	⧓	SPT		50/4"	2	116			
48										
50	SP	⧗	RS		50/6"					

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-22-09
BORING COMPLETED			10-22-09
RIG	B-53	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-032

Page 1 of 1

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

GRAPHIC LOG | DESCRIPTION

Approx. Surface Elev.: 2024 ft

POORLY GRADED SAND Beige, loose with fine grained sand and trace sub-angular gravel.

4.5 2019.5

POORLY GRADED SAND WITH SILT AND GRAVEL Beige, medium dense with fine to coarse grained sand, trace sub-angular gravel, and non-plastic fines.

Calcium carbonate observed around 8 feet bgs.

Dense.

21 2003

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
2										
	SP	⧗	RS		14	1	107			
4										
6	SP-SM	⧗	RS		51	2	122			
8	SP-SM	⧗	RS		53	3	110			
10	SP-SM	⧗	RS		50/5"	3	95			
12										
14										
16	SP-SM	⧗	RS		80	2	113			
18										
20	SP-SM	○	NR		50/5"					

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	∇
WL		

Terracon

BORING STARTED			10-22-09
BORING COMPLETED			10-22-09
RIG	B-53	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-033

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 2040 ft

DESCRIPTION	Depth (ft)	Elev. (ft)
SILTY SAND Beige, medium dense with fine to coarse grained sand and trace sub-angular gravel. Some sub-angular gravel. Very dense.	9	2031
POORLY GRADED SAND WITH SILT AND GRAVEL Beige, very dense with fine to coarse grained sand, some sub-angular gravel, and non-plastic fines. Little to no gravel.	26.5	2013.5
Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.		

DEPTH, ft.	USCS SYMBOL	SAMPLE TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
3	SM	RS		47	4	111		
5.5	SM	RS		57	5	105		
8	SM	RS		91	4	110		
10.5	SP-SM	RS		67	3	116		
15.5	SP-SM	RS		50/6"	3	122		
20.5	SP-SM	RS		50/4"	5	115		
25.5	SP-SM	SPT		69	3			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-6-09
BORING COMPLETED			10-6-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-034

Page 1 of 2

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG

DESCRIPTION

Approx. Surface Elev.: 2061 ft

POORLY GRADED SAND WITH SILT AND GRAVEL Beige, dense with fine to coarse grained sand and some sub-angular gravel.

Calcium carbonate observed around 5 feet bgs.

Decreased gravel size and content.

Fine grained sand.

Beige to light-brown. Calcium carbonate observed around 31 feet bgs.

Continued Next Page

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS			
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
	SP-SM		RS		65	4	115		
	SP-SM		RS		58	6	113		
	SP-SM		RS		50/6"	5	119		
	SP-SM		RS		67	4	112		
	SP-SM		RS		50/5"	4	111		
	SP-SM		RS		50/5"	3	117		
	SP-SM		SPT		71	3			
	SP-SM		RS		50/5"	4	116		

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-7-09
BORING COMPLETED			10-7-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-034

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE	SAMPLE	SAMPLE	SAMPLE	TESTS	TESTS	TESTS	TESTS	TESTS
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	POORLY GRADED SAND WITH SILT AND GRAVEL Beige, dense with fine to coarse grained sand and some sub-angular gravel.	34 36 38	SP-SM	⧓	SPT		50/4"	5				
	Increased gravel content.	40 42 44	SP-SM	⧖	RS		50/5"	4	108			
	Decreased gravel content.	46 48	SP-SM	⧓	SPT		50/4"	5				
	51 2010	50	SP-SM	⧖	RS		50/4"	3				
	Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▽
WL		

BORING STARTED			10-7-09
BORING COMPLETED			10-7-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-035

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CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 2085 ft

POORLY GRADED SAND WITH SILT AND GRAVEL Beige, medium dense with fine to coarse grained sand and some sub-angular gravel.

Dense.

Very dense.

26.5 2058.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

USCS SYMBOL	SAMPLE				TESTS			
		TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
SP-SM	↕	BS						
SP-SM	⧖	RS		40	6	110		
SP-SM	⧖	RS		65	5	106		
SP-SM	⧖	RS		79	3	115		
SP-SM	○	NR		50/5"				
SP-SM	⧖	RS		50/3"	4	118		
SP-SM	⧖	RS		50/5"	5	122		
SP-SM	⧗	SPT		59	4			

DEPTH, ft.: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

BORING STARTED			10-7-09
BORING COMPLETED			10-7-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-036

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 2090 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
▨	**<u>POORLY GRADED SAND WITH SILT AND GRAVEL</u>** Beige, medium dense with fine to coarse grained sand and some sub-angular gravel.	2										
▨		4	SP-SM	⧖	RS		49	2	121			
▨		6	SP-SM	⧖	RS		47	3	115			
▨	Very dense.	8	SP-SM	⧖	RS		50/4"	2	129			
▨	Dense.	10	SP-SM	⧖	RS		73	3	117			
▨		12										
▨		14										
▨	Light-brown.	16	SP-SM	⧖	RS		74	3	113			
▨		18										
▨		20	SP-SM	⧖	RS		50/5"	4	111			
▨		22										
▨		24										
▨	26.5 2063.5	26	SP-SM	⧗	SPT		75	3				
	Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-7-09
BORING COMPLETED			10-7-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-037

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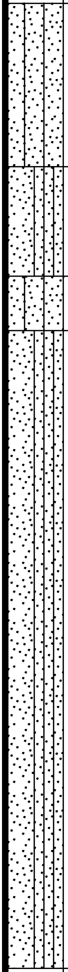
CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG



DESCRIPTION

Approx. Surface Elev.: 2086 ft

SILTY SAND Beige to light-brown, medium dense to dense with fine grained sand and trace sub-angular gravel.

Calcium carbonate observed around 3 feet bgs.

4.5 — 2081.5

POORLY GRADED SAND WITH SILT AND GRAVEL Beige, very dense with fine to coarse grained sand, sub-angular gravel, and non-plastic fines.

7.5 — 2078.5

SILTY SAND WITH GRAVEL Beige to light-brown, very dense with fine to coarse grained sand and sub-angular gravel.

9 — 2077

POORLY GRADED SAND WITH SILT AND GRAVEL Beige, very dense with fine to coarse grained sand, sub-angular gravel, and non-plastic fines.

26.5 — 2059.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.	USCS SYMBOL		SAMPLE TYPE	RECOVERY (in)	BLOWS/FT.	TESTS WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
	SM	⧗	SPT		10				
2	SM	⧗	RS		69	4	115		
	SM	⧗	SPT		78				
4	SP-SM	⧗	RS		50/6"	3	114		
6	SP-SM	⧗	SPT		68				
8	SM	⧗	RS		50/5"	3	113		
10	SP-SM	⧗	SPT		50				
	SP-SM	⧗	RS		50/6"	2	122		
12	SP-SM	⧗	SPT		28				
14	SP-SM	⧗	SPT		59				
16	SP-SM	⧗	RS		50/6"	3	117		
18									
20	SP-SM	⧗	RS		50/5"	5	111		
22									
24									
26	SP-SM	⧗	SPT		50/5"	4			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-7-09
BORING COMPLETED			10-7-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

BOREHOLE 2000 60095029 BORING LOGS.GPJ TERR2000.GDT 12/11/09

LOG OF BORING NO. B-038

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 2065 ft

Depth, ft	Description	Elev., ft
4.5	**POORLY GRADED SAND** Beige. medium dense with fine to coarse grained sand.	2060.5
7	**POORLY GRADED SAND WITH SILT AND GRAVEL** Beige, dense with fine to coarse grained sand and sub-angular gravel.	2058
12.5	**POORLY GRADED SAND WITH GRAVEL** Red-brown, very dense with fine to coarse grained sand and sub-angular gravel.	2052.5

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

DEPTH, ft.: 2, 4, 6, 8, 10, 12

USCS SYMBOL		SAMPLE TYPE	RECOVERY (in)	BLOWS/FT.	TESTS WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
SP	⧗	RS		47	2	115		
SP-SM	⧗	RS		64	4	118		
SP	⧗	RS		50/5"	4	117		
SP	⧗	RS		92				
SP	⧓	SPT		50/3"				

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-22-09
BORING COMPLETED			10-22-09
RIG	B-53	FOREMAN	MLS
		JOB #	60095029

LOG OF BORING NO. B-039

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 2178 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX
POORLY GRADED SAND WITH SILT Beige, medium dense with fine to coarse grained sand and trace sub-angular gravel.	3	SP-SM	RS		22	1	106		
Increased gravel content. Less fines.	5.5	SP-SM	RS		54	2	122		
Dense with increased coarse sand.	8	SP-SM	RS		48	1	122		
Very dense.	10.5	SP-SM	RS		69	2	117		
	15.5	SP-SM	RS		50/5"	1	118		
	20.5	SP-SM	RS		50/5"	1	125		
25.5 — 2152.5									
POORLY GRADED SAND Light-brown, medium dense with fine grained sand.	25.5	SP	SPT		57	2			
26.5 — 2151.5									

Bottom of boring.
Groundwater not encountered.
Boring backfilled with soil cuttings.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	10-7-09
BORING COMPLETED	10-7-09
RIG CME-75	FOREMAN MLS
	JOB # 60095029

LOG OF BORING NO. B-049

Page 1 of 1

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

DESCRIPTION Approx. Surface Elev.: 2514 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX
<u>POORLY GRADED SAND WITH SILT AND GRAVEL</u> Beige, very dense with fine to medium grained sand and sub-angular gravel.	2	SP-SM		RS						
	4	SP-SM		RS		50/6"	1	125		
Increased coarse grained sand and fine sub-angular gravel.	6	SP-SM		RS		55	0	124		
	8	SP-SM		RS		64	2	117		
Thin zone of increased fines.	10 12 14	SP-SM		RS		69	2	116		
Increased gravel content.	16 18	SP-SM		RS		50/5"	1	111		
Decreased gravel content.	20 22 24	SP-SM		RS		50/3"	3	114		
25.5 2488.5										
Bottom of boring. Groundwater not encountered. Boring backfilled with soil cuttings.	26	SP-SM	○	NR		50/5"				

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			10-7-09
BORING COMPLETED			10-7-09
RIG	CME-75	FOREMAN	MLS
		JOB #	60095029

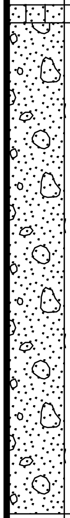
LOG OF TEST PIT NO. TP-016

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 2187 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	0.5 **SILTY SAND** Beige with fine grained sand and some sub-angular gravel. 2186.5											
	POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel and cobble. Intermittent layers of increased fines and increased gravels. Calcium carbonate buildup observed on test pit walls at 5, 6, and 7 feet bgs.	2 4										
				↕	BS			1				
	14 2173	6 8 10 12 14										
	Bottom of test pit. Groundwater not encountered. Test pit backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED		10-21-09	
TEST PIT COMPLETED		10-21-09	
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

LOG OF TEST PIT NO. TP-018

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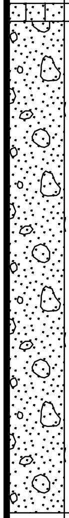
CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG



DESCRIPTION

Approx. Surface Elev.: 2281 ft

0.5 **SILTY SAND** Beige with fine grained sand and some sub-angular gravel. 2280.5

POORLY GRADED SAND WITH GRAVEL
Beige with fine to coarse grained sand and sub-angular gravel and cobble.
Intermittent layers of increased fines and increased gravels.
Calcium carbonate buildup observed on test pit walls at 5 feet bgs.

14 2267

Bottom of test pit.
Groundwater not encountered.
Test pit backfilled with soil cuttings.

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS			
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
2		↕	BS			1			
4		↕	BS			1			
6									
8									
10									
12									
		↕	BS						
14						2			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED			10-21-09
TEST PIT COMPLETED			10-21-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

LOG OF TEST PIT NO. TP-026

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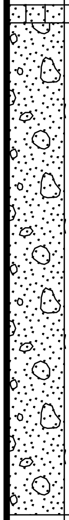
CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One



GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 2049 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	0.5 **SILTY SAND** Beige with fine grained sand and some sub-angular gravel. 2048.5											
	POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel and cobble. Calcium carbonate buildup observed on test pit walls at 5 feet bgs. Intermittent layers of increased fines and increased gravels.	2 4										
		6		↕	BS			2				
		8 10 12										
	14 2035	14		↕	BS			2				
	Bottom of test pit. Groundwater not encountered. Test pit backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

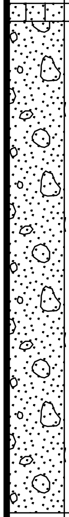
Terracon

TEST PIT STARTED			10-21-09
TEST PIT COMPLETED			10-21-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

BOREHOLE 2000 60095029 BORING LOGS.GPJ TERR2000.GDT 12/11/09

LOG OF TEST PIT NO. TP-027

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**



GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 2309 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	
	0.5 **SILTY SAND** Beige with fine grained sand and some sub-angular gravel. 2308.5											
	POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel and cobble. Intermittent layers of increased fines and increased gravels.	2 4										
				↕	BS			1				
		6 8 10 12										
				↕	BS							
	14 2295	14										
	Bottom of test pit. Groundwater not encountered. Test pit backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED			10-21-09
TEST PIT COMPLETED			10-21-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

LOG OF TEST PIT NO. TP-040

Page 1 of 1

CLIENT	
Stirling Energy Systems	
SITE	PROJECT
East of Barstow, California	**Solar One**

DESCRIPTION Approx. Surface Elev.: 2341 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
				TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel and cobble. Intermittent layers of increased fines and increased gravels. Calcium carbonate buildup observed on test pit walls at 5.5 feet bgs.	2 4										
	6		↕	BS			2				
	8 10 12										
14 2327	14		↕	BS			2				
Bottom of test pit. Groundwater not encountered. Test pit backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED			10-19-09
TEST PIT COMPLETED			10-19-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

LOG OF TEST PIT NO. TP-041

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

Approx. Surface Elev.: 2452 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
				TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
SILTY SAND Beige with fine grained sand and some sub-angular gravel. 1.5 — 2450.5	2										
POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel cobble. Intermittent layers of increased fines and increased gravels. Calcium carbonate buildup observed on test pit walls at 4 feet bgs.	4										
	6		↕	BS			3				
	8										
	10		↕	BS			4				
	12										
14 — 2438	14		↕	BS			4				

Bottom of test pit.
Groundwater not encountered.
Test pit backfilled with soil cuttings.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED			10-20-09
TEST PIT COMPLETED			10-20-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

LOG OF TEST PIT NO. TP-042

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 2572 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	SILTY SAND Beige with fine grained sand and some sub-angular gravel. 2 2570	2										
	POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel and cobble. Intermittent layers of increased fines and increased gravels. Calcium carbonate buildup observed on test pit walls at 6 feet bgs.	4 6 8 10 12		↕	BS			3				
	14 2558	14		↕	BS			2				
	Bottom of test pit. Groundwater not encountered. Test pit backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED			10-20-09
TEST PIT COMPLETED			10-20-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

LOG OF TEST PIT NO. TP-044

Page 1 of 1

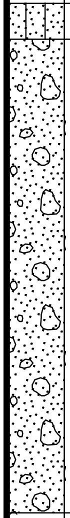
CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

DESCRIPTION

Approx. Surface Elev.: 2865 ft



GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS			
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
	SILTY SAND Beige with fine grained sand and some sub-angular gravel.	1 (2864)									
	POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel and cobble. Intermittent layers of increased fines and increased gravels. Calcium carbonate buildup observed on test pit walls at 3.5 feet bgs.										
		5–6		↕	BS			2			
		11–12		↕	BS			2			
		13–14		↕	BS			2			
		14 (2851)									

Bottom of test pit.
Groundwater not encountered.
Test pit backfilled with soil cuttings.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED			10-20-09
TEST PIT COMPLETED			10-20-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

LOG OF TEST PIT NO. TP-045

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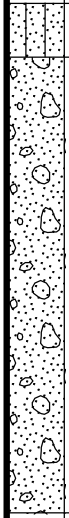
CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG



DESCRIPTION

Approx. Surface Elev.: 2654 ft

Depth	Description	Elev.
	SILTY SAND Beige with fine grained sand and some sub-angular gravel.	
1.5	**POORLY GRADED SAND WITH GRAVEL** Beige with fine to coarse grained sand and sub-angular gravel and cobble. Calcium carbonate buildup observed on test pit walls from 1.5 to 3 feet bgs. Intermittent layers of increased fines and increased gravels.	2652.5
14	Bottom of test pit. Groundwater not encountered. Test pit backfilled with soil cuttings.	2640

DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
			TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
2										
		↕	BS			1				
4										
		↕	BS			2				
6										
8										
10										
12										
		↕	BS			2				
14										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED			10-20-09
TEST PIT COMPLETED			10-20-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

LOG OF TEST PIT NO. TP-046

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 2447 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel and cobble.											
		2		↕	BS			1				
	Calcium carbonate buildup observed on test pit walls at 3 feet bgs.			↕	BS			3				
		4		↕	BS			2				
	Intermittent layers of increased fines and increased gravels.	6										
		8										
		10										
		12										
	14 2433	14										
	Bottom of test pit. Groundwater not encountered. Test pit backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

TEST PIT STARTED			10-20-09
TEST PIT COMPLETED			10-20-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

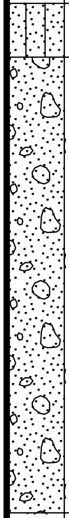
LOG OF TEST PIT NO. TP-047

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 2474 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS			
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
	**SILTY SAND** Beige with fine grained sand and some sub-angular gravel. 1.5 2472.5										
	POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel and cobble. Calcium carbonate buildup observed on test pit walls at 1.5 feet bgs. Intermittent layers of increased fines and increased gravels.	2									
				↕	BS			4			
		4									
		6									
		8									
		10									
		12									
	14 2460	14		↕	BS			3			
	Bottom of test pit. Groundwater not encountered. Test pit backfilled with soil cuttings.										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED			10-19-09
TEST PIT COMPLETED			10-19-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

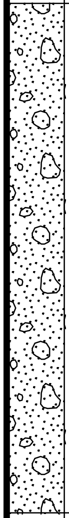
LOG OF TEST PIT NO. TP-048

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 2280 ft	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS				
					TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	**POORLY GRADED SAND WITH GRAVEL** Beige with fine to coarse grained sand and sub-angular gravel and cobble. Calcium carbonate buildup observed on test pit walls at 3 feet bgs. Intermittent layers of increased fines and increased gravels.	2										
				↕	BS			1				
		4 6 8 10 12										
				↕	BS							
	14 2266	14										
	Bottom of test pit. Groundwater not encountered. Test pit backfilled with soil cuttings.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED			10-19-09
TEST PIT COMPLETED			10-19-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

LOG OF TEST PIT NO. TP-050

Page 1 of 1

CLIENT **Stirling Energy Systems**	
SITE **East of Barstow, California**	PROJECT **Solar One**

				SAMPLE				TESTS				
GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL		TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX	
	POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel and cobble.	2										
				↕	BS			2				
	Calcium carbonate buildup observed on test pit walls at 4 feet bgs. Intermittent layers of increased fines and increased gravels.	4 6										
				↕	BS			2				
8	Bottom of test pit. Groundwater not encountered. Test pit backfilled with soil cuttings.	8										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	⊻ NE	⊻
WL	⊻	⊻
WL		

Terracon

TEST PIT STARTED			10-19-09
TEST PIT COMPLETED			10-19-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

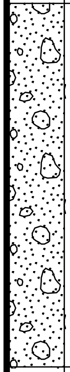
LOG OF TEST PIT NO. TP-051

Page 1 of 1

CLIENT
Stirling Energy Systems

SITE
East of Barstow, California

PROJECT
Solar One



DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE				TESTS			
				TYPE	RECOVERY (in)	BLOWS/FT.	WATER CONTENT, %	DRY DENSITY pcf	LIQUID LIMIT	PLASTICITY INDEX
POORLY GRADED SAND WITH GRAVEL Beige with fine to coarse grained sand and sub-angular gravel and cobble.	2									
			↕	BS			1			
	4									
Intermittent layers of increased fines and increased gravels.			↕	BS			3			
	6									
	8		↕	BS			2			
Calcium carbonate buildup observed on test pit walls at 9 feet bgs.			↕	BS			5			
	10									

Bottom of test pit.
Groundwater not encountered.
Test pit backfilled with soil cuttings.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ NE	▼
WL	▼	▼
WL		

Terracon

TEST PIT STARTED			10-19-09
TEST PIT COMPLETED			10-19-09
BACKHOE	B-95	FOREMAN	MLS
		JOB #	60095029

Field Exploration Description

A total of 32 test borings and 14 test pits were drilled/excavated at the site between October 5 and October 22, 2009. The borings were drilled to depths ranging from approximately 12½ to 51 feet below the ground surface and the test pits were excavated to depths ranging from 8 to14 feet bgs at the approximate locations shown on the attached Field Exploration Locations diagram, Exhibit 2. The test borings and test pits were located as follows:

Boring	Approximate Latitude (degrees)	Approximate Longitude (degrees)	Completed	Issues
B-001	34.8049	116.4836	Y	
Trench-002			***N***	Fault Trench. Not part of scope.
B-003	34.8051	116.4746	Y	
B-004	34.7982	116.4735	Y	
B-005	34.8039	116.4592	Y	
B-006	34.7979	116.4524	Y	
B-007	34.7936	116.4525	Y	
B-008	34.7890	116.4475	Y	
B-009	34.8039	116.4471	Y	
B-010	34.8039	116.4471	Y	
B-011	34.8033	116.4472	Y	
B-012	34.8032	116.4472	Y	
B-013	34.8027	116.4403	Y	
B-014	34.7946	116.4425	Y	
B-015	34.7920	116.4358	Y	
TP-016	34.8348	116.4243	Y	
B-017	34.8214	116.4256	Y	
TP-018	34.8129	116.4194	Y	
B-019	34.8022	116.4257	Y	
B-020	34.7897	116.4234	Y	
B-021	34.7840	116.4105	***N***	In NAF area or Utility Easement, 4x4
Trench-022			***N***	Fault Trench. Not part of scope.
B-023	34.8003	116.4136	Y	
B-024	34.8098	116.4101	Y	
B-025	34.8211	116.4139	Y	
TP-026	34.8259	116.4132	Y	
TP-027	34.8266	116.3966	Y	
B-028	34.8210	116.3993	Y	
B-029	34.8145	116.3909	Y	
B-030			***N***	Duplicate of boring B-031
B-031	34.8075	116.3982	Y	
B-032	34.7983	116.4001	Y	
B-033	34.7859	116.3976	Y	

Boring	Approximate Latitude (degrees)	Approximate Longitude (degrees)	Completed	Issues
B-034	34.7848	116.3902	Y	
B-035	34.7812	116.3843	Y	
B-036	34.7817	116.3826	Y	
B-037	34.7836	116.3823	Y	
B-038	34.7905	116.3876	Y	
B-039	34.8032	116.3808	Y	
TP-040	34.8193	116.3773	Y	
TP-041	34.8279	116.3812	Y	
TP-042	34.8334	116.3805	Y	
B-043	34.8273	116.3706	***N***	In accessible by 4x4
TP-044	34.8367	116.3541	Y	
TP-045	34.8271	116.3565	Y	
TP-046	34.8169	116.3619	Y	
TP-047	34.8156	116.3478	Y	
TP-048	34.8042	116.3614	Y	
B-049	34.7999	116.3705	Y	

The test borings were advanced with a truck-mounted CME-75 drill rig utilizing 8-inch diameter hollow-stem augers and the test pits were excavated with a backhoe.

