PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
Converse Project No. 17-81-247-01

February 5, 2018

Prepared For:

Creative Adaptation, Inc.
440 E. Huntington Drive, Suite 316
Arcadia, CA 91006

Prepared By:

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Converse Consultants
Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services

February 5, 2018

Mr. James Oravets
Project Manager
Creative Adaptation, Inc
440 E. Huntington Drive, Suite 316
Arcadia, CA 91006

Subject: **PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT**
Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
Converse Project No. 17-81-247-01

Dear Mr. Oravets:

Converse Consultants (Converse) has prepared this report to present the results of our geotechnical investigation performed for the proposed Mojave Narrows Medical Pavilion to be located northeast of Yates Road and Ridgecrest Road, City of Victorville, San Bernardino County, California. This report was prepared in accordance with our proposal dated August 18, 2017, your Acceptance of Agreement and Authorization to Proceed dated December 7, 2017.

Based on our field investigations, laboratory testing and engineering analysis, we conclude that the site is suitable for the proposed structures from a geotechnical standpoint provided the recommendations presented in this report are incorporated during the design and construction of the project. An additional geotechnical investigation will be required to meet California Geological Survey (CGS) - Note 48 requirements and to get regulatory approval. This investigation may result in revisions to the recommendations presented in this report.

We appreciate the opportunity to be of service to Creative Adaptation, Inc. If you have any questions, please do not hesitate to contact us at 909-796-0544.

CONVERSE CONSULTANTS

Hashmi S. E. Quazi, PhD, PE, GE
Principal Engineer

Dist.: 5/Addressee
HSQ/SM/JB/ZA/kvg

PROFESSIONAL CERTIFICATION

This report has been prepared by the following professionals whose seals and signatures appear hereon.

The findings, recommendations, specifications and professional opinions contained in this report were prepared in accordance with the generally accepted professional engineering and engineering geologic principle and practice in this area of Southern California. We make no other warranty, either expressed or implied.

Zahangir Alam, PhD, EIT
Senior Staff Engineer

Jay Burnham, GIT
Senior Staff Geologist

Hashmi S. E. Quazi, PhD, PE, GE
Principal Engineer

Scot Mathis, PG, CEG
Senior Geologist

EXECUTIVE SUMMARY

The following is a summary of our geotechnical study, findings, conclusions, and recommendations, as presented in the body of this report. Please refer to the appropriate sections of the report for complete conclusions and recommendations. In the event of a conflict between this summary and the report, or an omission in the summary, the report shall prevail.

- The proposed Mojave Narrows Medical Pavilion project consists of construction of an approximately 61,005 square foot, 3-story assisted living facility; 42,000 square foot, 2-story skilled nursing facility; 41,265 square foot, 3-story independent living facility; 26,180 square foot, 2-story medical office building; and 22,260 square foot, 2-story rehabilitation building. The project also includes driveways, walkways, parking stalls, underground and above ground utilities, landscape, and hardscape. The foundation type and structural loads are not known at this time of report preparation. Also, site grading plan was not available.

- The project site is located roughly northeast of Yates Road and Ridgecrest Road; southwest of Horseshoe Lake and Mojave Narrows Regional Park; and east of Kemper Campbell Ranch Road in the floodplain of the adjacent active channel of the Mojave River. The project site is covered in moderately dense desert grass, bushes, and loose alluvium. Several stream channels and access roads cross the project site in various directions.

- Our scope of work included project setup, subsurface exploration, laboratory testing, engineering analysis, and preparation of this report.

- Twenty-seven exploratory borings (BH-01 through BH-27) were drilled between December 6 and 12, 2017 at the proposed site. The borings were advanced to maximum planned depths of between 6.5 and 51.5 feet bgs.

- The subsurface soil at the project site consisted primarily of unconsolidated alluvial sand and silty sand. Layers of clayey sand, and sandy clay were encountered in some borings at approximately 15 to 20 feet bgs and at approximately 45 feet bgs. Scattered gravel was observed in most of the borings.

- Groundwater was encountered at depths ranging from 14.1 to 23 feet bgs in some of the soil borings conducted within the project site. Historical groundwater depths in the vicinity of the project site ranged from 0.9 to 165 feet bgs. Groundwater will be encountered during construction of the proposed project in excavations which extend deeper than 14 feet bgs.

- The project site is not located within a currently designated San Bernardino County (2010) State of California Earthquake Fault Zone (CGS, 2007). There are no known active faults projecting toward or extending across the project site. The potential for surface rupture resulting from the movement of nearby major faults is not known with certainty but is considered low.

- The potential impact to the project site from liquefaction is considered high due to the presence of shallow ground water and granular sediments. For current and historical groundwater conditions, liquefiable layers exist from 15 to 50 and 1 to 50 feet bgs, respectively.

- Based on the flat-nature of the proposed site configuration, lateral spreading is not considered a risk. Lateral spreading, Landsliding, seiches, tsunamis, and earthquake-induced flooding is considered to be low.

- The collapse potential of the proposed site varies from 0.3 to 2.0, indicating slight collapse potential.

- The sulfate and chloride contents of soil samples tested correspond to American Concrete Institute (ACI) exposure category S0 and C1, respectively. Design recommendations for these categories are provided in the text of this report.

- The measured value of the minimum electrical resistivity of the samples when saturated were 310 (BH-09), 5,000, 6,900 and 8,500 Ohm-cm for the site. This indicates that the soils tested are moderately corrosive to ferrous metals in contact with the soil except for the sample from boring BH-09 where soils with severe corrosivity to ferrous metal were observed. A corrosion engineer should be consulted for corrosion mitigation measures for ferrous metals in contact with the soil.

- Prior to the start of any earthwork, the site should be cleared of all vegetation, and debris. The materials resulting from the clearing and grubbing operations should be removed from the site.

- Based on our subsurface exploration, we anticipate that the site soils will be excavatable with conventional heavy-duty earthworking and trenching equipment.

- Excavated onsite earth materials cleared of deleterious matter can be moisture conditioned and re-used as compacted fill.

- Based on our observation and testing of the subsurface soils, approximately the upper seven 5 to 7 feet of topsoil and alluvial deposits are not suitable for supporting structures or structural fill. Actual removal depth should be based on the observation of the conditions encountered during grading. The upper 12 inches of all excavated surfaces should be scarified and moisture conditioned, if necessary, and compacted to at least 90 percent relative compaction as per ASTM Standard D1557 test method, prior to placing any fill and/or structures.

- The building pads in fill lots should be excavated a depth of at least 5 feet bgs. The bottom 12 inches should be scarified, moisture conditioned, over-excavated and compacted to a minimum depth of 12 inches. The building pads in cut lots with less than 2 feet of cut below existing should be over-excavated to a depth of at least 5 feet bgs or to competent bottom, whichever is greater. The over-excavated subgrade should be scarified, moisture conditioned and compacted to a minimum depth of 12 inches. The cut and/or fill transition lots should be over-excavated to provide at least 5 feet of compacted fill over the entire pad.

- All areas to receive asphalt or concrete pavement should be overexcavated to a depth of 12 inches below finish grade. The overexcavation should extend at least 1 foot beyond the edge of pavement. In cut areas, 12 inches of the soils below the finish grade should be over-excavated and replaced as compacted fill. If the maximum difference of fill thickness between the cut and fill area exceeds 12 inches, then additional over-excavation and re-compaction should be conducted in the cut area to keep the fill thickness to 12 inches.

- Fill soils should be placed on scarified and recompacted excavation bottoms, moisture conditioned, and compacted to at least 90 percent of the laboratory maximum dry density. At least the upper 12 inches of fill beneath pavement intended to support vehicle loads should be compacted to at least 95 percent of the laboratory maximum dry density.

- Footings should be at least 18 inches in width and embedded to at least 18 inches below the lowest adjacent grade. The footing dimensions and reinforcement should be based on structural design. Continuous and isolated footings can be designed based on an allowable net bearing capacity of 2,200 psf.

- The total settlement of shallow footings from static structural loads and short-term settlement of properly compacted fill is anticipated to be 1 inch or less. The differential settlement resulting from static loads is anticipated to be 0.5 inches or less over a horizontal distance of 40 feet.

- The proposed site for the structures will have the potential for up to 3.2 inches of dynamic settlement during a large earthquake. We recommend that the planned structures be designed conservatively in anticipation of dynamic differential settlement of up to 0.5 inches in 40 horizontal feet. The static and dynamic settlement estimates should not be combined for design purposes.

- Lateral earth pressures design parameters are presented in the text of this report.

- Pavement design recommendations are presented in the text of this report.

- Recommendations for temporary sloped excavations are provided in the text of this report.

Based on our investigation, it is our professional opinion that the proposed location for Mojave Narrows Medical Pavilion is suitable for construction of the proposed upgrades and improvements provided the recommendations presented in this geotechnical investigation report are considered in the planning, design and construction of the project.

Additional geotechnical investigation will be required to meet California Geological Survey (CGS) - Note 48 requirements and to get regulatory approval. This investigation may result in revisions to the recommendations presented in this report.

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APPENDICES

1.0 INTRODUCTION

This report presents the results of our geotechnical investigation performed for the proposed Mojave Narrows Medical Pavilion located northeast of Yates Road and Ridgecrest Road, Victorville, San Bernardino County, California. The approximate location of the site is shown on Figure No. 1, *Approximate Project Location Map*.

The purposes of this investigation were to determine the nature and engineering properties of the subsurface soils and to provide preliminary recommendations for site earthwork, and design and construction of foundations for the proposed structures. This report is not intended to meet all requirements of CGS - Note 48 - Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings (CGS, 2013). Additional geotechnical investigation will be required to meet the CGS - Note 48 requirements. Future investigation may result in revisions to the findings and recommendations presented in this report.

This report is prepared for the project described herein and is intended for use solely by Creative Adaptation, Inc. and its authorized agents for design purposes. It should not be used as a bidding document but may be made available to the potential contractors for information on factual data only. For bidding purposes, the contractors should be responsible for making their own interpretation of the data contained in this report.

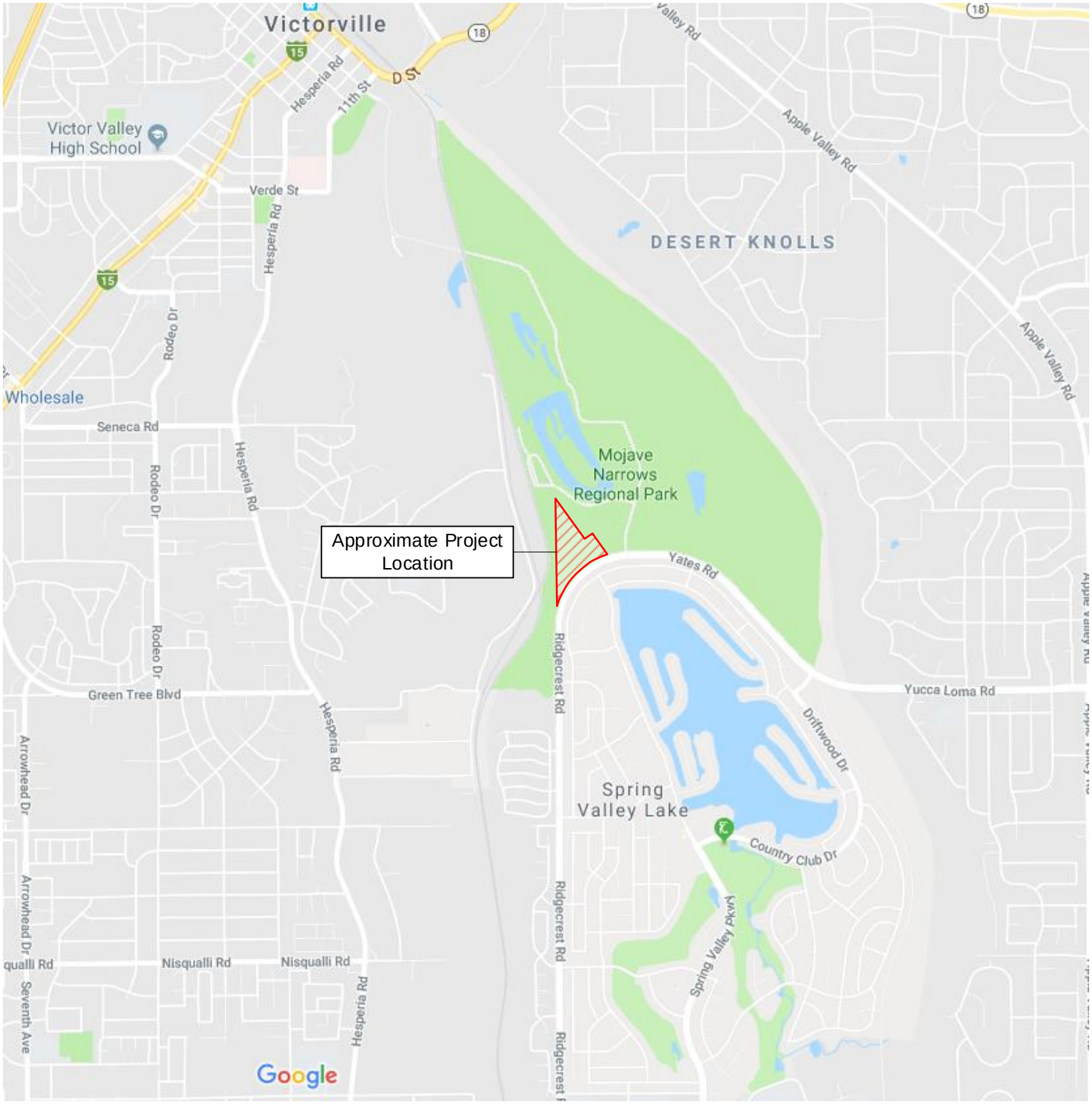
2.0 PROJECT DESCRIPTION

The proposed Mojave Narrows Medical Pavilion will consist of structures listed in the following table.

Table No. 1, List of Proposed Structures and Approximate Footprints

Structure	Footprint (Square Feet)
3-Story Assisted Living Facility	61,005
2-Story Skilled Nursing Facility	42,000
3-Story Independent Living Facility	41,265
2-Story Medical Office Building	26,180
2-Story Rehabilitation Building	22,260

The project will also include driveways, sidewalks, parking lots, underground and above-ground utilities, landscaping and hardscaping. The foundation type and structural loads are not known at this time of report preparation. Also, site grading plan was not available.



Approximate Project Location Map

Project:	Mojave Narrows Medical Pavilion
Location:	Northeast of Yates Road and Ridgecrest Road City of Victorville, San Bernardino County, California
For:	Creative Adaptation, Inc.

Project No.
17-81-247-01

Converse Consultants

Figure No.
1

3.0 SITE DESCRIPTION

The triangular-shaped project site is located roughly northeast of Yates Road and Ridgecrest Road; southwest of Horseshoe Lake and Mojave Narrows Regional Park; and east of Kemper Campbell Ranch Road. The site surface is uneven with an overall gentle slope from a maximum elevation of approximately 2,778 feet amsl (above mean sea level) in the southwestern corner to approximately 2,757 feet amsl in the northwestern corner.

The project site is covered in moderately dense desert grass, bushes, and loose alluvium. The site is surrounded by barbed wire fencing and only accessible across a wash on the west or south side of the property. The site is crossed by an active sewer pipeline near the western boundary and there are indications of additional utilities. A set of railroad tracks run roughly adjacent to the western boundary of the project site. Several stream-cut channels and access roads cross the site in various directions. The overall surface condition is shown in the following photographs.

Photograph 1: *Typical surface conditions with access road crossing the site.*

Photograph 2: *Western edge of project site.*

Photograph 3: *Typical dense surface cover.*

4.0 SCOPE OF WORK

The scope of this investigation includes the following tasks presented below.

4.1 Project Set-up

As part of the project set-up, our staff performed the following tasks.

- Conducted a site reconnaissance and marked the boring locations so drill rig access to all the locations is available.
- Notified Underground Service Alert (USA) at least 48 hours prior to drilling to clear the borings locations of any conflicts with existing underground utilities.
- Engaged a California-licensed driller to drill exploratory borings.

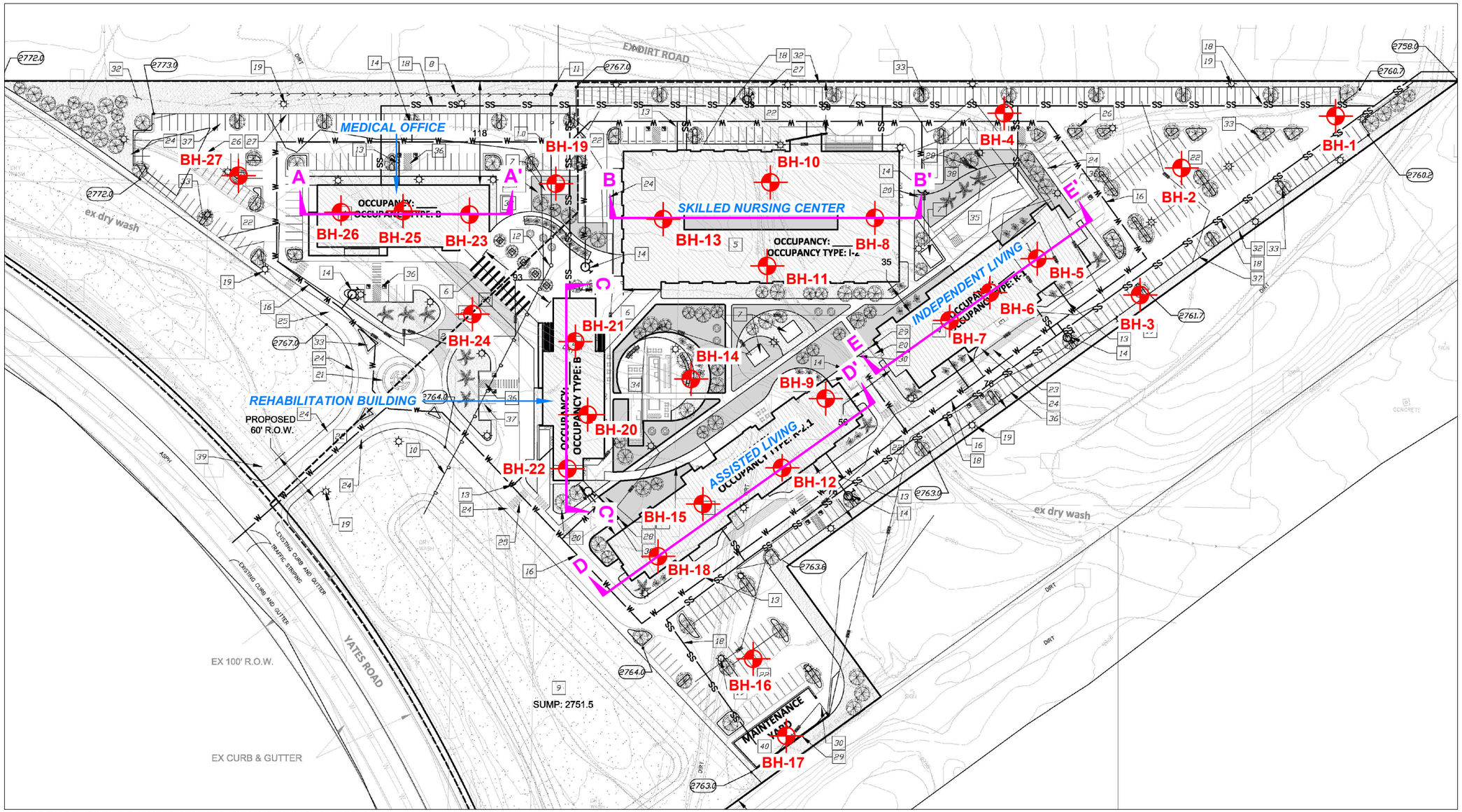
4.2 Subsurface Exploration

Twenty-seven exploratory borings (BH-01 through BH-27) were drilled between December 6 and 12, 2017 at the proposed site. The borings were advanced to maximum planned depths of between 6.5 and 51.5 feet bgs.

Approximate boring locations are indicated in Figure No. 2, *Approximate Boring Locations Map*. For a description of the field exploration and sampling program see Appendix A, *Field Exploration*. Boring numbers and associated structures are presented in the table below.

Table No. 2, Boring Details and Associated Structures

Structure	Boring No.	Depth
3-Story Assisted Living Facility	BH-09	21.5
	BH-12	51.5
	BH-15	21.5
	BH-18	21.5
2-Story Skilled Nursing Facility	BH-08	51.5
	BH-10	21.5
	BH-11	21.5
	BH-13	21.5
3-Story Independent Living Facility	BH-05	21.5
	BH-06	21.5
	BH-07	21.5
2-Story Medical Office Building	BH-23	51.5
	BH-25	21.5
	BH-26	21.5



REFERENCE: CIVIL DRAWING BY EPIC ENGINEERING. SHEET C0.0

EXPLANATION

BH-27 — NUMBER AND APPROXIMATE LOCATION OF EXPLORATORY BORINGS

A — A' — GEOLOGIC CROSS SECTION

0 120 240

APPROXIMATE SCALE IN FEET

APPROXIMATE BORING LOCATIONS MAP

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Project: Mojave Narrow Medical Pavilion
Location: Northeast of Yates Road and Ridgecrest Road
City of Lake Victorville, San Bernardino County, California
For: Parsons Environmental & Infastructure, Inc.

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Figure No. 2

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Structure	Boring No.	Depth
2-Story Rehabilitation Building	BH-20	51.5
	BH-21	21.5
	BH-22	21.5
Maintenance Yard	BH-17	21.5
Parking Lot	BH-02	6.5
	BH-16	6.5
	BH-27	6.5
Utilities/Miscellaneous	BH-01	16.5
	BH-03	16.5
	BH-04	16.5
	BH-14	16.5
	BH-19	21.5
	BH-24	6.5

(* Based on the structural footprints, additional borings will be required prior to CGS review for note 48)

4.3 Laboratory Testing

Representative samples of the site soils were tested in the laboratory to aid in the soil classification and to evaluate the relevant engineering properties. These tests included the following.

- *In-situ* moisture contents and dry density (ASTM D2216)
- R-value (Caltrans CT301)
- Soil corrosivity (California Tests 422, 417, and 643)
- Collapse potential (ASTM D5333)
- Grain size distribution (ASTM D422)
- Maximum dry density and optimum moisture content (ASTM D1557)
- Direct shear (ASTM D3080)
- Consolidation (ASTM D2435)

For *in-situ* moisture and dry density data, see the Logs of Borings in Appendix A, *Field Exploration*. For a description of the laboratory test methods and test results, see Appendix B, *Laboratory Testing Program*.

4.4 Report Preparation

Data and information obtained from the document review, field exploration, and laboratory testing program were compiled and evaluated. Geotechnical analyses of the compiled data were performed and this report was prepared to present our findings, conclusions, and recommendations for the proposed project.

5.0 SITE CONDITIONS

The surface and subsurface conditions encountered at the site during our investigation are described in the following sections.

5.1 Subsurface Profile

Based on the exploratory borings, the subsurface soil at the project site consisted primarily of unconsolidated alluvial sand and silty sand. Layers of clayey sand, and sandy clay were encountered in some borings at approximately 15 to 20 feet bgs and at approximately 45 feet bgs. Scattered gravel was observed in most of the borings. Figures No. 3a through 3c, *Geologic Cross Sections A-A' and B-B', C-C' and D-D', and E-E'* have been drawn across the subject site to illustrate the subsurface conditions.

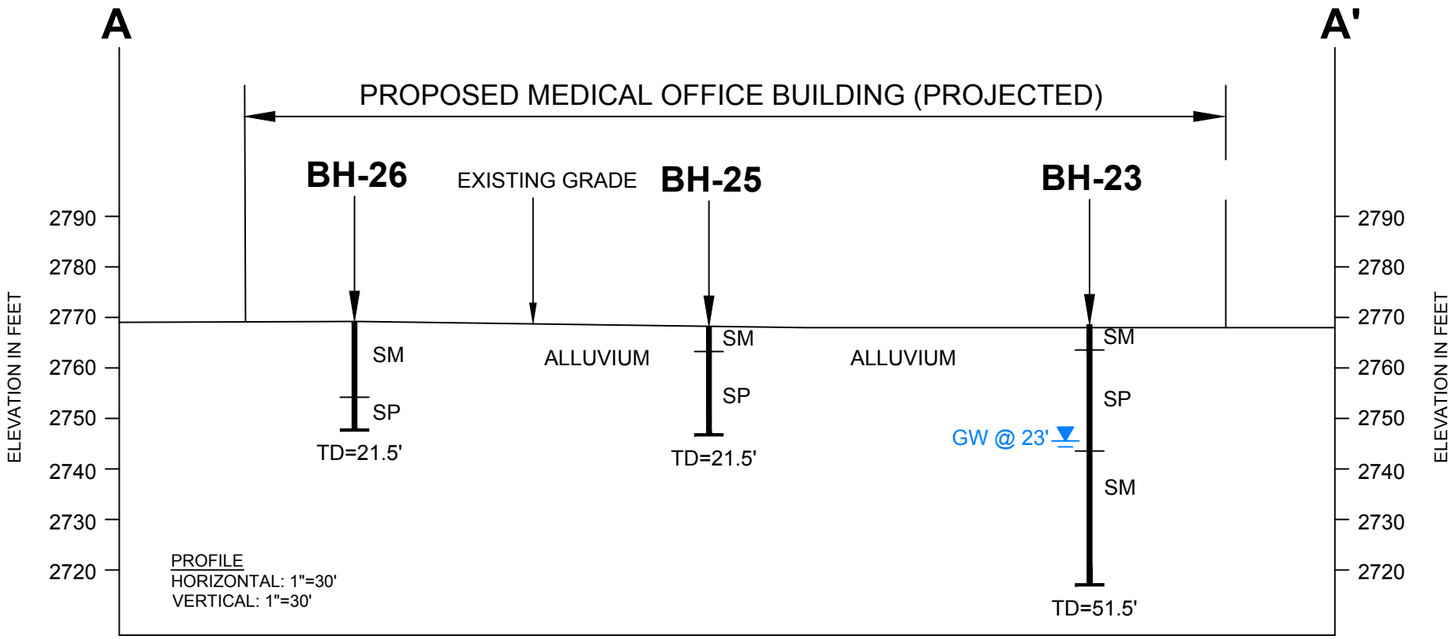
For a detailed description of the subsurface materials encountered in the exploratory borings, see Drawings No. A-2 through A-28, *Logs of Borings,* in Appendix A, *Field Exploration.*

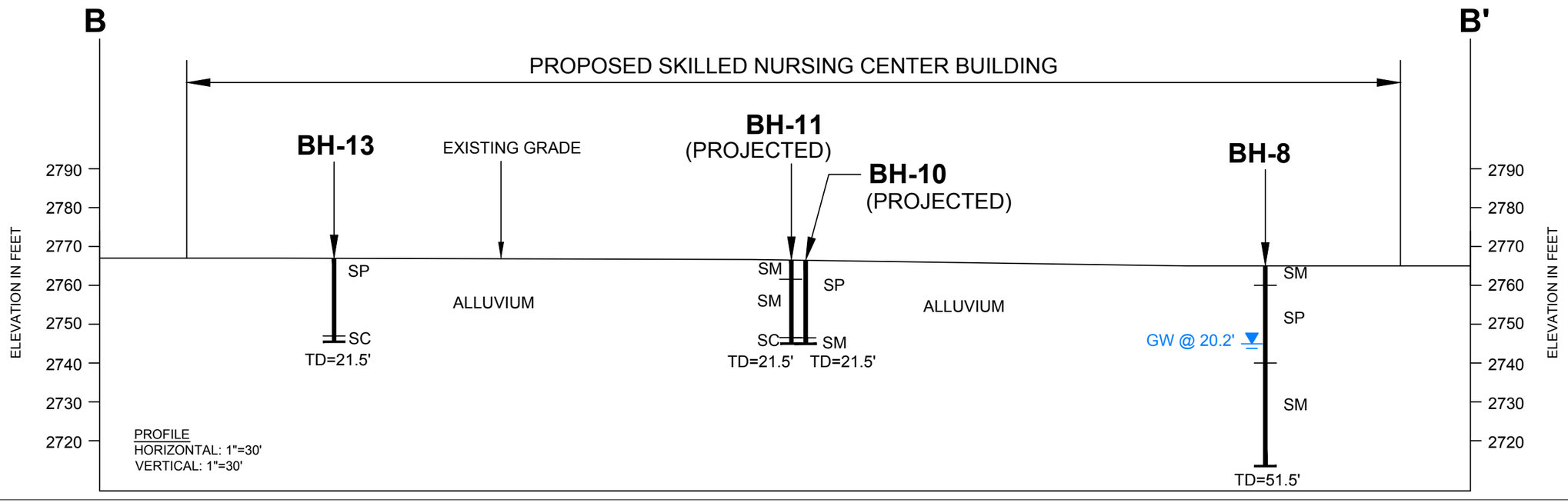
5.2 Groundwater

Groundwater was encountered at depths ranging from 14.1 to 23 feet bgs in some of the soil borings conducted within the project site. Based on the depth at which groundwater was encountered during our investigation, the depth to groundwater generally increases from east to west. The depths at which groundwater was encountered in each boring is presented in Table No. 3, *Summary of Current Groundwater Depths*.

