GEOTECHNICAL INVESTIGATION REPORT
Long Valley Creek Overflow Bridge 7C-12
Hackstaff Road (County Road 322)
Doyle, California

Prepared For

County of Lassen Department of Public Works
Lassen County Administrative Building
707 Nevada Street, Suite 4
Susanville, California 96130
Converse Project No. 05-13163-01

March 6, 2006

60th Anniversary
1946 - 2006

Converse Consultants

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

March 6, 2006

Mr. Dave Ernaga
Associate Engineer
County of Lassen Department of Public Works
Lassen County Administrative Building
707 Nevada Street, Suite 4
Susanville, California 96130

Subject: **GEOTECHNICAL INVESTIGATION REPORT**
Long Valley Creek Overflow Bridge No. 7C-12
Hackstaff Road (County Road 322)
Doyle, California
Converse Project No. 05-13163-01

Dear Mr. Ernaga:

Converse Consultants (Converse) has prepared this geotechnical report to present the findings of our geotechnical exploration performed for the proposed replacement of the Long Valley Creek Overflow Bridge 7C-12 located on Hackstaff Road (Count y Road 322) near Doyle, California. This report was prepared in accordance with your written contract.

It is our opinion that the subject site can be developed from a geotechnical standpoint to support the proposed replacement of the 7C-12, provided the findings, conclusions, and recommendations presented in this report are incorporated in the preparation of the final grading plan, foundation design, and construction of the project.

The geotechnical recommendations provided in this report are for foundation design. The recommendations contained herein are contingent upon adequate monitoring of the geotechnical aspects of the construction by Converse Consultants.

We appreciate this opportunity to be of continued service to the County of Lassen Department of Public Works. If you should have any questions, please feel free to contact the undersigned at (916) 331-5444.

CONVERSE CONSULTANTS

Duston D. Marlow, PG, CEG
Senior Engineering Geologist

Dist: 6/Addressee
DDM/drs

4708 Roseville Road, Suite 114, North Highlands, California 95660
Telephone: (916) 331-5444 ♦ Facsimile: (916) 331-6444 ♦ e-mail: dmarlow@converseconsultants.com

PROFESSIONAL CERTIFICATION

This report has been prepared by the staff of Converse Consultants under the professional supervision of the registered engineer(s) whose seals and signatures appear hereon.

The findings, recommendations and professional opinions presented in this report were prepared in accordance with generally accepted professional geological and engineering practice at this time in Northern California. There is no other warranty, either expressed or implied.

DUSTON D.
MARLOW
No. [illegible]
Exp. 11/30/06

Duston D. Marlow, PG, CEG
Senior Engineering Geologist

DEAN R. STANPHILL
No. 2271
Exp. 12/31/06

Dean R. Stanphill, GE
Senior Vice President

EXECUTIVE SUMMARY

The following is a summary of our geotechnical investigation, 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 site is located east of Doyle, California. The existing bridge is located on Hackstaff Road (County Road 322) for the Long Valley Creek Overflow. The site is currently developed with the existing bridge which is characterized by concrete construction and timber piles.

- Our scope of work included field investigation, laboratory testing, geological analyses, engineering analyses, and preparation of this report. A total of 2 borings were drilled to depths ranging from 51.5 feet and 61.5 feet (16.9 meters to 20.2 meters) below the existing ground surface (bgs).

- Laboratory testing consisting of sieve analysis, Atterberg Limits, direct shear, and corrosion potential were performed for soil classification purposes and evaluation of relevant physical characteristics and engineering properties.