The borings and test pits were located in the field using the proposed site plan and an aerial photograph of the site, and a handheld gps unit. The accuracy of field exploration locations should only be assumed to the level implied by the method used.

Continuous lithologic logs of each boring were recorded by the field geologist during the drilling operations. At selected intervals, samples of the subsurface materials were taken by driving split-spoon or ring-barrel samplers. Bulk samples of subsurface materials were also obtained.

Penetration resistance measurements were obtained by driving the split-spoon and ring-barrel samplers into the subsurface materials with a 140-pound automatic hammer falling 30 inches. The penetration resistance value is a useful index in estimating the consistency or relative density of materials encountered.

Groundwater conditions were evaluated in each boring at the time of site exploration.

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-^{3}/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the “Standard Penetration” or “N-value”. For 3” O.D. ring samplers (RS) the penetration value is reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer falling 30 inches, reported as “blows per foot,” and is not considered equivalent to the “Standard Penetration” or “N-value.”

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	<2	Very Soft
500 – 1,000	2-3	Soft
1,001 – 2,000	4-6	Medium Stiff
2,001 – 4,000	7-12	Stiff
4,001 – 8,000	13-26	Very Stiff
8,000+	26+	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Ring Sampler (RS) Blows/Ft.	Relative Density
0 – 3	0-6	Very Loose
4 – 9	7-18	Loose
10 – 29	19-58	Medium Dense
30 – 49	59-98	Dense
50+	99+	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

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Exhibit A-6

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests^{A}

				Soil Classification	
				Group Symbol	**Group Name**^{B}
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines^{C}	$Cu \geq 4$ and $1 \leq Cc \leq 3^{E}$	GW	Well-graded gravel^{F}
			$Cu < 4$ and/or $1 > Cc > 3^{E}$	GP	Poorly graded gravel^{F}
		Gravels with Fines More than 12% fines^{C}	Fines classify as ML or MH	GM	Silty gravel^{F,G,H}
			Fines classify as CL or CH	GC	Clayey gravel^{F,G,H}
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines^{D}	$Cu \geq 6$ and $1 \leq Cc \leq 3^{E}$	SW	Well-graded sand^{I}
			$Cu < 6$ and/or $1 > Cc > 3^{E}$	SP	Poorly graded sand^{I}
		Sands with Fines More than 12% fines^{D}	Fines classify as ML or MH	SM	Silty sand^{G,H,I}
			Fines Classify as CL or CH	SC	Clayey sand^{G,H,I}
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above “A” line^{J}	CL	Lean clay^{K,L,M}
			PI < 4 or plots below “A” line^{J}	ML	Silt^{K,L,M}
		organic	Liquid limit – oven dried < 0.75	OL	Organic clay^{K,L,M,N}
			Liquid limit – not dried		Organic silt^{K,L,M,O}
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above “A” line	CH	Fat clay^{K,L,M}
			PI plots below “A” line	MH	
		organic	Liquid limit – oven dried < 0.75	OH	Organic clay^{K,L,M,P}
			Liquid limit – not dried		Organic silt^{K,L,M,Q}
Highly organic soils			Primarily organic matter, dark in color, and organic odor	PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add “with sand” to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add “with organic fines” to group name.

[I] If soil contains ≥ 15% gravel, add “with gravel” to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add “with sand” or “with gravel,” whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add “sandy” to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add “gravelly” to group name.

[N] PI ≥ 4 and plots on or above “A” line.

[O] PI < 4 or plots below “A” line.

[P] PI plots on or above “A” line.

[Q] PI plots below “A” line.

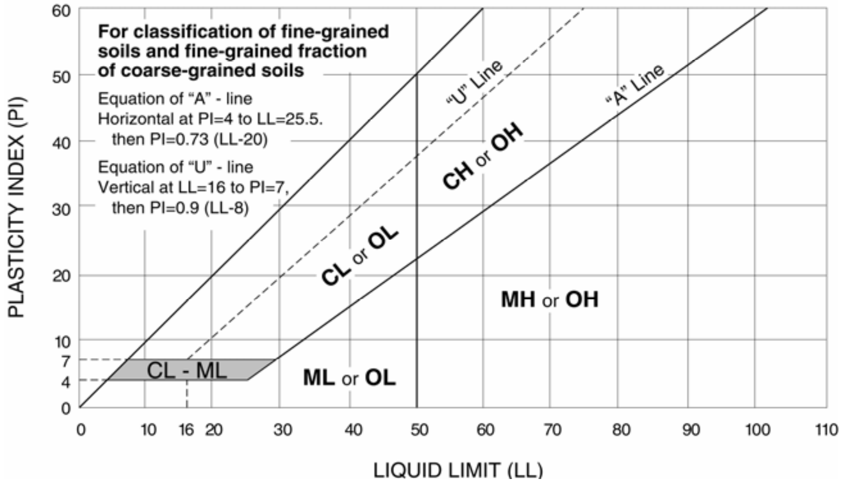


Exhibit A-7

APPENDIX B

LABORATORY TESTING

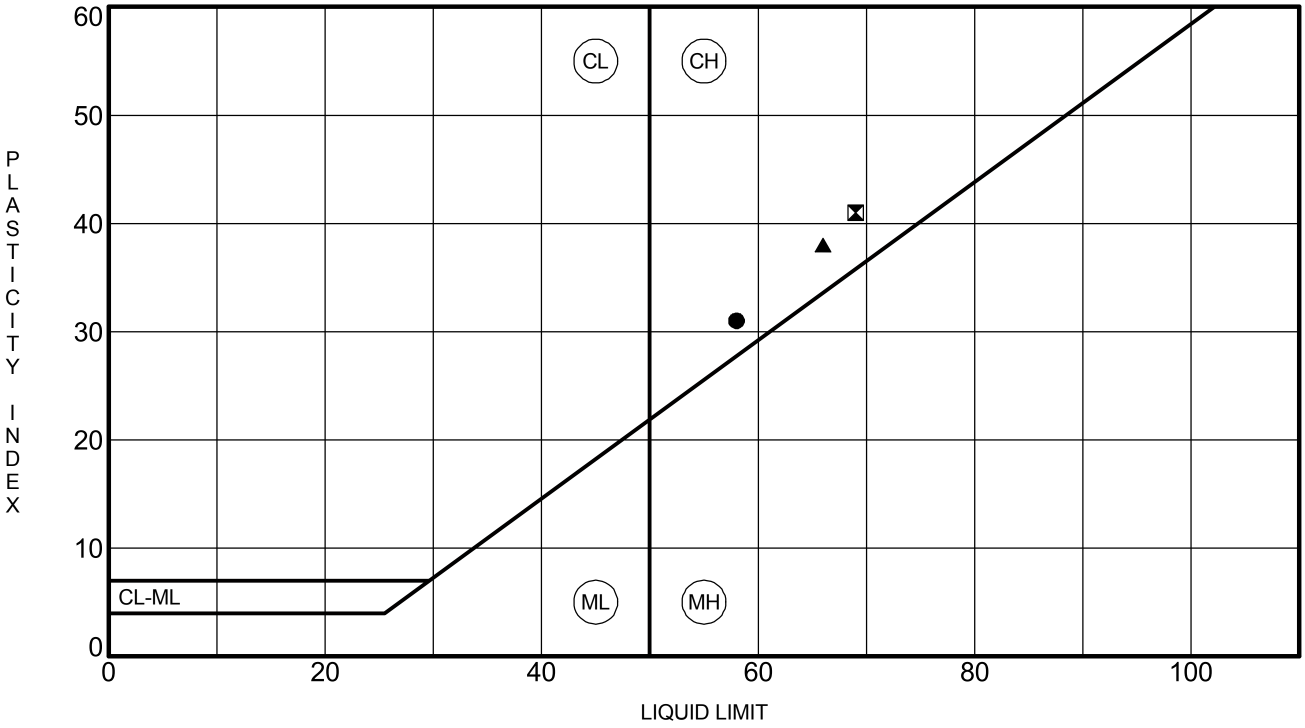
Laboratory Testing

Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS) described in Appendix A. At that time, the field descriptions were confirmed or modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil samples and the test results are presented in this appendix. The laboratory test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

- Consolidation
- Sieve Analysis
- Atterberg Limits
- Direct Shear
- Soluble Chlorides
- pH
- Standard Proctor
- In-situ Water Content
- In-situ Dry Density
- Moisture Density Relationship
- Remolded Expansion/Swell
- Soluble Sulfates
- Minimum Resistivity

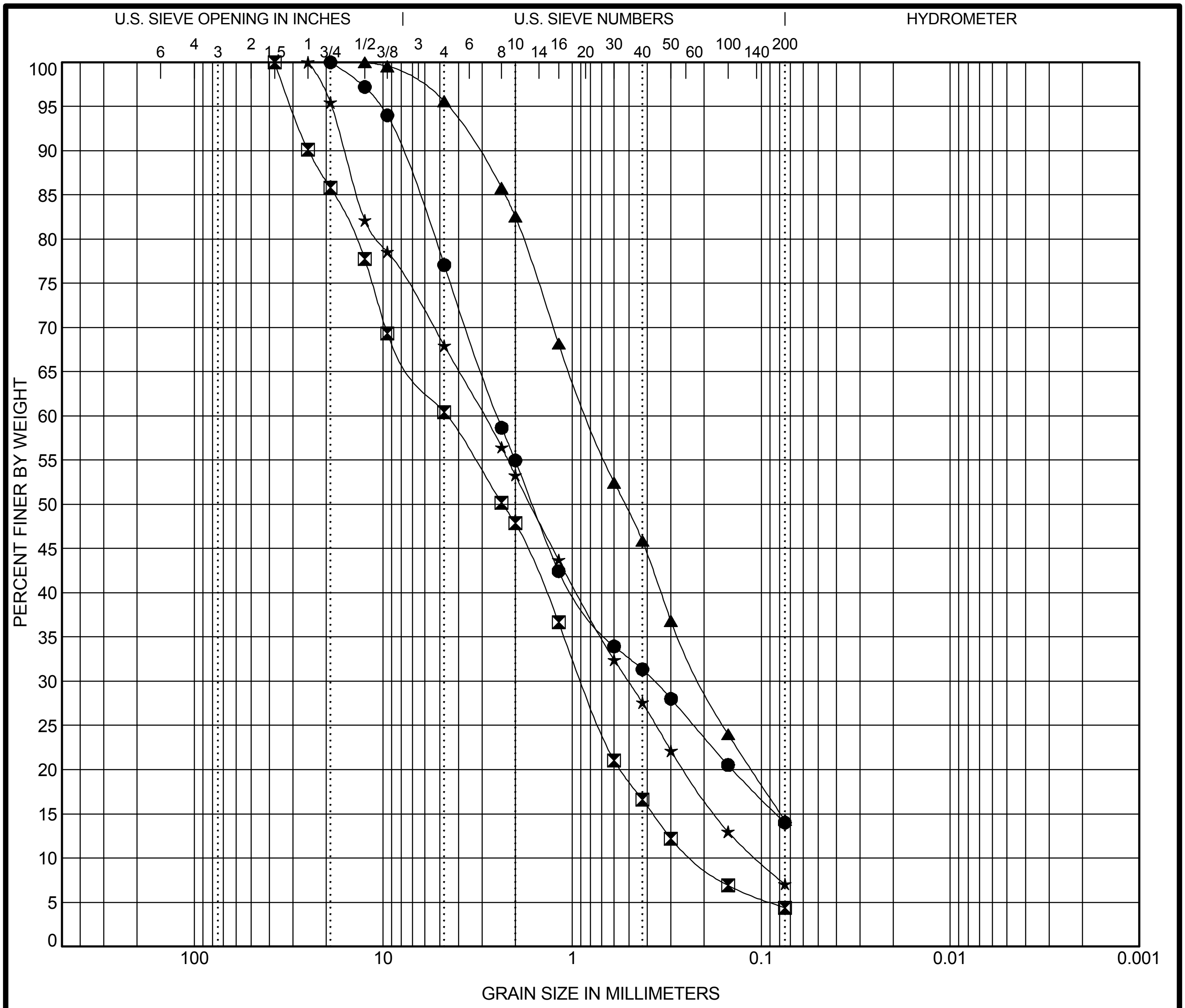


	Specimen Identification		LL	PL	PI	%Fines	Classification
●	**B-005**	**5.0ft**	**58**	**27**	**31**		**FAT CLAY (CH)**
⧗	**B-007**	**10.0ft**	**69**	**28**	**41**		**FAT CLAY (CH)**
▲	**B-008**	**5.0ft**	**66**	**28**	**38**		**FAT CLAY (CH)**

ATTERBERG LIMITS RESULTS

Terracon

Project: Calico - Solar One
Site: East of Barstow, California
Job #: 60095029
Date: 12-9-09



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● B-009	7.5ft	**SILTY SAND with GRAVEL (SM)**					
☒ B-010	5.0ft	**POORLY GRADED SAND with GRAVEL (SP)**				**0.8**	**20.5**
▲ B-011	20.0ft	**SILTY SAND (SM)**					
★ B-036	7.5ft	**POORLY GRADED SAND with SILT and GRAVEL**				**0.8**	**27.7**

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-009	7.5ft	**19**	**2.5**	**0.4**		**23**	**63**	**14**	
☒ B-010	5.0ft	**37.5**	**4.6**	**0.9**	**0.2**	**40**	**56**	**4**	
▲ B-011	20.0ft	**12.5**	**0.8**	**0.2**		**4**	**81**	**14**	
★ B-036	7.5ft	**25**	**2.9**	**0.5**	**0.1**	**32**	**61**	**7**	

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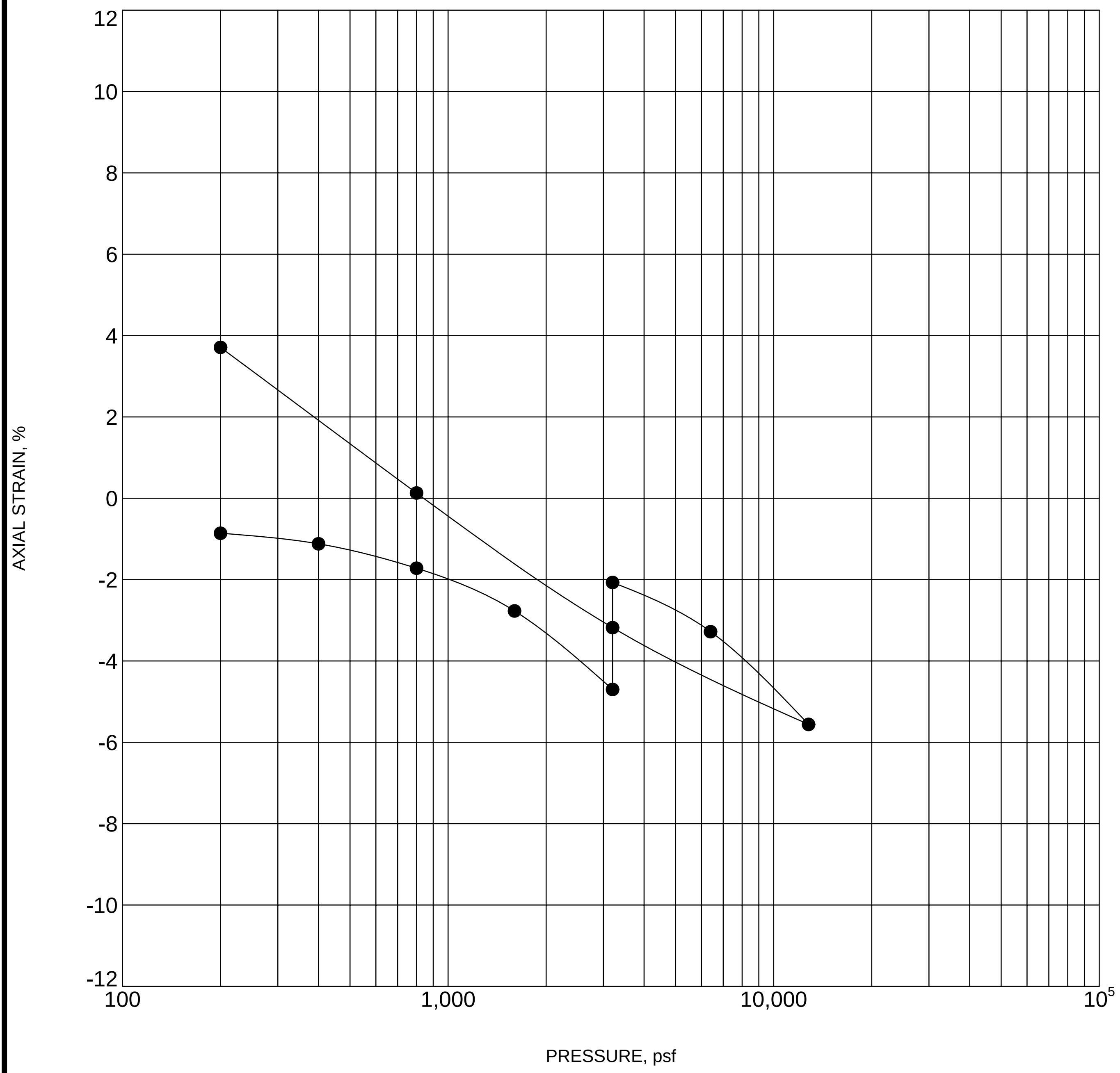
GRAIN SIZE DISTRIBUTION

Project: Calico - Solar One
Site: East of Barstow, California
Job #: 60095029
Date: 12-9-09

B-1

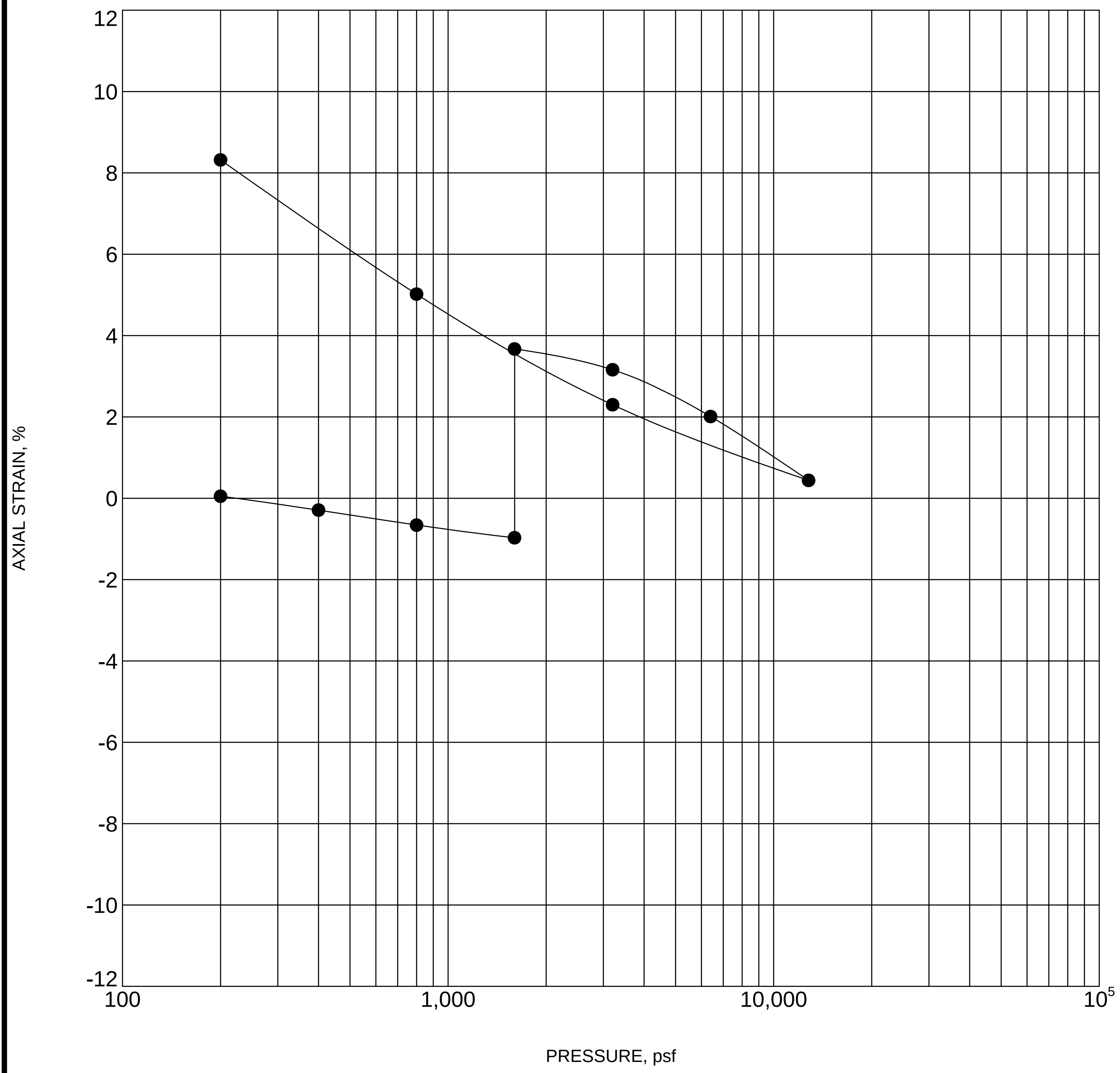


	Specimen Identification		Classification	γ_d , pcf	WC,%
●	**B-006**	**20.0 ft**	**FAT CLAY (CH)**	**94**	**25**