Table No. 3, Summary of Encountered Groundwater Depths

Boring No.	Groundwater Depth (ft. bgs)
BH-05	20.5
BH-06	17.8
BH-07	18.0
BH-08	20.2
BH-11	18.8
BH-12	16.7
BH-15	16.9
BH-17	14.1
BH-18	16.1
BH-20	21.4
BH-21	19.7
BH-22	15.4
BH-23	23.0





GEOLOGIC CROSS SECTIONS A-A' AND B-B'

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Project: Mojave Narrow Medical Pavilion
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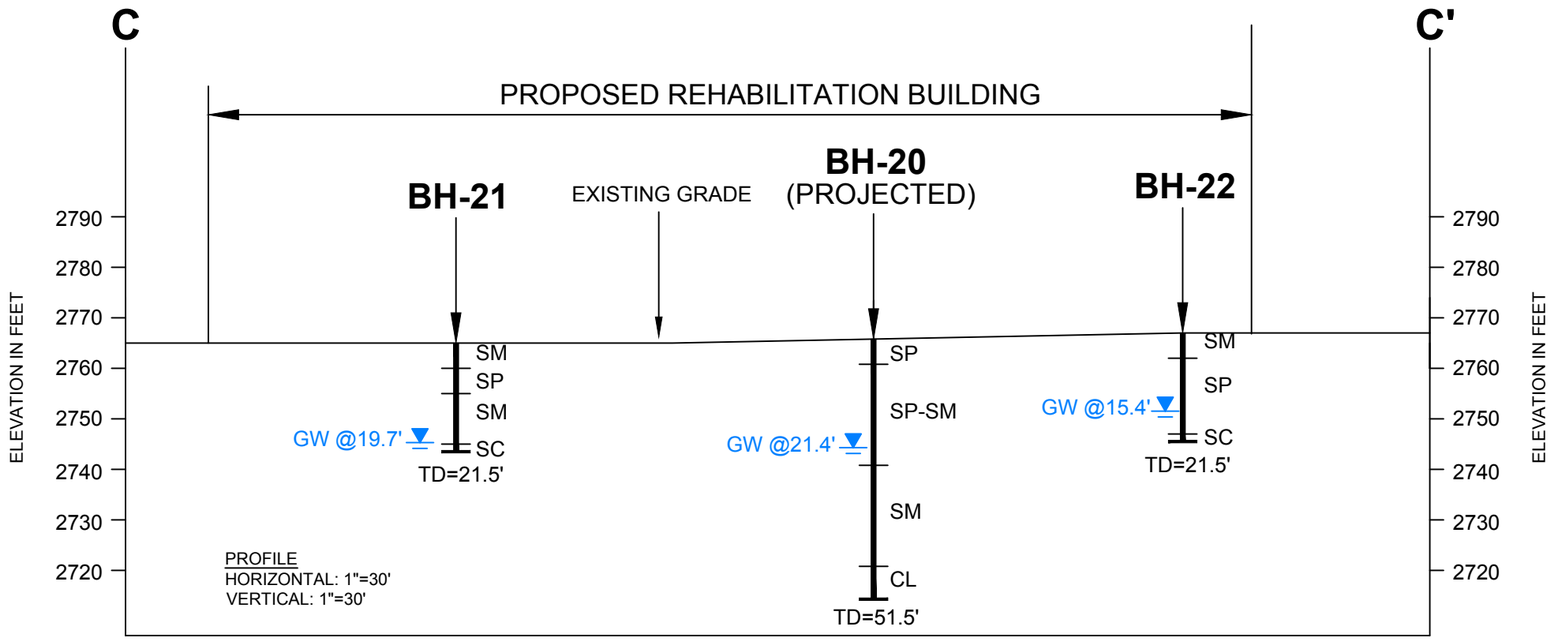
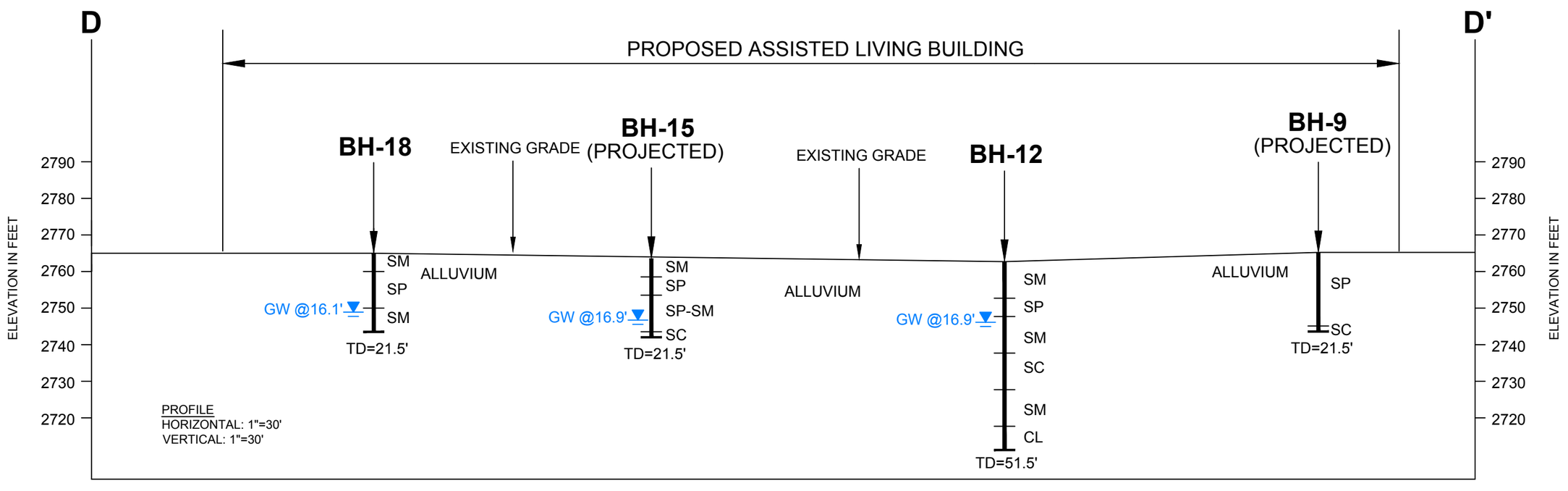
Figure No. 3a





GEOLOGIC CROSS SECTIONS C-C′ AND D-D′

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Project: Mojave Narrow Medical Pavilion
Location: Northeast of Yates Road and Ridgecrest Road
City of Lake Victorville, San Bernardino County, California
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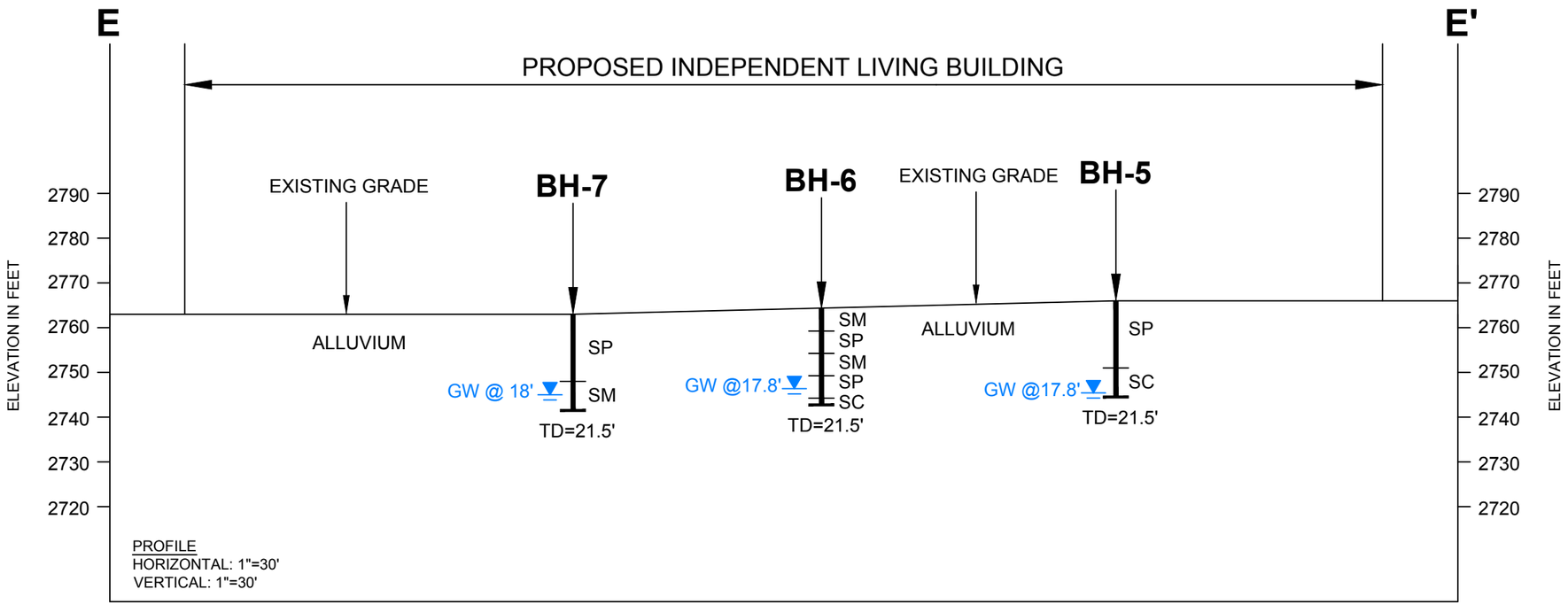
Project No. 17-81-247-01

Figure No. 3b



GEOLOGIC CROSS SECTIONS E-E'

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Project: Mojave Narrow Medical Pavilion
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Figure No. 3c

Regional databases were reviewed to estimate expected groundwater conditions in the vicinity of the project site. Data in the Table No. 4 was found on the National Water Information System (USGS, 2018a). Due to the number of sites with available data in the project area, sites closest to the proposed project site were selected.

Table No. 4, Summary of USGS Groundwater Depth Data

Site No.	Location	Groundwater Depth Range (ft. bgs)	Date Range
343051117161601	East of Park Rd within Mojave Narrows Park	7.97	1992
343046117155801	East of Park Rd within Mojave Narrows Park	1.5-5.6	1996-2005
343106117162202	North of Park Rd within Mojave Narrows Park	6.21-9.26	2009-2018
343004117153805	Northwest of Yucca Loma Rd and Fortuna Ln	5.51-19.35	2007-2018
342959117165701	South of east end of Coad Rd	50.57-59.19	1993-2008
334413117102901	Northeast of Hesperia Rd and Eureka St	107.2-165	1988-2014
343120117170301	East of Kemper Campbell Ranch Rd	0.9-3.76	1993-1994

The current depth to groundwater varies across the project site and was encountered at approximately 14 feet bgs at the shallowest point. The historical high groundwater level is approximately 1-foot bgs. Groundwater will be encountered during construction of the proposed project in excavations which extend deeper than 14 feet bgs. The depth to groundwater may vary laterally and over time due to precipitation, irrigation, groundwater pumping, water level in nearby lakes, or other factors.

5.3 Excavatability

The subsurface materials along the site are expected to be excavatable by conventional heavy-duty earth moving equipment.

The phrase “conventional heavy-duty excavation equipment” is intended to include commonly used equipment such as excavators, scrapers, and trenching machines. It does not include hydraulic hammers (“breakers”), jackhammers, blasting, or other specialized equipment and techniques used to excavate hard earth materials. Selection of an appropriate excavation equipment models should be done by an experienced earthwork contractor.

5.4 Subsurface Variations

Based on results of the subsurface exploration and our experience, some variations in the continuity and nature of subsurface conditions within the project site should be anticipated. Because of the uncertainties involved in the nature and depositional characteristics of the earth material, care should be exercised in interpolating or extrapolating subsurface conditions between or beyond the boring locations.

5.5 Flooding

Review of National Flood Insurance Rate Maps (FEMA, August 28, 2008) indicates that the project site is located within Flood Hazard Zone "X". Zone "X" is designated as "Areas determined to be outside the 0.2% chance floodplain". The approximate project boundaries are shown relative to nearby flood hazard zones on Figure No. 4, *Flood Hazard Map*. The project site is also located within a San Bernardino County dam inundation zone (San Bernardino County, 2010).

6.0 ENGINEERING GEOLOGY

The regional and local geology within the proposed project area are discussed below.

6.1 Regional Geology

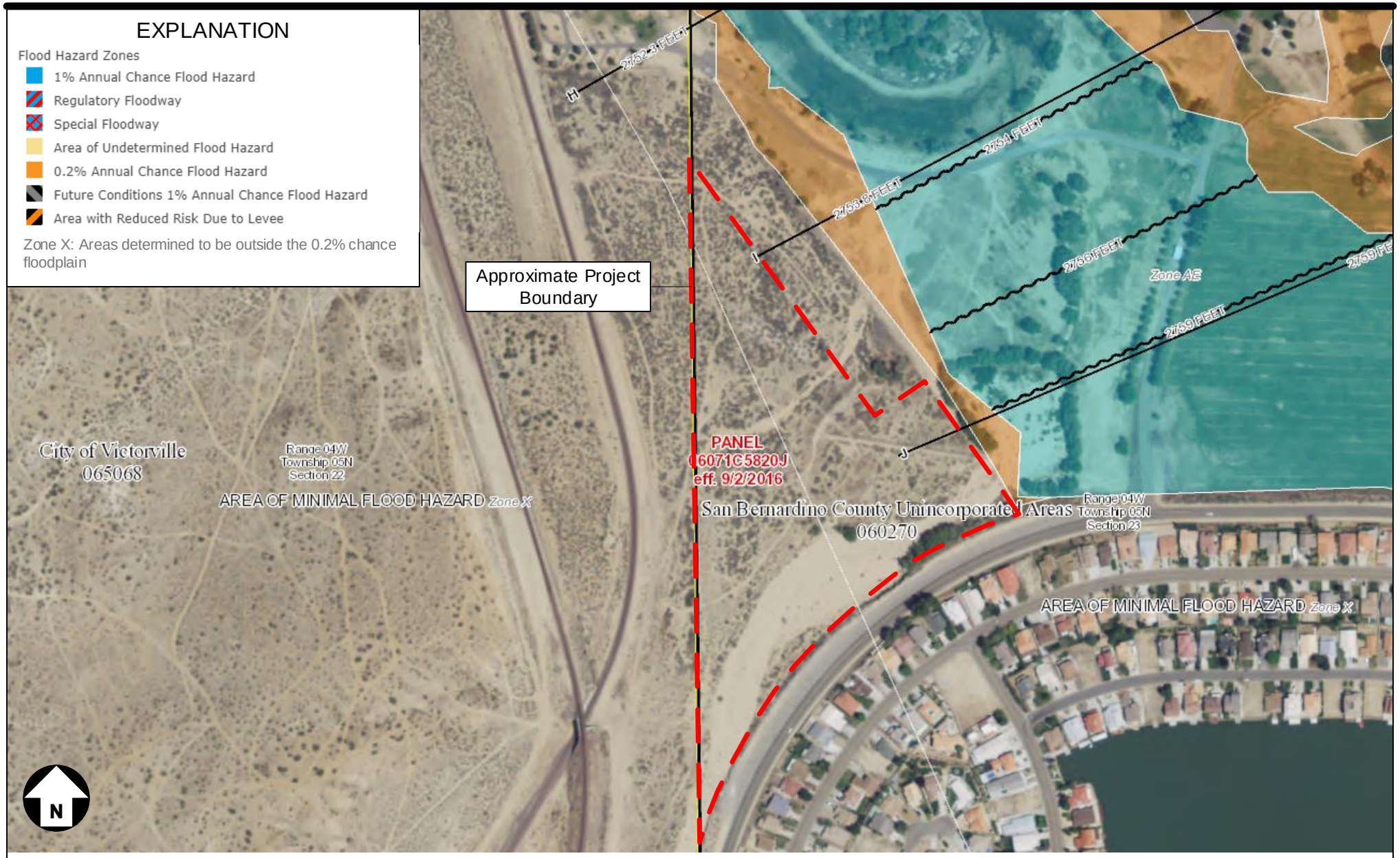
The project site is located in the Mojave Desert Geomorphic Province of Southern California. The Mojave Desert is a broad interior region of isolated mountain ranges separated by wide desert plains. The area is roughly triangular shaped and bounded by the Garlock Fault on the north, the San Andreas Fault on the southwest, and the Colorado River on the east. The drainages are primarily closed and terminate in playas within the valley floors.

The province is a seismically active region primarily characterized by a series of northwest-southeast-trending strike-slip faults and east-west trending secondary faults. The most prominent of the nearby fault zones include the Helendale, Lenwood, Landers, and San Andreas Fault Zones, all of which have been known to be active during Quaternary time.

Extension of the region has resulted in exposure of basement rocks dating to the Precambrian age, deposition of young Holocene-aged sedimentary basins, and eruptions of volcanic units.

6.2 Local Geology

The project site is located within an active stream channel that feeds into the Mojave River. Regional mapping (Diblee and Minch, 2008; Hernandez, Brown, and Cox, 2008)



Flood Hazard Map

Project: Mojave Narrows Medical Pavilion
Location: Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No.
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Converse Consultants

Figure No.
4

indicates that the site is generally underlain by young (Holocene-aged) alluvial deposits. These deposits primarily consist of unconsolidated to weakly consolidated gravel, sand, and silt. The geology in the vicinity of the project site is shown on Figure No. 5, *Project Site Geologic Map*.

7.0 FAULTING AND SEISMICITY

The approximate distance and seismic characteristics of nearby faults are discussed in the following subsections.

7.1 Faulting

The project site is not located within a currently designated San Bernardino County (2010) State of California Earthquake Fault Zone (CGS, 2007). There are no known active faults projecting toward or extending across the project site. The potential for surface rupture resulting from the movement of nearby major faults is not known with certainty but is considered low.

The proposed site is situated in a seismically active region. As is the case for most areas of Southern California, ground shaking resulting from earthquakes associated with nearby and more distant faults may occur at the project site. During the life of the project, seismic activity associated with active faults can be expected to generate moderate to strong ground shaking at the site.

The following tables contain a list of active and potentially active faults within one-hundred (100) kilometers of the subject site. The fault parameters and distances presented in the Table No. 5 are based on the output from EQFAULT (Blake, 2000), revised in accordance with CGS fault parameters (Cao et. al., 2003). The approximate site location with respect to regional faults is shown on Figure No. 6, *Southern California Regional Fault Map*.

Table No. 5, Seismic Characterisitcs of Nearby Active Faults

Fault Name	Closest Distance To The Site (Km)	Moment Magnitude (Mw)
North Frontal Fault Zone (West)	10.4 (16.8)	7.2
Helendale - S. Lockhardt	11.7 (18.8)	7.3
Cleghorn	15.4 (24.8)	6.5
San Andreas - San Bernardino	19.2 (30.9)	7.2
San Andreas - Southern	19.2 (30.9)	7.4
Cucamonga	19.6 (31.5)	6.9
San Andreas - Mojave	19.9 (32.1)	7.4
San Jacinto-San Bernardino	22.6 (36.3)	6.7

EXPLANATION

Af Artificial fill and disturbed areas (Holocene, historic) - Surfaces intensely modified by human construction and grading activities.

Qw Wash deposits (late Holocene) – Alluvium of active washes. Unconsolidated fine- to medium-grained sand, with some coarse sand and fine gravel, and silt.

Qa Modern alluvium of the Mojave River (Holocene) - Loose yellowish-gray sand, silt, and pebble-cobble gravel forming active channel and floodplain of the Mojave River. Consists predominately of moderately sorted coarse-grained to very coarse-grained sand.

Qf Modern alluvial fan deposits (Holocene) - Loose, unweathered yellowish-gray to light-yellowish-brown sand and gravel.

Qya Younger alluvium of Mojave River (Holocene) - Loose to weakly consolidated yellowish-gray to grayishorange sand, silt, and pebble-cobble gravel.

Qoam Alluvium of the ancestral Mojave River (Pleistocene and Pliocene) - Loose to well-consolidated yellowish-gray to light-yellowish-brown sand, silt, and pebble-cobble gravel.

0 0.25 0.5 Miles

N

Approximate Project Boundary

Map adapted from: CGS HERNANDEZ, J.L., BROWN, H.J., AND COX, B.F., 2008, Geologic map of the Victorville 7.5-minute quadrangle, San Bernardino County, California: A digital database: California Geological Survey, Preliminary Geologic Maps, scale 1:24,000.

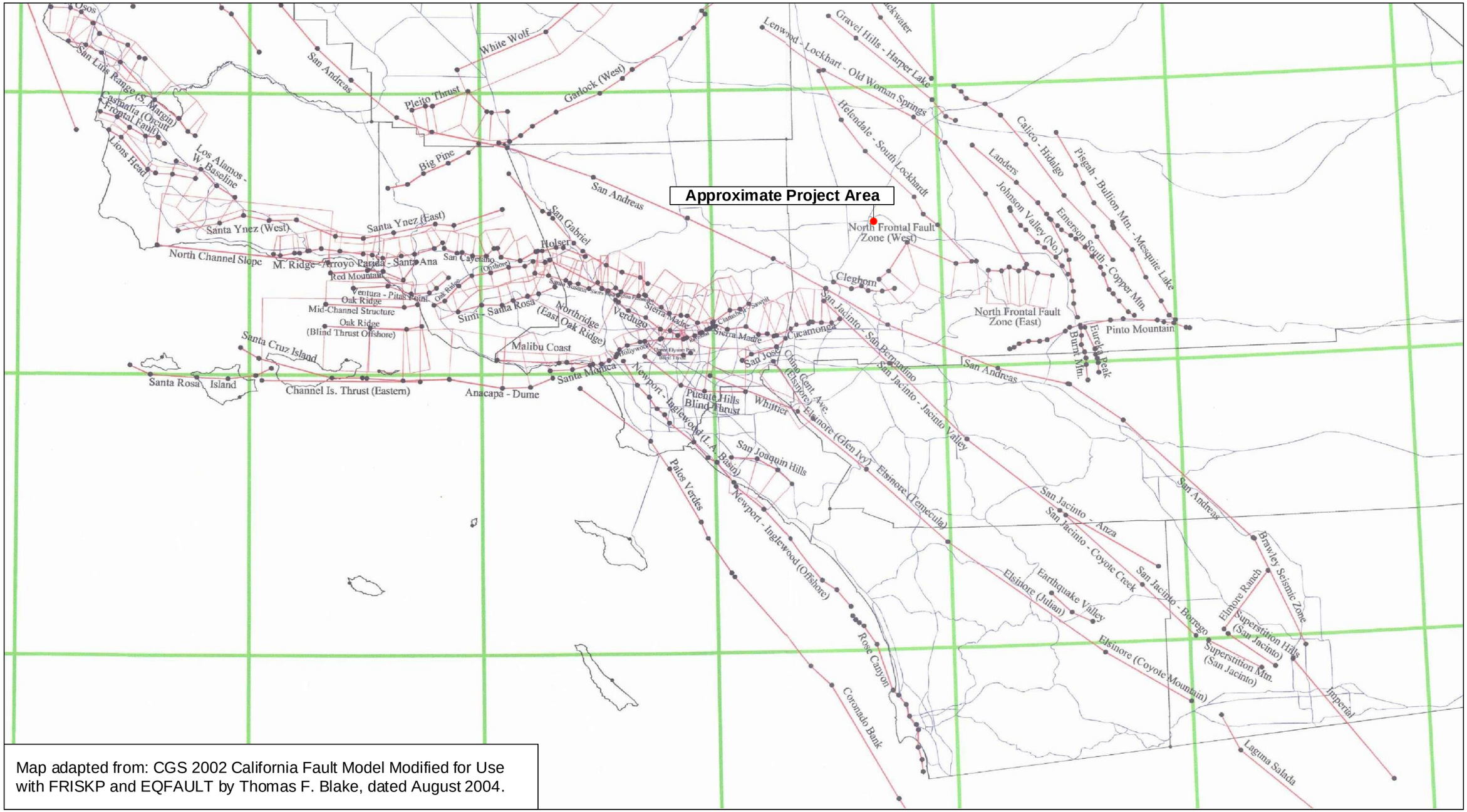
Project Site Geologic Map

Project: Mojave Narrows Medical Pavilion
Location: Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No.
17-81-247-01

Converse Consultants

Figure No.
5



Map adapted from: CGS 2002 California Fault Model Modified for Use with FRISKP and EQFAULT by Thomas F. Blake, dated August 2004.