- There are no known active faults projecting toward or crossing the site. Active (Holocene age) faulting is located east of the site. The active faults are the Honey Lake Fault Zone and the Fort Sage fault. The Honey Lake Fault Zone is located approximately 0.6 miles (1 KM) east of the study site and trends northhwest to southeast trending fault within Long Valley. The other active fault is the Fort Sage fault located approximately 3 miles (4.8 KM) northeast of the site and trends north to south., where is splays off the Honey Lake Fault Zone. Both the Honey Lake Fault Zone and the Fort Sage fault have produced large magnitude earthquakes (5.2 and 5.6, respectively) in historic times (1979 and 1950, respectively). The site is not situated within a currently designated Alquist-Priolo Zone. Ground shaking from earthquakes associated with nearby and distant faults may occur during the lifetime of the project. Based on “Peak Acceleration from Credible Earthquakes in California”, (Mualchin, L. and Jones, A. L., 1992), the peak ground acceleration shown is 0.6g. The soil profile is identified as Type “D”, stiff soil.

- Groundwater was encountered at 10 feet (3.3 meters) bgs in B-1 and 11.5 feet (3.8 meters) bgs in B-2.

- The upper natural soils encountered consist of silty sand, clayey sands, sandy clay, and sands. Dense and/or hard materials were not encountered until an approximate depth of 40 feet (13.1 meters).

- The upper natural soils are generally moist to wet and are generally very loose to medium dense.

- In areas of new fill, the exposed subgrade soils should be moisture conditioned so that the upper 1-foot (0.3 meters) of subgrade soils are at near optimum moisture content. The exposed bottom soils should be proof-rolled with heavy equipment to check for loose or soft areas. The exposed subgrade soils should be compacted to at least 90 percent of the laboratory maximum density determined in accordance with ASTM Text Method D-1557.

- The site is paved and it appears that some concrete improvements have been performed in the past. There are weeds and vegetation on the shoulder of the road. This portion of the site will require grubbing and removal of scattered debris, weeds and other unsuitable materials prior to commencement of grading.

- The general site area is used for agricultural and livestock purposes and is a low-lying, relatively flat area. At the time of our site visit, water was flowing in the channel.

- The proposed bridge shall be of reinforced concrete slab construction, 18-inches (0.457 meters) thick, with three equal spans. Foundation support will be by Standard Class 625 piles using design loads 625 kiloNewtons. We further understand that the desired configuration is an "Alternative V" pile (closed end pipe pile).

- Typical pile length recommendations are 42 feet (12.8 meters) for a 625 kiloNewton pile.

- Lateral design is not included in our scope of services. Lateral pile capacities can be provided upon request.

- Surface drainage should be sloped away from the structure. Ponding of surface water should not be allowed adjacent to the structure.

- All embankment fill materials should be placed in approximately horizontal layers in maximum 8-inch (0.203 meters) loose layers. Each layer should be moisture conditioned to within 2 percent of optimum moisture content and compacted by rolling with compaction equipment or other acceptable methods to at least 95 percent of the maximum dry density as determined by ASTM D-1557. Slopes for embankments are recommended at 2.5:1 (horizontal: vertical).

- Temporary construction slopes, greater than 3 feet (0.92 meters) in height should be sloped or shored in accordance with the requirements of CAL-OSHA.

- The earth materials at the site should be excavatable with conventional heavy-duty earth moving equipment.

- The on-site soils are negligible in concentration of water-soluble sulfate as defined by the UBC 1997 edition. Type I or II Portland cement may be used for concrete construction.

- In general, the corrosivity of the site soils to ferrous metals is in the range of heavy to severely corrosive. A corrosion engineer should be consulted to provide mitigation recommendations, if there are ferrous metals in direct content with the site soils.

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ILLUSTRATIONS

APPENDICES

1.0 INTRODUCTION

This report presents the findings of our geotechnical investigation performed at the site of the proposed replacement of the Long Valley Creek Overflow Bridge 7C-12 located on Hackstaff Road (County Road 322), east of Doyle, California. The purpose of this investigation was to determine the nature and engineering properties of the subsurface soils and to provide recommendations regarding general site grading and for design and construction.