Notes:

CONSOLIDATION TEST RESULTS

Project: Calico - Solar One
Site: East of Barstow, California
Job #: 60095029
Date: 12-10-09



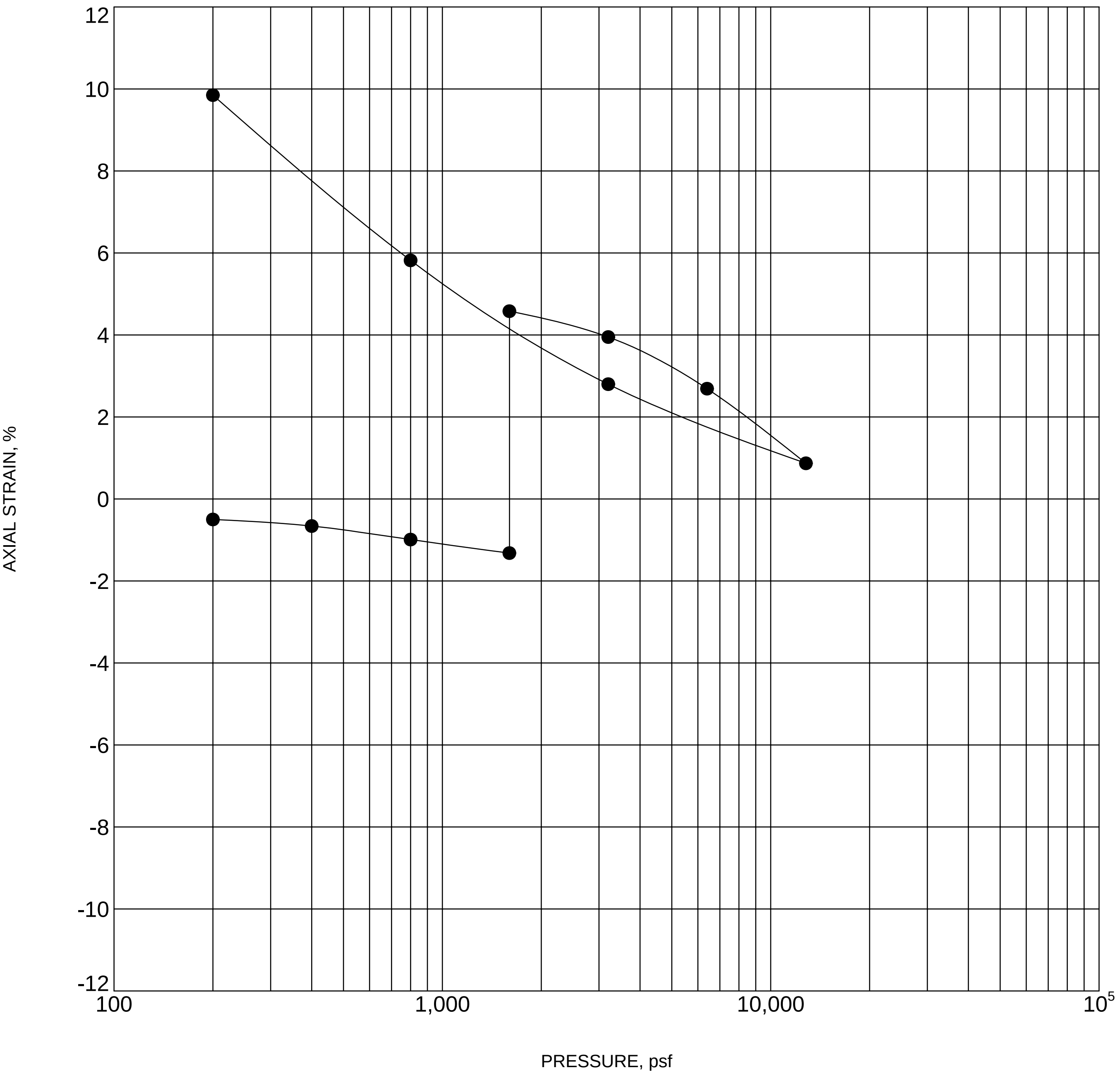
Specimen Identification			Classification	γ_d , pcf	WC,%
●	**B-007**	**15.0 ft**	**FAT CLAY (CH)**	**104**	**22**

Notes:

CONSOLIDATION TEST RESULTS

Terracon

Project: Calico - Solar One
Site: East of Barstow, California
Job #: 60095029
Date: 12-10-09

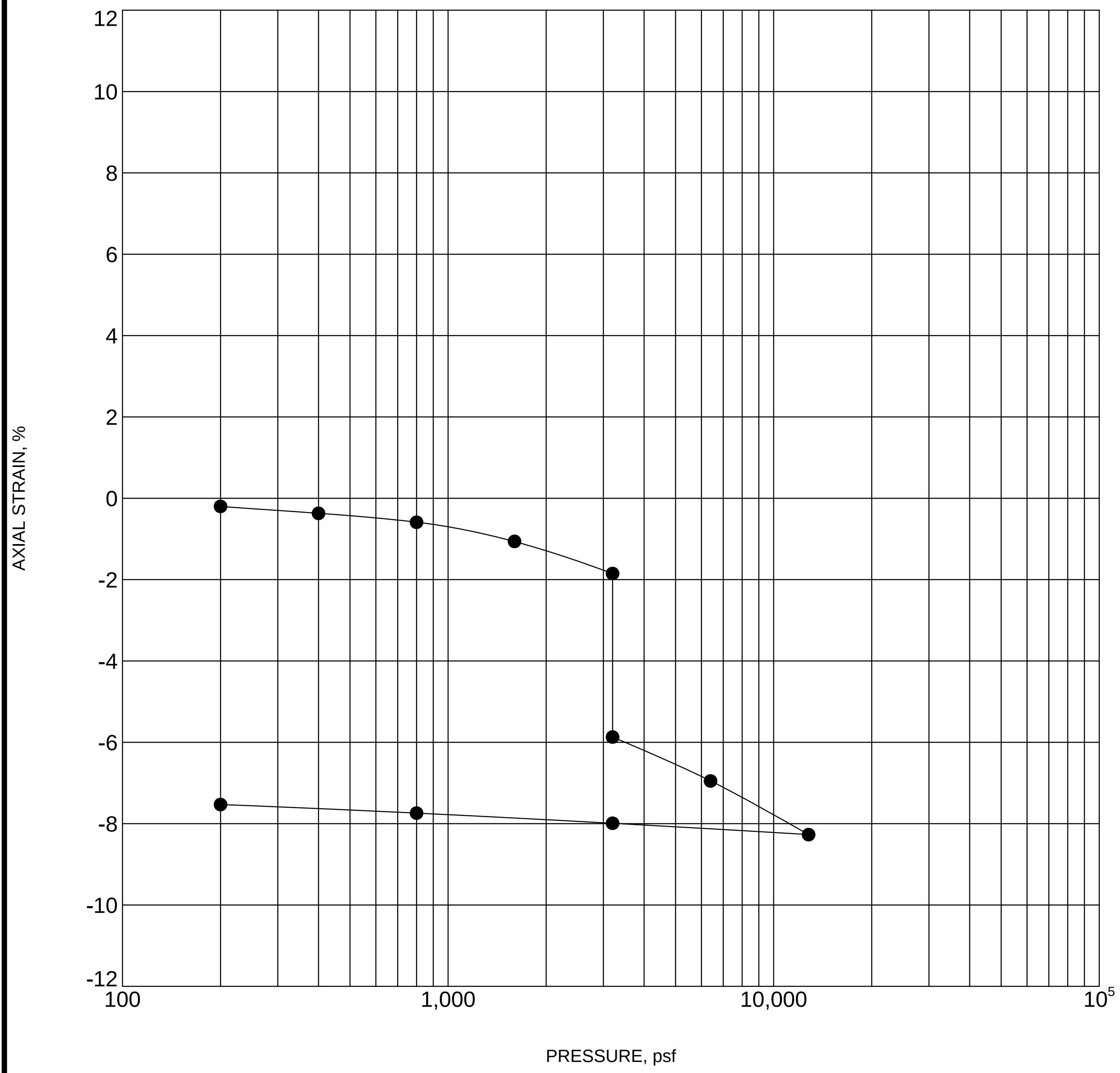


Specimen Identification			Classification	γ_d, pcf	WC,%
●	**B-008**	**7.5 ft**	**FAT CLAY (CH)**	**96**	**27**

Notes:

CONSOLIDATION TEST RESULTS

Project: Calico - Solar One
Site: East of Barstow, California
Job #: 60095029
Date: 12-10-09



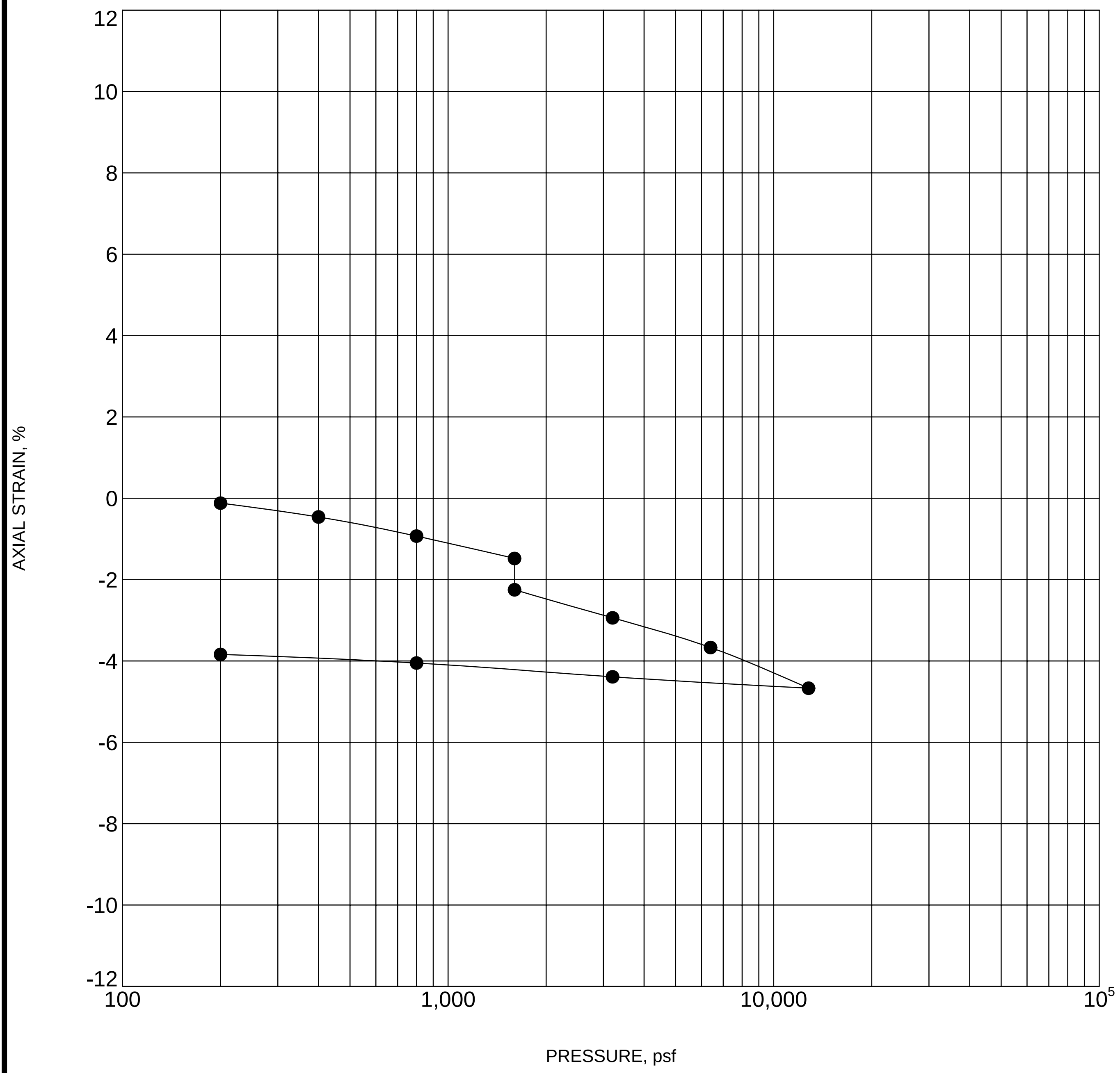
Specimen Identification			Classification	γ_d, pcf	WC,%
●	**B-009**	**20.0 ft**	**SILTY SAND with GRAVEL (SM)**	**111**	**4**

Notes:

CONSOLIDATION TEST RESULTS

Terracon

Project: Calico - Solar One
Site: East of Barstow, California
Job #: 60095029
Date: 12-10-09



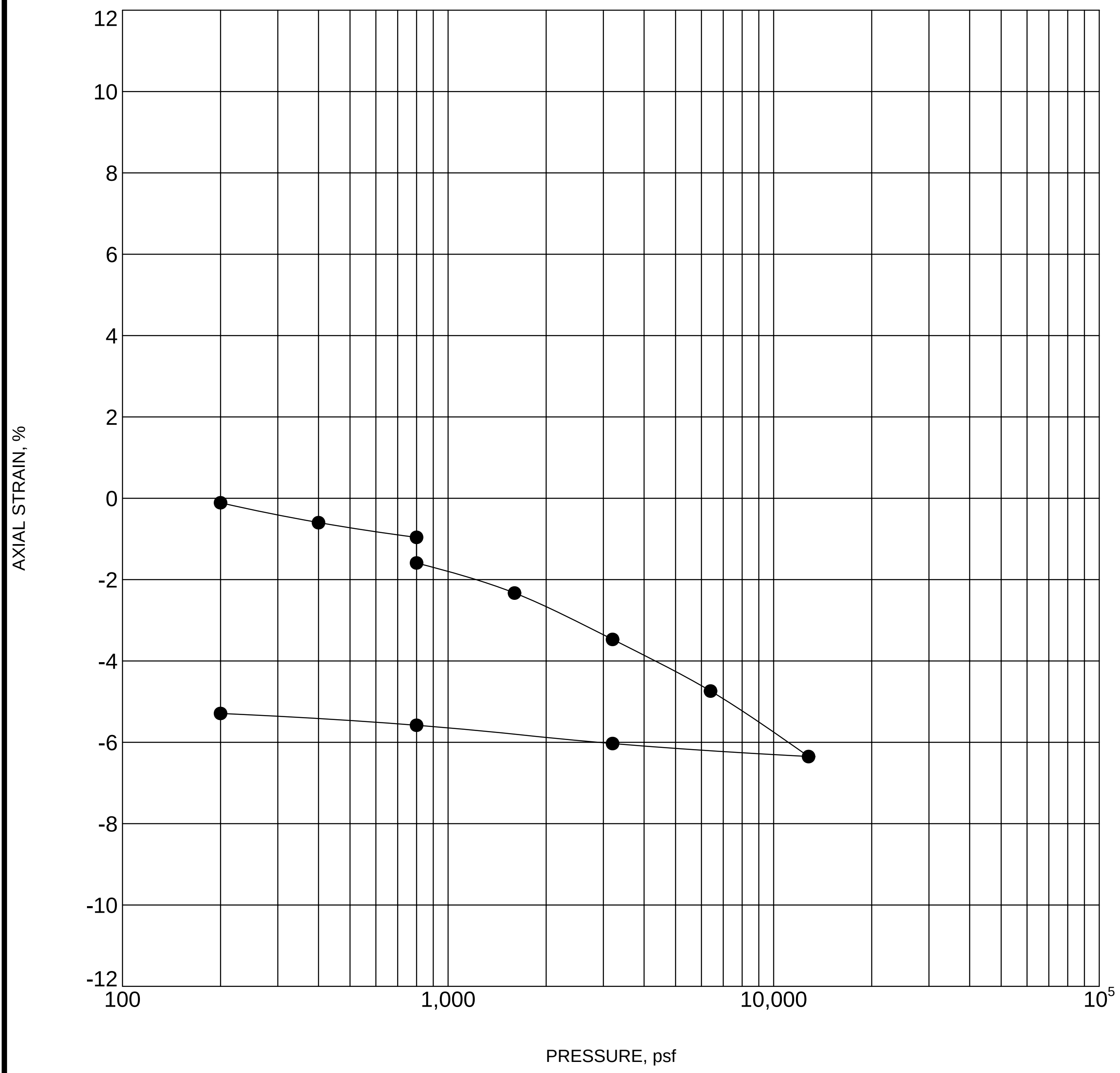
	Specimen Identification		Classification	γ_d, pcf	WC,%
●	**B-029**	**10.0 ft**	**POORLY GRADED SAND with SILT and GRAVEL (SP-SM)**	**124**	**2**

Notes:

Terracon

CONSOLIDATION TEST RESULTS

Project: Calico - Solar One
Site: East of Barstow, California
Job #: 60095029
Date: 12-10-09

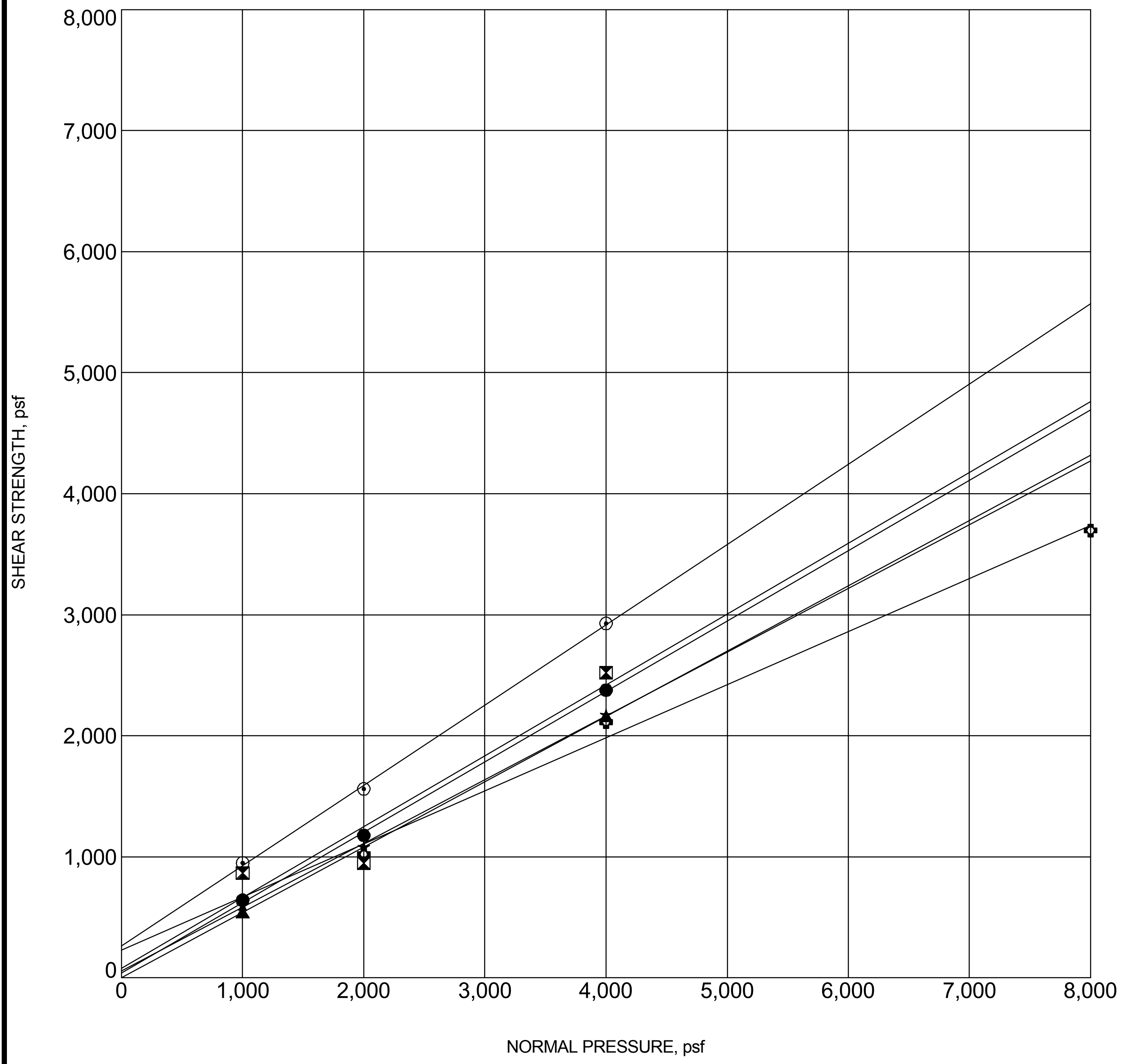


	Specimen Identification		Classification	γ_d, pcf	WC,%
●	**B-033**	**5.0 ft**	**SILTY SAND (SM)**	**105**	**5**

Notes:

CONSOLIDATION TEST RESULTS

Project: Calico - Solar One
Site: East of Barstow, California
Job #: 60095029
Date: 12-10-09