Southern California Regional Fault Map

Project: Mojave Narrows Medical Pavilion
Location: Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No.
17-81-247-01

Converse Consultants

Figure No.
6

Fault Name	Closest Distance To The Site (Km)	Moment Magnitude (Mw)
Lenwood-Lockhart-Old Woman Sprgs	26.1 (42.0)	7.5
North Frontal Fault Zone (East)	30.4 (48.9)	6.7
Landers	31.3 (50.4)	7.3
Sierra Madre	31.5 (50.7)	7.2
Gravel Hills - Harper Lake	31.9 (51.3)	7.1
Johnson Valley (Northern)	33.4 (53.7)	6.7
San Jacinto-San Jacinto Valley	34.1 (54.9)	6.9
San Jose	36.0 (57.9)	6.4
Clamshell-Sawpit	37.4 (60.2)	6.5
Calico - Hidalgo	38.4 (61.8)	7.3
Blackwater	38.6 (62.2)	7.1
Emerson So. - Copper Mtn.	42.1 (67.8)	7.0
Chino-Central Ave. (Elsinore)	43.2 (69.5)	6.7
Pinto Mountain	44.4 (71.4)	7.2
Raymond	47.7 (76.8)	6.5
Elsinore-Glen Ivy	49.7 (80.0)	6.8
Whittier	49.7 (80.0)	6.8
Pisgah-Bullion Mtn.-Mesquite Lk	49.9 (80.3)	7.3
Verdugo	50.1 (80.7)	6.9
Elysian Park Thrust	50.6 (81.4)	6.7
Burnt Mtn.	56.4 (90.8)	6.5
Eureka Peak	56.9 (91.5)	6.4
San Jacinto-Anza	56.9 (91.6)	7.2
San Gabriel	58.7 (94.4)	7.2
Sierra Madre (San Fernando)	59.1 (95.1)	6.7
Elsinore-Temecula	60.0 (96.5)	6.8

7.2 CBC 2016 Seismic Design Parameters

Seismic design parameters based on the 2016 California Building Code and site coordinates 34.5084 N, -117.2769 W are provided below.

Table No. 6, CBC 2016 Seismic Parameters

Seismic Parameters	Values
Site Class	D
Mapped Short period (0.2-sec) Spectral Response Acceleration, S_s	1.489g
Mapped 1-second Spectral Response Acceleration, S_1	0.579g
Site Coefficient (from Table 1613.5.3(1)), F_a	1.0

Seismic Parameters	Values
Site Coefficient (from Table 1613.5.3(2)), F_v	1.5
MCE 0.2-sec period Spectral Response Acceleration, S_{Ms}	1.489g
MCE 1-second period Spectral Response Acceleration, S_{M1}	0.869g
Design Spectral Response Acceleration for short period, S_{ds}	0.993g
Design Spectral Response Acceleration for 1-second period, S_{d1}	0.579g
Maximum Peak Ground Acceleration, PGA_M	0.500g

7.3 Secondary Effects of Seismic Activity

Aside from generating damaging ground motion, a nearby seismic event may impact a project by ground surface fault rupture, soil liquefaction, inducing landslides, earthquake-induced flooding, lateral spreading, earthquake-induced flooding, seiches, and differential settlement and ground lurching. A site-specific discussion on each of the above secondary effects is provided below:

Ground Surface Fault Rupture: The site is not located within a currently designated State of California or San Bernardino County Earthquake Fault Zone (CGS, 2007; San Bernardino County, 2010a). Based on a review of existing geologic information, no known active fault zone crosses or projects toward the site. The potential for surface rupture resulting from the movement of the nearby major faults is not known with certainty but is considered very low.

***Dynamic Settlement (Liquefaction and Dry Seismic Settlement)*:** Liquefaction is defined as the phenomenon in which a soil mass within about the upper 50 feet of the ground surface suffers a substantial reduction in its shear strength, due the development of excess pore pressures. During earthquakes, excess pore pressures in saturated soil deposits may develop as a result of induced cyclic shear stresses, resulting in liquefaction.

Soil liquefaction occurs during or after strong ground shaking. There are several requirements for liquefaction to occur. They are as follows.

- Soils must be submerged.
- Soils must be loose to medium-dense.
- Ground motion must be intense.
- Duration of shaking must be sufficient for the soils to lose shear resistance.

The liquefaction potential in the project area has not yet been determined by San Bernardino County (San Bernardino County, 2010a). Due to the presence of shallow ground water and granular sediments, liquefaction will occur at the project site. For

current and historical groundwater conditions, liquefiable layers exist from 15 to 50 and 1 to 50 feet bgs, respectively.

Seismically-induced settlement occurs in unsaturated, unconsolidated, granular sediments during ground shaking associated with earthquakes.

The project has the potential for up to 3.20 inches of dynamic settlement in the area investigated. Detailed information is provided in the Section 10.6 *Settlement* and in the *Appendix C, Dynamic Settlement Analysis* of this report.

Landslides: Seismically induced landslides and slope failures are common occurrences during or soon after large earthquakes. The project site is not located within a designated zone of landslide susceptibility (San Bernardino County, 2010a). There are no significant slopes at the project site, therefore, the potential for seismically induced landslides affecting the proposed site is considered to be low.

Lateral Spreading: Seismically induced lateral spreading involves lateral movement of earth materials over a deeper layer which has liquified due to ground shaking. It differs from a slope failure in that ground failure involving a large movement does not occur due to the flatter slope of the initial ground surface. Lateral spreading is characterized by near-vertical cracks with predominantly horizontal movement of the soil mass involved over the liquefied soils. Based on the flat-nature of the proposed site configuration, lateral spreading is not considered a risk.

Earthquake-Induced Flooding: Dams or other water-retaining structures may fail as a result of large earthquakes, resulting in flooding. The project area is located within a San Bernardino County designated dam inundation zone (San Bernardino County, 2010b). There is a potential for flood waters to affect the project site if The Silverwood Lake and/or Mojave Forks Dam were to breach in the event of a large earthquake.

Tsunamis: Tsunamis are large waves generated by fault displacement or major ground movement. Based on the inland location of the site, tsunamis do not pose a hazard.

Seiches: Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Seiching within the nearby lakes could result in flooding of portions of the site during a large earthquake.

8.0 LABORATORY TEST RESULTS

Results of the various laboratory tests are presented in Appendix B, *Laboratory Testing Program,* except for the results of *in-situ* moisture and dry density tests which are presented on the Logs of Borings in Appendix A, *Field Exploration.* The results are also discussed below.

8.1 Physical Testing

The results of laboratory tests on samples obtained from each site is presented below.

- *In-situ* Moisture and Dry Density – Results of *in-situ* moisture and dry density tests performed in accordance with ASTM Standard D2216 are presented on the Logs of Borings in Appendix A, *Field Exploration.* Dry densities of upper 10 feet soils of the proposed site ranged from 95 to 123 pcf with moisture contents ranging from 1 to 10 percent. Results are presented in the log of borings in Appendix A, *Field Exploration.*
- R-Value – Two representative bulk samples were tested in accordance with Caltrans Test Method 301. The results of the R-value test were 29 and 30.
- Collapse Potential – Six relatively undisturbed representative samples collected from the upper 5 feet were tested in accordance with the ASTM Standard D5333 test method. The collapse potential was measured under a vertical stress of 2.0 kips per square foot (ksf). The test results showed collapse potential between 0.3 to 2.0 percent, indicating slight collapse potential.
- Grain Size Analysis – Five representative samples were tested to determine the relative grain size distribution in accordance with the ASTM Standard D422. The test results are graphically presented in Drawing No. B-1, *Grain Size Distribution Results.*
- Maximum Dry Density and Optimum Moisture Content – Results of four typical moisture-density relationships tested in accordance with ASTM D1557 are presented in Table B-2, *Maximum Dry Density Test Results* and in Drawing No. B-2, *Moisture-Density Relationship Results*, in Appendix B, *Laboratory Testing Program*. The laboratory maximum dry densities were ranged from 127.5 to 129.5 pounds per cubic foot (pcf) and the optimum moisture contents were varied from 4.5 to 7.0 percent.
- Direct Shear – Six direct shear tests were performed in accordance with ASTM Standard D3080 on relatively undisturbed ring samples. The results of the direct shear tests are presented in Drawings No. B-3 through B-8, *Direct Shear Test Results* in Appendix B, *Laboratory Testing Program*.
- Consolidation Test – Five consolidation tests were performed on relatively undisturbed samples of the site soil, in accordance to ASTM Standard D2435. The test results are shown on Drawings No. B-9 through B-13, *Consolidation Test Results,* in Appendix B, *Laboratory Testing Program.*

8.2 Chemical Testing - Corrosivity Evaluation

Four representative soil samples were tested to determine minimum electrical resistivity, pH, and chemical content, including soluble sulfate and chloride concentrations. The purpose of these tests was to determine the corrosion potential of site soils when placed in contact with common pipe materials. These tests were performed by EG Laboratory

in accordance with California Test Methods 643, 422, and 417. The test results presented in Appendix B, *Laboratory Testing Program* and summarized below.

- The pH measurements of the samples were ranged from 7.69 to 8.41.
- The soluble sulfate contents of the samples were ranged from 0.001 to 0.064 percent by weight.
- The chloride concentrations of the samples were ranged from 95 to 850 ppm.
- The minimum electrical resistivities of the samples when saturated were ranged from 310 to 8,500 ohm-cm.

9.0 EARTHWORK RECOMMENDATIONS

We anticipate that cut-and-fill grading techniques will be used during development of the site. Recommendations for site preparation and remedial grading and estimates of shrinkage and subsidence are provided in the following sections.

9.1 General

This section contains our general recommendations regarding earthwork and grading for the proposed improvements. These recommendations are based on the results of our field exploration, laboratory tests, our experience with similar projects, and data evaluation as presented in the preceding sections. These recommendations may require modification by the geotechnical consultant based on findings during the final investigation or observation of the actual field conditions during grading.

Prior to the start of construction, all underground existing utilities and appurtenances (if any) should be located at the project site. Such utilities should either be protected in-place or removed and replaced during construction as required by the project specifications. All excavations should be conducted in such a manner as not to cause loss of bearing and/or lateral support of existing structures or utilities.

All debris, surface vegetation, deleterious material, and surficial soils containing roots and perishable materials should be stripped and removed from the site. Deleterious material, including organics, concrete, and debris generated during excavation, should not be placed as fill.

The final bottom surfaces of all excavations should be observed and approved by the project geotechnical consultant prior to placing any fill. Based on these observations, localized areas may require remedial grading deeper than indicated herein. Therefore, some variations in the depth and lateral extent of excavation recommended in this report should be anticipated.

9.2 Over-Excavation/Removal

Based on our observation and testing of the subsurface soils, approximately the upper seven 5 to ten 7 feet of topsoil and alluvial deposits are not suitable for supporting structures or structural fill. Site grading should include removal, processing, and compaction of these unsuitable soils.

Actual removal depth should be based on the observation of the conditions encountered during grading. The upper 12 inches of all excavated surfaces should be scarified and moisture conditioned, if necessary, and compacted to at least 90 percent relative compaction as per ASTM Standard D1557 test method, prior to placing any fill and/or structures. Over-excavation for cut and/or fill areas is discussed below:

- The building pads in fill lots should be excavated a depth of at least 5 feet bgs. The bottom 12 inches should be scarified, moisture conditioned, over-excavated and compacted to a minimum depth of 12 inches.
- The building pads in cut lots with less than 2 feet of cut below existing grade should be over-excavated to a depth of at least 5 feet bgs or to competent bottom, whichever is greater. The over-excavated subgrade should be scarified, moisture conditioned and compacted to a minimum depth of 12 inches.
- The cut and/or fill transition lots should be over-excavated to provide at least 5 feet of compacted fill over the entire pad.

All areas to receive asphalt or concrete pavement should be overexcavated to a depth of 12 inches below finish grade. The overexcavation should extend at least 1 foot beyond the edge of pavement. In cut areas, 12 inches of the soils below the finish grade should be over-excavated and replaced as compacted fill. If the maximum difference of fill thickness between the cut and fill area exceeds 12 inches, then additional over-excavation and re-compaction should be conducted in the cut area to keep the fill thickness to 12 inches.

If isolated pockets of very soft, loose, or pumping subgrade are encountered, the overexcavation should be locally deepened, as needed, to expose undisturbed, firm, and unyielding soils.

9.3 Subgrade Stabilization

Groundwater was encountered at a depth of 14.1 feet bgs at its shallowest point. Any excavation for foundation or underground utilities which extend below 12 feet bgs will encounter soft subgrade soils. Excavations which extend below 14 feet bgs will encounter groundwater. Soft and unstable subgrade areas should be stabilized in order to provide the required support for the proposed structures. The stabilization method described below should be tested in a small area to determine the most effective procedures prior to application in a larger area.

Subgrade soils may be stabilized by wheel-rolling crushed rock into the soft surface to increase the density and resistance to displacement under loads. The rock should be spread and wheel-rolled into the soft soil in thin lifts. The subgrade stability should be evaluated after each lift of rock. If multiple lifts are required for stability, additional overexcavation may be necessary to compensate for the added volume of the rock.

9.4 Structural Backfill

Structural backfill should meet the criteria set in the following sections.

9.4.1 Backfill materials

No fill or base should be placed until excavations and/or natural ground preparation have been observed by the geotechnical consultant. The native soils encountered within the project site are generally considered suitable for re-use as compacted fill. Excavated soils should be processed, including cleaning roots and debris, removal of oversized particles, mixing, and moisture conditioning, before placing as compacted fill. On-site soils used as fill should meet the following criteria.

- No particles larger than 3 inches in largest dimension.
- Rocks larger than 1 inch should not be placed within the upper 12 inches of subgrade soils.
- Free of all organic matter, debris, or other deleterious material.
- Expansion index of 30 or less.
- Sand Equivalent greater than 15 (greater than 30 for pipe bedding).

Imported materials, if required, should meet the following criteria prior to being used as structural backfill (engineered fill).

- Predominantly granular
- No particles larger than 3 inches in largest dimension.
- Free of organic material, loam, trash, or other deleterious material.
- Expansion index of 30 or less.
- Contain less than 30 percent by weight retained in 3/4-inch sieve.
- Contain less than 40 percent fines (passing #200 sieve).

Any imported fill should be tested and approved by geotechnical representative prior to delivery to the site.

9.4.2 Structural Wall Backfill

Backfill behind any structural wall should be compacted using lightweight construction equipment to avoid overstressing the walls. Compaction of backfill adjacent to structural

walls can produce excessive lateral pressures. Improper types and locations of compaction equipment and/or compaction techniques may damage the walls. The use of heavy compaction equipment should not be permitted within a horizontal distance of 5 feet from the wall. Only handheld compactors should be permitted to perform compaction within the recommended five-foot zone. Loose soil, form work, and debris should be removed prior to backfilling.

9.5 Compacted Fill Placement

All surfaces to receive structural fills should be scarified to a depth of 6 inches. The soil should be moisture conditioned to within ±3 percent of optimum moisture content for coarse soils and 0 to 2 percent above optimum moisture content for fine soils. The scarified soils should be recompacted to at least 90 percent of the laboratory maximum dry density.

Fill soils should be thoroughly mixed and moisture conditioned to within ±3 percent of optimum moisture content for coarse soils and 0 to 2 percent above optimum moisture content for fine soils. Fill soils should be evenly spread in horizontal lifts not exceeding 8 inches in uncompacted thickness.

All fill placed at the site should be compacted to at least 90 percent of the laboratory maximum dry densities as determined by ASTM Standard D1557 test method, unless a higher compaction is specified herein. At least the upper 12 inches of subgrade soils underneath pavements intended to support vehicle loads should be scarified, moisture conditioned, and compacted to at least 95 percent of the laboratory maximum dry density.

Fill materials should not be placed, spread or compacted during unfavorable weather conditions. When site grading is interrupted by heavy rain, filling operations should not resume until the geotechnical consultant approves the moisture and density conditions of the previously placed fill.

9.6 Shrinkage and Subsidence

The volume of excavated and recompacted soils may be expected to increase or decrease as a result of grading. The shrinkage and/or bulkage would depend on, among other factors, the depth of cut and/or fill, and the grading method and equipment utilized. For preliminary estimation, bulking and shrinkage factors for various units of earth material at the site may be taken as presented below.

- The shrinkage factor (defined as a percentage of soil volume reduction when moisture conditioned and compacted to the average of 92 percent relative compaction) for the upper 5 feet of soils is estimated to range from 2 to 18 percent. An average value of 10 percent may be used for preliminary earthwork planning.
- Subsidence (defined as the settlement of native materials from the equipment load applied during grading) would depend on the construction methods including type of equipment utilized. For estimation purposes, ground subsidence may be taken as 0.1 feet.

Although these values are only approximate, they represent our best estimates of the factors to be used to calculate lost volume that may occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field-testing using the actual equipment and grading techniques be conducted.

9.7 Utility Trench Backfill

The following sections present earthwork recommendations for utility trench backfill, including subgrade preparation, pipe bedding, and trench zone backfill.

Open cuts adjacent to existing roadways and/or adjacent structures are not recommended within a 1:1 (horizontal:vertical) plane extending down and away from the roadway or structures perimeter. If open cuts are located within the 1:1 downward plane away from roadways and structure perimeters due to space limitations or existing utility/structure constraints, the following options are recommended.

Spoils from the trench excavation should not be stockpiled more than 6 feet in height or within a horizontal distance from the trench edge equal to the depth of the trench. Spoils should not be stockpiled behind the shoring, if any, within a horizontal distance equal to the depth of the trench, unless the shoring has been designed for such loads.

9.7.1 Pipeline Subgrade Preparation

The final subgrade surface should be level, firm, uniform, free of loose materials, and properly graded to provide uniform bearing and support to the entire section of the pipe placed on bedding material. Protruding oversize particles, larger than 3 inches in dimension, if any, should be removed from the trench bottom and replaced with compacted on-site materials.

Any loose, soft and/or unsuitable materials encountered at the pipe sub-grade should be removed and replaced with an adequate bedding material.

During the digging of depressions for proper sealing of the pipe joints, the pipe should rest on a prepared bottom for as near its full length as is practicable.

9.7.2 Pipe Bedding

Bedding is defined as the material supporting and surrounding the pipe to 1 foot above the pipe. To provide uniform and firm support for the pipe, compacted granular materials such as clean sand, gravel or ¾-inch crushed aggregate, or crushed rock may be used as pipe bedding material. Typically, soils with sand equivalent value of 30 or more are used as pipe bedding material. Sand equivalent of the on-site soils should be tested before using as bedding material.

The type and thickness of the granular bedding placed underneath and around the pipe, if any, should be selected by the pipe designer. The load on the rigid pipes and deflection of flexible pipes and, hence, the pipe design, depends on the type and the amount of bedding placed underneath and around the pipe.

Bedding materials should be vibrated in-place to achieve compaction. Care should be taken to densify the bedding material below the springline of the pipe. Prior to placing the pipe bedding material, the pipe subgrade should be uniform and properly graded to provide uniform bearing and support to the entire section of the pipe placed on bedding material. During the digging of depressions for proper sealing of the pipe joints, the pipe should rest on a prepared bottom for as near its full length as is practicable.

Migration of fines from the surrounding native and/or fill soils must be considered in selecting the gradation of any imported bedding material. We recommend that the pipe bedding material should satisfy the following criteria:

$$D_{15} < 2.5 \text{ mm and } D_{50} < 19.0 \text{ mm}$$

where D_{15} and D_{50} represent particle sizes of the bedding material corresponding to 15 percent and 50 percent passing by weight, respectively.

9.7.3 Trench Zone Backfill

The trench zone is defined as the portion of the trench above the pipe bedding extending up to the final grade level of the trench surface. Excavated site soils free of oversize particles and deleterious matter may be used to backfill the trench zone. Detailed trench backfill recommendations are provided below.

- Trench excavations to receive backfill should be free of trash, debris or other unsatisfactory materials at the time of backfill placement.
- Trench zone backfill should be compacted to at least 90 percent of the laboratory maximum dry density as per ASTM D1557 test method. At least the upper 1 foot of trench backfill underlying pavement should be compacted to at least 95 percent of the laboratory maximum dry density as per ASTM D1557 test method.

- Particles larger than 1 inch should not be placed within 12 inches of the pavement subgrade. No more than 30 percent of the backfill volume should be larger than ¾-inch in the largest dimension. Gravel should be well mixed with finer soil. Rocks larger than 3 inches in the largest dimension should not be placed as trench backfill.
- Trench backfill should be compacted by mechanical methods, such as sheepsfoot, vibrating or pneumatic rollers or mechanical tampers to achieve the density specified herein. The backfill materials should be brought to within ± 3 percent of optimum moisture content for coarse-grained soil, and between optimum and 2 percent above optimum for fine-grained soil, then placed in horizontal layers. The thickness of uncompacted layers should not exceed 8 inches. Each layer should be evenly spread, moistened or dried as necessary, and then tamped or rolled until the specified density has been achieved.
- The contractor should select the equipment and processes to be used to achieve the specified density without damage to adjacent ground, structures, utilities and completed work.
- The field density of the compacted soil should be measured by the ASTM D1556 (Sand Cone) or ASTM D6938 (Nuclear Gauge) or equivalent.
- Observations and field tests should be performed by the project soils consultant to confirm that the required degree of compaction has been obtained. Where compaction is less than that specified, additional compactive effort should be made with adjustment of the moisture content as necessary, until the specified compaction is obtained.
- It should be the responsibility of the contractor to maintain safe working conditions during all phases of construction.

Trench backfill should not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations should not resume until field tests by the project's geotechnical consultant indicate that the moisture content and density of the fill are in compliance with project specifications.

9.8 Site Drainage

Adequate positive drainage should be provided away from the structures and excavation areas to prevent ponding and to reduce percolation of water into the foundation soils. The buildings pad should have a gradient of at least 2 percent towards drainage facilities. The drainage gradient should be 1 percent for paved areas and 2 percent in landscaped areas. Surface drainage should be directed to suitable non-erosive devices.

10.0 DESIGN RECOMMENDATIONS

Design recommendations are presented in the following sections.

10.1 General Evaluation

The various design recommendations provided in this section are based on the assumptions that in preparing the site, the above earthwork recommendations will be implemented.

10.2 Shallow Foundation Design Parameters

The proposed structures may be supported on continuous spread footing and/or isolated spread footings. The design of the shallow foundations should be based on the recommended parameters presented in the table below.

Table No. 7, Recommended Foundation Parameters

Parameter	Value
Minimum continuous spread footing width	18 inches
Minimum isolated footing width	18 inches
Minimum continuous or isolated footing depth of embedment below lowest adjacent grade	18 inches
Allowable net bearing capacity	2,200 psf

The footing dimensions and reinforcement should be based on structural design. The allowable bearing capacity can be increased by overburden pressure of 150 psf for each foot of width or depth of footing embedment to the maximum of 3,500 psf for other structures.

The net allowable bearing values indicated above are for the dead loads and frequently applied live loads and are obtained by applying a factor of safety of 3.0 to the net ultimate bearing capacity. If normal code requirements are applied for design, the above vertical bearing value may be increased by 33 percent for short duration loadings, which will include loadings induced by wind or seismic forces.

10.3 Mat Foundations

The proposed structures may be supported on mat foundations. The modulus of subgrade reaction (k) for design of flexible mat foundations was estimated from the available soil compressibility data and published charts. For design of flexible mat foundations, the following equation may be used.

$$k = k_1[(B+1)/2B]^2$$

Where:
k= vertical modulus of subgrade reaction for mat foundation, kips per cubic feet
k_1= 200 kcf, normalized modulus of subgrade reaction for 1 square foot footing

B= foundation width, feet
E= 1.5 ksi, Young's Modulus
ν = 0.35, Poisson's Ratio

The mat foundations dimensions and reinforcement should be based on structural design.

10.4 Lateral Earth Pressures and Resistance to Lateral Loads

In the following subsections, the lateral earth pressures and resistance to lateral loads are estimated by using on-site native soils strength parameters obtained from laboratory testing.

10.4.1 Active Earth Pressures

The active earth pressure behind any buried wall or foundation depends primarily on the allowable wall movement, type of backfill materials, backfill slopes, wall or foundation inclination, surcharges, and any hydrostatic pressures. The recommended lateral earth pressures for level backfill profile for the site are presented in the following table.

Table No. 8, Active and At-Rest Earth Pressures

Loading Conditions	Lateral Earth Pressure (psf/ft depth)
Active earth conditions (wall is free to deflect at least 0.001 radian)	42
At-rest (wall is restrained)	62

These pressures assume a level ground surface behind the walls for a distance greater than the walls height, no surcharge and no hydrostatic pressure. If water pressure is allowed to build up behind the walls, the active pressures should be reduced by 50 percent and added to a full hydrostatic pressure to compute the design pressures against the walls.

10.4.2 Passive Earth Pressure

Resistance to lateral loads can be assumed to be provided by a combination of friction acting at the base of foundations and by passive earth pressure. A coefficient of friction of 0.35 between concrete and soil may be used with the dead load forces. An allowable passive earth pressure of 250 psf per foot of depth may be used for the sides of footings poured against recompacted soils. A factor of safety of 1.5 was applied in calculating passive earth pressure. The maximum value of the passive earth pressure should be limited to 2,200 psf for compacted fill.

Vertical and lateral bearing values indicated above are for the total dead loads and frequently applied live loads. If normal code requirements are applied for design, the

above vertical bearing and lateral resistance values may be increased by 33 percent for short duration loading, which will include the effect of wind or seismic forces.

Due to the low overburden stress of the soil at shallow depth, the upper 1 foot of passive resistance should be neglected unless the soil is confined by pavement or slab.

10.4.3 Seismic Earth Pressure

The equivalent fluid seismic pressure was calculated using Seed and Whitman (1970) procedure. The seismic force applied to the wall is based on a horizontal seismic acceleration coefficient equal to one-third of the peak ground acceleration in accordance with Caltrans Bridge Design Specifications (Caltrans, 2004). An equivalent fluid seismic pressure of 26H pcf may be assumed under active loading conditions at the top of an inverted triangle pressure distribution where H is the height of the backfill behind the wall. Under at-rest conditions, the active equivalent fluid seismic pressure should be increased by 30 percent.

10.5 Soil Expansion

Shallow foundations should be designed to accommodate the anticipated soil expansion. During grading, the site soils will likely be moved and blended, and additional soil may be imported. The expansion potential of the finish-grade soils should be tested at the completion of grading. If the expansion potential of finish grade is very low (expansion index <20), no mitigation is necessary. If low, medium or high expansion potential is observed, the following mitigation could be utilized to reduce the potential for uplift and distress due to soil expansion.

- Moisture variation within the site soils must be minimized during and after construction.
- Fill should be placed at 2 to 3 percent over optimum moisture content.
- Irrigation should be minimized and the use of drought tolerant landscaping should be considered.
- Use of v-ditches or other surface drainage should be used to avoid ponding.
- Controlled pre-wetting of the soil before placement of the foundation.
- A structural slab (extra thickness and reinforcement) could be used to mitigate soil expansion.
- Calcium treatments (lime with cement and fly ash) could be used to reduce expansion potential.
- The upper several feet of expansive soil be removed and replaced with imported non-expansive material and compacted to prepare a stable layer of soil at the building footprint.
- Other mitigation options such as alternative soil stabilizers, perimeter apron, and French drains and cutoff walls also could be utilized to minimize soil expansion.

During construction, the contractor should determine effective methods to minimize moisture variations.

10.6 Settlement

The total settlement of shallow footings from static structural loads and short-term settlement of properly compacted fill is anticipated to be 1 inch or less. The differential settlement resulting from static loads is anticipated to be 0.5 inches or less over a horizontal distance of 40 feet.

Our analysis of the potential dynamic settlement is presented in Appendix C, *Dynamic Settlement Analysis*. We estimate that the proposed site has the potential for up to 3.2 inches of dynamic settlement during a large earthquake. We recommend that the planned structures be designed conservatively in anticipation of dynamic differential settlement of up to 0.5 inches in 40 horizontal feet.

The static and dynamic settlement estimates should not be combined for design purposes. The maximum combined static and dynamic settlement is not anticipated to exceed the maximum anticipated dynamic settlement.

10.7 Soil Corrosivity

The results of chemical testing of four representative soil samples from the site were evaluated for corrosivity with respect to common construction materials such as concrete and steel. The test results are presented in Appendix B, *Laboratory Testing Program* and design recommendations pertaining to soil corrosivity are presented below.

The sulfate contents of the sampled soils correspond to American Concrete Institute (ACI) exposure category S0 for these sulfate concentrations (ACI 318-14, Table 19.3.1.1). No concrete type restrictions are specified for exposure category S0 (ACI 318-14, Table 19.3.2.1). A minimum compressive strength of 2,500 psi is recommended.

We anticipate that concrete structures such as footings, slabs, and flatwork will be exposed to moisture from precipitation and irrigation. Based on the site locations and the results of chloride testing of the site soils, we do not anticipate that concrete structures will be exposed to external sources of chlorides, such as deicing chemicals, salt, brackish water, or seawater. ACI specifies exposure category C1 where concrete is exposed to moisture, but not to external sources of chlorides (ACI 318-14, Table 19.3.1.1). ACI provides concrete design recommendations in ACI 318-14, Table 19.3.2.1, including a compressive strength of at least 2,500 psi and a maximum chloride content of 0.3 percent.

The measured value of the minimum electrical resistivity of the samples when saturated were 310, 5,000, 6,900 and 8,500 Ohm-cm for the site. This indicates that the soils tested of the proposed site are moderately corrosive to ferrous metals in contact with the soil except at location boring BH-09 where soils with severe corrosivity (electrical resistivity 310) to ferrous metal were observed (Romanoff, 1957). According to EG Labs, there may be a possibility of the presence of oil at boring BH-09 which causes low electrical resistivity. Converse does not practice in the area of corrosion consulting. A qualified corrosion consultant should provide appropriate corrosion mitigation measures for any ferrous metals in contact with the site and site soils.

10.8 Asphalt Concrete Pavement

Two laboratory tests were performed to determine R-value. The observed R-values of the site soils were 29 and 30. Preliminary asphalt concrete pavement sections corresponding to Traffic Indices (TIs) ranging from 5 to 8 and R -value of 29 are presented in the table below.

Table No. 9, Recommended Preliminary Pavement Sections

	Traffic Index (TI)	Pavement Section	
		Asphalt Concrete (inches)	Aggregate Base (inches)
R-value 29	5	3.5	5.0
	6	4.0	7.0
	7	4.5	9.0
	8	5.5	10.5

At or near the completion of grading, subsurface samples should be tested to evaluate the actual subgrade R-value for final pavement design.

Prior to placement of aggregate base, at least the upper 12 inches of subgrade soils should be scarified, moisture-conditioned if necessary, and recompacted to at least 95 percent of the laboratory maximum dry density as defined by ASTM Standard D1557 test method.

Base materials should conform with Section 200-2.2,"*Crushed Aggregate Base*," of the current Standard Specifications for Public Works Construction (SSPWC; Public Works Standards, 2015) and should be placed in accordance with Section 301.2 of the SSPWC.

Asphaltic concrete materials should conform to Section 203 of the SSPWC and should be placed in accordance with Section 302.5 of the SSPWC.

11.0 CONSTRUCTION RECOMMENDATIONS

Temporary sloped excavation and shoring design recommendations are presented in the following sections.

11.1 General

Both sloped and vertical braced excavations can be considered for the foundations at the proposed project site and pipelines associated with it. Recommendations pertaining to temporary excavations are presented in this section.

Depending on the sequence of construction, excavations may be required near existing streets or structures, which may require vertical side wall excavation. Where the side of the excavation is a vertical cut, it should be adequately supported by temporary shoring to protect workers and any adjacent structures.

All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met. The soils exposed in cuts should be observed during excavation by the geotechnical consultant and the competent person designated by the contractor. If potentially unstable soil conditions are encountered, modifications of slope ratios for temporary cuts may be required.

11.2 Temporary Sloped Excavations

Temporary open-cut trenches may be constructed with side slopes as recommended in the following table. Temporary cuts encountering soft and wet fine-grained soils; dry loose, cohesionless soils or loose fill from trench backfill may have to be constructed at a flatter gradient than presented below.

Table No. 10, Slope Ratios for Temporary Excavations

Soil Type	Depth of Excavation (ft)	Recommended Maximum Slope (Horizontal:Vertical)[1]
Silty Sand (SM), Clayey Sand (SC) and Sandy Clay (CL)	0-4	Vertical
	4-10	1:1
Sand (SP) and Sand with Silt (SP-SM)	0-4	1:1
	4-10	1.5:1

[1] Slope ratio assumed to be uniform from top to toe of slope.

For steeper temporary construction slopes or deeper excavations, or unstable soil encountered during the excavation, shoring or trenches should be provided by the contractor to protect the workers in the excavation. Design recommendations for temporary shoring can be provided if necessary.

Surfaces exposed in slope excavations should be kept moist but not saturated to retard raveling and sloughing during construction. Adequate provisions should be made to protect the slopes from erosion during periods of rainfall. Surcharge loads, including construction materials, should not be placed within 5 feet of the unsupported slope edge. Stockpiled soils with a height higher than 6 feet will require greater distance from trench edges.

12.0 FUTURE GEOTECHNICAL INVESTIGATION

According to CGS Note 48, one boring should be conducted per 5000 square feet of building footprint. Based on the total building footprint of the project, a total of 38 borings is required to meet CGS Note 48 requirements. As a part of preliminary geotechnical investigation, a total of 27 borings were drilled at the time of field investigation. In addition, site specific ground motion analysis (if applicable) and slope stability analysis (if applicable) will be required based on CGS Note 48. Hence, future geotechnical investigation is necessary to meet CGS Note 48 requirements and to get regulatory approval.

13.0 GEOTECHNICAL SERVICES DURING CONSTRUCTION

The project geotechnical consultant should review plans and specifications as the project design progresses. Such review is necessary to identify design elements, assumptions, or new conditions which require revisions or additions to our geotechnical recommendations.

The project geotechnical consultant should be present to observe conditions during construction. Geotechnical observation and testing should be performed as needed to verify compliance with project specifications. Additional geotechnical recommendations may be required based on subsurface conditions encountered during construction.

14.0 CLOSURE

This report is prepared for the project described herein and is intended for use solely by Creative Adaptation, Inc. and their authorized agents, to assist in the design and construction of the proposed project. Our findings and recommendations were obtained in accordance with generally accepted professional principles practiced in geotechnical engineering. We make no other warranty, either expressed or implied.

Converse Consultants is not responsible or liable for any claims or damages associated with interpretation of available information provided to others. Site exploration identifies actual soil conditions only at those points where samples are taken, when they are taken. Data derived through sampling and laboratory testing is extrapolated by Converse employees who render an opinion about the overall soil conditions. Actual

conditions in areas not sampled may differ. In the event that changes to the project occur, or additional, relevant information about the project is brought to our attention, the recommendations contained in this report may not be valid unless these changes and additional relevant information are reviewed and the recommendations of this report are modified or verified in writing. In addition, the recommendations can only be finalized by observing actual subsurface conditions revealed during construction. Converse cannot be held responsible for misinterpretation or changes to our recommendations made by others during construction.

As the project evolves, continued consultation and construction monitoring by a qualified geotechnical consultant should be considered an extension of geotechnical investigation services performed to date. The geotechnical consultant should review plans and specifications to verify that the recommendations presented herein have been appropriately interpreted, and that the design assumptions used in this report are valid. Where significant design changes occur, Converse may be required to augment or modify the recommendations presented herein. Subsurface conditions may differ in some locations from those encountered in the explorations, and may require additional analyses and, possibly, modified recommendations.

Design recommendations given in this report are based on the assumption that the recommendations contained in this report are implemented. Additional consultation may be prudent to interpret Converse's findings for contractors, or to possibly refine these recommendations based upon the review of the actual site conditions encountered during construction. If the scope of the project changes, if project completion is to be delayed, or if the report is to be used for another purpose, this office should be consulted.

15.0 REFERENCES

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Appendix A

Field Exploration

APPENDIX A

FIELD EXPLORATION

Our field investigation included a subsurface exploration program consisting of drilling soil borings. The borings were located in the field using approximate distances from local streets and landmarks as a guide. The indicated boring locations should be considered accurate only to the degree implied by the method used to identify them in the field.

Twenty-seven exploratory borings (BH-01 through BH-27) were drilled between December 6 and 12, 2017 at the proposed site. The borings were advanced to maximum planned depths of 6.5, 16.5, 21.5 and 51.5 feet bgs.

The borings were advanced using a track-mounted drill rig equipped with 8-inch diameter hollow-stem augers for soils sampling. Encountered materials were continuously logged by a Converse geologist and classified in the field by visual classification in accordance with the Unified Soil Classification System. Where appropriate, the field descriptions and classifications have been modified to reflect laboratory test results.

Relatively undisturbed samples were obtained using California Modified Samplers (2.4 inches inside diameter and 3.0 inches outside diameter) lined with thin sample rings. The steel ring sampler was driven into the bottom of the borehole with successive drops of a 140-pound driving weight falling 30 inches. Blow counts at each sample interval are presented on the boring logs. Samples were retained in brass rings (2.4 inches inside diameter and 1.0 inch in height) and carefully sealed in waterproof plastic containers for shipment to the Converse laboratory. Bulk samples of typical soil types were also obtained.

Standard Penetration Testing (SPT) was also performed in accordance with the ASTM Standard D1586 test method in borings BH-08, BH-12, BH-20, and BH-23 at depths of 20, 30, 40, and 50 feet bgs using a standard (1.4 inches inside diameter and 2.0 inches outside diameter) split-barrel sampler. The mechanically driven hammer for the SPT sampler was 140 pounds, falling 30 inches for each blow. The recorded blow counts for every 6 inches for a total of 1.5 feet of sampler penetration are shown on the Logs of Borings.

The exact depths at which material changes occur cannot always be established accurately. Unless a more precise depth can be established by other means, changes in material conditions that occur between drive samples are indicated on the logs at the top of the next drive sample.

Following the completion of logging and sampling, the borings were backfilled with soil cuttings and tamped. Since, it is not possible to adequately compact the soils inside the borings, there is a possibility that the surface may settle over time. If construction is delayed, we recommend the owner monitor the boring locations and backfill any depressions that might occur or provide protection around the boring locations to prevent trip and fall injuries from occurring near the area of any potential settlement.

For a key to soil symbols and terminology used in the boring logs, refer to Drawing No. A-1, *Unified Soil Classification and Key to Boring Log Symbols*. For logs of borings, see Drawings No. A-2 through A-28, *Logs of Borings*.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE)	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS (MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE)	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE)	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING LOG SYMBOLS

SAMPLE TYPE

STANDARD PENETRATION TEST
Split barrel sampler in accordance with ASTM D-1586-84 Standard Test Method

DRIVE SAMPLE 2.42" I.D. sampler (CMS).

DRIVE SAMPLE No recovery

BULK SAMPLE

GROUNDWATER WHILE DRILLING

GROUNDWATER AFTER DRILLING

LABORATORY TESTING ABBREVIATIONS			
TEST TYPE (Results shown in Appendix B)		STRENGTH	
		Pocket Penetrometer	p
		Direct Shear	ds
		Direct Shear (single point)	ds*
		Unconfined Compression	uc
CLASSIFICATION		Triaxial Compression	tx
Plasticity	pi	Vane Shear	vs
Grain Size Analysis	ma	Consolidation	c
Passing No. 200 Sieve	wa	Collapse Test	col
Sand Equivalent	se	Resistance (R) Value	r
Expansion Index	ei	Chemical Analysis	ca
Compaction Curve	max	Electrical Resistivity	er
Hydrometer	h	Permeability	perm
Disturb	Dist.	Soil Cement	sc

Apparant Density	Very Loose	Loose	Medium	Dense	Very Dense
SPT (N)	< 4	4 - 11	11 - 30	31 - 50	> 50
CA Sampler	< 5	5 - 12	13 - 35	36 - 60	> 60
Relative Density (%)	< 20	20 - 40	40 - 60	60 - 80	> 80

Consistency	Very Soft	Soft	Medium	Stiff	Very Stiff	Hard
SPT (N)	< 2	2-4	5-8	9-15	16-30	> 30
CA Sampler	< 3	3-6	7-12	13-25	26-50	> 50

UNIFIED SOIL CLASSIFICATION AND KEY TO BORING LOG SYMBOLS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaption, Inc.

Project No.
17-81-247-01

Drawing No.
A-1

Project ID: 17-81-247-01.GPJ; Template: KEY

Log of Boring No. BH-01

Dates Drilled: 12/12/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2764 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SILTY SAND (SM):** fine to medium-grained, light brown.						
5		**SAND (SP):** fine to coarse-grained, brown.	■		9/13/15	2	106	
10		- gravel up to 0.5" in largest dimension	■	▨	10/14/14	2	106	max
15		**SANDY CLAY (CL):** fine to medium-grained sand, brown.	■		5/9/10	21	99	
		End of Boring at 16.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/12/17.						

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Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-2

Log of Boring No. BH-02

Dates Drilled: 12/12/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2768 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SAND (SP):** fine to medium-grained, light brown.	■		8/13/19	1	116	
5			■		10/12/12	4	109	col
		End of Boring at 6.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/12/17.						

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Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-3

Log of Boring No. BH-03

Dates Drilled: 12/12/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2768 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM: **SAND (SP):** fine to medium-grained, light brown.	■		6/10/11	3	116	
5			■		7/15/18	3	112	
10			■	▨	30/39/40	2	111	
15		- brown	■		9/12/13	4	110	
		End of Boring at 16.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/12/17.						

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Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-4

Log of Boring No. BH-04

Dates Drilled: 12/12/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2771 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM: **SILTY SAND (SM):** fine to medium-grained, light brown.						
5		**SAND (SP):** fine to coarse-grained, gravel up to 2" in largest dimension, brown.	■		9/12/14	3	112	
10			■	▨	13/22/30	2	121	
15			■		15/28/39	4	116	
		End of Boring at 16.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/12/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-5

Log of Boring No. BH-05

Dates Drilled: 12/12/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2766 Depth to Water (ft): 20.5

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SAND (SP):** fine to medium-grained, light brown.	■		11/16/19	4	112	
5			■		10/13/13	4	105	ds
10			■		8/8/10	1	93	
15		**CLAYEY SAND (SC):** fine to coarse-grained, reddish-brown.	■		8/18/18	14	108	c
20		▽	■		5/6/19	15	124	
		End of Boring at 21.5 feet bgs. Groundwater encountered at 20.5 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/12/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-6

Log of Boring No. BH-06

Dates Drilled: 12/12/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2763 Depth to Water (ft): 17.8

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, gravel up to 1" in largest dimension, light brown.						ca, er, ma
5		**SAND (SP):** fine to coarse-grained, brown.			8/10/11	1	95	
10		**SILTY SAND (SM):** fine to coarse-grained, gravel up to 0.5" in largest dimension, reddish-brown.			11/16/18	8	111	col
15		**SAND (SP):** fine to medium-grained, brown.			4/5/5	2	95	
20		**CLAYEY SAND (SC):** fine to coarse-grained, brown.			7/14/14	14	112	
		End of Boring at 21.5 feet bgs. Groundwater encountered at 17.8 bgs. Borehole backfilled with soil cuttings and tamped on 12/12/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-7

Log of Boring No. BH-07

Dates Drilled: 12/12/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2763 Depth to Water (ft): 18

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SAND (SP):** fine to coarse-grained, light brown.						
5			■		8/15/18	2	103	
			■		10/17/18	2	110	
10			■		8/13/15	2	110	
15		**SILTY SAND (SM):** fine to medium-grained, reddish-brown.	■		11/15/17	6	108	
20			■		16/25/26	14	117	
		End of Boring at 21.5 feet bgs. Groundwater encountered at 18 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/12/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-8

Log of Boring No. BH-08

Dates Drilled: 12/12/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2765 Depth to Water (ft): 20.2

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, gravel up to 0.5" in largest dimension, light brown.	■	▨	8/12/13	6	98	ma
5		**SAND (SP):** fine to medium-grained, brown.	■		6/12/13	3	113	ds
			■		22/35/44	3	118	c
10			■		16/24/27	2	115	
15			■		11/18/23	2	115	
20		▽	⊠		8/10/10			
25		**SILTY SAND (SM):** fine to medium-grained, gravel up to 0.5" in largest dimension, brown.	■		17/51-6"	11	125	
30			⊠		7/10/6			

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **A-9a**

Log of Boring No. BH-08

Dates Drilled: 12/12/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2765 Depth to Water (ft): 20.2

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM **SILTY SAND (SM):** fine to medium-grained, grayish-brown.	■		10/29/50-3.5"	12	118	
40			☒		17/26/50-4.5"			
45			■		27/50-2"	9	126	
50			☒		10/14/19			
		End of Boring at 51.5 feet bgs. Groundwater encountered at 20.2 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/12/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
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For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-9b

Log of Boring No. BH-09

Dates Drilled: 12/11/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2766 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, light brown.	■		9/11/15	8	112	
5		- fine to medium-grained, brown	■	▨	4/5/10	10	101	ca, er
10			■		5/5/8	10	101	
15		- gravel up to 1" in largest dimension	■		9/9/10	6	111	
20		- brown	■		13/24/31	9	121	
		End of Boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/11/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
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Project No. 17-81-247-01

Drawing No. A-10

Log of Boring No. BH-10

Dates Drilled: 12/11/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2767 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SAND (SP):** fine to medium-grained, light brown.						
5			■		9/14/11	3	115	
10			■		8/16/19	2	119	
15		- gravel up to 1" in largets dimension	■		10/17/24	1	123	
20		**SILTY SAND (SM):** fine to coarse-grained, reddish-brown.	■		18/26/30	6	116	
		End of Boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/11/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
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Project No. 17-81-247-01

Drawing No. A-11

Log of Boring No. BH-11

Dates Drilled: 12/11/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2768 Depth to Water (ft): 18.8

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, gravel up to 1" in largest dimension, light brown.		■				
5		**SILTY SAND (SM):** fine to coarse-grained, brown.	■		7/10/16	4	123	col
10			■		14/24/24	2	120	
15			■		12/17/20	1	112	
20		**CLAYEY SAND (SC):** fine to coarse-grained, brown.	■		10/16/21	13	117	
		End of Boring at 21.5 feet bgs. Groundwater encountered at 18.8 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/11/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
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Project No. 17-81-247-01

Drawing No. A-12

Log of Boring No. BH-12

Dates Drilled: 12/11/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2762 Depth to Water (ft): 16.7

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM: **SILTY SAND (SM):** fine to medium-grained, brown.		■				
5			■		5/8/15	10	105	
10		**SAND (SP):** fine to coarse-grained, gravel up to 0.5" in largest dimension, reddish-brown.	■		7/16/21	1	115	ds
15		**SILTY SAND (SM):** fine to coarse-grained, brown.	■		15/24/25	12	105	
20			⊠		12/14/12			
25		**CLAYEY SAND (SC):** fine to coarse-grained, gravel up to 1.5" in largest dimension, brown.	■		5/17/40	15	113	
30			⊠		5/10/33			

Converse Consultants

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Project No. 17-81-247-01

Drawing No. A-13a

Log of Boring No. BH-12

Dates Drilled: 12/11/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2762 Depth to Water (ft): 16.7

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, gravel up to 2" in largest dimension, brown.	■		41/50-3"	7	130	
40			☒		5/8/18			
45		**SANDY CLAY (CL):** fine to coarse-grained sand, brown.	■		15/28/50	22	105	
50			☒		10/15/20			
		End of Boring at 51.5 feet bgs. Groundwater encountered at 16.7 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/11/17.						

Converse Consultants

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Project No. 17-81-247-01

Drawing No. A-13b

Log of Boring No. BH-13

Dates Drilled: 12/6/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2767 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SAND (SP):** fine to coarse-grained, light brown.	■		7/10/13	2	109	
5					6/11/12			
10		- gravel up to 2" in largest dimension	■		12/14/19	2	115	
15			■		16/22/20	2	109	
20		**CLAYEY SAND (SC):** fine to medium-grained, gravel up to 2" in largest dimension, brown.	■		7/20/26	14	113	
		End of Boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/6/17.						

Converse Consultants

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Project No. 17-81-247-01

Drawing No. A-14

Log of Boring No. BH-14

Dates Drilled: 12/11/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2763 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, light brown.						
5		**SAND (SP):** fine to coarse-grained, -gravel up to 0.5" in largest dimension, brown.	■		8/12/15	1	120	
10			■	▨	13/21/21	3	116	
15			■		13/18/29	5	112	
		End of Boring at 16.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/11/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
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Project No. 17-81-247-01

Drawing No. A-15

Log of Boring No. BH-15

Dates Drilled: 12/11/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2762 Depth to Water (ft): 16.9

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, light brown.						
5		**SAND (SP):** fine to coarse-grained, light brown.	■		3/9/15	2	107	
			■		11/16/14	2	110	col
10		**SAND with SILT (SP-SM):** fine to medium-grained, brown.	■	▨	3/3/8	7	112	c ma, max
15			■		8/10/18	8	115	
20		**CLAYEY SAND (SC):** fine to coarse-grained, - gravel up to 1" in largest dimension, reddish-brown.	■		19/30/34	15	118	
		End of Boring at 21.5 feet bgs. Groundwater encountered at 16.9 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/11/17.						

Converse Consultants

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Project No. 17-81-247-01

Drawing No. A-16

Log of Boring No. BH-16

Dates Drilled: 12/11/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2760 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SAND (SP):** fine to medium-grained, light brown.	■		16/24/38	5	111	
5			■		16/26/27	1	121	ds
		End of Boring at 6.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/11/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
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For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-17

Log of Boring No. BH-17

Dates Drilled: 12/11/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2762 Depth to Water (ft): 14.1

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM: **SILTY SAND (SM):** fine to medium-grained, gravel up to 0.5" in largest dimension, brown.	■	▨	12/13/20	10	115	r
5		**SAND (SP):** fine to coarse-grained, brown.	■		19/15/19	4	123	
10		**SANDY SILT (ML):** fine to coarse-grained sand, brown.	■		4/6/7	21	103	
15			■		3/3/6	18	120	
20		**CLAYEY SAND (SC):** fine to coarse-grained, brown.	■		13/22/22	15	123	
		End of Boring at 21.5 feet bgs. Groundwater encountered at 14.1 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/11/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
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Project No. 17-81-247-01

Drawing No. A-18

Log of Boring No. BH-18

Dates Drilled: 12/11/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2765 Depth to Water (ft): 16.1

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, light brown.						
5		**SAND (SP):** fine to coarse-grained, gravel up to 0.5" in largest dimension, brown.	■		8/13/17	2	108	
10		light brown	■		10/13/15	2	114	
15		**SILTY SAND (SM):** fine to coarse-grained, reddish-brown.	■		9/13/15	12	108	
20			■		12/26/36	11	119	
		End of Boring at 21.5 feet bgs. Groundwater encountered at 16.1 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/11/17.						

Converse Consultants

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Project No. 17-81-247-01

Drawing No. A-19

Log of Boring No. BH-19

Dates Drilled: 12/6/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2768 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SAND (SP):** fine to medium-grained, light brown.						
5			■	▨	6/8/10	3	95	
		- gravel up to 1" in largest dimension	■	▨	11/14/16	1	109	
10			■		9/11/14	1	104	
15			■		12/26/29	2	119	
20		**CLAYEY SAND (SC):** fine to coarse-grained, brown.	■		12/44/28	13	119	
		End of Boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/6/17.						