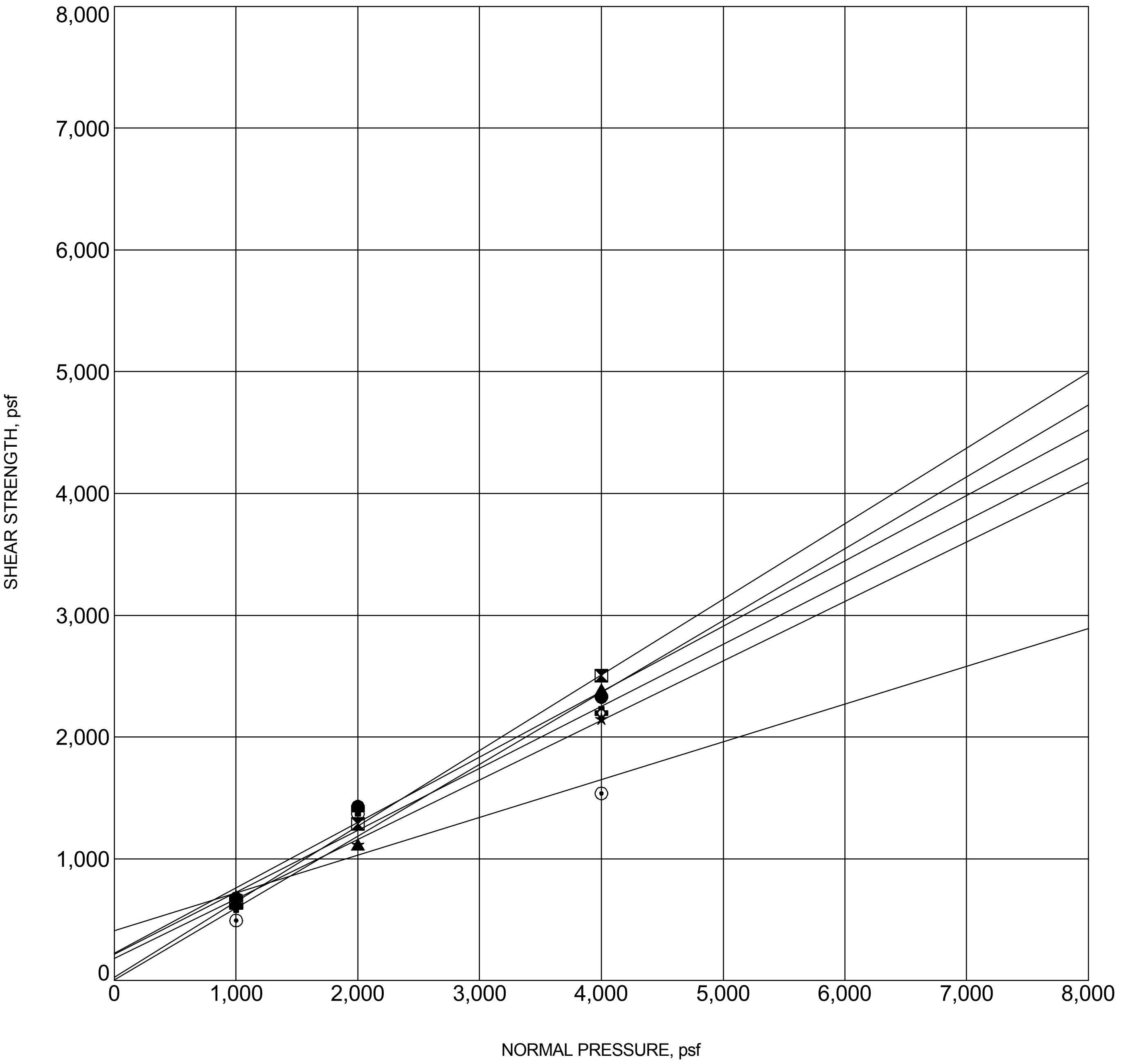
Specimen Identification			Classification	γ_d, pcf	WC,%	c, psf	ϕ°
●	**B-001**	**5.0ft**	**POORLY GRADED SAND with SILT (SP-SM)**	**96**	**3**	**40**	**30**
⧗	**B-005**	**20.0ft**	**FAT CLAY (CH)**	**97**	**28**	**78**	**30**
▲	**B-009**	**2.5ft**	**POORLY GRADED SAND (SP)**	**114**	**1**	**0**	**28**
★	**B-009**	**5.0ft**	**SILTY SAND with GRAVEL (SM)**	**119**	**3**	**54**	**28**
⊙	**B-009**	**30.0ft**	**SILT (ML)**	**90**	**13**	**264**	**34**
✿	**B-009**	**40.0ft**	**SILTY SAND with GRAVEL (SM)**	**83**	**19**	**228**	**24**

Terracon

DIRECT SHEAR TEST

Project: Calico - Solar One
Site: East of Barstow, California
Job #: 60095029
Date: 12-9-09

TC_DIRECT_SHEAR 60095029 BORING LOGS.GPJ TERRACON.GDT 12/9/09



Specimen Identification			Classification	γ_d, pcf	WC,%	c, psf	ϕ°
●	**B-011**	**10.0ft**	**SILTY SAND (SM)**	**117**	**3**	**222**	**28**
⧗	**B-013**	**10.0ft**	**POORLY GRADED SAND with SILT and GRAVEL (SP-SM)**	**108**	**5**	**26**	**32**
▲	**B-015**	**7.5ft**	**POORLY GRADED SAND with SILT (SP-SM)**	**105**	**9**	**4**	**31**
★	**B-031**	**7.5ft**	**SILTY SAND with GRAVEL (SM)**	**109**	**3**	**180**	**26**
⊙	**B-035**	**2.5ft**	**POORLY GRADED SAND with SILT and GRAVEL (SP-SM)**	**110**	**6**	**408**	**17**
✿	**B-037**	**7.5ft**	**SILTY SAND with GRAVEL (SM)**	**113**	**3**	**216**	**27**

Terracon

DIRECT SHEAR TEST

Project: Calico - Solar One
Site: East of Barstow, California
Job #: 60095029
Date: 12-9-09

Terracon
Consulting Engineers & Scientists

Project: Solar One
Proj. No.: 60095029
Tested By: CP **Date:** 10/29/2009

Expansion Index

Sample and Soil Information		
	Boring No.:	**B-006**
	Sample No.:	**NA**
	Sample Depth:	**10'**
	Soil Classification (USCS Symbol):	**Fat Clay (CH)**

Test Standard Used		
	☐	UBC 18-2
	☒	ASTM D 4829

Weight Prior to Screening	NA	g
Weight After Screening	NA	g
Percent Retained on #4 Sieve	NA	%

Moisture Determination	**Units**	**Initial**	**Final**
Assumed Moisture Content	%		
Tare Weight	g	214.1	105.3
Weight of Soil (Wet) + Tare	g	281.7	693.5
Weight of Soil (Dry) + Tare	g	270.1	575.3
Moisture Content	%	20.7%	43.1%
Density Determination			
Weight of Soil + Ring (Wet)	g	526.2	588.2
Weight of Ring	g	195.6	195.6
Wet Weight of Soil	g	330.6	392.6
Wet Density	pcf	100.5	
Final Sample Height	in		1.1037
Final Volume	ft^3		0.0080
Final Wet Density	pcf		107.9
Dry Density	pcf	83.3	75.4
Degree of Saturation (G_s = 2.7)	%	54.6	94.2

Initial Dry Density	83.3	pcf
Initial MC	20.7	%
Initial Saturation	**54.6**	%
Final Dry Density	75.4	pcf
Final MC	43.1	%
Final Saturation	**94.2**	%

	Date	**Time**	**Dial Reading**	**Deflection**
Start	10/29/2009	9:50	0.0740	
Add Water (After 10 minutes)	**10/29/2009**	**10:00**	**0.0881**	**0.0141**
				-
				-
				-
				-
				-
				-
24 hours	**10/30/2009**	**18:14**	**0.1777**	**0.0896**

Expansion Index, EI	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

EI Measured Expansion Index = 88

Recommend to use EI = **93**

EI_{50} Expansion Index = 93

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Consulting Engineers & Scientists

Expansion Index

Project: Solar One
Proj. No.: 60095029
Tested By: CP **Date:** 11/12/2009

Sample and Soil Information		
	Boring No.:	**B-007**
	Sample No.:	**NA**
	Sample Depth:	**7.5'**
	Soil Classification (USCS Symbol):	**Fat Clay (CH)**

Test Standard Used		
	☐	UBC 18-2
	☒	ASTM D 4829
	☐	
	☐	
	☐	

Weight Prior to Screening	NA	g
Weight After Screening	NA	g
Percent Retained on #4 Sieve	NA	%

Moisture Determination	**Units**	**Initial**	**Final**
Assumed Moisture Content	%		
Tare Weight	g	214.1	105.3
Weight of Soil (Wet) + Tare	g	256.0	703.0
Weight of Soil (Dry) + Tare	g	248.7	572.8
Moisture Content	%	21.1%	47.9%
Density Determination			
Weight of Soil + Ring (Wet)	g	525.4	597.7
Weight of Ring	g	195.6	195.6
Wet Weight of Soil	g	329.8	402.1
Wet Density	pcf	100.3	
Final Sample Height	in		1.0890
Final Volume	ft^3		0.0079
Final Wet Density	pcf		112.0
Dry Density	pcf	82.8	75.7
Degree of Saturation (G_s = 2.7)	%	55.0	105.5

Initial Dry Density	82.8	pcf
Initial MC	21.1	%
Initial Saturation	**55.0**	%
Final Dry Density	75.7	pcf
Final MC	47.9	%
Final Saturation	**105.5**	%

	Date	**Time**	**Dial Reading**	**Deflection**
Start	11/5/2009	15:42	0.0311	
Add Water (After 10 minutes)	**11/5/2009**	**15:52**	**0.0300**	**-0.0011**
				-
				-
				-
				-
				-
				-
24 hours	**11/6/2009**	**14:36**	**0.1201**	**0.0901**

Expansion Index, EI	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

EI Measured Expansion Index = 90

Recommend to use EI = **95**

EI_{50} Expansion Index = 95

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Consulting Engineers & Scientists

Project: Solar One
Proj. No.: 60095029
Tested By: CP **Date:** 11/5/2009

Expansion Index

Sample and Soil Information		
	Boring No.:	**B-008**
	Sample No.:	**NA**
	Sample Depth:	**2.5'**
	Soil Classification (USCS Symbol):	**Fat Clay (CH)**

Test Standard Used
☐ UBC 18-2
☒ ASTM D 4829

Weight Prior to Screening	NA	g
Weight After Screening	NA	g
Percent Retained on #4 Sieve	NA	%

Moisture Determination	**Units**	**Initial**	**Final**
Assumed Moisture Content	%		
Tare Weight	g	214.1	105.3
Weight of Soil (Wet) + Tare	g	289.3	703.0
Weight of Soil (Dry) + Tare	g	278.6	586.2
Moisture Content	%	16.6%	41.0%
Density Determination			
Weight of Soil + Ring (Wet)	g	555.7	597.7
Weight of Ring	g	195.7	195.7
Wet Weight of Soil	g	360.0	402.0
Wet Density	pcf	109.4	
Final Sample Height	in		1.0890
Final Volume	ft^3		0.0079
Final Wet Density	pcf		111.9
Dry Density	pcf	93.9	79.4
Degree of Saturation (G_s = 2.7)	%	56.4	98.6

Initial Dry Density	93.9	pcf
Initial MC	16.6	%
Initial Saturation	**56.4**	%
Final Dry Density	79.4	pcf
Final MC	41.0	%
Final Saturation	**98.6**	%

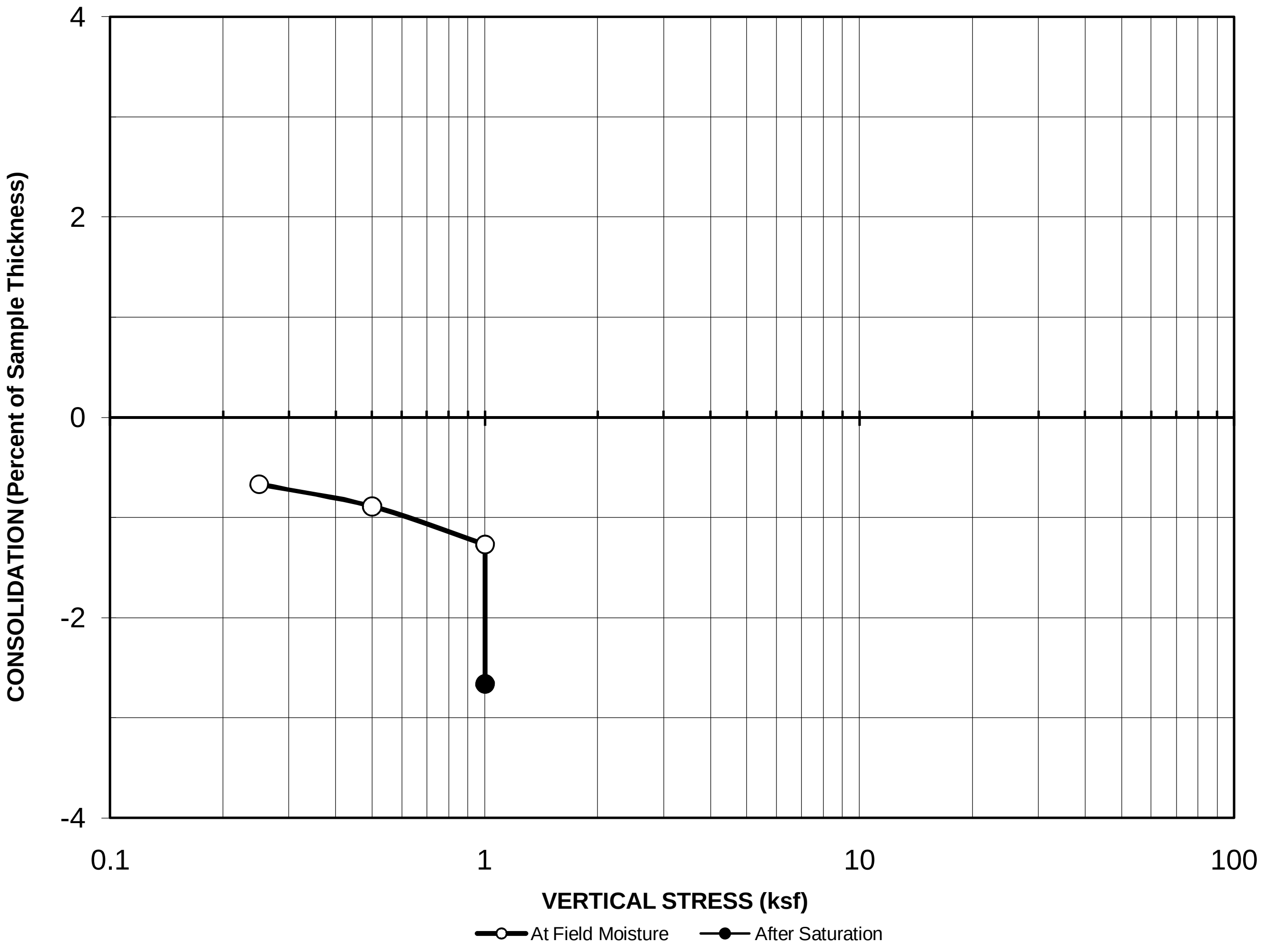
	Date	**Time**	**Dial Reading**	**Deflection**
Start	11/5/2009	15:42	0.0311	
Add Water (After 10 minutes)	**11/5/2009**	**15:52**	**0.0300**	**-0.0011**
				-
				-
				-
				-
				-
				-
24 hours	**11/6/2009**	**14:36**	**0.1201**	**0.0901**

Expansion Index, EI	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

EI Measured Expansion Index = 90

Recommend to use EI = **96**

EI_{50} Expansion Index = 96



Boring No. : B-023

Sample No.: NA

Depth (feet): 7.5

Sample Type: Undisturbed

Soil Description: Silty Sand (SM)

Initial Dry Unit Weight (pcf): 112.6

Initial Moisture Content (%): 3.1

Final Moisture Content (%): 15.2

Assumed Specific Gravity: 2.7

Initial Void Ratio: 0.50

Collapse Potential (%): 1.4

COLLAPSE POTENTIAL
ASTM D 5333

Project Name: Solar One

Project No.: 60095029

Date: 11/3/2009

Figure No:

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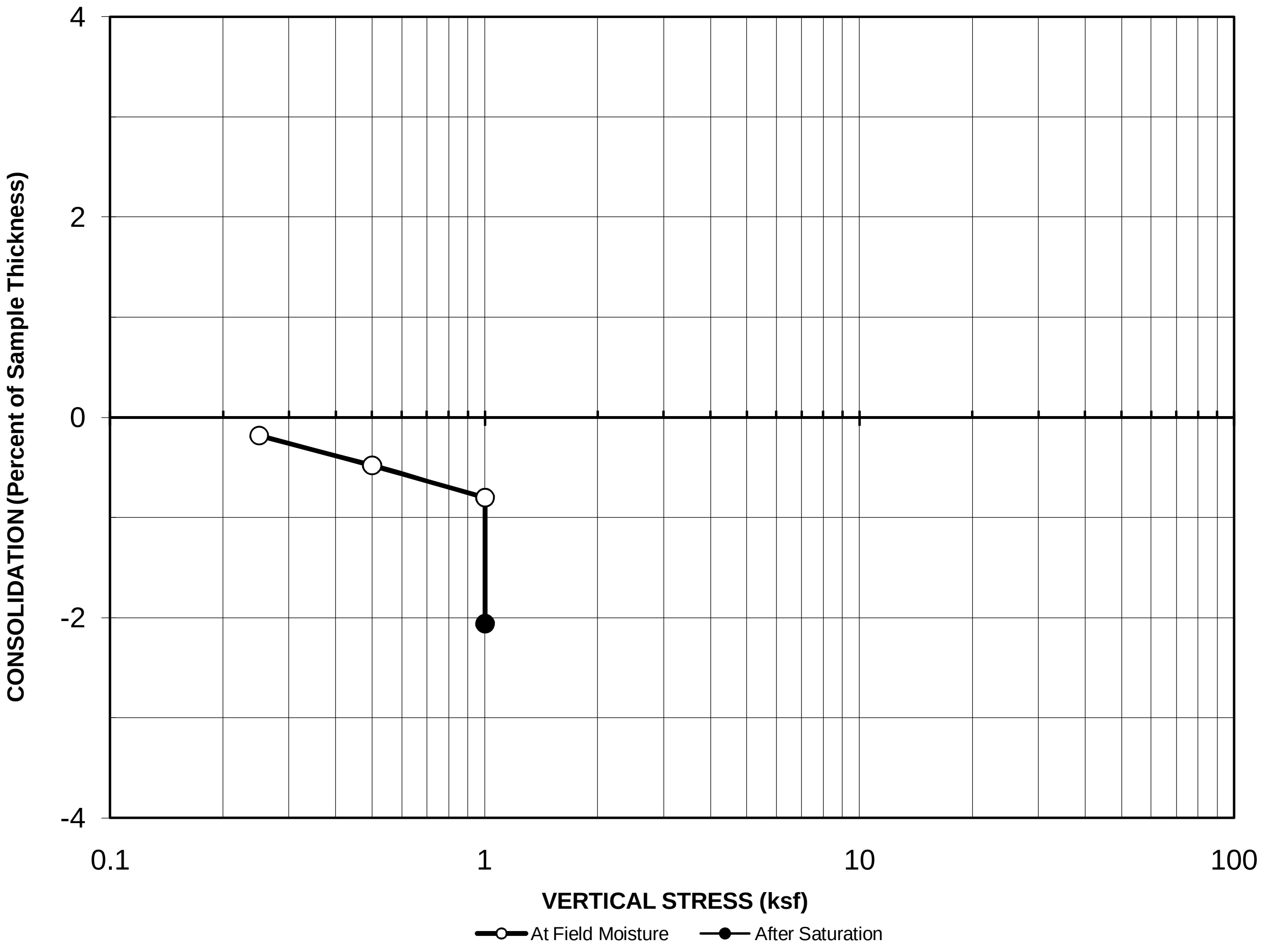
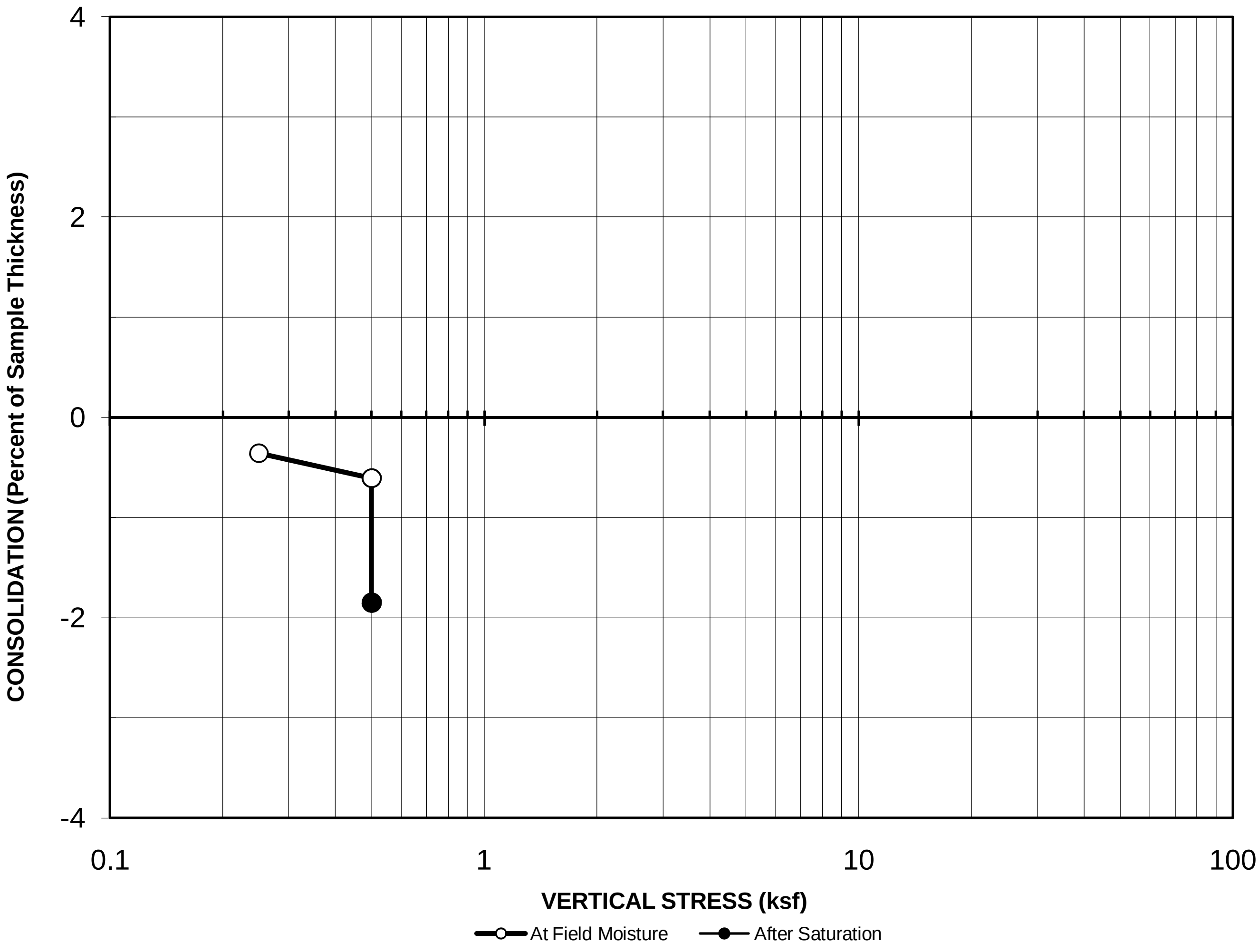