Converse Consultants

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Project No. 17-81-247-01

Drawing No. A-20

Log of Boring No. BH-20

Dates Drilled: 12/8/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2764 Depth to Water (ft): 21.4

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SAND (SP):** fine to coarse-grained, light brown.	■		8/12/14	1	120	
5		**SAND with SILT (SP-SM):** fine to coarse-grained, gravel up to 1" in largest dimension, brown.	■	▨	10/18/22	5	106	ds ca, er, ma
10			■		8/13/19	7	113	
15			■		9/12/18	5	112	
20		▽	☒		6/10/10			
25		**SILTY SAND (SM):** fine to coarse-grained, brown.	■		14/18/25	13	115	
30			☒		4/6/5			

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Project No. 17-81-247-01

Drawing No. A-21a

Log of Boring No. BH-20

Dates Drilled: 12/8/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2764 Depth to Water (ft): 21.4

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, brown.	■		7/12/20	10	120	
40			☒		5/13/20			
45		**SANDY CLAY (CL):** fine to medium-grained sand, grayish-brown.	■		14/27/50-5"	26	102	
50			☒		10/13/18			
		End of Boring at 51.5 feet bgs. Groundwater encountered at 21.4 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/8/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
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For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-21b

Log of Boring No. BH-21

Dates Drilled: 12/6/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2765 Depth to Water (ft): 19.7

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, light brown.						max
5		**SAND (SP):** fine to coarse-grained, gravel up to 1" in largest dimension, light brown.			9/10/11	1	109	col
					9/16/15	1	113	
10		**SILTY SAND (SM):** fine to medium-grained, light brown.			12/24/27	6	121	c
15					10/18/24	7	108	
20		**CLAYEY SAND (SC):** fine to coarse-grained, brown.			13/24/30	14	119	
		End of Boring at 21.5 feet bgs. Groundwater encountered at 19.7 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/6/17.						

Converse Consultants

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Project No. 17-81-247-01

Drawing No. A-22

Log of Boring No. BH-22

Dates Drilled: 12/8/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2767 Depth to Water (ft): 15.4

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, light brown.						
5		**SAND (SP):** fine to coarse-grained,.	■		9/12/13	2	108	
10		- gravel up to 0.5" in largest dimension	■		9/11/15	1	108	
15		▽	■		9/11/16	2	99	
20		**CLAYEY SAND (SC):** fine to coarse-grained, gravel up to 0.5" in largest dimension, brown.	■		4/7/14	16	115	
		End of Boring at 21.5 feet bgs. Groundwater encountered at 15.4 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/8/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-23

Log of Boring No. BH-23

Dates Drilled: 12/6/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2768 Depth to Water (ft): 23

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, gravel up to 0.5" in largest dimension, light brown.	■	▨	9/16/17	11	103	ca, er
5		**SAND (SP):** fine to coarse-grained, light brown.	■		6/12/15	1	117	
10		- gravel up to 2" in largest dimension	■		11/19/25	2	107	
15			■		15/27/29	2	115	
20		- fine to medium-grained, reddish-brown	☒		15/30/32			
25		**SILTY SAND (SM):** fine to medium-grained, gravel up to 1" in largest dimension, brown.	■	▨	10/11/8	6	121	
30			☒		3/4/6			

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **A-24a**

Log of Boring No. BH-23

Dates Drilled: 12/6/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2768 Depth to Water (ft): 23

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM **SILTY SAND (SM):** fine to medium-grained, gravel up to 1.5" in largest dimension, brown.	■		4/33/50-3"	12	116	
40			☒		15/13/11			
45			■		13/50-5"	7	125	
50			☒		11/13/14			
		End of Boring at 51.5 feet bgs. Groundwater encountered at 23 feet bgs. Borehole backfilled with soil cuttings and tamped on 12/6/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-24b

Log of Boring No. BH-24

Dates Drilled: 12/6/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2766 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SAND (SP):** fine to coarse-grained, light brown.						
			■		15/25/29	3	117	
5		- gravel up to 1.5" in largest dimension	■		18/19/23	1	107	
		End of Boring at 6.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/6/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
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For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-25

Log of Boring No. BH-25

Dates Drilled: 12/6/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2768 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, light brown.	■		7/11/12	6	114	c
5		**SAND (SP):** fine to coarse-grained, light brown.	■		7/12/15	1	122	col
10		- gravel up to 1" in largest dimension	■		7/13/14	1	107	
15		- gravel up to 2" in largest dimension, reddish-brown	■		12/17/22	3	112	
20			■		26/35/27	5	116	
		End of Boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/6/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
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For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-26

Log of Boring No. BH-26

Dates Drilled: 12/6/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2769 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, light brown.						
5		- gravel up to 1" in largest dimension	■	▨	9/11/15	7	100	ds ma, max
			■	▨	11/13/15	6	108	
10			■		8/13/18	7	102	
15		**SAND (SP):** fine to coarse-grained, reddish-brown.	■		14/22/37	1	117	
20			■		28/34/31	4	118	
		End of Boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/6/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **A-27**

Log of Boring No. BH-27

Dates Drilled: 12/6/2017 Logged by: William Buckley Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2772 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM: **SILTY SAND (SM):** fine to coarse-grained, light brown.	■	▨	8/16/20	6	102	r
5		**SAND (SP):** fine to coarse-grained, brown.	■		11/14/12	1	113	
		End of Boring at 6.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings and tamped on 12/6/17.						

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. 17-81-247-01

Drawing No. A-28

Appendix B

Laboratory Testing Program

APPENDIX B

LABORATORY TESTING PROGRAM

Tests were conducted in our laboratory on representative soil samples for the purpose of classification and evaluation of their physical properties and engineering characteristics. The amount and selection of tests were based on the geotechnical parameters required for this project. Test results are presented herein and on the Logs of Borings, in Appendix A, *Field Exploration*. The following is a summary of the various laboratory tests conducted for this project.

***In-Situ* Moisture Content and Dry Density**

Results of these tests performed on relatively undisturbed ring samples were used to aid in the classification and to provide quantitative measure of the *in situ* dry density and moisture content. Data obtained from this test provides qualitative information on strength and compressibility characteristics of the site soils. For test results, see the Logs of Borings in Appendix A, *Field Exploration*.

R-value

Two representative bulk soil samples were tested for resistance value (R-value) in accordance with California Test Method CT301. The test is designed to provide a relative measure of soil strength for use in pavement design. The test results are shown in the following table.

Table No. B-1, R-Value Test Results

Boring No.	Depth (feet)	Soil Classification	Measured R-value
BH-17	0-5	Silty Sand (SM)	29
BH-27	0-5	Silty Sand (SM)	30

Collapse Tests

To evaluate the moisture sensitivity (collapse/swell potential) of the encountered soils, six collapse tests were performed in accordance with the ASTM Standard D5333 laboratory procedure. The sample was loaded to approximately 2 kips per square foot (ksf), allowed to stabilize under load, and then submerged. The test results including the consolidation test are presented in the following table.

Table No. B-2, Collapse Test Results

Boring No.	Depth (feet)	Soil Classification	Percent Swell + Percent Collapse -	Collapse Potential
BH-02	5.0-6.5	Sand (SP)	-0.7	Slight
*BH-05	15.0-16.5	Clayey Sand (SC)	-0.3	Slight
BH-06	10.0-11.5	Silty Sand (SM)	-0.4	Slight
*BH-8	7.0-8.5	Sand (SP)	-2.0	Slight
BH-11	5.0-6.5	Silty Sand (SM)	-0.8	Slight
BH-15	7.0-8.5	Sand (SP)	-0.6	Slight
*BH-15	10.0-11.5	Sand with Silt (SP-SM)	-0.5	Slight
BH-21	5.0-6.5	Sand (SP)	-1.6	Slight
*BH-21	10.0-11.5	Silty Sand (SM)	-0.5	Slight
BH-25	5.0-6.5	Sand (SP)	-0.9	Slight
*BH-25	2.5-4.0	Silty Sand (SM)	-0.7	Slight

(*Consolidation test)

Soil Corrosivity Tests

Four representative soil samples were tested to determine minimum electrical resistivity, pH, and chemical content, including soluble sulfate and chloride concentrations. The purpose of the tests was to determine the corrosion potential of site soils when placed in contact with common construction materials. The tests were performed by EG Labs in accordance to Caltrans Test Methods 643, 422 and 417. Test results are presented in the following table.

Table No. B-3, Summary of Soil Corrosivity Test Results

Boring No.	Depth (feet)	pH	Soluble Sulfates (CA 417) (% by weight)	Soluble Chlorides (CA 422) (ppm)	Min. Resistivity (CA 643) (Ohm-cm)
BH-06	0-5	8.05	0.001	95	8,500
BH-09	5-10	7.69	0.064	850	310
BH-20	5-10	8.41	0.003	115	5,000
BH-23	0-5	8.09	0.001	115	6,900

Grain-Size Analyses

To assist in classification of soils, mechanical grain-size analyses were performed on five select samples in accordance with the ASTM Standard D422 test method. Grain-size curves are shown in Drawing No. B-1, *Grain Size Distribution Results*.

Maximum Density and Optimum Moisture Content Tests

Laboratory maximum dry density-optimum moisture content relationship test was performed on four representative bulk samples. These tests were conducted in accordance with the ASTM Standard D1557 test method. The test results are presented in Drawing No. B-2, *Moisture-Density Relationship Results,* and are summarized in the following table.

Table No B-4, Summary of Moisture-Density Relationship Results

Boring No.	Depth (feet)	Soil Description	Optimum Moisture (%)	Maximum Density (lb/cft)
BH-01	10-15	Sand (SP), Brown	4.5	128.0
BH-15	10-15	Sand with Silt (SP-SM), Brown	6.0	128.0
BH-21	0-5	Silty Sand (SM), Light Brown	7.0	127.5
BH-26	5-10	Silty Sand (SM), Light Brown	6.5	129.5

Direct Shear Tests

Six direct shear tests were performed on relatively undisturbed samples in soaked moisture condition in accordance with ASTM D3080. For each test, three samples contained in brass sampler rings were placed, one at a time, directly into the test apparatus and subjected to a range of normal loads appropriate for the anticipated conditions. The samples were then sheared at a constant strain rate of 0.004 to 0.025 inch/minute depending on the soil type. Shear deformation was recorded until a maximum of about 0.25-inch shear displacement was achieved. Ultimate strength was selected from the shear-stress deformation data and plotted to determine the shear strength parameters. For test data, including sample density and moisture content, see Drawings No. B-3 through B-8*, Direct Shear Test Results,* and the following table.

Table No. B-5, Summary of Direct Shear Test Results

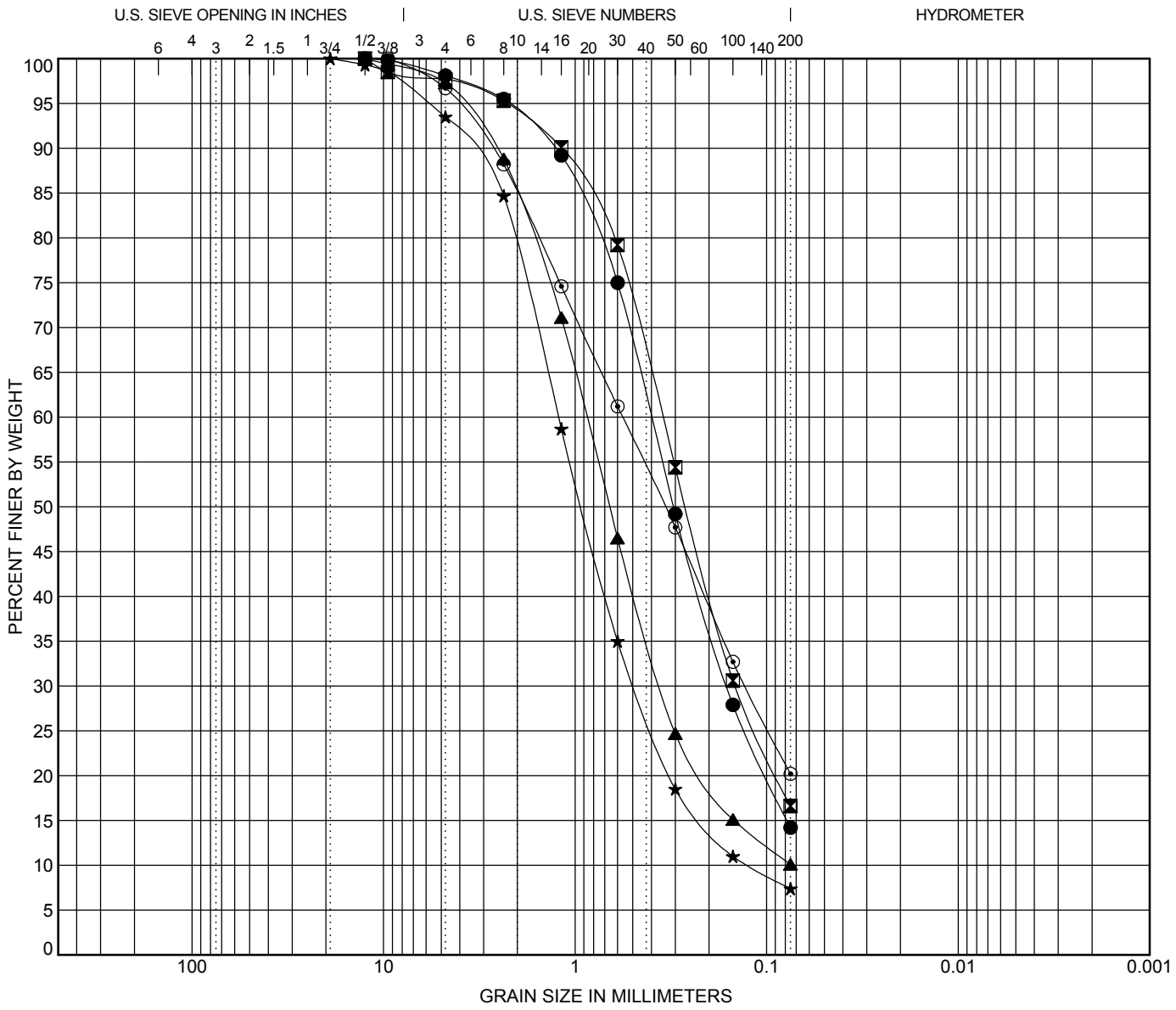
Boring No.	Depth (feet)	Soil Description	Peak Strength Parameters	
			Friction Angle (degrees)	Cohesion (psf)
BH-05	5.0-6.5	Sand (SP)	30	60
BH-08	5.0-6.5	Sand (SP)	31	10
BH-12	10.0-11.5	Sand (SP)	32	70
BH-16	5.0-6.5	Sand (SP)	33	40
BH-20	5.0-6.5	Sand with Silt (SP-SM)	31	80
BH-26	5.0-6.5	Silty Sand (SM)	30	40

Consolidation Tests

This test was conducted in accordance with ASTM Standard D2435 method. Data obtained from this test performed on five relatively undisturbed ring samples were used to evaluate the settlement characteristics of the on-site soils under load. Preparation for this test involved trimming the sample, placing it in a 1-inch-high brass ring, and loading it into the test apparatus, which contained porous stones to accommodate drainage during testing. Normal axial loads were applied to one end of the sample through the porous stones, and the resulting deflections were recorded at various time periods. The load was increased after the sample reached a reasonable state of equilibrium. Normal loads were applied at a constant load-increment ratio, successive loads being generally twice the preceding load. For test result, including sample density and moisture content, see Drawings No. B-9 through B-13, *Consolidation Test Results*.

Sample Storage

Soil samples presently stored in our laboratory will be discarded 30 days after the date of this report, unless this office receives a specific request to retain the samples for a longer period.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring No.	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	BH-06	0-5	SILTY SAND (SM)					
⊠	BH-08	0-5	SILTY SAND (SM)					
▲	BH-15	10-15	SAND WITH SILT (SP-SM)				1.96	11.76
★	BH-20	5-10	SAND WITH SILT (SP-SM), FEW GRAVEL				1.56	9.87
⊙	BH-26	5-10	SILTY SAND (SM)					

	Boring No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BH-06	0-5	12.5	0.401	0.161		1.9	83.9	14.2	
⊠	BH-08	0-5	12.5	0.351	0.146		2.3	81.1	16.6	
▲	BH-15	10-15	12.5	0.87	0.355		2.7	87.2	10.1	
★	BH-20	5-10	19	1.222	0.486	0.124	6.5	86.1	7.4	
⊙	BH-26	5-10	9.5	0.564	0.129		3.3	76.5	20.2	

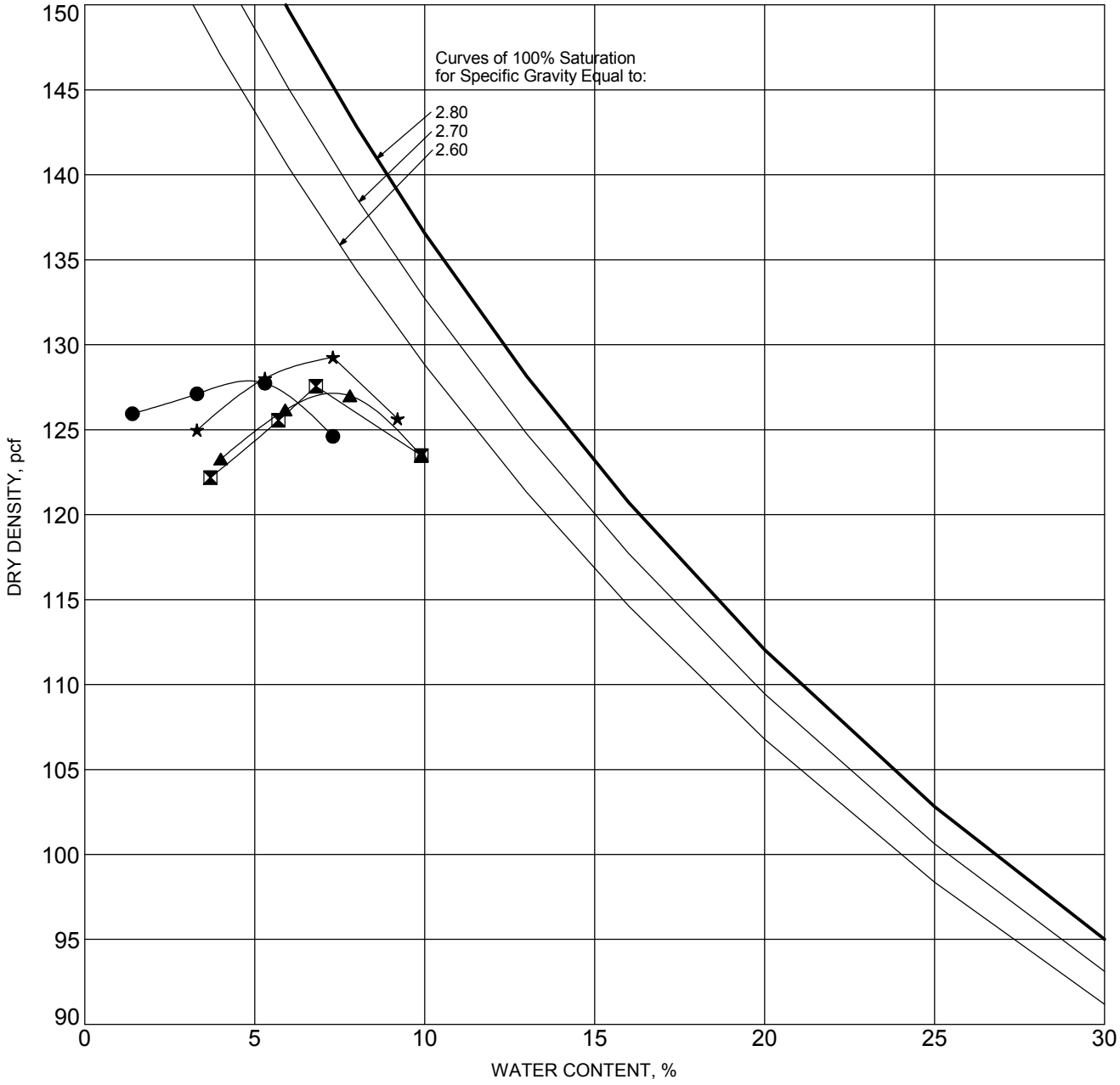
GRAIN SIZE DISTRIBUTION RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-1**



SYMBOL	BORING NO.	DEPTH (ft)	DESCRIPTION	ASTM TEST METHOD	OPTIMUM WATER, %	MAXIMUM DRY DENSITY, pcf
●	**BH-01**	**10-15**	**SAND (SP), BROWN**	**D1557- A**	**4.5**	**128.0**
⊠	**BH-15**	**10-15**	**SAND WITH SILT (SP-SM), BROWN**	**D1557- A**	**6.0**	**128.0**
▲	**BH-21**	**0-5**	**SILTY SAND (SM), LIGHT BROWN**	**D1557- A**	**7.0**	**127.5**
★	**BH-26**	**5-10**	**SILTY SAND (SM), LIGHT BROWN**	**D1557- A**	**6.5**	**129.5**

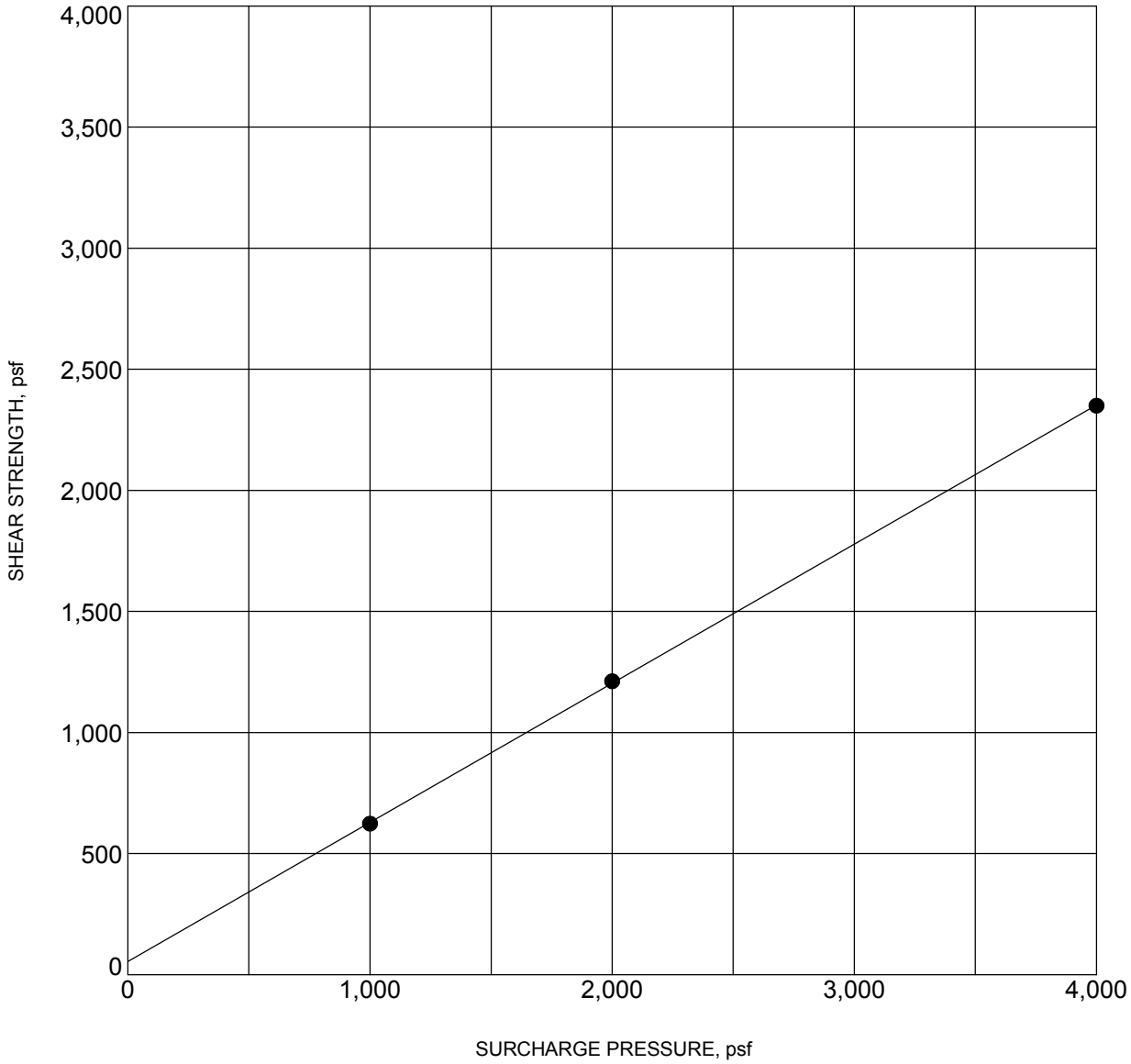
MOISTURE-DENSITY RELATIONSHIP RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-2**



BORING NO.	:	**BH-05**	DEPTH (ft)	:	**5.0-6.5**
DESCRIPTION	:	**SAND (SP)**			
COHESION (psf)	:	**60**	FRICTION ANGLE (degrees):		**30**
MOISTURE CONTENT (%)	:	**3.9**	DRY DENSITY (pcf)	:	**104.9**

NOTE: Ultimate Strength.