Boring No. :	B-032	Initial Dry Unit Weight (pcf):	111.8
Sample No.:	NA	Initial Moisture Content (%):	2.8
Depth (feet):	7.5	Final Moisture Content (%):	15.1
Sample Type:	Undisturbed	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand (SM)	Initial Void Ratio:	0.51
		Collapse Potential (%):	0.3

COLLAPSE POTENTIAL
ASTM D 5333

Project Name: Solar One
Project No.: 60095029
Date: 11/11/2009
Figure No:

Terracon
Consulting Engineers & Scientists



Boring No. : B-037

Sample No.: NA

Depth (feet): 2.5

Sample Type: Undisturbed

Soil Description: Silty Sand (SM)

Initial Dry Unit Weight (pcf): 114.1

Initial Moisture Content (%): 3.8

Final Moisture Content (%): 15.4

Assumed Specific Gravity: 2.7

Initial Void Ratio: 0.48

Collapse Potential (%): 1.2

COLLAPSE POTENTIAL
ASTM D 5333

Project Name: Solar One
Project No.: 60095029
Date: 11/3/2009
Figure No:

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COMPACTION TEST

Client Name : Tessera
Project Name: Solar One
Project No. : 60095029
Location:
Sample No. : B-001
Visual Sample Description: Yellowish Brown Sand (SW-SM)

Tested By : ZC Date: 10/14/09
Calculated By : ZC Date: 10/14/09
Checked By : CP Date: 10/14/09
Depth (ft) : 0 to 2.5

Compaction Method ☒ ASTM D1557
☐ ASTM D698

Preparation Method ☒ Moist
☐ Dry

MOLD VOLUME (CU.FT) 0.0333

Trail No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3651.8	3748.4	3836.0	3805.4		
Wt. of Mold (gm.)	1862.7	1862.7	1862.7	1862.7		
Net Wt. of Soil (gm.)	1789.1	1885.7	1973.3	1942.7		
Container No.						
Wt. of Container (gm.)	214.1	214.1	214.1	214.1		
Wet Wt. of Soil + Cont. (gm.)	431.7	450.1	520.7	527.9		
Dry Wt. of Soil + Cont. (gm.)	418.9	432.0	489.1	487.6		
Moisture Content (%)	6.3	8.3	11.5	14.7		
Wet Density (pcf)	118.4	124.8	130.6	128.6		
Dry Density (pcf)	111.5	115.3	117.2	112.1		

Maximum Dry Density (pcf) **117.5** Optimum Moisture Content (%) **10.0**

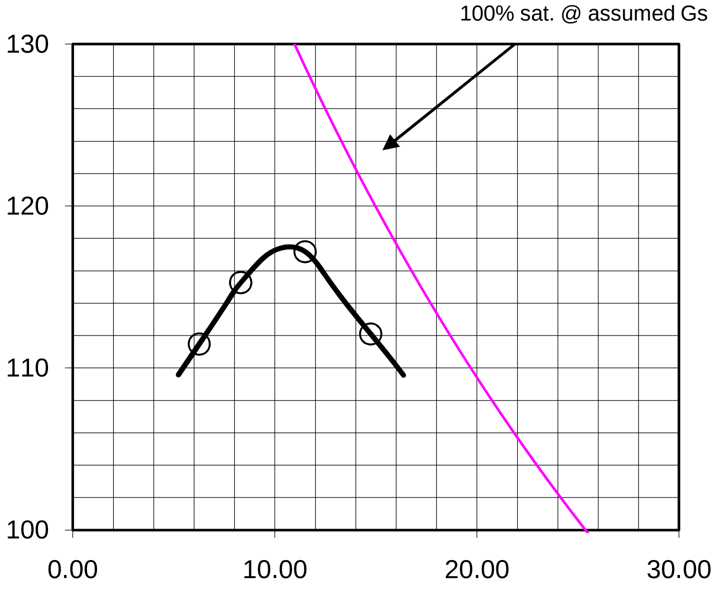
Assumed Specific Gravity = 2.70

PROCEDURE USED

☒ *Method A*
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

☐ *Method B*
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

☐ *Method C*
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + in <30%



COMPACTION TEST

Client Name : Tessera
Project Name: Solar One
Project No. : 60095029
Location:
Sample No. : B-007
Visual Sample Description: Light Brown Sand W/ Silt (SP-SM)

Tested By : ZC Date: 11/26/09
Calculated By : ZC Date: 11/26/09
Checked By : CP Date: 11/26/09
Depth (ft) : 0-1

Compaction Method ☒ ASTM D1557
☐ ASTM D698

Preparation Method ☒ Moist
☐ Dry

MOLD VOLUME (CU.FT) 0.0333

Trail No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3725.1	3821.7	3881.1	3834.3		
Wt. of Mold (gm.)	1862.7	1862.7	1862.7	1862.7		
Net Wt. of Soil (gm.)	1862.4	1959.0	2018.4	1971.6		
Container No.						
Wt. of Container (gm.)	214.1	214.1	214.1	214.1		
Wet Wt. of Soil + Cont. (gm.)	420.6	424.9	406.1	412.9		
Dry Wt. of Soil + Cont. (gm.)	413.3	413.5	392.9	396.0		
Moisture Content (%)	3.7	5.7	7.4	9.3		
Wet Density (pcf)	123.3	129.7	133.6	130.5		
Dry Density (pcf)	118.9	122.7	124.4	119.4		

Maximum Dry Density (pcf) **124.6** Optimum Moisture Content (%) **6.5**

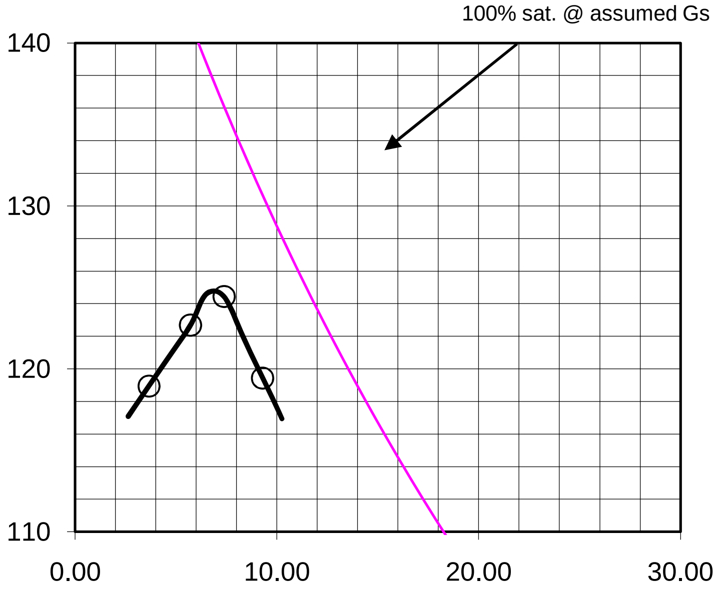
Assumed Specific Gravity = 2.60

PROCEDURE USED

☐ *Method A*
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

☒ *Method B*
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

☐ *Method C*
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + in <30%



COMPACTION TEST

Client Name : Tessera
Project Name: Solar One
Project No. : 60095029
Location:
Sample No. : B-013
Visual Sample Description: Reddish Brown Sand Silt Clay (SM-SC)

Tested By : ZC Date: 10/22/09
Calculated By : ZC Date: 10/22/09
Checked By : CP Date: 10/22/09
Depth (ft) : 0-1

Compaction Method ☒ ASTM D1557
☐ ASTM D698

Preparation Method ☒ Moist
☐ Dry

MOLD VOLUME (CU.FT) 0.0333

Trail No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3725.9	3840.4	3990.3	3956.8		
Wt. of Mold (gm.)	1862.7	1862.7	1862.7	1862.7		
Net Wt. of Soil (gm.)	1863.2	1977.7	2127.6	2094.1		
Container No.						
Wt. of Container (gm.)	214.1	214.1	214.1	214.1		
Wet Wt. of Soil + Cont. (gm.)	423.8	467.5	427.5	422.5		
Dry Wt. of Soil + Cont. (gm.)	416.2	454.7	412.1	404.1		
Moisture Content (%)	3.8	5.3	7.8	9.7		
Wet Density (pcf)	123.4	130.9	140.9	138.6		
Dry Density (pcf)	118.9	124.3	130.7	126.4		

Maximum Dry Density (pcf) 130.5 Optimum Moisture Content (%) 7.0

Assumed Specific Gravity = 2.70

PROCEDURE USED

☒ *Method A*

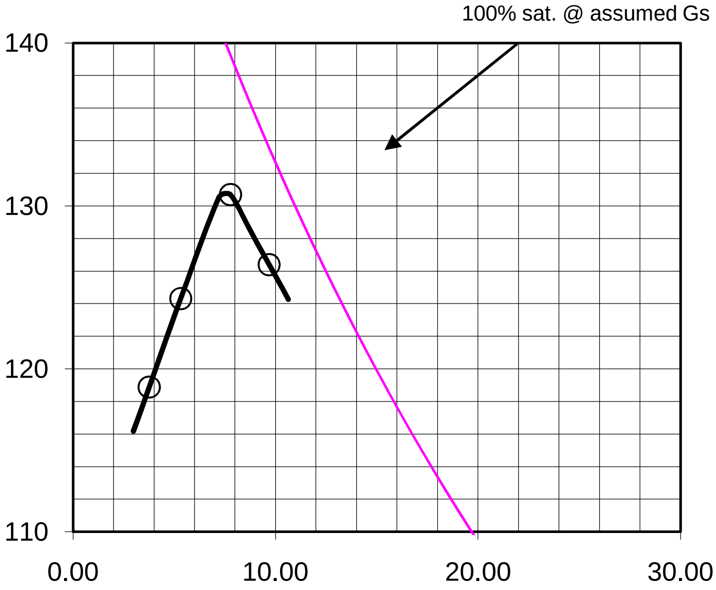
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

☐ *Method B*

Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

☐ *Method C*

Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + in <30%



COMPACTION TEST

Client Name : Tessera
Project Name: Solar One
Project No. : 60095029
Location:
Sample No. : B-017
Visual Sample Description: Brown Sand Silt Clay (SM-SC)

Tested By : ZC Date: 11/26/09
Calculated By : ZC Date: 11/26/09
Checked By : CP Date: 11/26/09
Depth (ft) : 0-1

Compaction Method ☒ ASTM D1557 ☐ ASTM D698

Preparation Method ☒ Moist ☐ Dry

MOLD VOLUME (CU.FT) 0.0333

Trail No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3794.1	3898.6	3934.2	3895.6		
Wt. of Mold (gm.)	1862.7	1862.7	1862.7	1862.7		
Net Wt. of Soil (gm.)	1931.4	2035.9	2071.5	2032.9		
Container No.						
Wt. of Container (gm.)	214.1	214.1	214.1	214.1		
Wet Wt. of Soil + Cont. (gm.)	387.7	431.5	389.6	423.5		
Dry Wt. of Soil + Cont. (gm.)	375.2	411.4	369.8	396.3		
Moisture Content (%)	7.8	10.2	12.7	14.9		
Wet Density (pcf)	127.9	134.8	137.1	134.6		
Dry Density (pcf)	118.7	122.3	121.7	117.1		

Maximum Dry Density (pcf) **123.2** Optimum Moisture Content (%) **11.5**

Assumed Specific Gravity = 2.75

PROCEDURE USED

☒ *Method A*

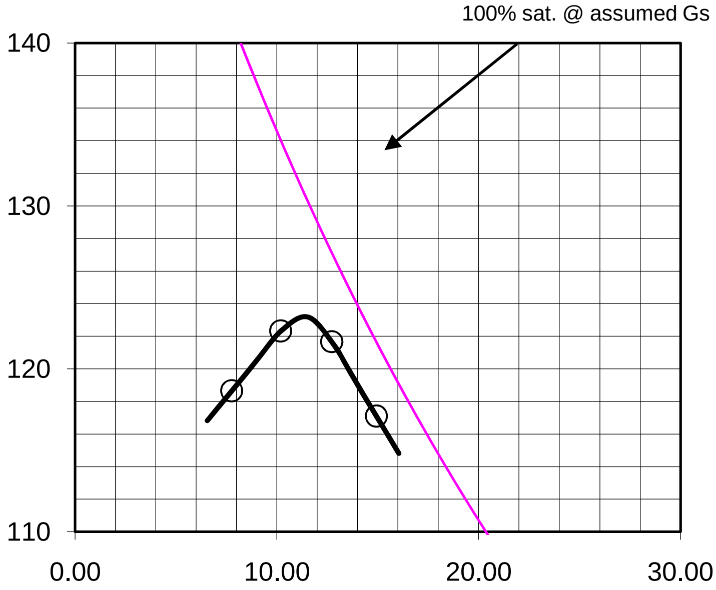
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

☐ *Method B*

Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

☐ *Method C*

Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + in <30%



COMPACTION TEST

Client Name : Tessera
Project Name: Solar One
Project No. : 60095029
Location: B-021
Sample No. :
Visual Sample Description: Silty Sand (SM)

Tested By : CP Date: 11/04/09
Calculated By : CP Date: 11/04/09
Checked By : CP Date: 11/04/09
Depth (ft) : 0 to 1

Compaction Method ☒ ASTM D1557
☐ ASTM D698

Preparation Method ☒ Moist
☐ Dry

MOLD VOLUME (CU.FT) 0.0333

Trail No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3738.8	3834.8	3864.4	3822.1		
Wt. of Mold (gm.)	1862.1	1862.1	1862.1	1862.1		
Net Wt. of Soil (gm.)	1876.7	1972.7	2002.3	1960.0		
Container No.						
Wt. of Container (gm.)	214.1	214.1	214.1	214.1		
Wet Wt. of Soil + Cont. (gm.)	382.9	411.1	499.0	483.6		
Dry Wt. of Soil + Cont. (gm.)	371.7	392.7	468.1	450.0		
Moisture Content (%)	7.1	10.3	12.1	14.2		
Wet Density (pcf)	124.2	130.6	132.6	129.8		
Dry Density (pcf)	116.0	118.4	118.2	113.6		

Maximum Dry Density (pcf) **119.0** Optimum Moisture Content (%) **11.0**

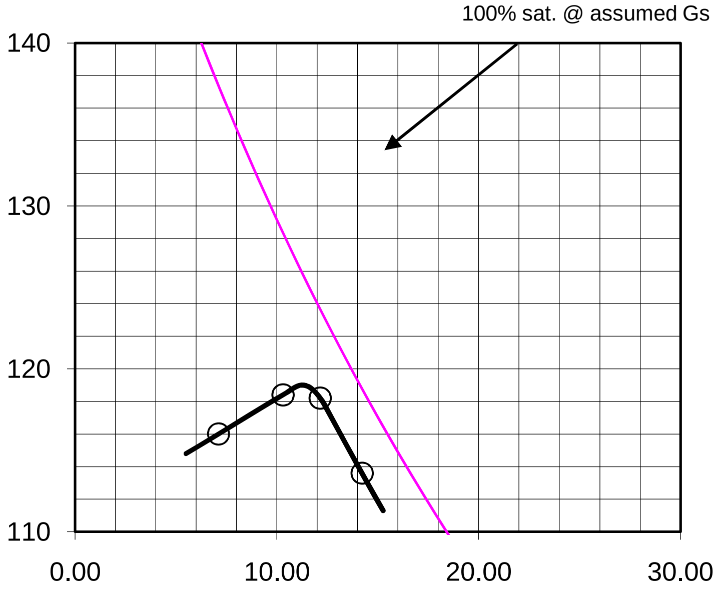
Assumed Specific Gravity = 2.61

PROCEDURE USED

☒ *Method A*
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

☐ *Method B*
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

☐ *Method C*
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + in <30%



COMPACTION TEST

Client Name : Tessera
Project Name: Solar One
Project No. : 60095029
Location:
Sample No. : B-031
Visual Sample Description: Yellowish brown Sand Gravel mix (SW)

Tested By : ZC Date: 11/26/09
Calculated By : ZC Date: 11/26/09
Checked By : CP Date: 11/26/09
Depth (ft) : 0-1

Compaction Method ☒ ASTM D1557
☐ ASTM D698

Preparation Method ☒ Moist
☐ Dry

MOLD VOLUME (CU.FT) 0.0333

Trail No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3708.4	3776.9	3825.9	3851.9		
Wt. of Mold (gm.)	1862.7	1862.7	1862.7	1862.7		
Net Wt. of Soil (gm.)	1845.7	1914.2	1963.2	1989.2		
Container No.						
Wt. of Container (gm.)	214.1	214.1	214.1	214.1		
Wet Wt. of Soil + Cont. (gm.)	386.8	428.4	431.3	449.2		
Dry Wt. of Soil + Cont. (gm.)	381.9	418.1	416.2	428.0		
Moisture Content (%)	2.9	5.0	7.5	9.9		
Wet Density (pcf)	122.2	126.7	130.0	131.7		
Dry Density (pcf)	118.7	120.6	120.9	119.8		

Maximum Dry Density (pcf) **122.4** Optimum Moisture Content (%) **6.0**

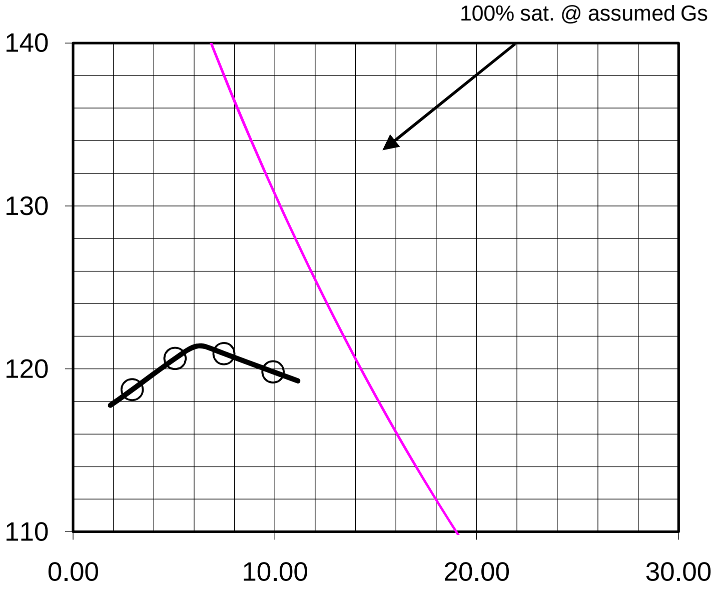
Assumed Specific Gravity = 2.65

PROCEDURE USED

☐ *Method A*
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

☒ *Method B*
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

☐ *Method C*
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + in <30%



COMPACTION TEST

Client Name : Tessera
Project Name: Solar One
Project No. : 60095029
Location:
Sample No. : B-0034
Visual Sample Description: Light Brown Silty Sand (SM)

Tested By : ZC Date: 11/26/09
Calculated By : ZC Date: 11/26/09
Checked By : CP Date: 11/26/09
Depth (ft) : 0-1

Compaction Method ☒ ASTM D1557
☐ ASTM D698

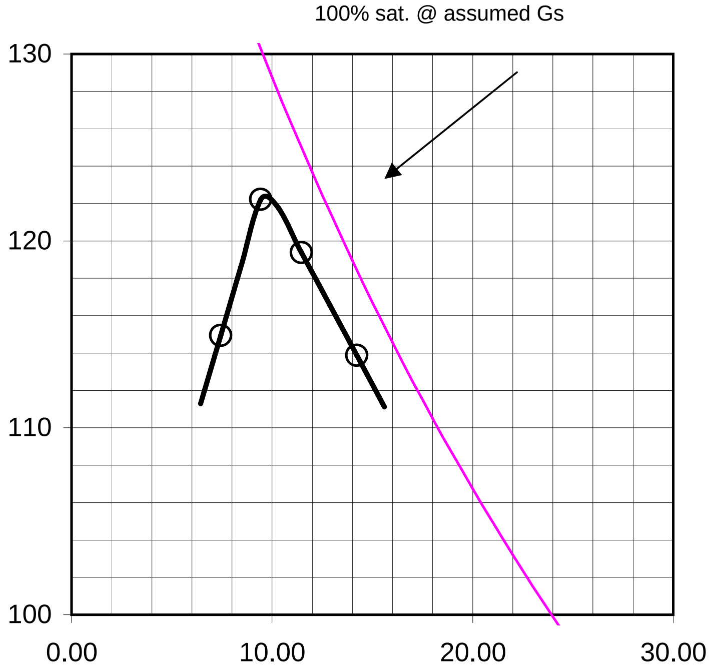
Preparation Method ☒ Moist
☐ Dry

MOLD VOLUME (CU.FT) 0.0333

Trail No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3827.3	3727.8	3883.1	3872.7		
Wt. of Mold (gm.)	1862.7	1862.7	1862.7	1862.7		
Net Wt. of Soil (gm.)	1964.6	1865.1	2020.4	2010.0		
Container No.						
Wt. of Container (gm.)	214.1	214.1	214.1	214.1		
Wet Wt. of Soil + Cont. (gm.)	431.7	412.1	425.1	409.4		
Dry Wt. of Soil + Cont. (gm.)	404.6	398.4	406.9	389.3		
Moisture Content (%)	14.2	7.4	9.4	11.5		
Wet Density (pcf)	130.1	123.5	133.8	133.1		
Dry Density (pcf)	113.9	114.9	122.2	119.4		