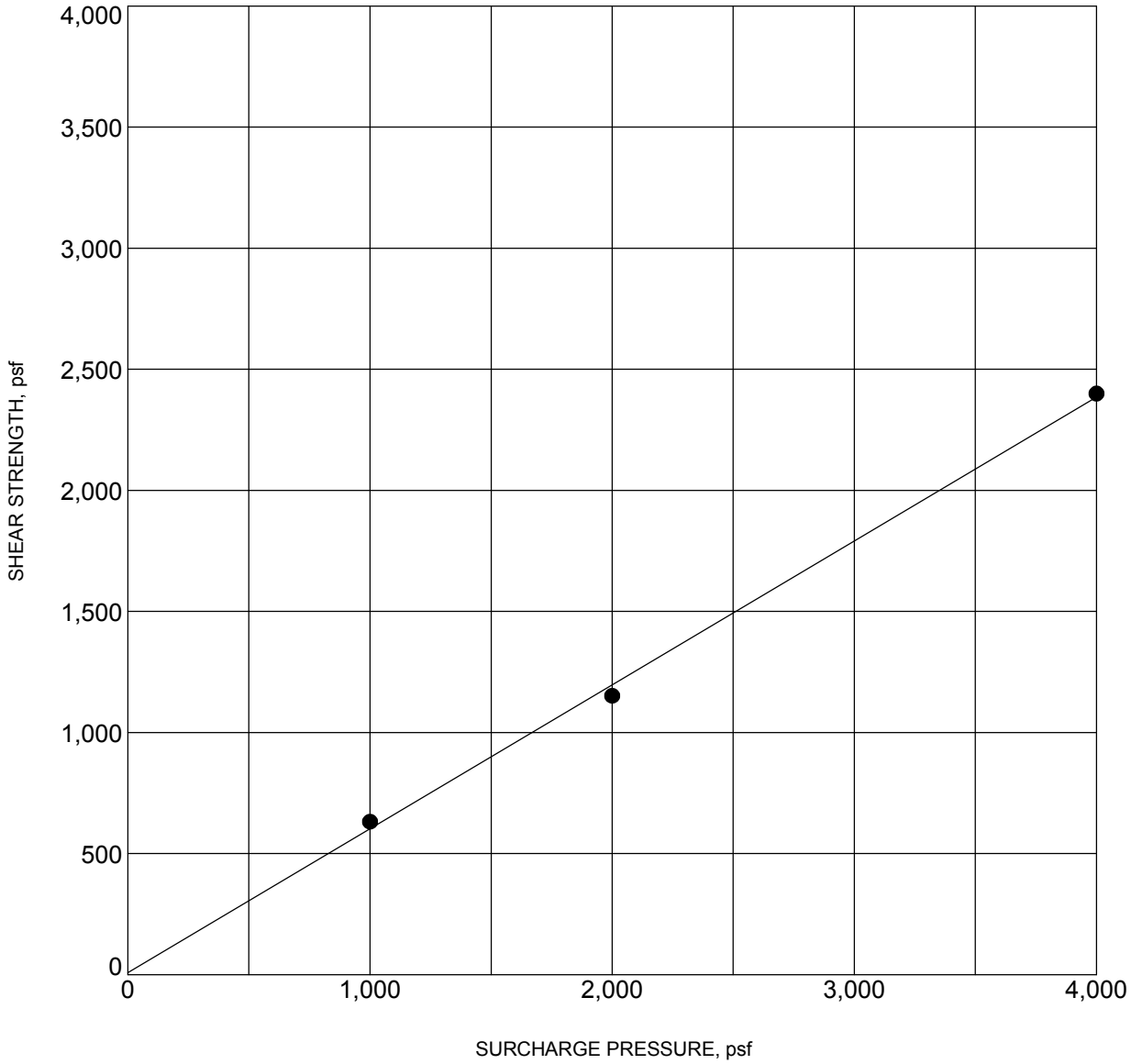
DIRECT SHEAR TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-3**



BORING NO.	:	**BH-08**	DEPTH (ft)	:	**5.0-6.5**
DESCRIPTION	:	**SAND (SP)**			
COHESION (psf)	:	**10**	FRICTION ANGLE (degrees):		**31**
MOISTURE CONTENT (%)	:	**5.2**	DRY DENSITY (pcf)	:	**98.7**

NOTE: Ultimate Strength.

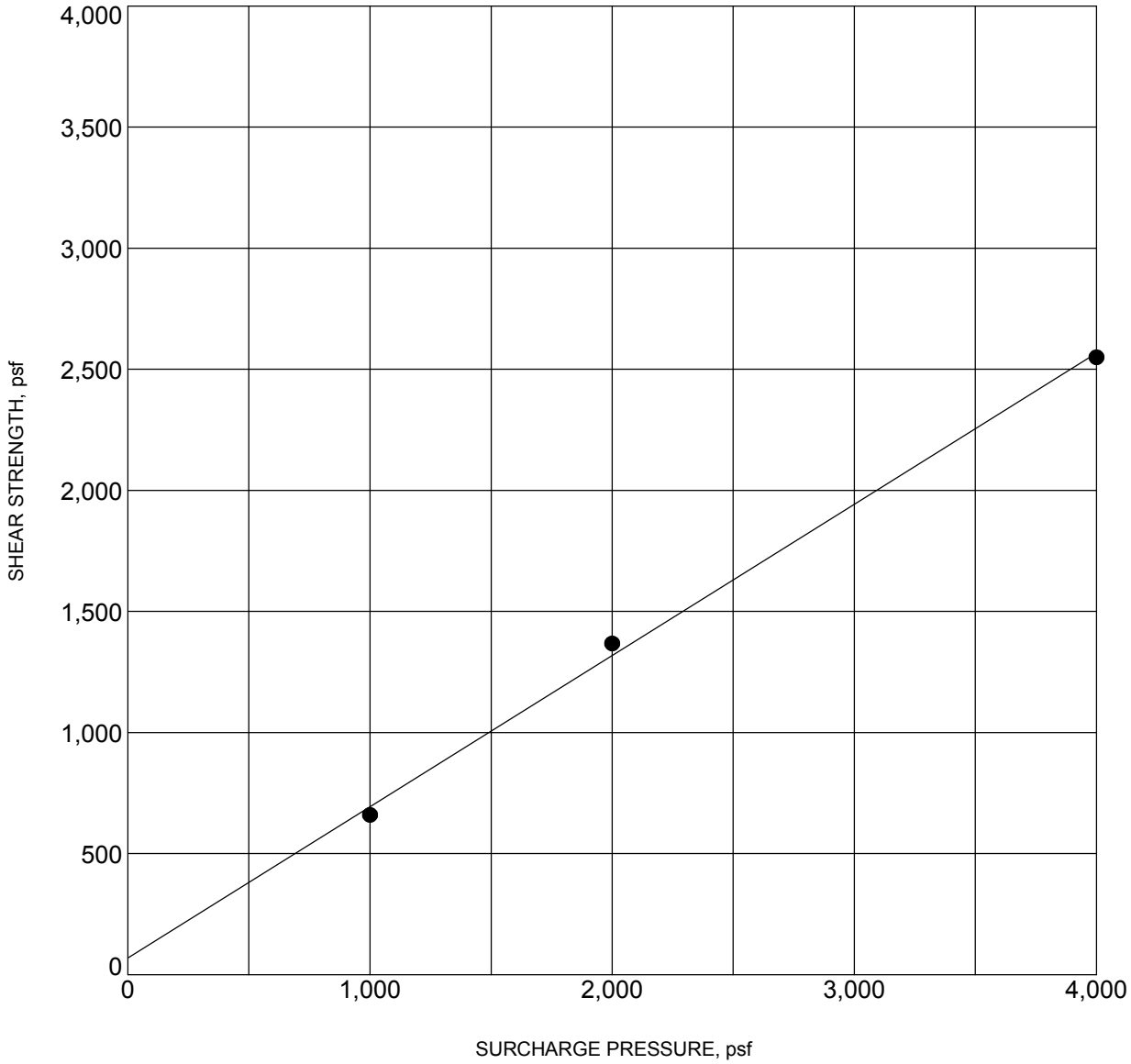
DIRECT SHEAR TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-4**



BORING NO.	:	**BH-12**	DEPTH (ft)	:	**10.0-11.5**
DESCRIPTION	:	**SAND (SP)**			
COHESION (psf)	:	**70**	FRICTION ANGLE (degrees):		**32**
MOISTURE CONTENT (%)	:	**3.5**	DRY DENSITY (pcf)	:	**115.9**

NOTE: Ultimate Strength.

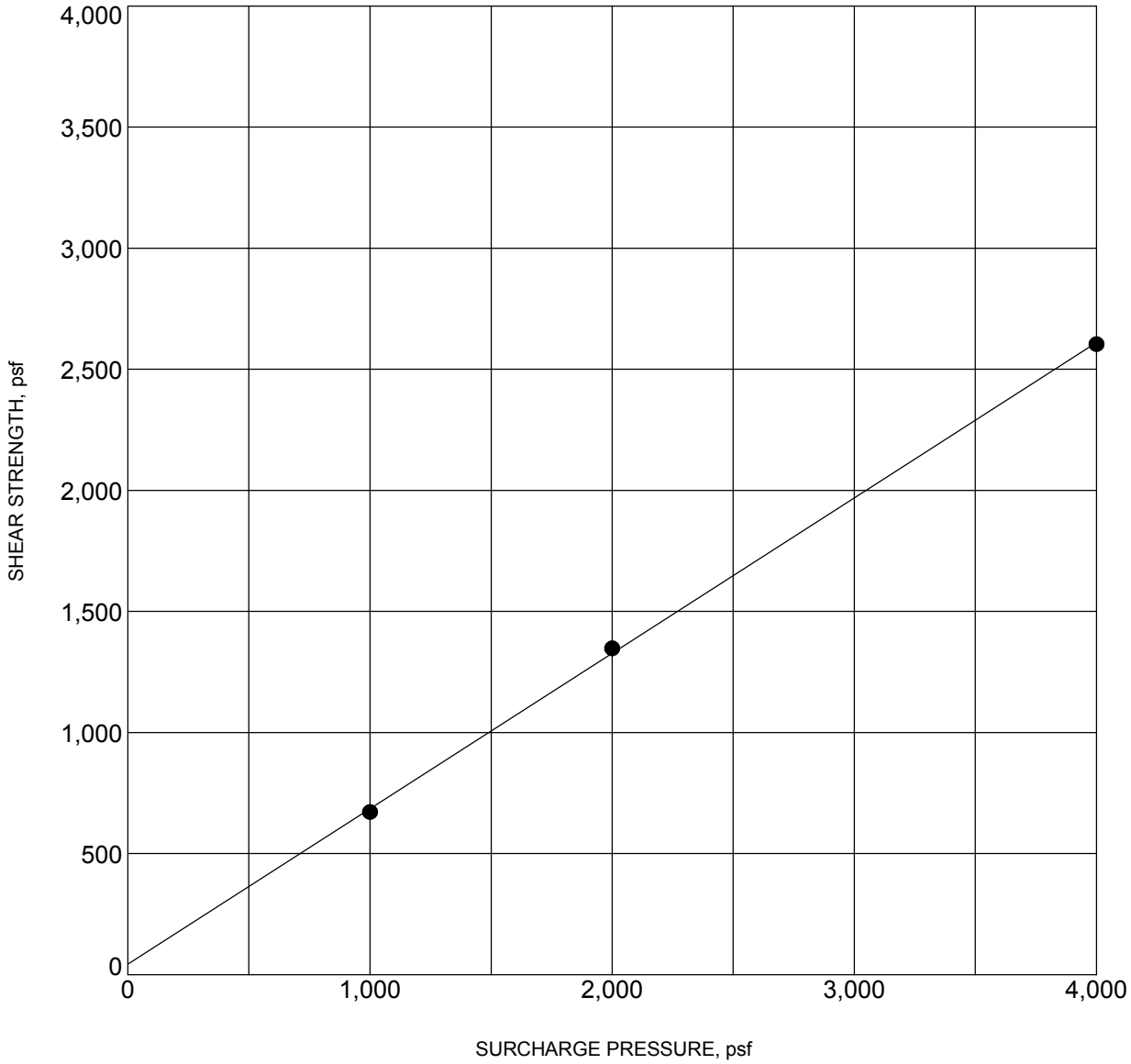
DIRECT SHEAR TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-5**



BORING NO.	:	**BH-16**	DEPTH (ft)	:	**5.0-6.5**
DESCRIPTION	:	**SAND (SP)**			
COHESION (psf)	:	**40**	FRICTION ANGLE (degrees):		**33**
MOISTURE CONTENT (%)	:	**4.0**	DRY DENSITY (pcf)	:	**122.3**

NOTE: Ultimate Strength.

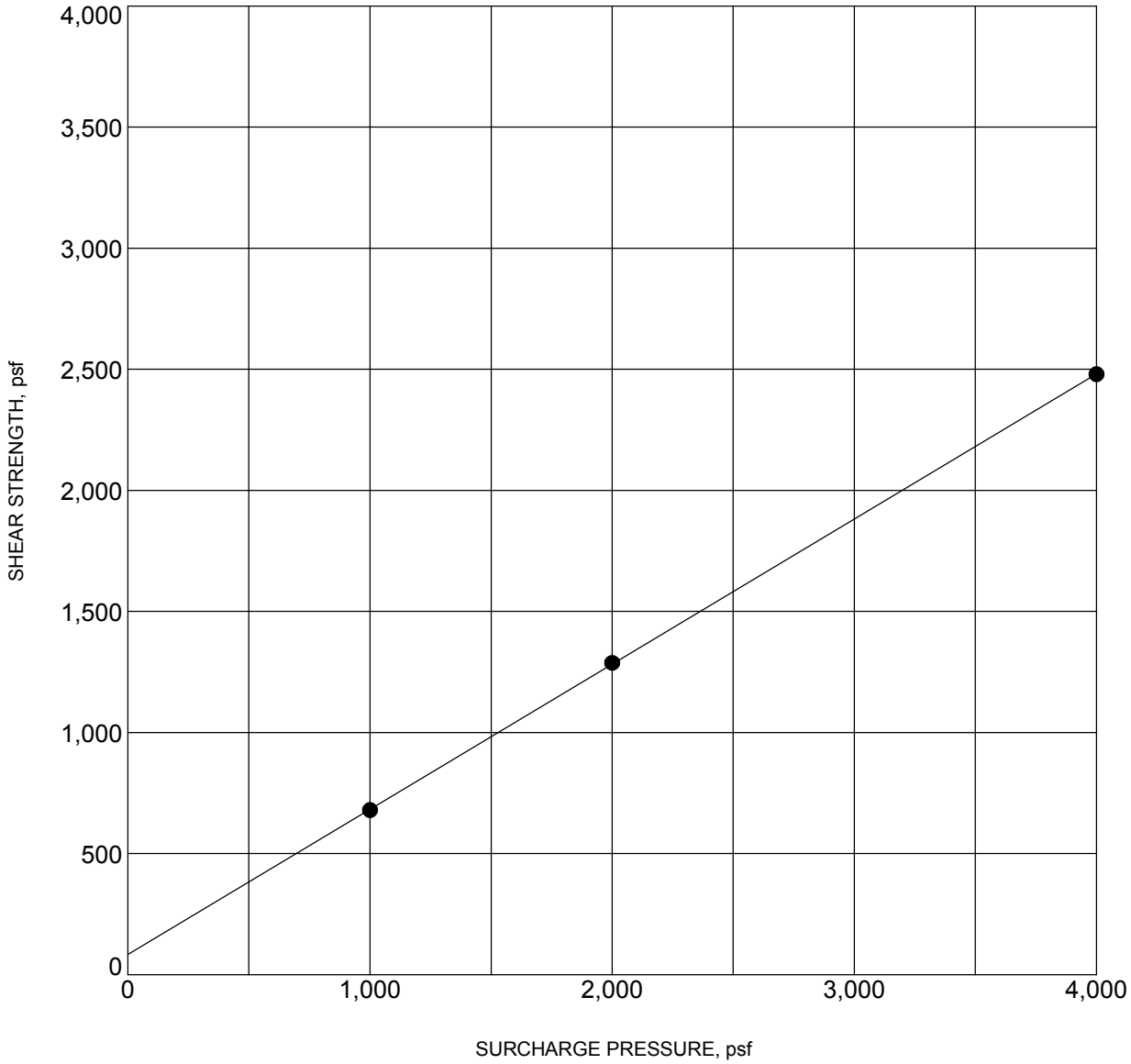
DIRECT SHEAR TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-6**



BORING NO.	:	**BH-20**	DEPTH (ft)	:	**5.0-6.5**
DESCRIPTION	:	**SAND WITH SILT (SP-SM)**			
COHESION (psf)	:	**80**	FRICTION ANGLE (degrees):		**31**
MOISTURE CONTENT (%)	:	**5.1**	DRY DENSITY (pcf)	:	**107.5**

NOTE: Ultimate Strength.

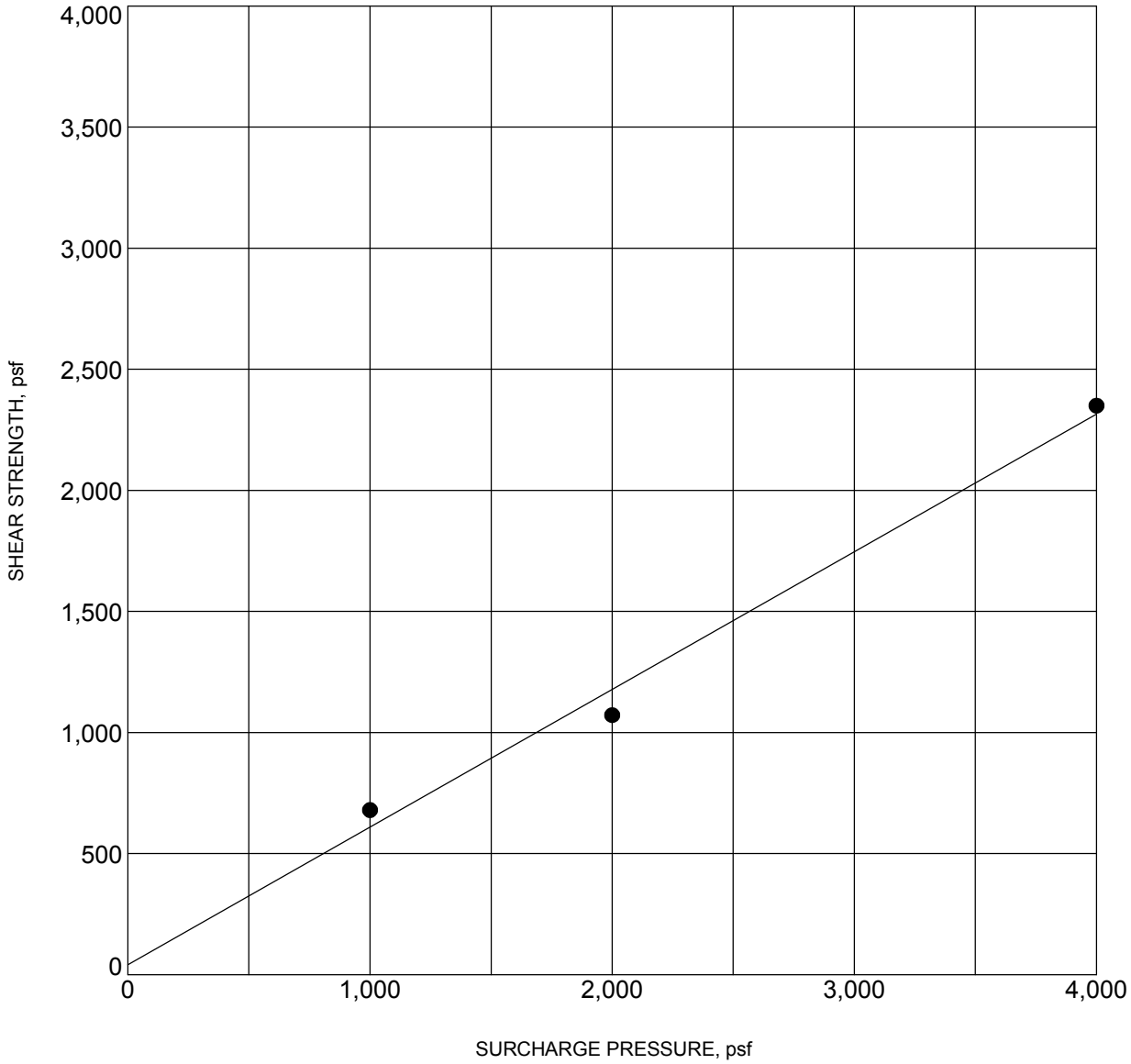
DIRECT SHEAR TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-7**



BORING NO.	:	**BH-26**	DEPTH (ft)	:	**5.0-6.5**
DESCRIPTION	:	**SILTY SAND (SM)**			
COHESION (psf)	:	**40**	FRICTION ANGLE (degrees):		**30**
MOISTURE CONTENT (%)	:	**7.0**	DRY DENSITY (pcf)	:	**96.0**

NOTE: Ultimate Strength.

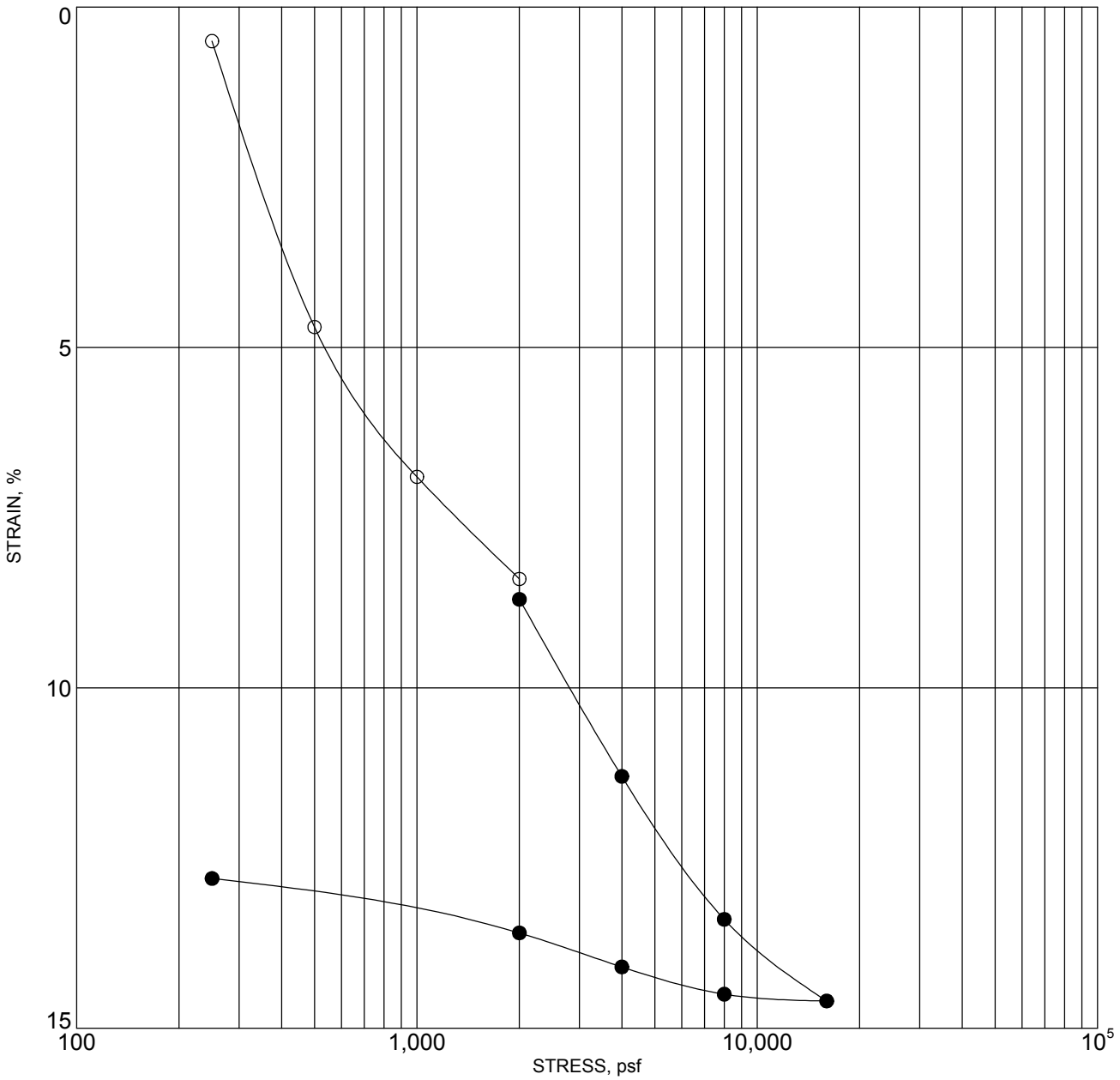
DIRECT SHEAR TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-8**



BORING NO. :	**BH-05**	DEPTH (ft) :	**15.0-16.5**
DESCRIPTION :	**CLAYEY SAND (SC)**		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	**13.5**	**108.3**	**68**	**0.676**
FINAL	**13.5**	**115.8**	**100**	**0.428**

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

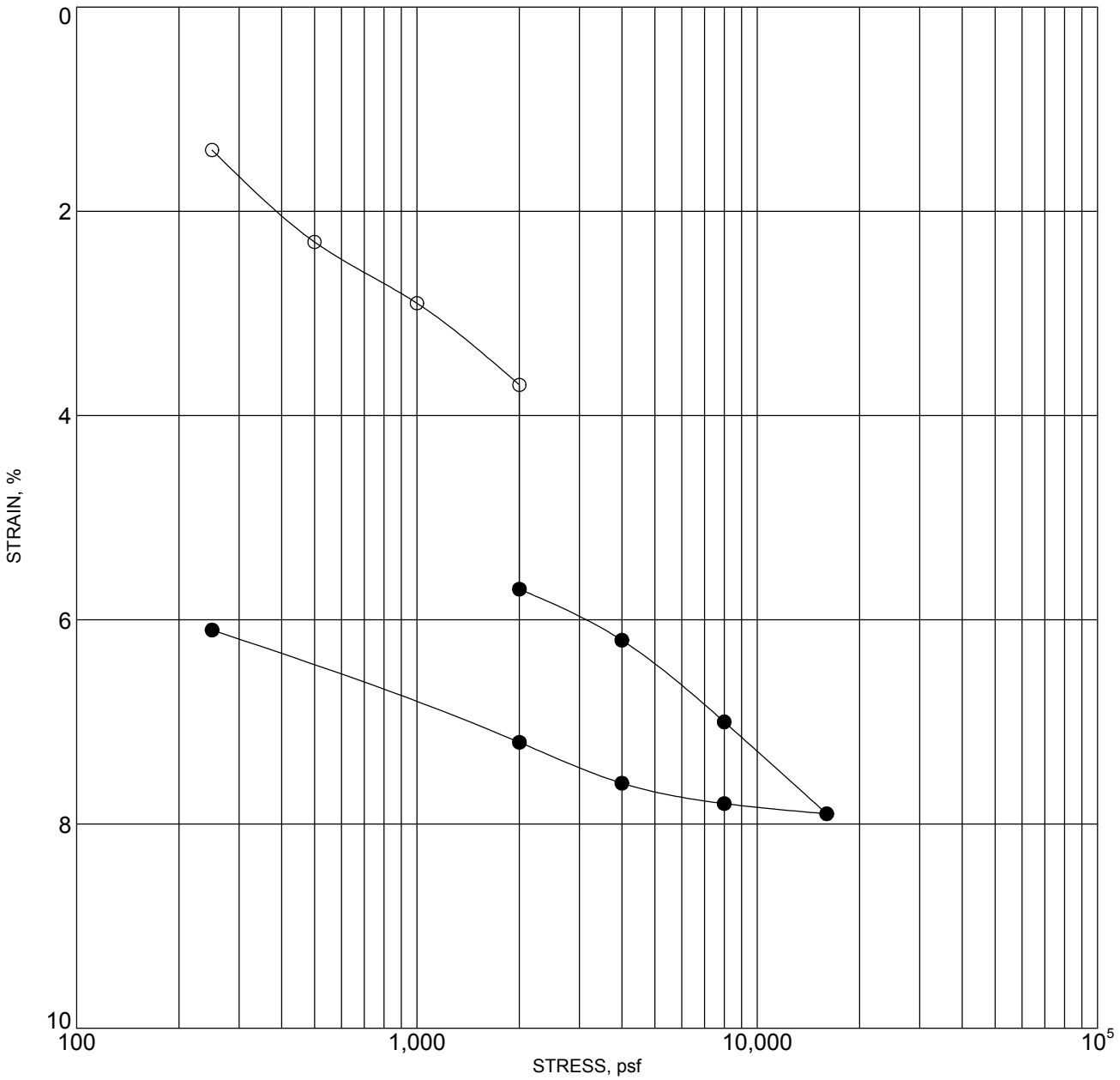
CONSOLIDATION TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-9**



BORING NO. :	BH-08	DEPTH (ft) :	7.0-8.5
DESCRIPTION :	SAND (SP)		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	5	125.0	45	0.378
FINAL	7.5	135.4	100	0.221

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

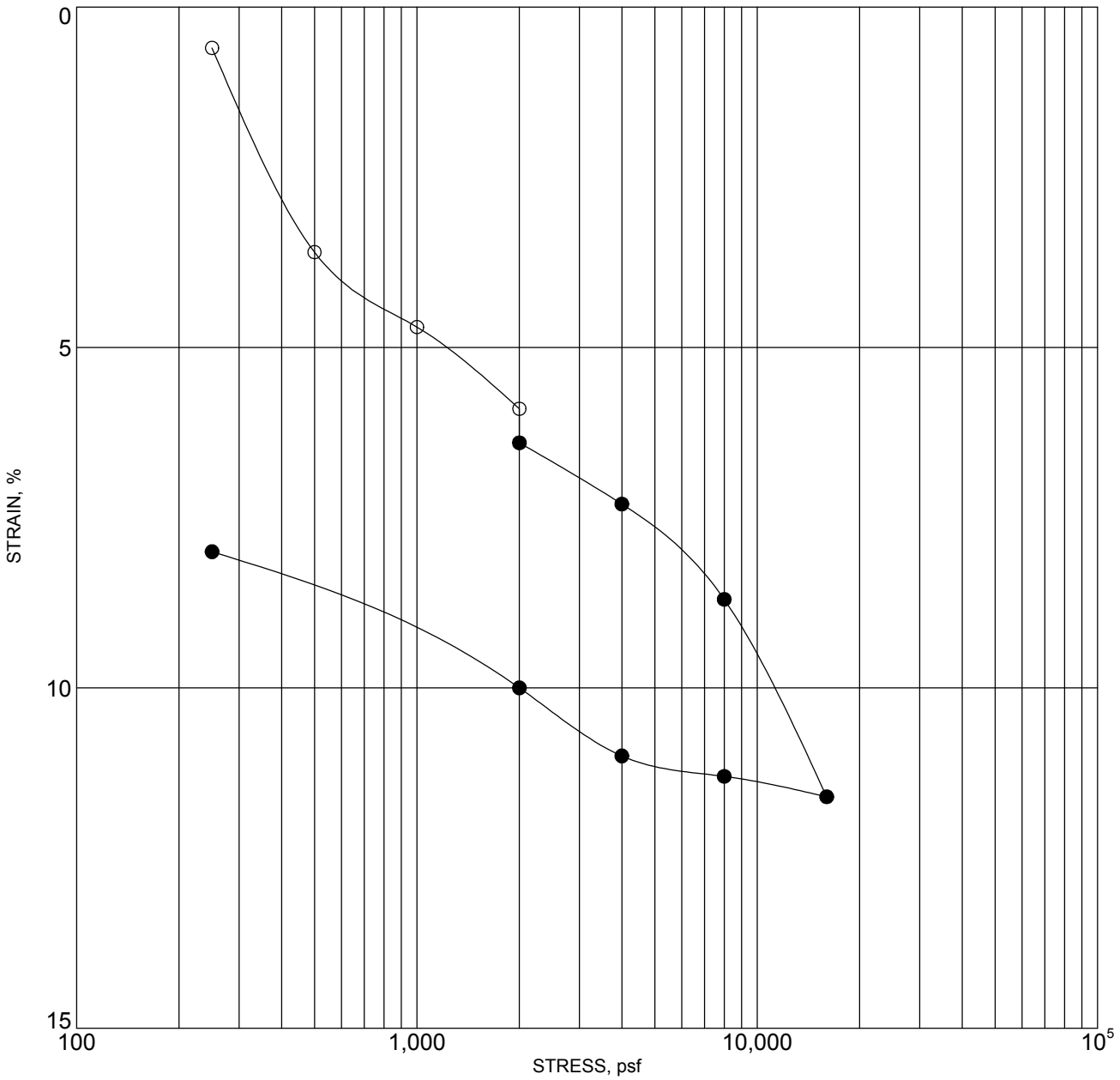
CONSOLIDATION TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-10**



BORING NO. :	**BH-15**	DEPTH (ft) :	**10.0-11.5**
DESCRIPTION :	**SAND WITH SILT (SP-SM)**		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	**7**	**119.6**	**49**	**0.517**
FINAL	**10**	**129.3**	**100**	**0.279**

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

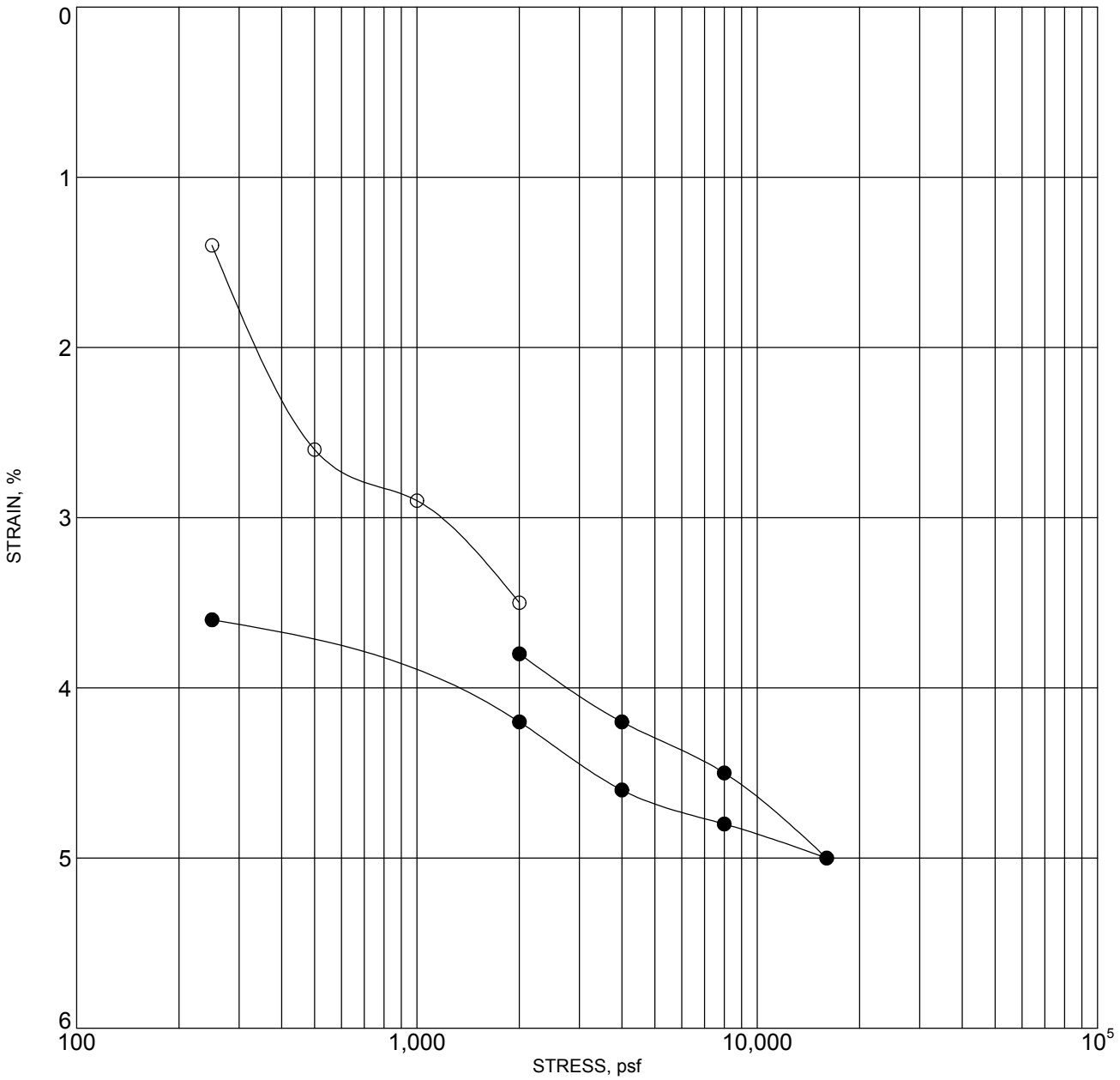
CONSOLIDATION TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-11**



BORING NO. :	**BH-21**	DEPTH (ft) :	**10.0-11.5**
DESCRIPTION :	**SILTY SAND (SM)**		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	**7**	**112.3**	**40**	**0.615**
FINAL	**12**	**123.9**	**100**	**0.335**

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

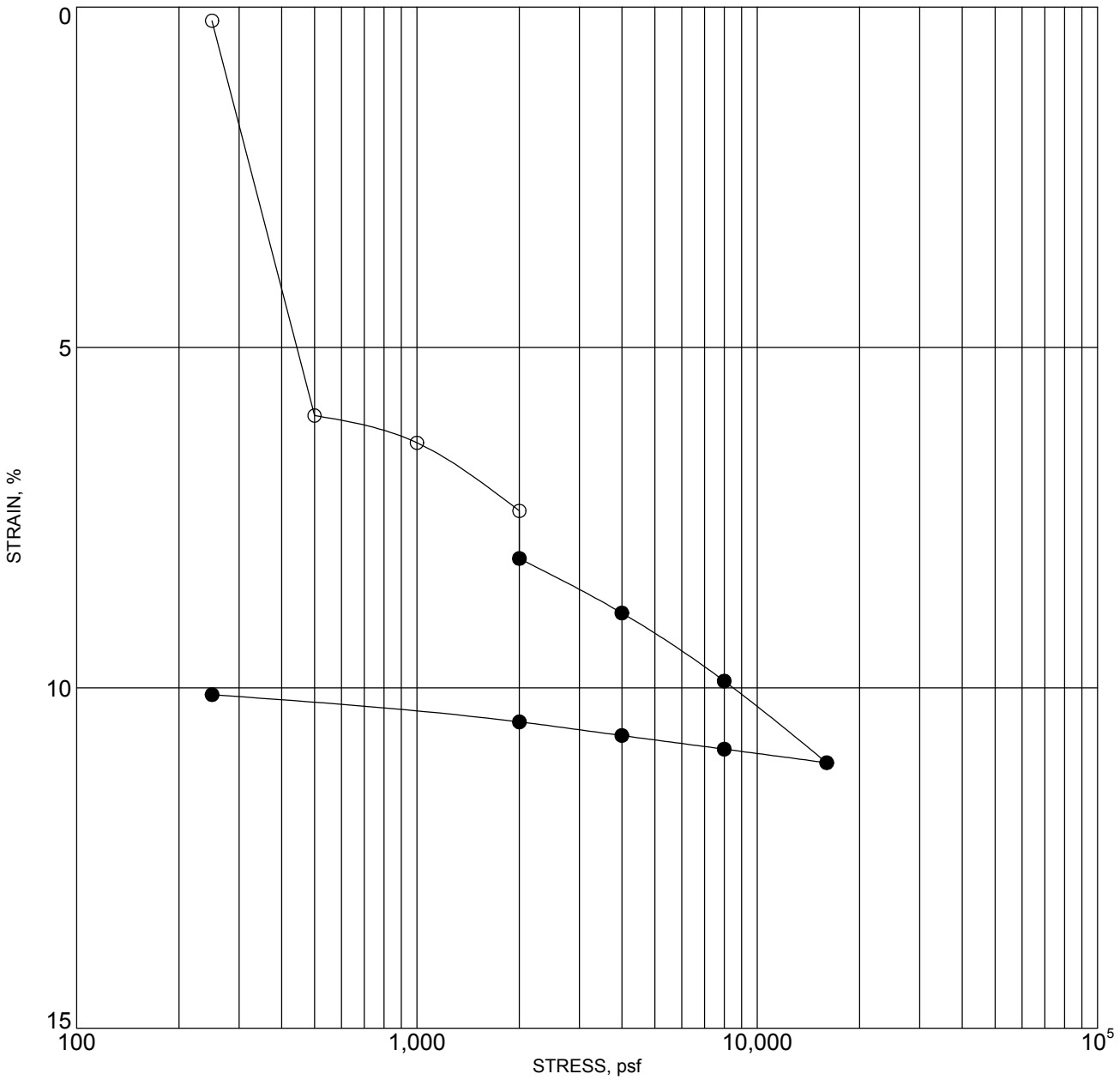
CONSOLIDATION TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-12**



BORING NO. :	**BH-25**	DEPTH (ft) :	**2.0-3.5**
DESCRIPTION :	**SILTY SAND (SM)**		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	**6**	**116.1**	**38**	**0.564**
FINAL	**11**	**126.5**	**100**	**0.307**

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

CONSOLIDATION TEST RESULTS

Converse Consultants

Mojave Narrows Medical Pavilion
Northeast of Yates Road and Ridgecrest Road
City of Victorville, San Bernardino County, California
For: Creative Adaptation, Inc.

Project No. **17-81-247-01**

Drawing No. **B-13**

Appendix C

Dynamic Settlement Analysis

APPENDIX C

DYNAMIC SETTLEMENT ANALYSIS

The subsurface data obtained from the 5 borings (Borings BH-06, BH-08, BH-12, BH-20, and BH-23) drilled during the field investigation were used to evaluate the dynamic settlement due to potential liquefaction and densification of relatively loose sediments subjected to ground shaking during earthquakes.

The dynamic analysis was performed using Liquefy Pro (Civiltech, 2012). An earthquake magnitude of M7.2 and a peak ground acceleration (PGA) of 0.50g, where g is the acceleration due to gravity, were selected for this analysis. The PGA was based on the CBC seismic design parameters presented in Section 7.2, *CBC Seismic Design Parameters*. Analysis considering both historical and current groundwater conditions were performed for each boring.

The results of our analyses are presented on Plates C-1 through C-10 and summarized in the following table.

Table C-1, Estimated Dynamic Settlements

Location	Groundwater Conditions (feet bgs)	Dynamic Settlement (inches)	Differential Dynamic Settlement (inch/40 linear feet)
B-06	17.8 (Current)	0.36	0.18
B-06	1.0 (Historical)	2.21	1.11
B-08	20.1 (Current)	1.37	0.69
B-08	1.0 (Historical)	1.34	0.67
B-12	16.7 (Current)	0.44	0.22
B-12	1.0 (Historical)	0.59	0.30
B-20	21.4 (Current)	1.62	0.81
B-20	1.0 (Historical)	1.89	0.95
B-23	23.0 (Current)	3.19	1.60
B-23	1.0 (Historical)	2.55	1.28

Based on our analysis, the project site has the potential for up to 3.2 inches of dynamic settlement. The differential settlement resulting from dynamic loads is anticipated to be half of the total settlement over a horizontal distance of 40 feet.

The potential differential dynamic settlement was evaluated using the potential total dynamic settlements at each boring location. The following tables describe the evaluation method.

The difference between the maximum estimated total dynamic settlements at each pair of boring locations was calculated, as presented in the following table.

Table C-2, Difference in Maximum Total Dynamic Settlement between Borings

Boring No.	Total Settlement (inches)	BH-06	BH-08	BH-12	BH-20	BH-23
		2.21	1.37	0.59	1.89	3.19
BH-06	2.21	0.00	--	--	--	--
BH-08	1.37	1.37	0.00	--	--	--
BH-12	0.59	1.62	0.78	0.00	--	--
BH-20	1.89	0.32	0.52	1.3	0.00	--
BH-23	3.19	0.98	1.82	2.6	1.3	0.00

The distances between pairs of borings as scaled from Figure 2, *Approximate Boring Locations Map* are presented in the following table.

Table C-3, Distance in Feet between Pairs of Borings

Boring No.	BH-06	BH-08	BH-12	BH-20	BH-23
	(feet)				
BH-06	0	--	--	--	--
BH-08	150	0	--	--	--
BH-12	300	292	0	--	--
BH-20	460	380	220	0	--
BH-23	580	448	440	260	0

The maximum estimated differential dynamic settlement between pairs of borings was calculated by dividing the difference in maximum total dynamic settlements by the distance between the borings. The results were normalized to a distance of 40 feet. The maximum estimated dynamic differential settlement over a horizontal distance of 40 feet is presented in the following table for each pair of borings.

Table C-4, Estimated Maximum Differential Dynamic Settlement between Borings

Boring No.	BH-06	BH-08	BH-12	BH-20	BH-23
	(inches over 40 horizontal feet)				
BH-06	0	--	--	--	--
BH-08	0.37	0	--	--	--
BH-12	0.23	0.11	0	--	--
BH-20	0.03	0.05	0.24	0	--
BH-23	0.07	0.16	0.24	0.20	0

Based on our evaluation of the potential total dynamic settlement at each boring location, and the distances between the boring locations, we estimate that the potential differential dynamic settlement within the site is less than 0.5 inches in a horizontal distance of 40 feet. We recommend that the planned structures be designed conservatively in anticipation of dynamic differential settlement of up to 0.5 inches in 40 horizontal feet.

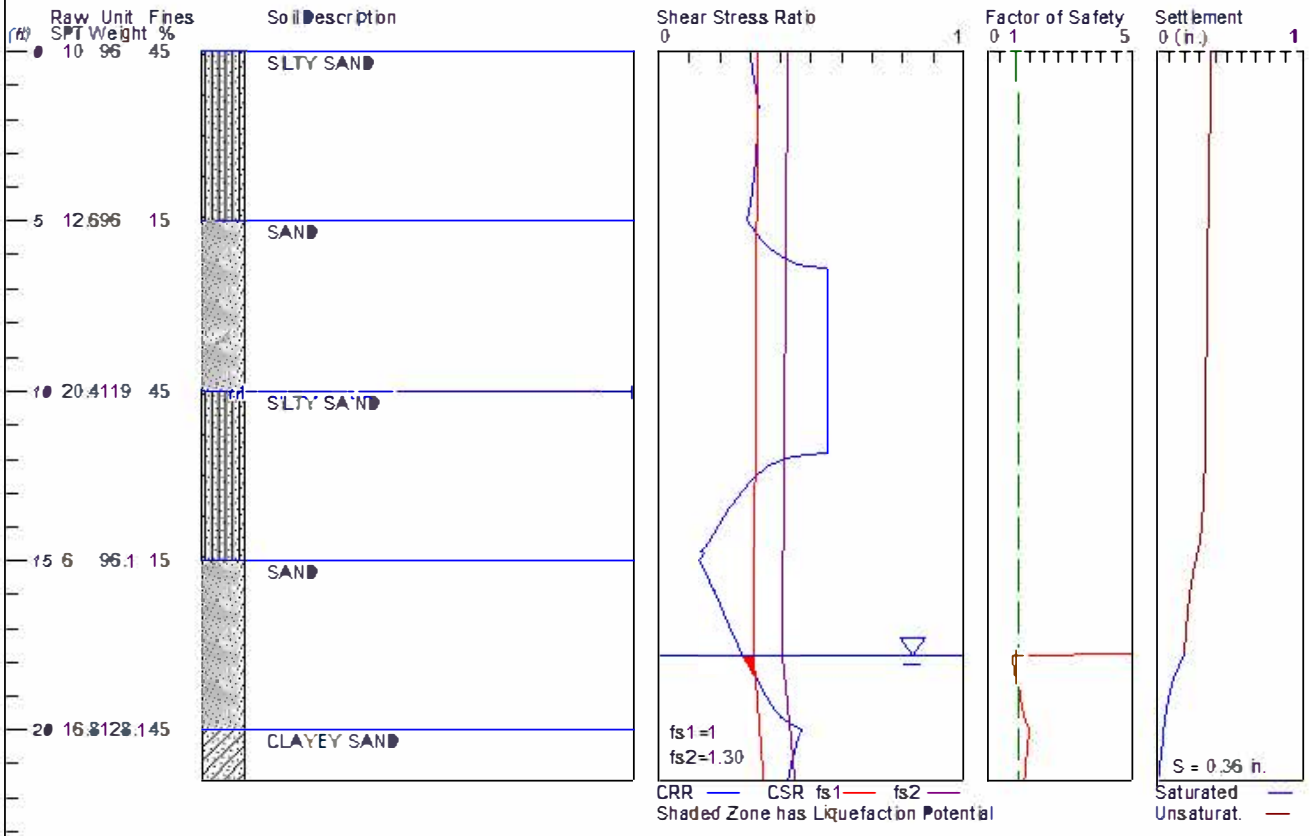
Total and differential dynamic settlement should be verified after final grading during construction by performing at least one boring for each structure.