Maximum Dry Density (pcf) **122.0** Optimum Moisture Content (%) **9.5**

Assumed Specific Gravity = 2.60



PROCEDURE USED

☐ *Method A*
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

☒ *Method B*
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

☐ *Method C*
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + in <30%

COMPACTION TEST

Client Name : Tessera
Project Name: Solar One
Project No. : 60095029
Location: B-035
Sample No. :
Visual Sample Description: Yellow-Brown Silty Sand (SP-SM0

Tested By : ZC Date: 10/14/09
Calculated By : ZC Date: 10/14/09
Checked By : CP Date: 10/14/09
Depth (ft) : 0-5'

Compaction Method ☒ ASTM D1557
☐ ASTM D698

Preparation Method ☒ Moist
☐ Dry

MOLD VOLUME (CU.FT) 0.0333

Trail No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3872.6	3959.2	3966.2	3937.3		
Wt. of Mold (gm.)	1862.7	1862.7	1862.7	1862.7		
Net Wt. of Soil (gm.)	2009.9	2096.5	2103.5	2074.6		
Container No.						
Wt. of Container (gm.)	214.1	214.1	214.1	214.1		
Wet Wt. of Soil + Cont. (gm.)	433.1	436.1	436.2	430.4		
Dry Wt. of Soil + Cont. (gm.)	418.9	418.9	415.2	405.8		
Moisture Content (%)	6.9	8.4	10.4	12.8		
Wet Density (pcf)	133.1	138.8	139.3	137.3		
Dry Density (pcf)	124.4	128.0	126.1	121.7		

Maximum Dry Density (pcf) **128.0** Optimum Moisture Content (%) **9.5**

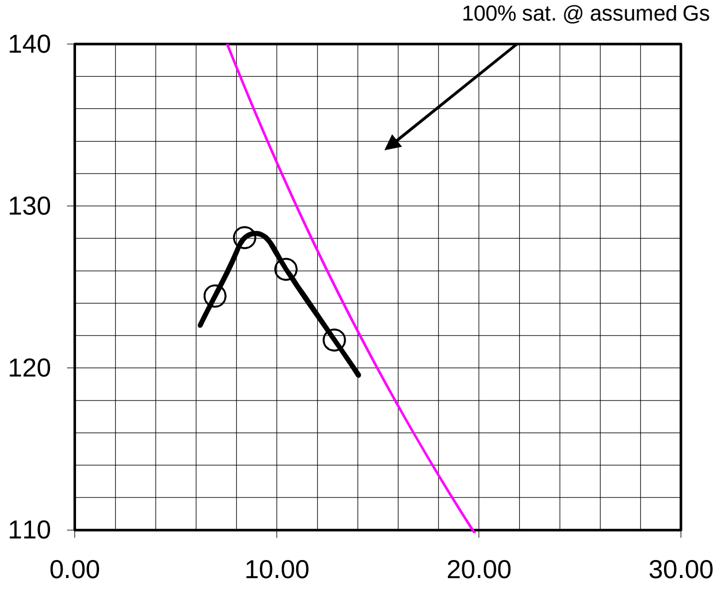
Assumed Specific Gravity = 2.70

PROCEDURE USED

☒ *Method A*
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

☐ *Method B*
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

☐ *Method C*
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + in <30%



COMPACTION TEST

Client Name : Tessera
Project Name: Solar One
Project No. : 6005029
Location:
Sample No. : B-043
Visual Sample Description: Gravel W/ Sand (GP)

Tested By : ZC Date: 11/26/09
Calculated By : ZC Date: 11/26/09
Checked By : CP Date: 11/26/09
Depth (ft) : 0-1

Compaction Method ☒ ASTM D1557
☐ ASTM D698

Preparation Method ☒ Moist
☐ Dry

MOLD VOLUME (CU.FT) 0.0333

Trail No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3705.4	3764.1	3804.1	3774.0		
Wt. of Mold (gm.)	1862.7	1862.7	1862.7	1862.7		
Net Wt. of Soil (gm.)	1842.7	1901.4	1941.4	1911.3		
Container No.						
Wt. of Container (gm.)	214.1	214.1	214.1	214.1		
Wet Wt. of Soil + Cont. (gm.)	412.8	401.8	435.3	418.9		
Dry Wt. of Soil + Cont. (gm.)	407.7	393.6	421.8	402.1		
Moisture Content (%)	2.6	4.6	6.5	8.9		
Wet Density (pcf)	122.0	125.9	128.5	126.5		
Dry Density (pcf)	118.9	120.4	120.7	116.2		

Maximum Dry Density (pcf) **121.0** Optimum Moisture Content (%) **5.5**

Assumed Specific Gravity = 2.60

PROCEDURE USED

☐ *Method A*

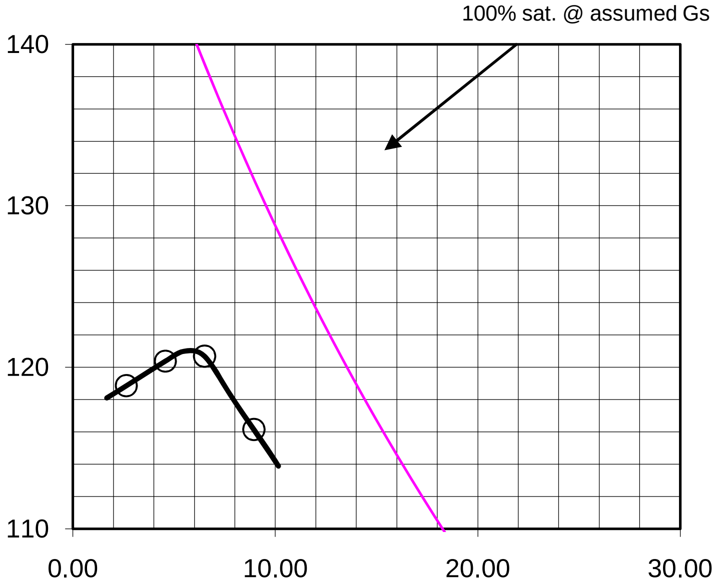
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

☒ *Method B*

Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

☐ *Method C*

Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + in <30%



COMPACTION TEST

Client Name : Tessera
Project Name: Solar One
Project No. : 60095026
Location: B-049
Sample No. :
Visual Sample Description: Gravel W/ Sand (GP)

Tested By : ZC Date: 07/16/09
Calculated By : ZC Date: 07/16/09
Checked By : CP Date: 07/17/09
Depth (ft) : 0-5

Compaction Method
☐ ASTM D1557
☒ ASTM D698

Preparation Method
☒ Moist
☐ Dry

MOLD VOLUME (CU.FT) 0.0333

Trail No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3695.2	3790.7	3823.8	3822.1		
Wt. of Mold (gm.)	1862.7	1862.7	1862.7	1862.7		
Net Wt. of Soil (gm.)	1832.5	1928.0	1961.1	1959.4		
Container No.						
Wt. of Container (gm.)	214.1	214.1	214.1	214.1		
Wet Wt. of Soil + Cont. (gm.)	434.1	471.2	520.9	483.6		
Dry Wt. of Soil + Cont. (gm.)	427.3	459.2	501.4	460.7		
Moisture Content (%)	3.2	4.9	6.8	9.3		
Wet Density (pcf)	121.3	127.6	129.8	129.7		
Dry Density (pcf)	117.6	121.7	121.6	118.7		

Maximum Dry Density (pcf) **122.5** Optimum Moisture Content (%) **6.0**

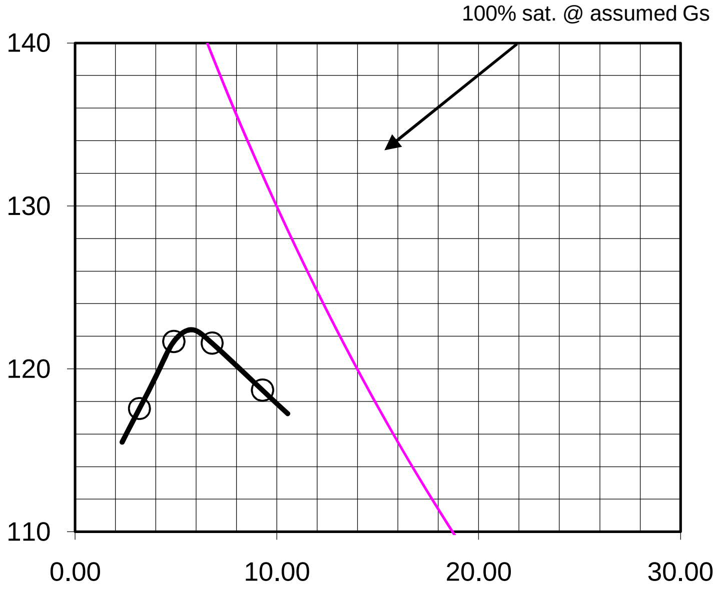
Assumed Specific Gravity = 2.63

PROCEDURE USED

☐ *Method A*
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 3 (Three)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

☒ *Method B*
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 3 (Three)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

☐ *Method C*
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 3 (Three)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + in <30%



R-VALUE TEST DATA

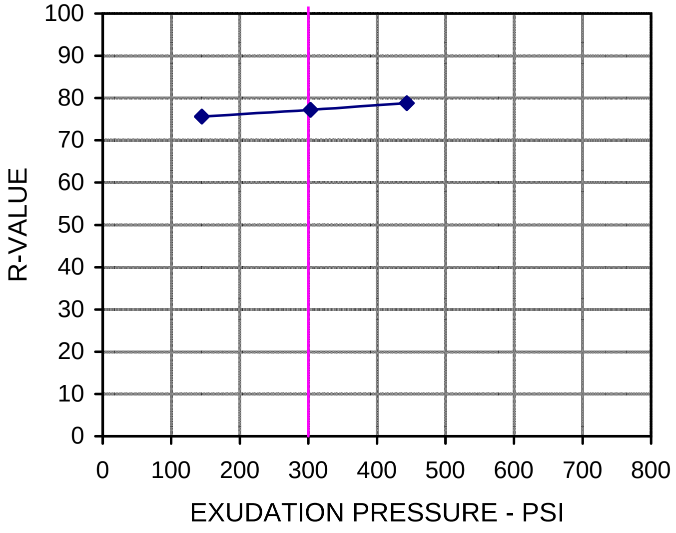
ASTM D2844

Project Name: Solar One
Tested By: ST/KM
Date: 11/17/09
Project Number: 60095029
Checked By: AP
Date: 11/18/09
Boring No.: B-020
Sample No.: Bulk
Depth (ft.): 0-5
Location: N/A
Soil Description: Pale Red Silty Sand

Mold Number	B	C	D		
Water Added, g	10	107	104		
Compact Moisture(%)	2.3	12.2	11.9		
Compaction Gage Pressure, psi	200	200	200		
Exudation Pressure, psi	443	145	303		
Sample Height, Inches	2.7	2.7	2.7		
Gross Weight Mold, g	3065	3068	3071		
Tare Weight Mold, g	1967	1969	1971		
Net Sample Weight, g	1098	1099	1100		
Expansion, inchesx10^{-4}	0	0	0		
Stability 2,000 (160 psi)	14/25	17/30	16/26		
Turns Displacement	4.25	4.19	4.57		
R-Value Uncorrected	76	72	74		
R-Value Corrected	79	76	77		
Dry Density, pcf	120.4	110.0	110.4		
Traffic Index	8.0	8.0	8.0		
G.E. by Stability	0.36	0.41	0.39		
G.E. by Expansion	0.00	0.00	0.00		

R-Value by Exudation = 77
R-Value by Expansion = N/A
Equilibrium R-Value = 77
(by Exudation)

Remarks: G_f = 1.5
0.0 % Retained on the ¾"



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Consulting Engineers & Scientists

CORROSION TEST RESULTS

Client Name: Tessera
Project Name: Solar One
Project No.: 60095029
Date: 11/6/2009

Boring No.	Sample No.	Depth (ft)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Temp. (°C)	Sulfate Content (ppm	Chloride Content (ppm)
B-001	-	0 to 2	SM	1,300	8.93	14.6	25	61
B-009	-	0 to 5	SP	5,900	8.18	14.8	1	61
B-014	-	0 to 2	SM	360	8.23	14.8	715	62
B-035	-	0 to 5	SP-SM	3,900	8.30	14.8	6	65
B-049	-	0 to 1	SP-SM	8,000	8.28	14.7	2	62
TP-045	-	5	SM	4,000	8.16	14.8	20	61

NOTES:

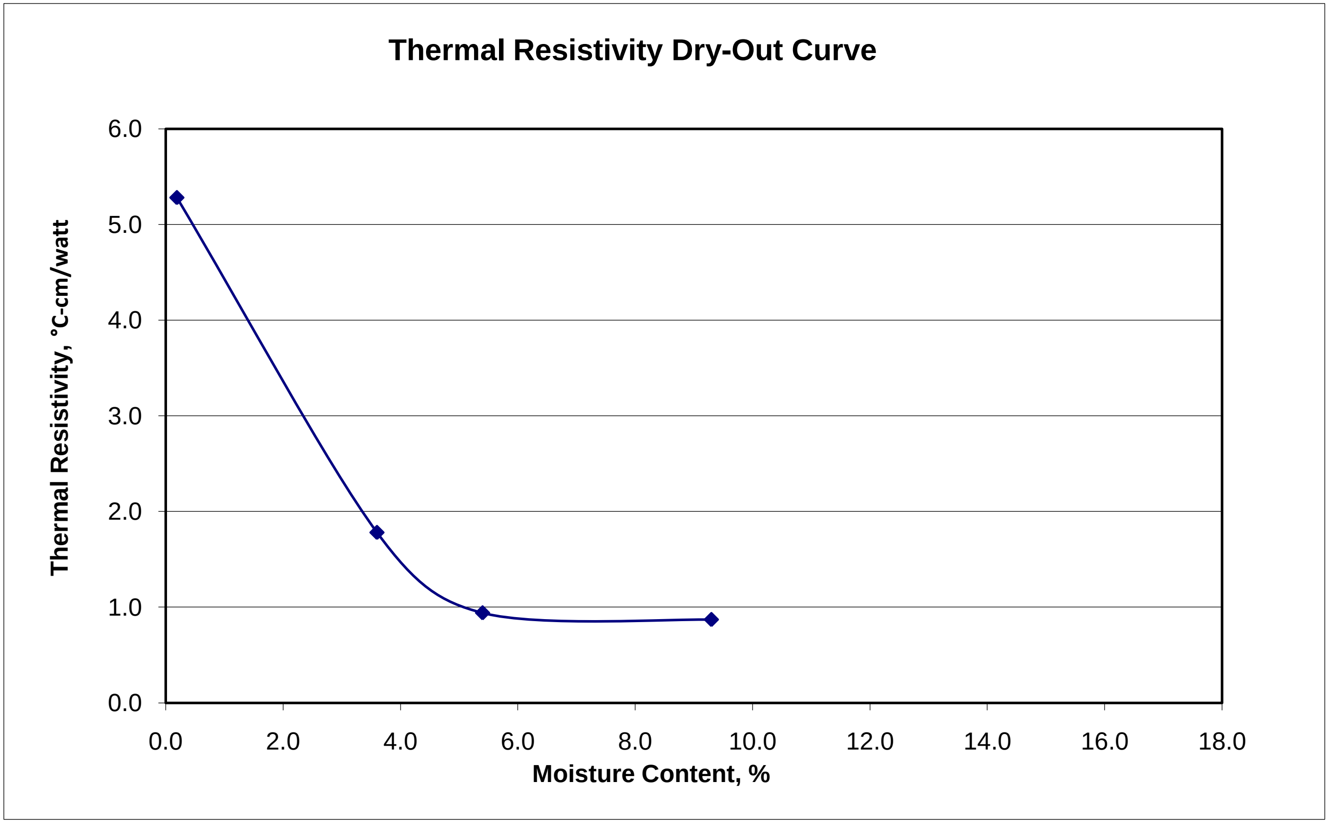
Resistivity Test and pH: California Test Methods 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

Project Name: Tessera Solar
Project Number: 60095029

Thermal Resistivity Test Results

Sample ID:	B-01 0'-2.5'
Soil Type:	
Standard/Modified Proctor:	Modified ASTM D-1557
Max Dry Density, pcf:	117.5
Opt. Moisture Content, %:	10.00%
Target % Compaction:	95%
Target Dry Density:	111.63

Moisture Content (%)	Dry Unit Weight (pcf)	Meter-Degrees (˚C-cm/watt)	Temperature (°C)
0.2	116.6	5	46.4
3.6	116.6	2	22.6
5.4	112.9	1	22.3
9.3	113.4	1	22.2

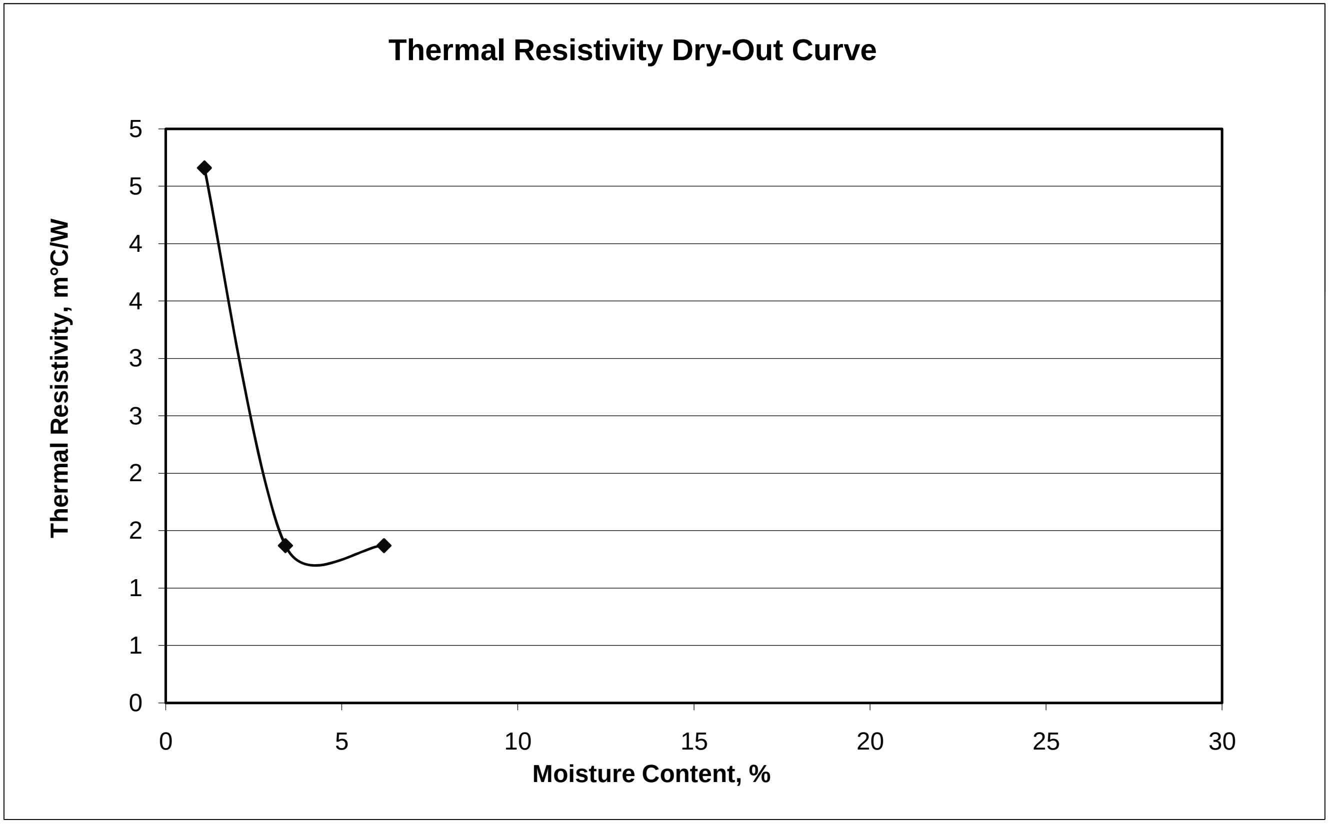


	Run By:	Approved By:

Project Name: Solar One
Project Number: 60095029

Thermal Resistivity Test Results

		Average Moisture Content (%)	Compaction (%)	Meter-Degrees (˚C-cm/watt)	Average Temperature (°C)
Sample ID:	B-007, 0,0' to 2.5'	6.2	98.0	1	22.5
Soil Type:	Br. Fat Clay	3.4	93.0	1	23.1
Standard/Modified Proctor:	Modified ASTM D-1557A	1.1	93.0	5	22.7
Max Dry Density, pcf:	124.6				
Opt. Moisture Content, %:	6.50%				
Target % Compaction:	95%				