LIQUEFACTION ANALYSIS

Mojave Narrows Medical Pavilion

Hole No.=BH-06 Water Depth=17.8 ft Surface Elev.=2763

Magnitude=7.2
Acceleration=0.5g

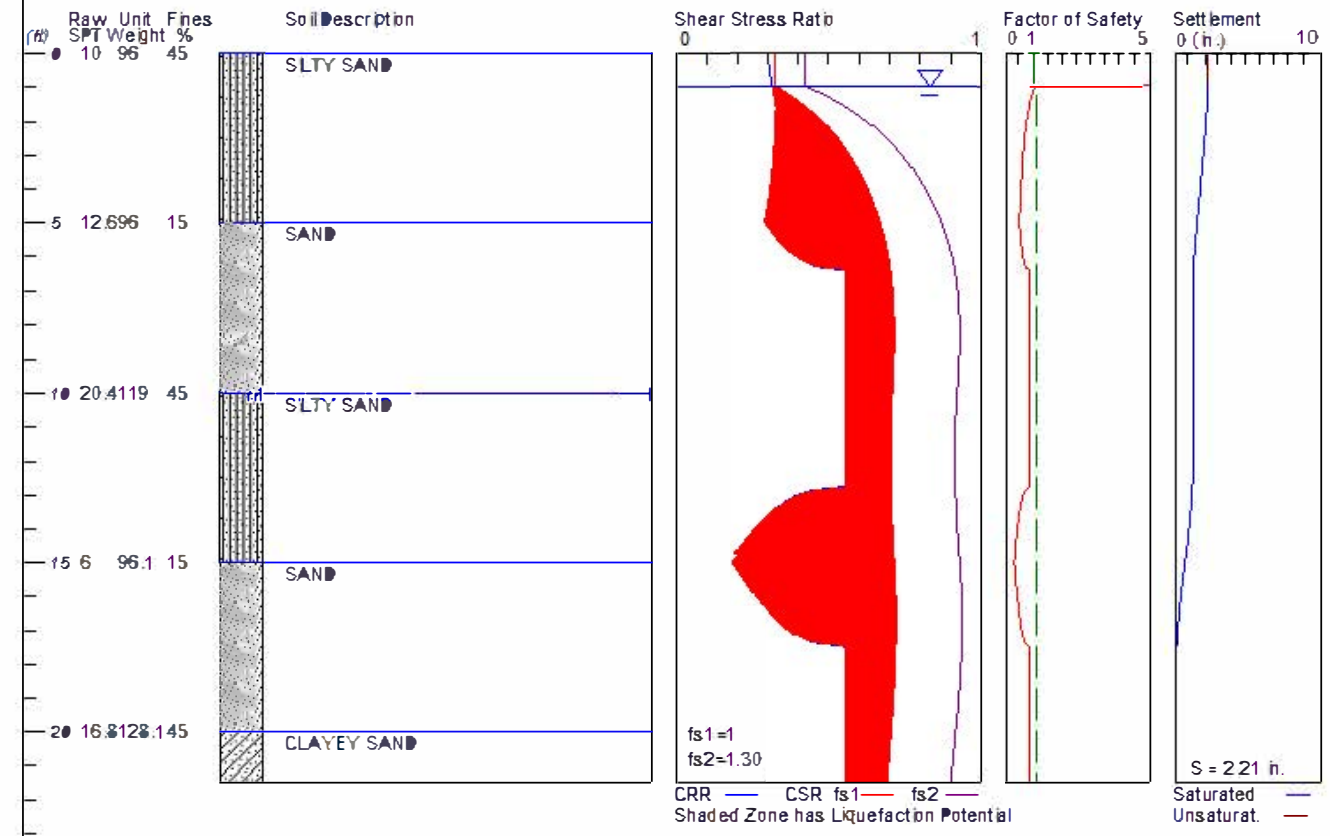


LIQUEFACTION ANALYSIS

Mojave Narrows Medical Pavilion

Hole No.=BH-06 Water Depth=1 ft Surface Elev.=2763

Magnitude=7.2
Acceleration=0.5g

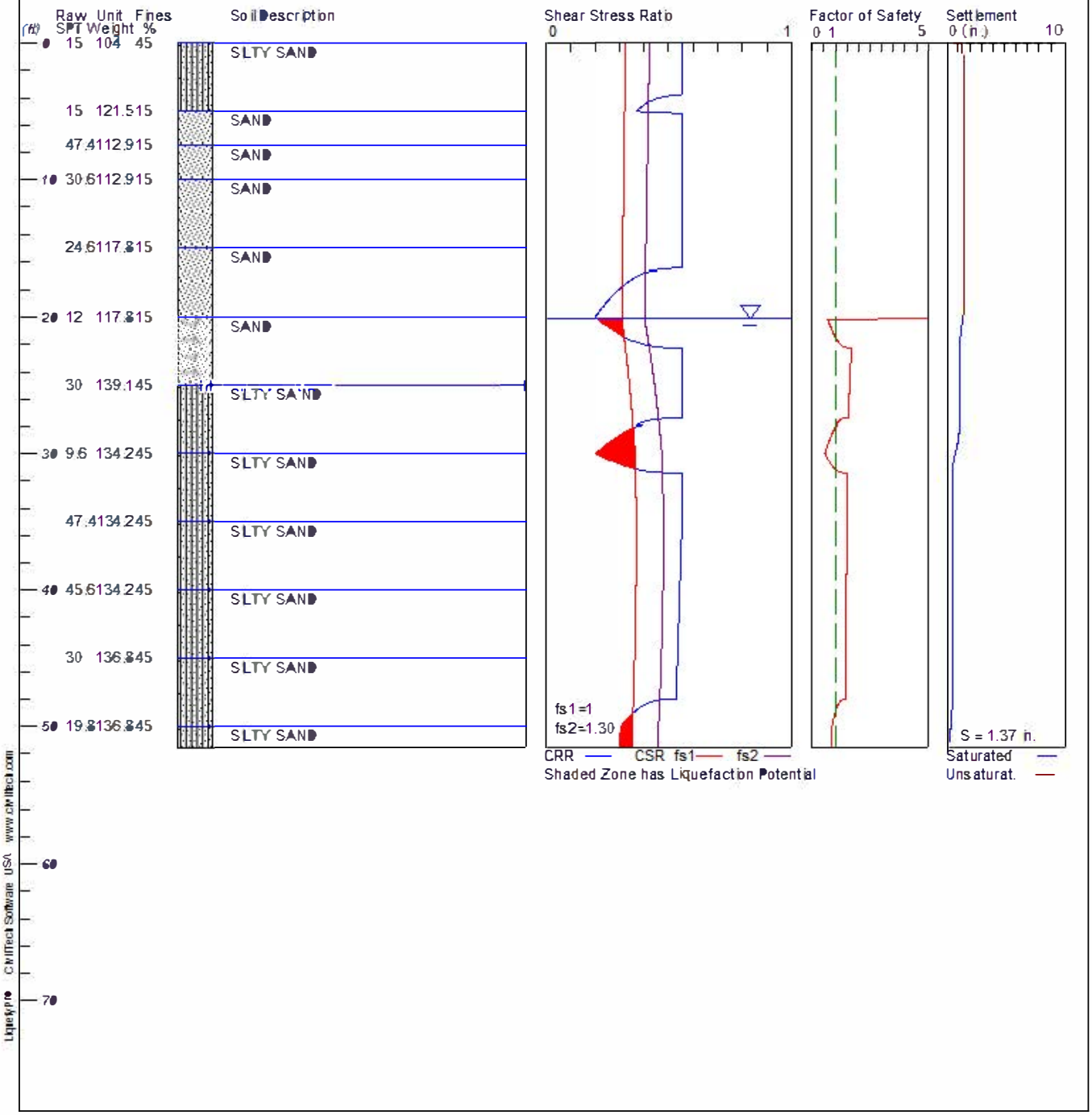


LIQUEFACTION ANALYSIS

Mojave Narrows Medical Pavilion

Hole No.=BH-08 Water Depth=20.1 ft Surface Elev.=2765

Magnitude=7.2
Acceleration=0.5g

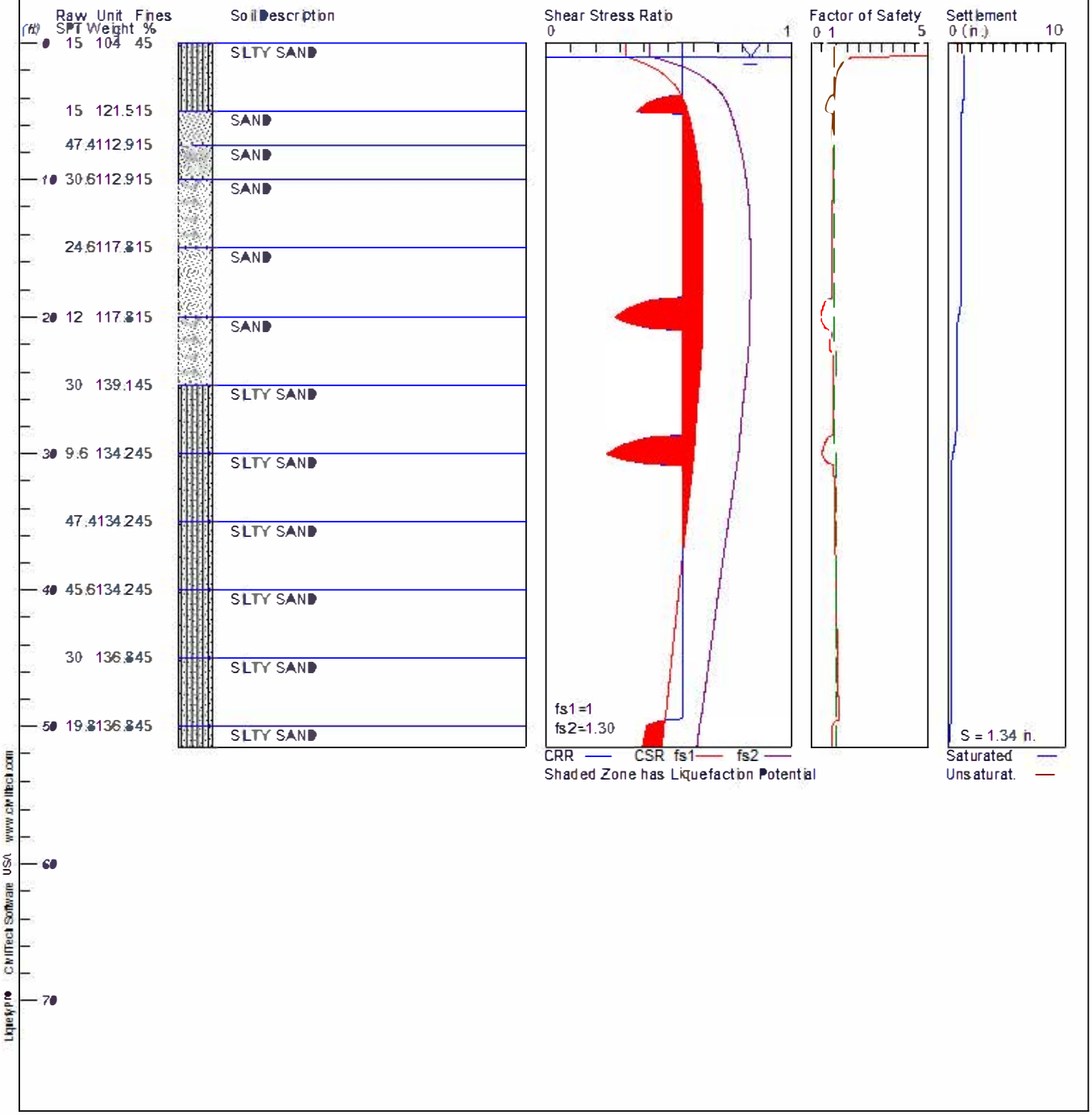


LIQUEFACTION ANALYSIS

Mojave Narrows Medical Pavilion

Hole No.=BH-08 Water Depth=1 ft Surface Elev.=2765

Magnitude=7.2
Acceleration=0.5g



CivilTech Corporation

Dynamic Settlement

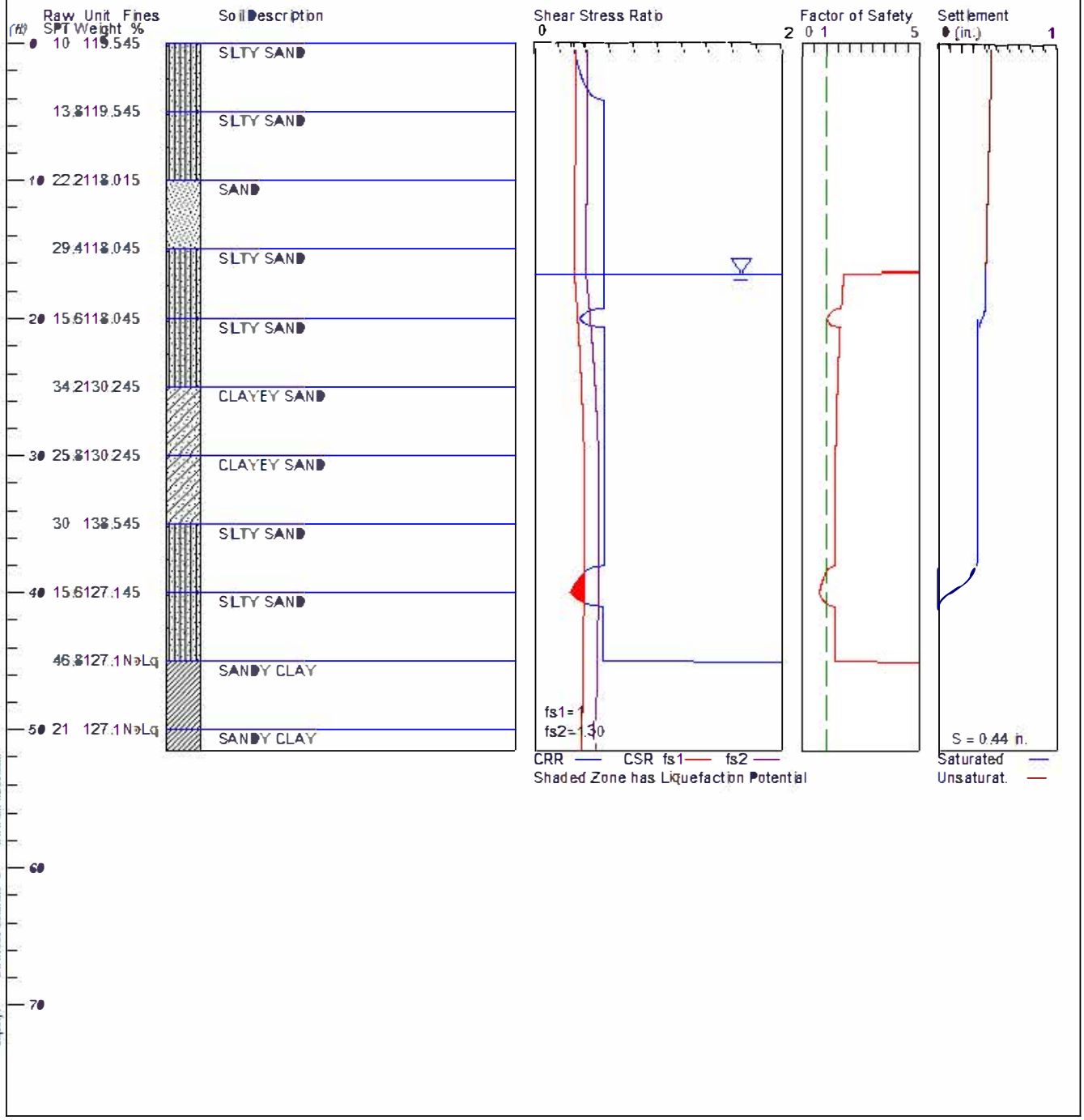
Plate C-4

LIQUEFACTION ANALYSIS

Mojave Narrows Medical Pavilion

Hole No.=BH-12 Water Depth=16.7 ft Surface Elev.=2762

Magnitude=7.2
Acceleration=0.5g



CivilTech Corporation

Dynamic Settlement

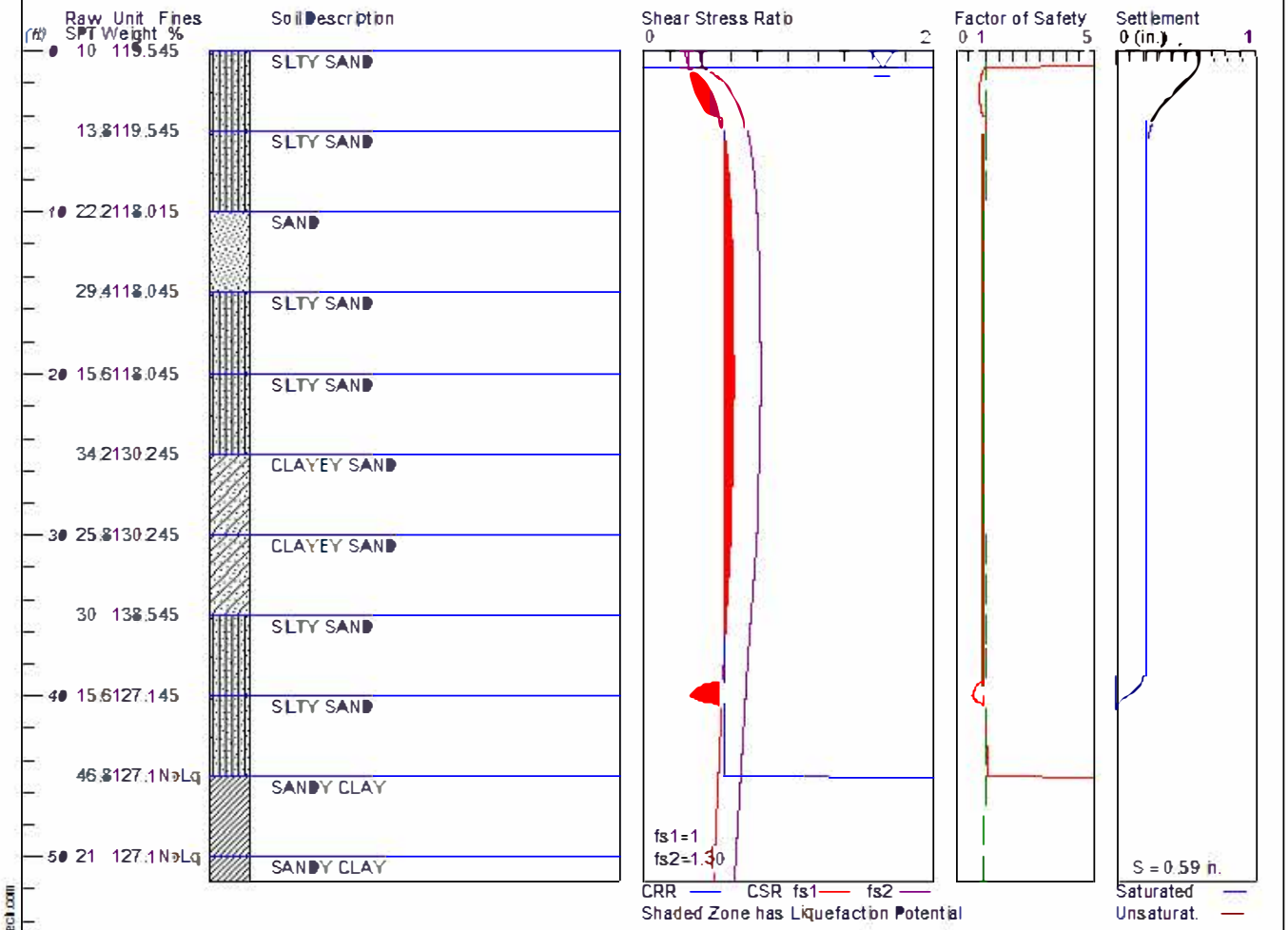
Plate C-5

LIQUEFACTION ANALYSIS

Mojave Narrows Medical Pavilion

Hole No.=BH-12 Water Depth=1 ft Surface Elev.=2762

Magnitude=7.2
Acceleration=0.5g

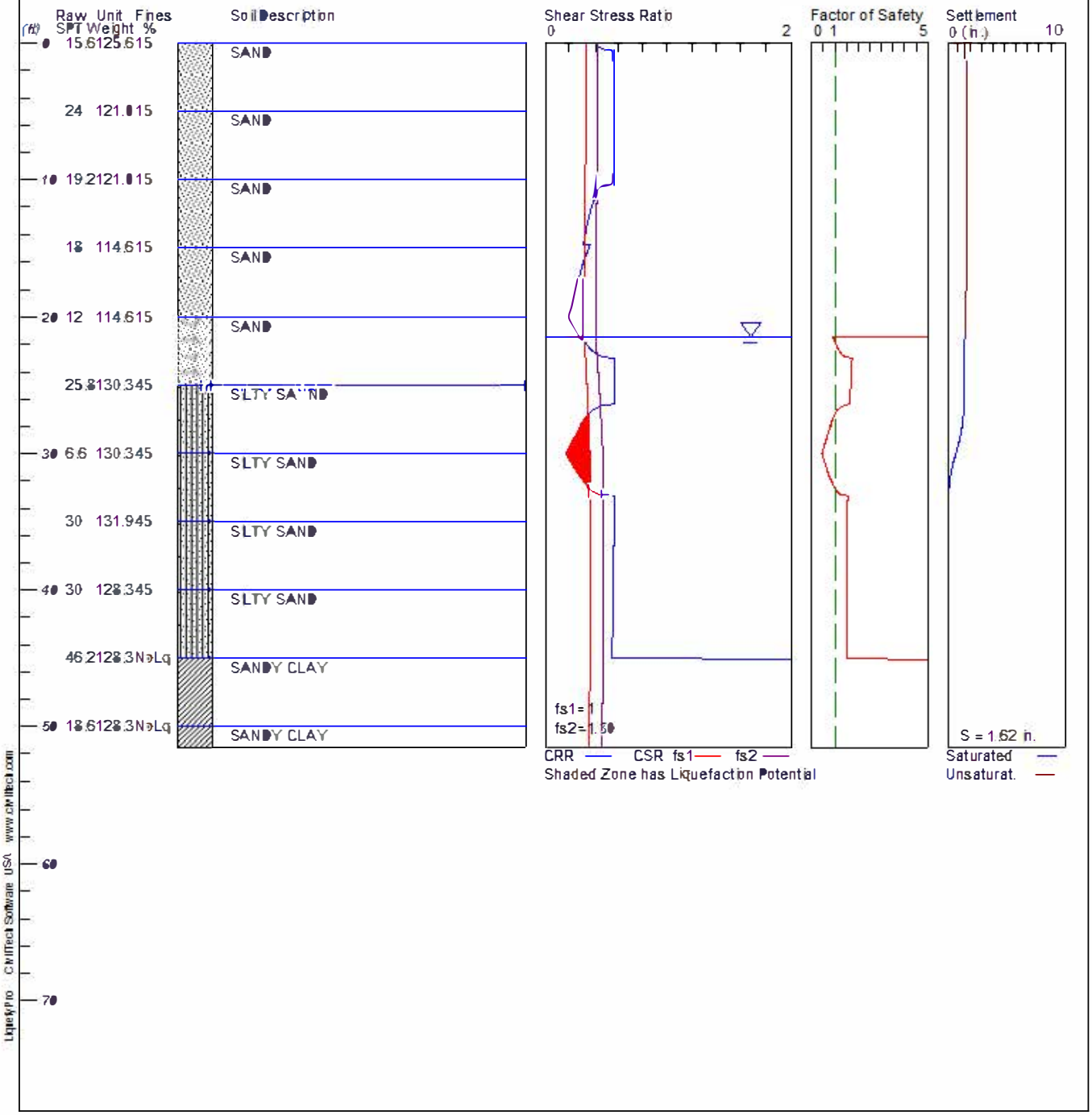


LIQUEFACTION ANALYSIS

Mojave Narrows Medical Pavilion

Hole No.=BH-20 Water Depth=21.4 ft Surface Elev.=2764

Magnitude=7.2
Acceleration=0.5g

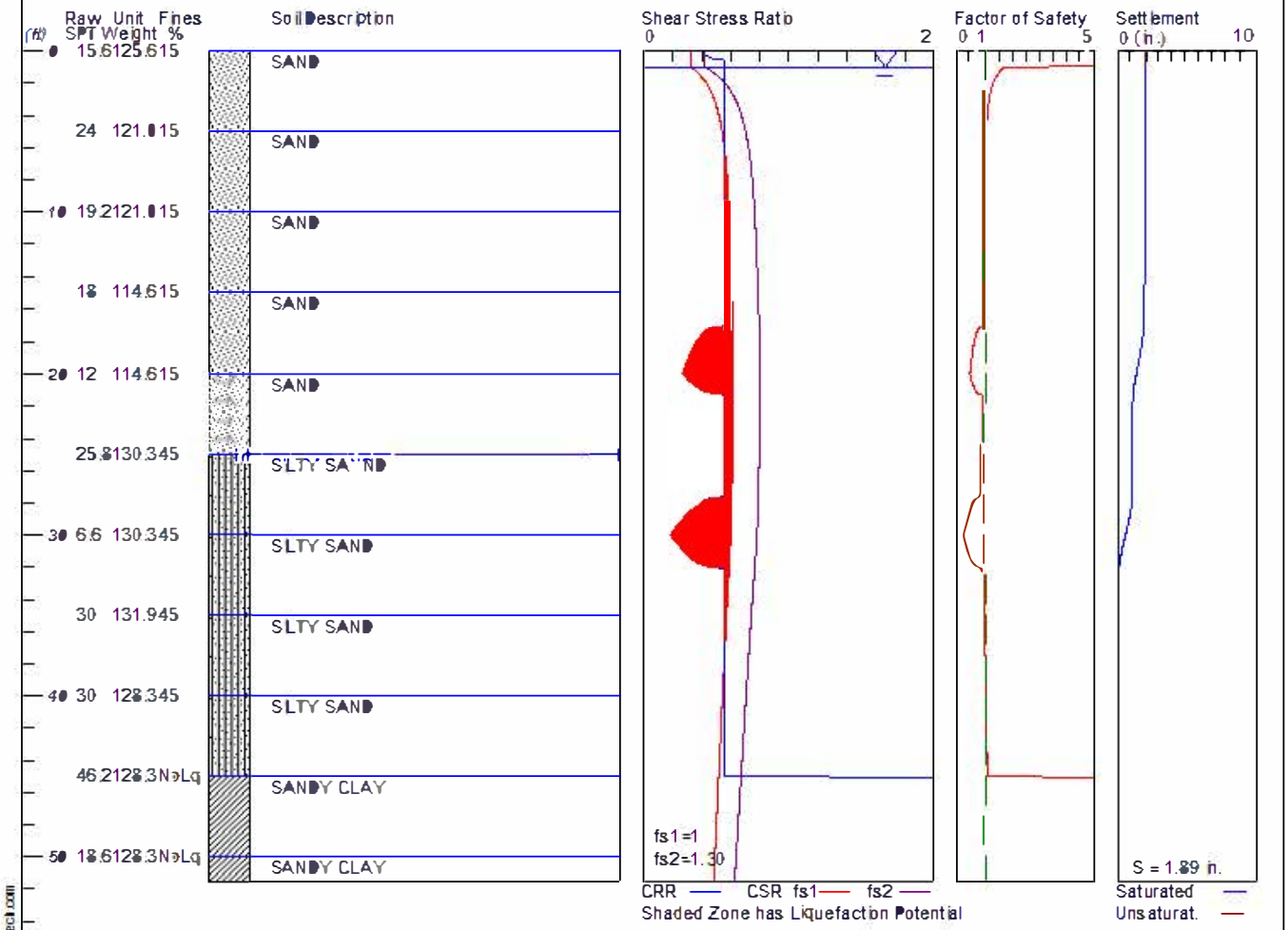


LIQUEFACTION ANALYSIS

Mojave Narrows Medical Pavilion

Hole No.=BH-20 Water Depth=1 ft Surface Elev.=2764

Magnitude=7.2
Acceleration=0.5g

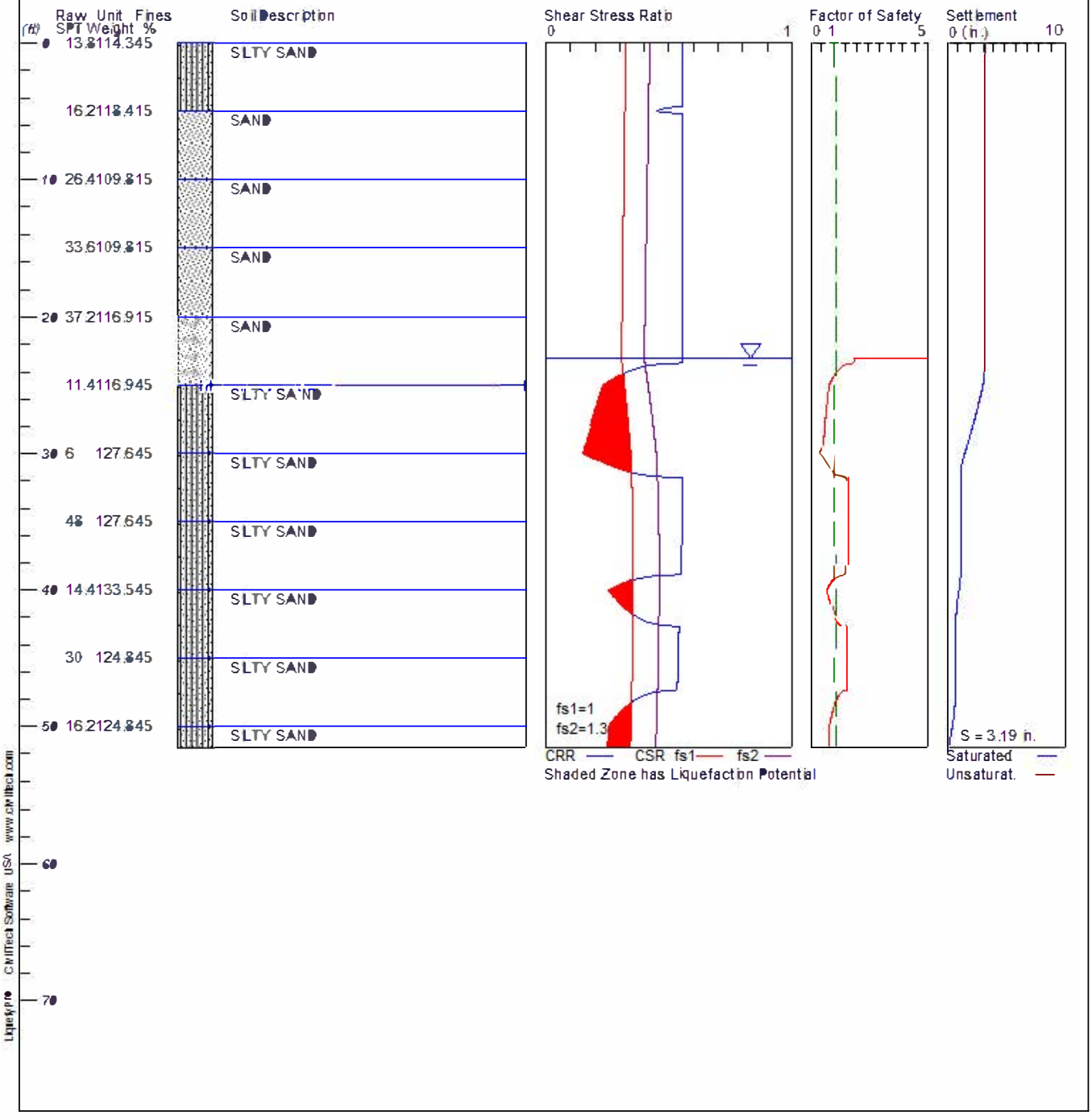


LIQUEFACTION ANALYSIS

Mojave Narrows Medical Pavilion

Hole No.=BH-23 Water Depth=23 ft Surface Elev.=2768

Magnitude=7.2
Acceleration=0.5g



CivilTech Corporation

Dynamic Settlement

Plate C-9

LIQUEFACTION ANALYSIS

Mojave Narrows Medical Pavilion

Hole No.=BH-23 Water Depth=1 ft Surface Elev.=2768

Magnitude=7.2
Acceleration=0.5g