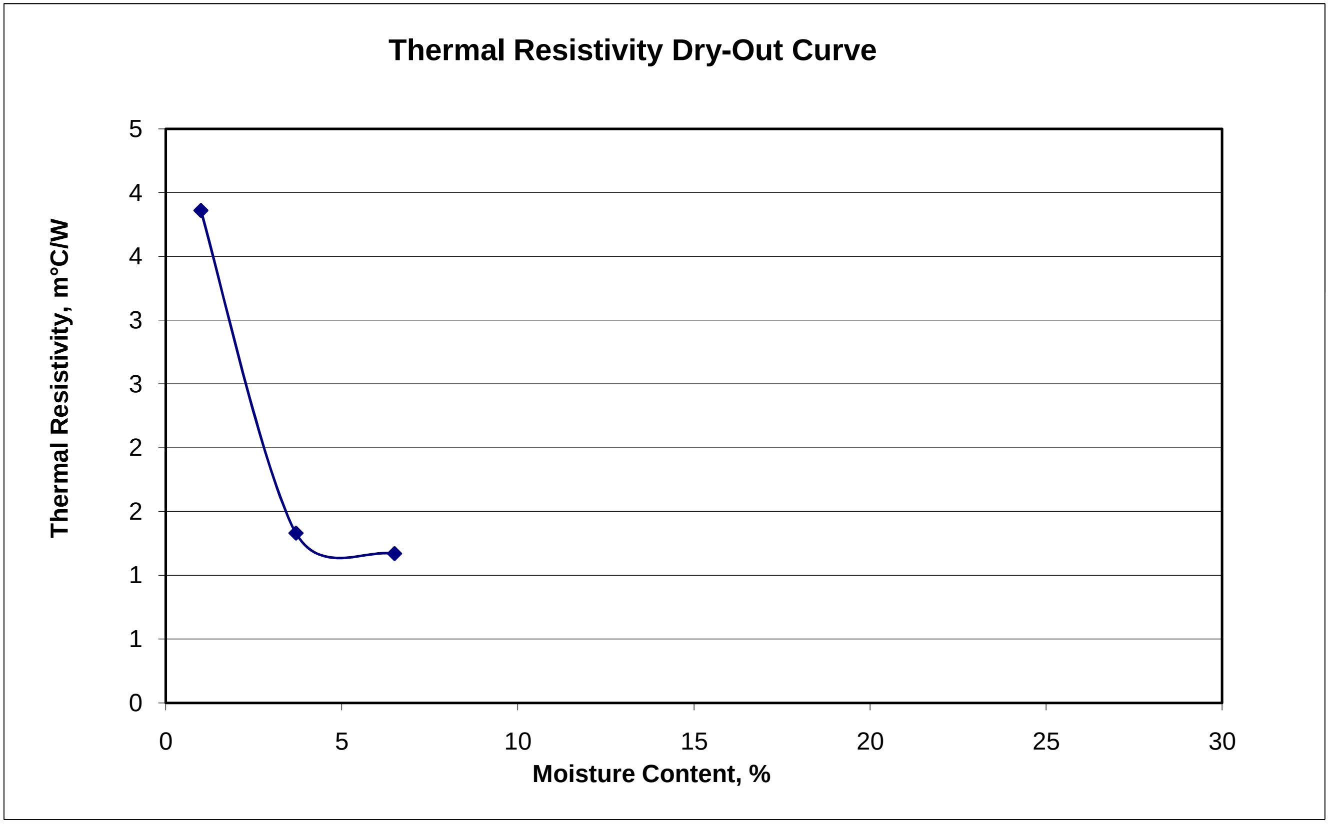


Run By: GL
Approved By: MG

Project Name:	Solar One
Project Number:	60095029

Thermal Resistivity Test Results

		Average Moisture Content (%)	Compaction (%)	Meter-Degrees (˚C-cm/watt)	Average Temperature (°C)
Sample ID:	B-013, 0,0' to 1'	6.5	94.0	1	22.6
Soil Type:	Br. Sand with Gravel	3.7	89.0	1	22.7
Standard/Modified Proctor:	Modified ASTM D-1557A	1.0	97.0	4	22.8
Max Dry Density, pcf:	130.5				
Opt. Moisture Content, %:	7.00%				
Target % Compaction:	95%				



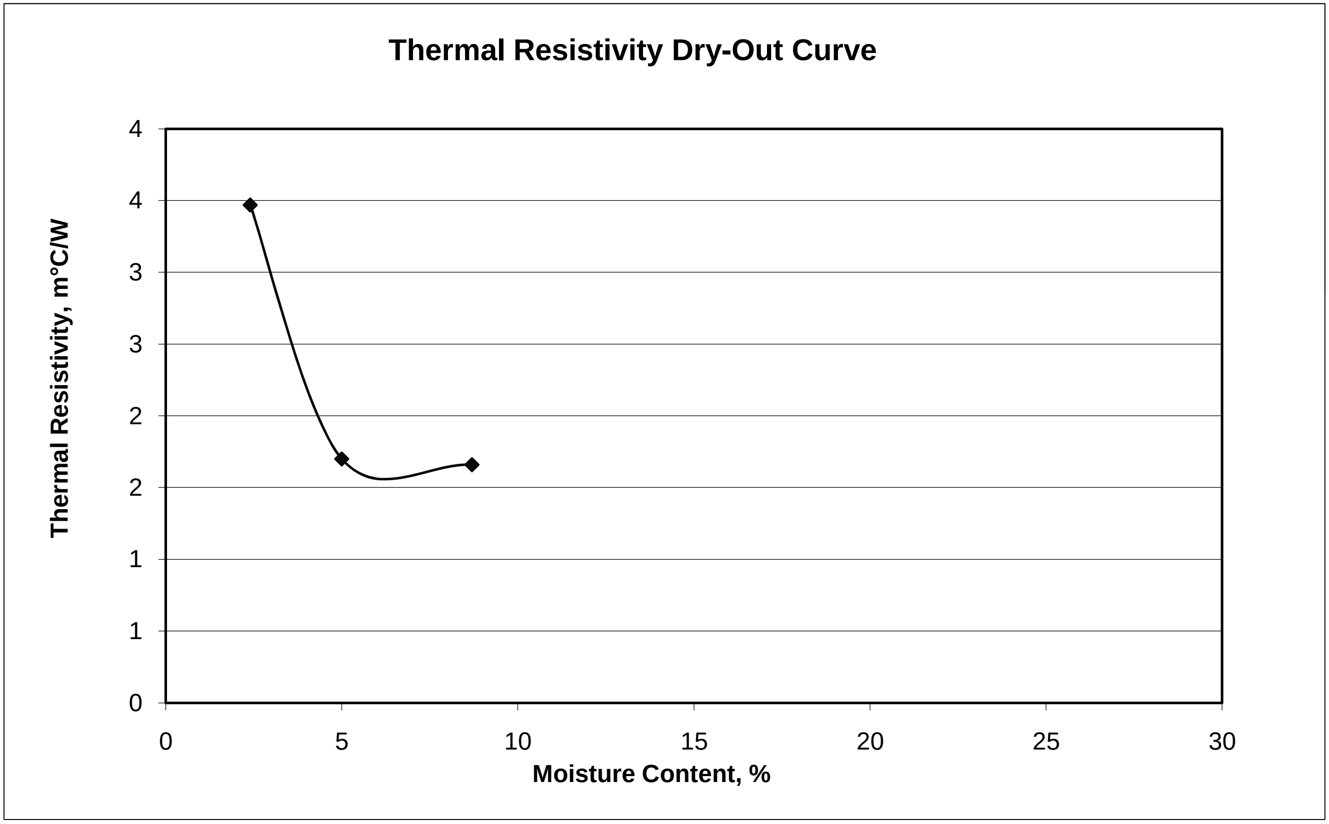
Run By: GL	Approved By: MG

Terracon

Project Name: Solar One
Project Number: 60095029

Thermal Resistivity Test Results

		Average Moisture Content (%)	Compaction (%)	Meter-Degrees (˚C-cm/watt)	Average Temperature (°C)
Sample ID:	B-017, 0,0' to 1'	8.7	90.0	2	22.5
Soil Type:	Br. Sand with Gravel	5.0	91.0	2	24.1
Standard/Modified Proctor:	Modified ASTM D-1557A	2.4	96.0	3	23.4
Max Dry Density, pcf:	123.2				
Opt. Moisture Content, %:	11.50%				
Target % Compaction:	95%				



Run By: GL	Approved By: MG

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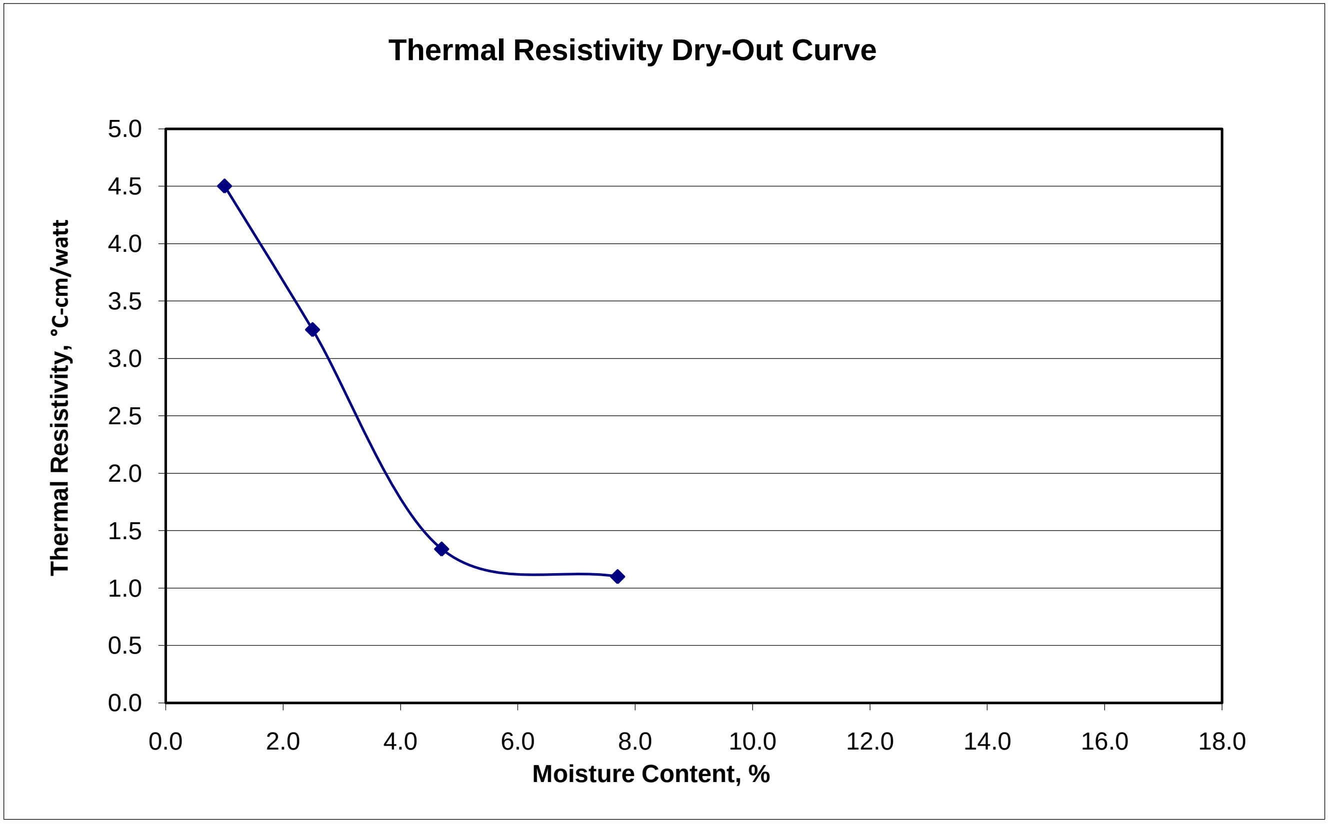
Project Name: Tessera Solar
Project Number: 60095029

Thermal Resistivity Test Results

Sample ID:	B-021 0'-1'
Soil Type:	
Standard/Modified Proctor:	Modified ASTM D-1557
Max Dry Density, pcf:	119
Opt. Moisture Content, %:	11.00%
Target % Compaction:	95%
Target Dry Density:	113.05

Moisture Content (%)	Dry Unit Weight (pcf)	Meter-Degrees (˚C-cm/watt)	Temperature (°C)
7.7	108.5	1	20.8
4.7	109.8	1	20.8
2.5	109.0	3	20.2
1.0	110.9	5	21.4



	Run By:	Approved By:

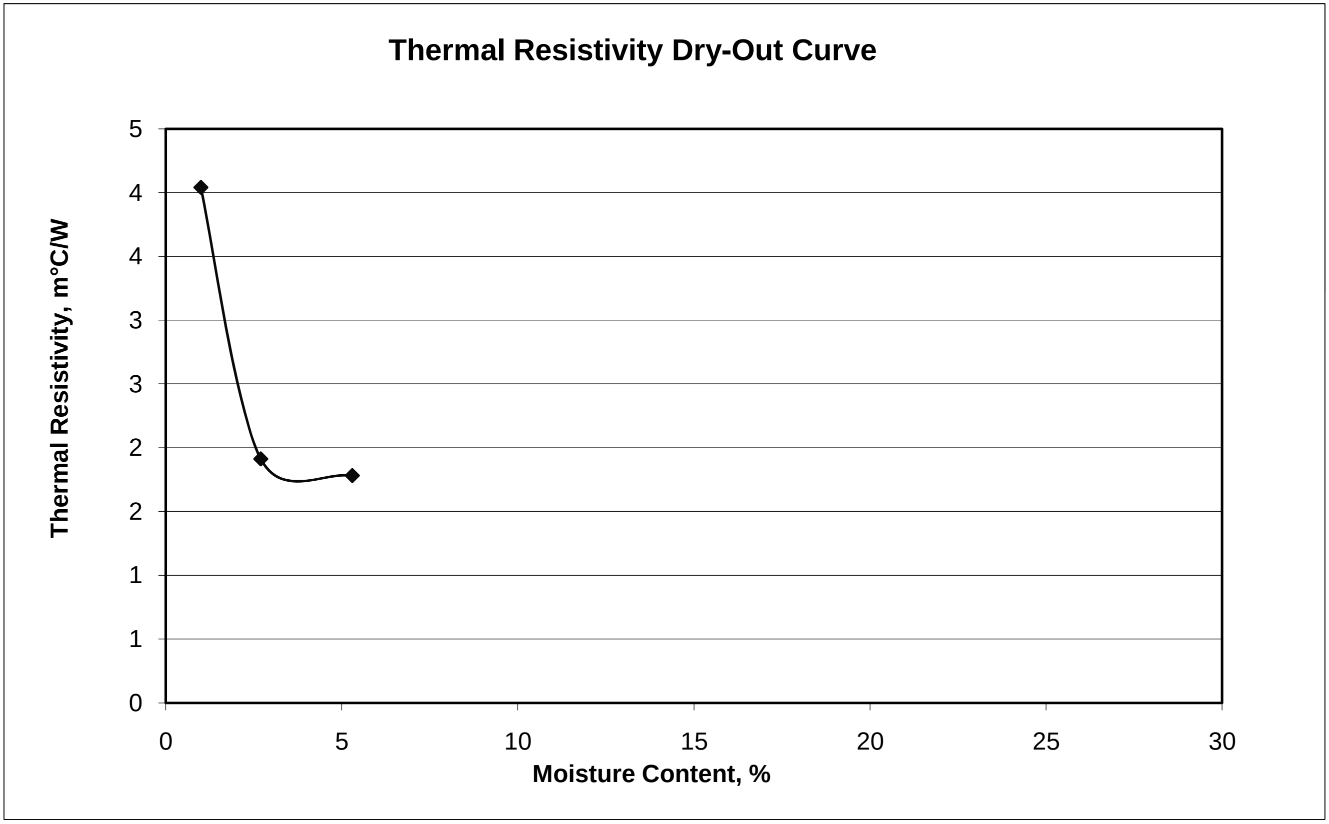
Terracon

Project Name: Solar One
Project Number: 60095029

Thermal Resistivity Test Results

Sample ID: B-031, 0,0' to 5'
Soil Type: Br. Sand with Gravel
Standard/Modified Proctor: Modified ASTM D-1557A
Max Dry Density, pcf: 122.4
Opt. Moisture Content, %: 6.00%
Target % Compaction: 95%

Average Moisture Content (%)	Compaction (%)	Meter-Degrees (˚C-cm/watt)	Average Temperature (°C)
5.3	96.0	2	22.8
2.7	96.0	2	22.4
1.0	98.0	4	23.0


Thermal Resistivity Dry-Out Curve

Run By: GL
Approved By: MG

Terracon

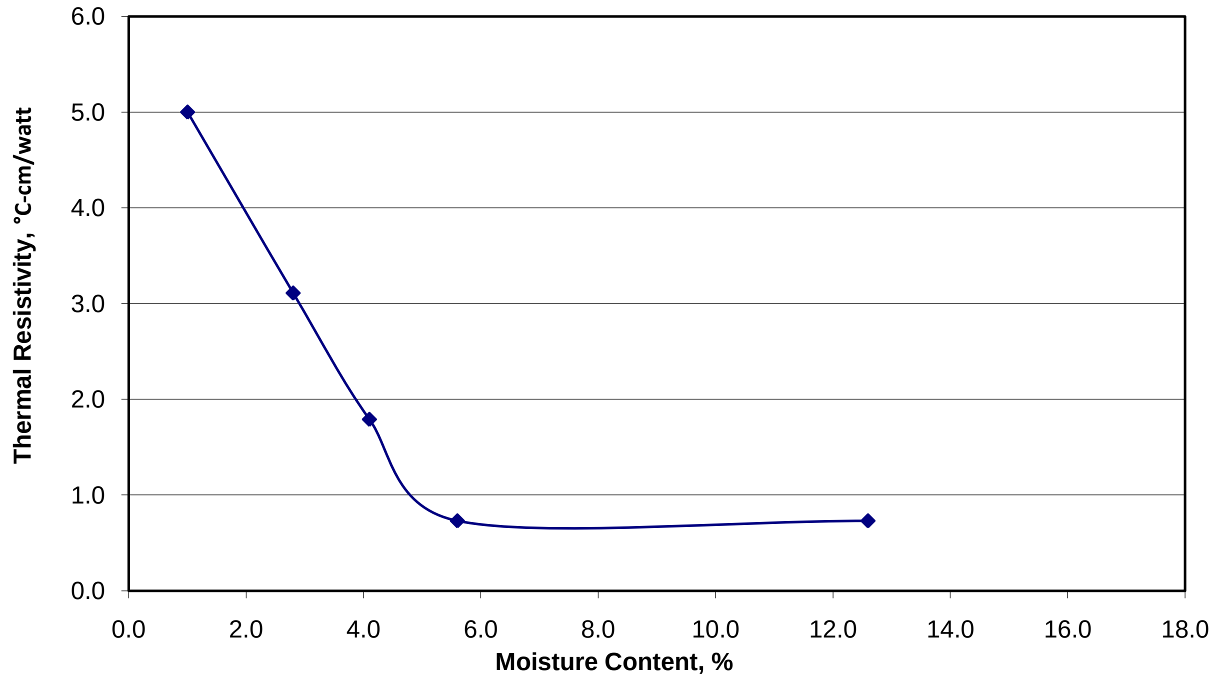
Project Name: Tessera Solar
Project Number: 60095029

Thermal Resistivity Test Results

Sample ID:	B-034 0'-1'
Soil Type:	
Standard/Modified Proctor:	Modified ASTM D-1557
Max Dry Density, pcf:	122
Opt. Moisture Content, %:	10.00%
Target % Compaction:	95%
Target Dry Density:	115.9

Moisture Content (%)	Dry Unit Weight (pcf)	Meter-Degrees (˚C-cm/watt)	Temperature (°C)
12.6	120.1	1	22.1
5.6	115.2	1	24.7
4.1	114.9	2	24.5
2.8	114.2	3	24.6
1.0	117.9	5	47.8

Thermal Resistivity Dry-Out Curve



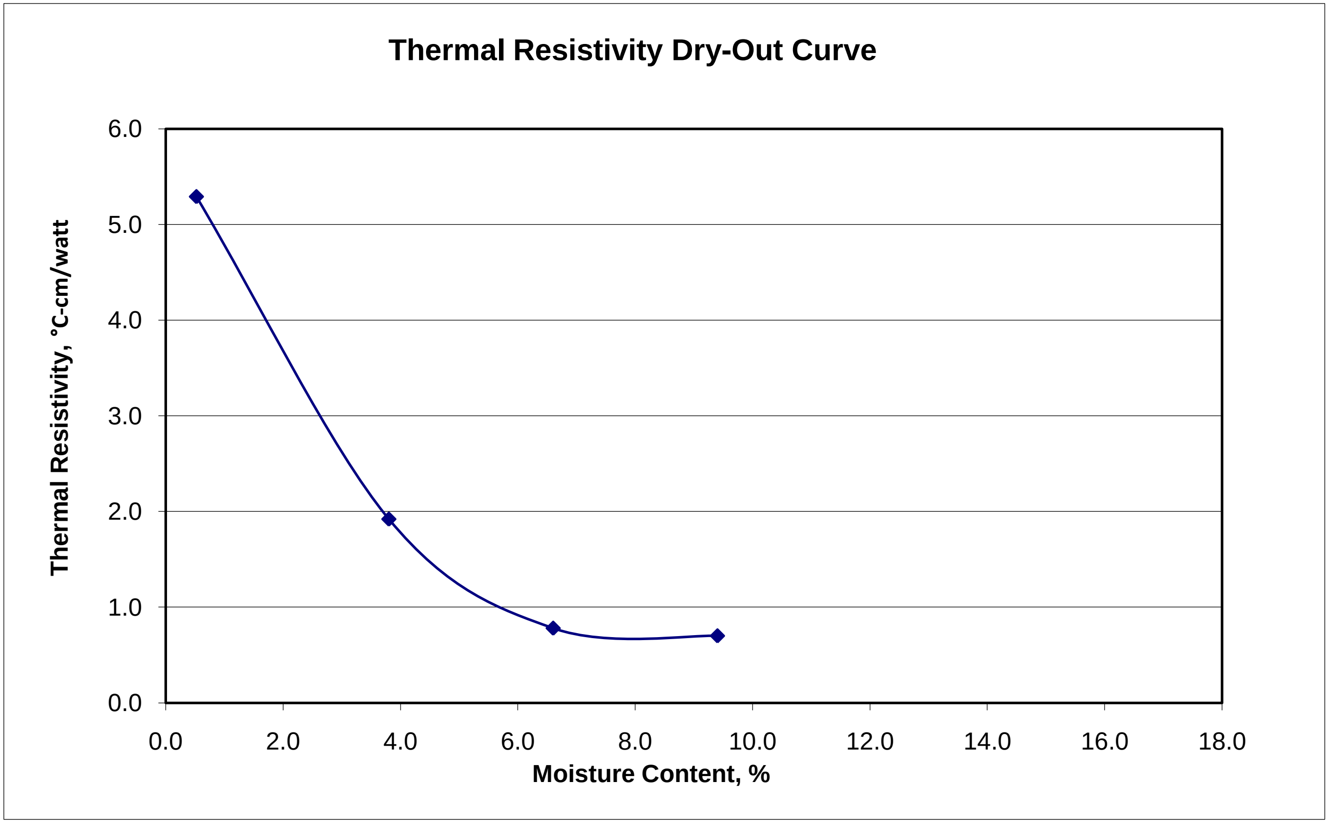
	Run By:	Approved By:

Project Name: Tessera Solar
Project Number: 60095029

Thermal Resistivity Test Results

Sample ID:	B-035 0'-5'
Soil Type:	
Standard/Modified Proctor:	Modified ASTM D-1557
Max Dry Density, pcf:	128
Opt. Moisture Content, %:	9.50%
Target % Compaction:	95%
Target Dry Density:	121.6

Moisture Content (%)	Dry Unit Weight (pcf)	Meter-Degrees (°C-cm/watt)	Temperature (°C)
0.5	122.1	5	41.9
3.8	122.2	2	23.9
6.6	125.1	1	22.2
9.4	126.1	1	22.2


Thermal Resistivity Dry-Out Curve

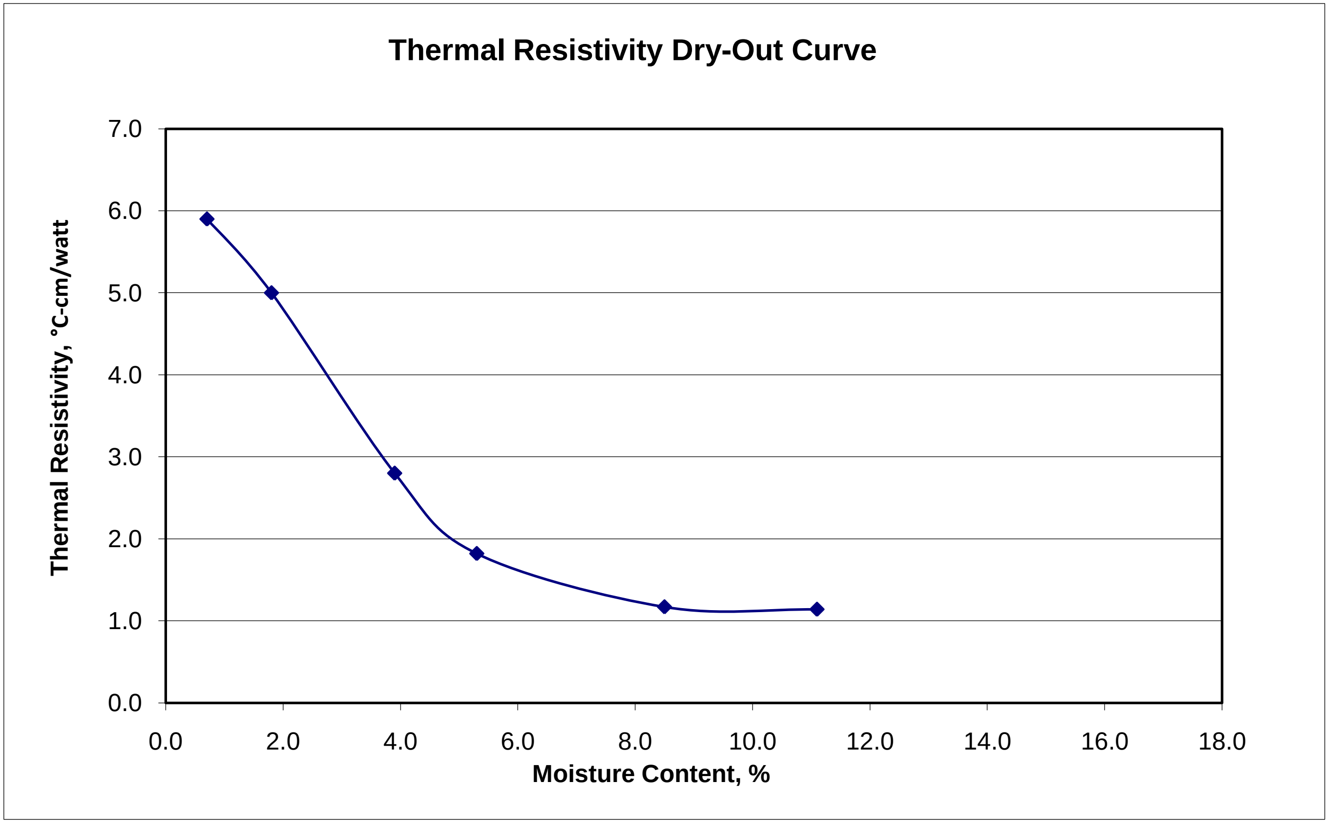
	Run By:	Approved By:

Project Name: Tessera Solar
Project Number: 60095029

Thermal Resistivity Test Results

Sample ID:	B-043 0'-1'
Soil Type:	
Standard/Modified Proctor:	Modified ASTM D-1557
Max Dry Density, pcf:	121
Opt. Moisture Content, %:	5.50%
Target % Compaction:	95%
Target Dry Density:	114.95

Moisture Content (%)	Dry Unit Weight (pcf)	Meter-Degrees (˚C-cm/watt)	Temperature (°C)
11.1	113.6	1	21.8
8.5	115.2	1	22.5
5.3	115.2	2	23.5
3.9	114.3	3	23.5
1.8	118.6	5	23.4
0.7	124.2	6	47.3



	Run By:	Approved By:

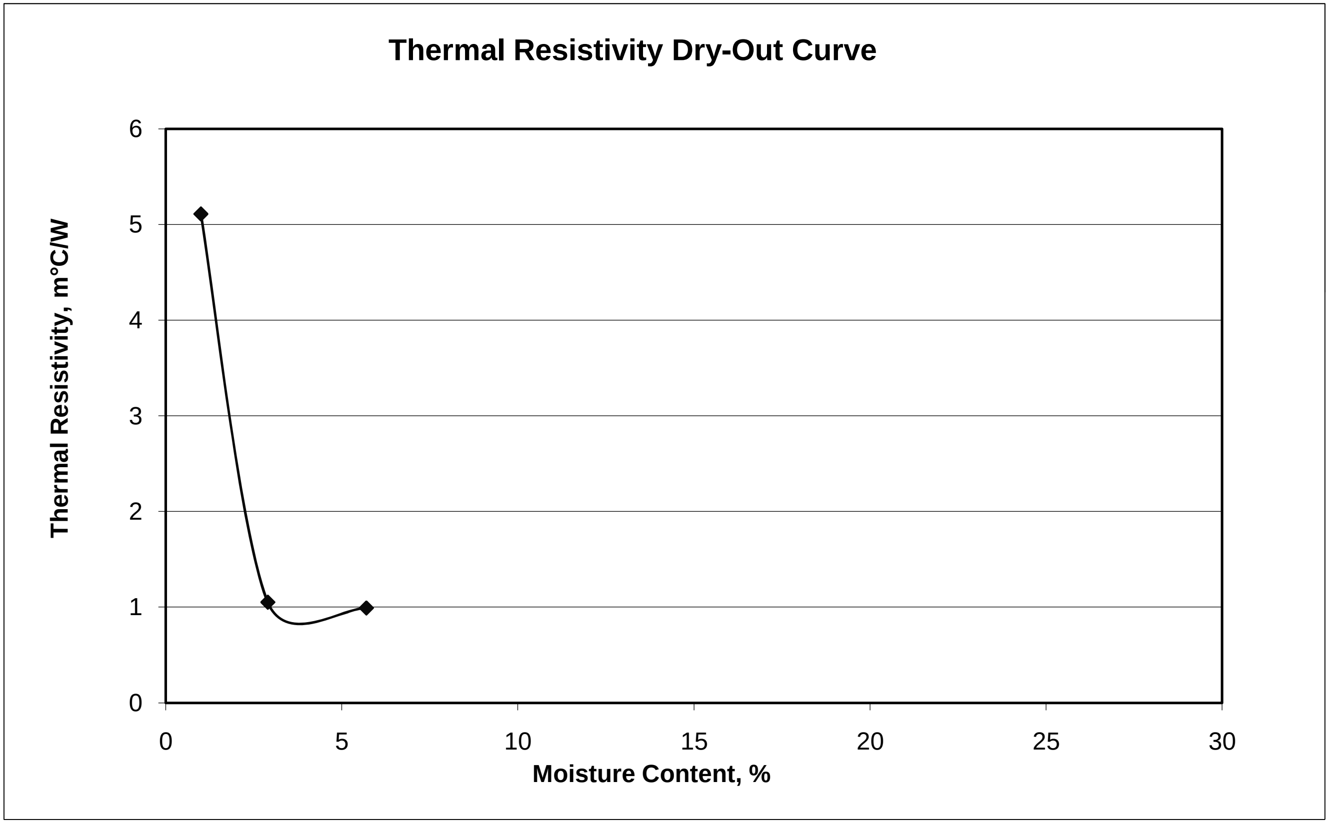
Terracon

Project Name: Solar One
Project Number: 60095029

Thermal Resistivity Test Results

Sample ID:	B-049 0' to 5'
Soil Type:	Br. Sand with Gravel
Standard/Modified Proctor:	Modified ASTM D-1557A
Max Dry Density, pcf:	122.5
Opt. Moisture Content, %:	6.00%
Target % Compaction:	95%

Average Moisture Content (%)	Compaction (%)	Meter-Degrees (˚C-cm/watt)	Average Temperature (°C)
5.7	96.0	1	22.7
2.9	99.0	1	22.8
1.0	98.0	5	22.8



	Run By: GL	Approved By: MG

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RESISTIVITY TEST REPORT

Project No: 60095029

Site Name: Solar One **Boring No.:** B-014

Site Address: Hwy 40 and Hector Road, Pisgah, CA

Report Prepared By: CP **Field Test By:** CP

Description of the soil as seen at the site:

Choose from the following descriptions that best describe the earth conditions:

Good clay earth
Solid Rock
[✓ Sandy Soil]
High Rise Site

Provide the following information:

Date of resistivity test: 10/21/2009

Weather for the seven days preceding the test: Clear and Sunny
(The last three days must have been clear and sunny.)

Model number of test instrument: Nilsson Model 400

Serial number of test instrument: 4-7530

RESITIVITY TESTING DATA AND RESULTS:

A (ft) =	2	4	8	16	20
FORMULA D= (OHM-CM)	383*R	766*R	1532*R	3064*R	3830*R
AREA 1 MEASURED R	19	5.1	1.7	0.92	0.61
AREA 1 CALC D	7277	3907	2604	2819	2336

Terracon

RESISTIVITY TEST REPORT

Project No: 60095029

Site Name: Solar One **Boring No.:** B-014

Site Address: Hwy 40 and Hector Road, Pisgah, CA

Report Prepared By: CP **Field Test By:** CP

Description of the soil as seen at the site:

Choose from the following descriptions that best describe the earth conditions:

Good clay earth

Solid Rock

[✓ Sandy Soil]

High Rise Site

Provide the following information:

Date of resistivity test: 10/21/2009

Weather for the seven days preceding the test: Clear and Sunny

(The last three days must have been clear and sunny.)

Model number of test instrument: Nilsson Model 400

Serial number of test instrument: 4-7530

RESITIVITY TESTING DATA AND RESULTS:

A (ft) =	2	4	8	16	20
FORMULA D= (OHM-CM)	383*R	766*R	1532*R	3064*R	3830*R
AREA 1 MEASURED R	20	6.7	3.2	3.2	3.2
AREA 1 CALC D	7660	5132	4902	9805	12256

Terracon

RESISTIVITY TEST REPORT

Project No: 60095029

Site Name: Solar One **Boring No.:** B-033

Site Address: Hwy 40 and Hector Road, Pisgah, CA

Report Prepared By: CP **Field Test By:** CP

Description of the soil as seen at the site:

Choose from the following descriptions that best describe the earth conditions:

Good clay earth

[✓ Sandy Soil]

Solid Rock

High Rise Site

Provide the following information:

Date of resistivity test: 10/21/2009

Weather for the seven days preceding the test: Clear and Sunny

(The last three days must have been clear and sunny.)

Model number of test instrument: Nilsson Model 400

Serial number of test instrument: 4-7530

RESITIVITY TESTING DATA AND RESULTS:

A (ft) =	2	4	8	16	20
FORMULA D= (OHM-CM)	383*R	766*R	1532*R	3064*R	3830*R
AREA 1 MEASURED R	660000	410000	740000	560000	200000
AREA 1 CALC D	252780000	314060000	1133680000	1715840000	766000000

Terracon

RESISTIVITY TEST REPORT

Project No: 60095029

Site Name: Solar One **Boring No.:** B-048

Site Address: Hwy 40 and Hector Road, Pisgah, CA

Report Prepared By: CP **Field Test By:** CP

Description of the soil as seen at the site:

Choose from the following descriptions that best describe the earth conditions:

Good clay earth

Solid Rock

[✓ Sandy Soil]

High Rise Site

Provide the following information:

Date of resistivity test: 10/21/2009

Weather for the seven days preceding the test: Clear and Sunny

(The last three days must have been clear and sunny.)

Model number of test instrument: Nilsson Model 400

Serial number of test instrument: 4-7530

RESITIVITY TESTING DATA AND RESULTS:

A (ft) =	2	4	8	16	20
FORMULA D= (OHM-CM)	383*R	766*R	1532*R	3064*R	3830*R
AREA 1 MEASURED R	1600	1300	1900	1800	8900
AREA 1 CALC D	612800	995800	2910800	5515200	34087000

Terracon

RESISTIVITY TEST REPORT

Project No: 60095029

Site Name: Solar One **Boring No.:** B-029

Site Address: Hwy 40 and Hector Road, Pisgah, CA

Report Prepared By: CP **Field Test By:** CP

Description of the soil as seen at the site:

Choose from the following descriptions that best describe the earth conditions:

Good clay earth	Solid Rock
[✓ Sandy Soil]	High Rise Site

Provide the following information:

Date of resistivity test: 10/21/2009

Weather for the seven days preceding the test: Clear and Sunny
(The last three days must have been clear and sunny.)

Model number of test instrument: Nilsson Model 400

Serial number of test instrument: 4-7530

RESITIVITY TESTING DATA AND RESULTS:

A (ft) =	2	4	8	16	20
FORMULA D= (OHM-CM)	383*R	766*R	1532*R	3064*R	3830*R
AREA 1 MEASURED R	140000	130000	160000	71000	16000
AREA 1 CALC D	53620000	99580000	245120000	217544000	61280000

Terracon

RESISTIVITY TEST REPORT

Project No: 60095029

Site Name: Solar One **Boring No.:** B-025

Site Address: Hwy 40 and Hector Road, Pisgah, CA

Report Prepared By: CP **Field Test By:** CP

Description of the soil as seen at the site:

Choose from the following descriptions that best describe the earth conditions:

Good clay earth

Solid Rock

Sandy Soil

High Rise Site

Provide the following information:

Date of resistivity test: 10/21/2009

Weather for the seven days preceding the test: Clear and Sunny

(The last three days must have been clear and sunny.)

Model number of test instrument: Nilsson Model 400

Serial number of test instrument: 4-7530

RESITIVITY TESTING DATA AND RESULTS:

A (ft) =	2	4	8	16	20
FORMULA D= (OHM-CM)	383*R	766*R	1532*R	3064*R	3830*R
AREA 1 MEASURED R	310	300	4700	120	0
AREA 1 CALC D	118730	229800	7200400	367680	0

Terracon

RESISTIVITY TEST REPORT

Project No: 60095029

Site Name: Solar One **Boring No.:** B-043

Site Address: Hwy 40 and Hector Road, Pisgah, CA

Report Prepared By: CP **Field Test By:** CP

Description of the soil as seen at the site:

Choose from the following descriptions that best describe the earth conditions:

Good clay earth

Solid Rock

Sandy Soil

High Rise Site

Provide the following information:

Date of resistivity test: 10/21/2009

Weather for the seven days preceding the test: Clear and Sunny

(The last three days must have been clear and sunny.)

Model number of test instrument: Nilsson Model 400

Serial number of test instrument: 4-7530

RESITIVITY TESTING DATA AND RESULTS:

A (ft) =	2	4	8	16	20
FORMULA D= (OHM-CM)	383*R	766*R	1532*R	3064*R	3830*R
AREA 1 MEASURED R	1000	10900	12000	12000	0
AREA 1 CALC D	383000	8349400	18384000	36768000	0

Terracon

RESISTIVITY TEST REPORT

Project No: 60095029

Site Name: Solar One **Boring No.:** B-032

Site Address: Hwy 40 and Hector Road, Pisgah, CA

Report Prepared By: MLS **Field Test By:** MLS

Description of the soil as seen at the site:

Choose from the following descriptions that best describe the earth conditions:

Good clay earth
Solid Rock
[✓ Sandy Soil]
High Rise Site

Provide the following information:

Date of resistivity test: 10/23/2009

Weather for the seven days preceding the test: Clear and Sunny
(The last three days must have been clear and sunny.)

Model number of test instrument: Nilsson Model 400

Serial number of test instrument: 4-7530

RESITIVITY TESTING DATA AND RESULTS:

A (ft) =	2	4	8	16	20
FORMULA D= (OHM-CM)	383*R	766*R	1532*R	3064*R	3830*R
AREA 1 MEASURED R	120	20	400	20	11
AREA 1 CALC D	45960	15320	612800	61280	42130

Terracon

RESISTIVITY TEST REPORT

Project No: 60095029

Site Name: Solar One **Boring No.:** TP-044

Site Address: Hwy 40 and Hector Road, Pisgah, CA

Report Prepared By: MLS **Field Test By:** MLS

Description of the soil as seen at the site:

Choose from the following descriptions that best describe the earth conditions:

Good clay earth

[✓ Sandy Soil]

Solid Rock

High Rise Site

Provide the following information:

Date of resistivity test: 10/30/2009

Weather for the seven days preceding the test: Clear and Sunny

(The last three days must have been clear and sunny.)

Model number of test instrument: Nilsson Model 400

Serial number of test instrument: 4-7530

RESITIVITY TESTING DATA AND RESULTS:

A (ft) =	2	4	8	16	20
FORMULA D= (OHM-CM)	383*R	766*R	1532*R	3064*R	3830*R
AREA 1 MEASURED R	56000	1800	2000	4600	6500
AREA 1 CALC D	21448000	1378800	3064000	14094400	24895000

APPENDIX C

ASFE INSERT

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

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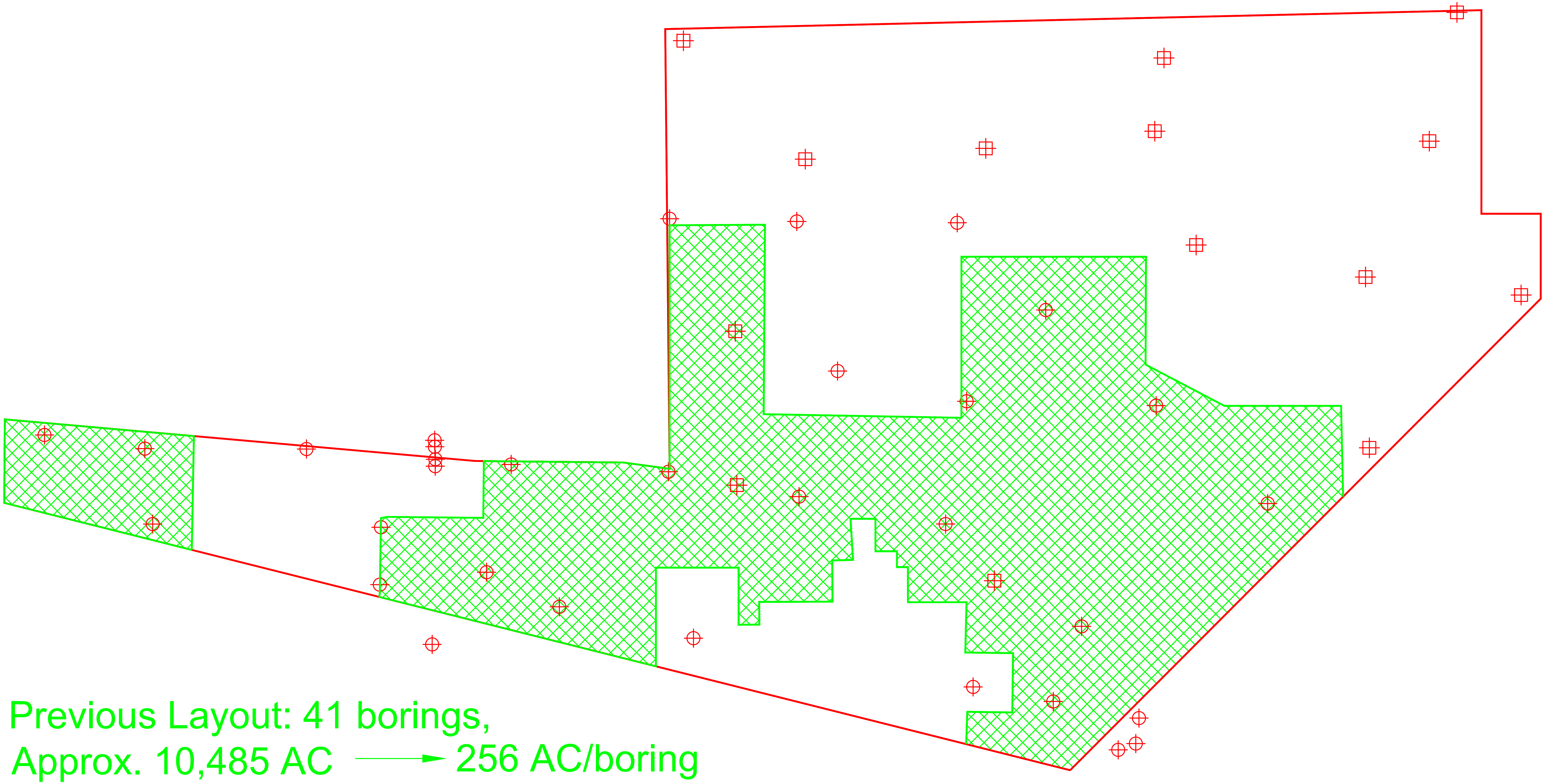

Previous Layout: 41 borings,

Approx. 10,485 AC ⟶ 256 AC/boring

Current Layout: 20 borings,

Approx. 4,613 AC ⟶ 231 AC/boring