The site location is shown on Drawing No. 1, *Site Location Map.*

This report is written for the project described herein and is intended for use solely by Mr. Dave Ernaga and the County of Lassen Department of Public Works. 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

2.1 Site Conditions

The site is located east of Doyle, California. The existing bridge is located on Hackstaff Road (County Road 322). The site is currently developed with the existing bridge which is characterized by with concrete construction and timber piles. No information was available as to the depth of the existing timber piles, although these have typically been 10 to 20 feet (3 meters to 6.1 meters) deep.

The general site area is used for agricultural and livestock purposes and is a low-lying, relatively flat area. At the time of our site visit, water was flowing in the channel.

2.2 Proposed Development

The proposed development is the replacement of the Long Valley Creek Overflow Bridge 7C-12 located on Hackstaff Road (County Road 322), east of Doyle, California. The existing bridge is reported to be of concrete construction with timber piles.

It is our understanding that the new bridge will be supported on 18-inch (0.457 meters) diameter closed-end pipe piles. Foundation support will be by Standard Class 625 piles using design loads of 625 kiloNewtons. The primary design consideration was to establish the bearing strata below loose and potentially liquefiable strata and into underlying dense granular materials. Surficial soils in the vicinity of the proposed abutments consist of loose to medium dense materials to a depth of approximately 40 feet (13.10 meters).

3.0 SCOPE OF WORK

The scope of our present investigation included site reconnaissance, subsurface exploration, soil sampling, laboratory testing, geological analyses, engineering analyses, and preparation of this report. The scope of work included the following tasks:

3.1 Field Exploration

Our field exploration included a site reconnaissance. The purpose of the site reconnaissance was to observe surface conditions and to select exploratory boring locations. The approximate locations of the borings are shown in Drawing No. 2, *Boring Locations Map.*

The test borings were advanced using a truck-mounted rig equipped with 4½-inch (0.114-meter) diameter solid stem auger and rotary wash methods below the groundwater table for soil sampling. A total of 2 borings were drilled on December 6, 2005 to depths of 51.5 feet (16.9 meters) and 61.5 feet (20.2 meters), respectively.

Subsurface conditions encountered in the borings were continuously logged and classified in the field by visual and manual examination in accordance with the Unified Soil Classification System. Field exploration procedures and boring logs are presented in A-1 through A-7 in Appendix A, *Field Exploration*.

3.2 Laboratory Testing

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

- *In-situ* moisture contents (ASTM Standard D2216-92)
- Particle Size Distribution (ASTM Standard D422)
- Atterberg Limits Determination (ASTM Standard D 4318)
- Direct Shear (ASTM Standard D 3080)
- Corrosion, resistivity, chlorides, sulfates, and pH

For a description of the laboratory test methods and test results, see Appendix B, *Laboratory Testing Program*. For *in-situ* moisture content and dry density, see the Logs of Borings in Appendix A, *Field Exploration,* A-1 through A-7.

3.3 Report Preparation

Data obtained from the field exploration and laboratory testing program were evaluated. Geotechnical analyses were performed and this report was prepared to present our findings, conclusions, and recommendations for the proposed construction of the piles for the bridge.

4.0 SITE FINDINGS

4.1 Geology

The site is situated on Hackstaff Road (County Road 322), east of Doyle, California. The site is located within the northern portion of the Basin and Range Geologic Province in the western United States. The entire region has been subjected to extension that thinned and cracked the crust as it was pulled apart, creating large faults. This area is a broad basin block of the crust that subsided east of the Sierra Nevada.

The site geology is based upon our subsurface investigation and the Geologic Map of the California (Jennings, C. W., 1977) and the Fault Activity Map of California and Adjacent Areas (Jennings, C. W., 1994). The proposed site is characterized by unconsolidated and semi-consolidated lacustrine and playa deposits. These deposits are non-marine and are a part of the Honey Lake Quaternary sediments.

4.2 Geotechnical Characteristics of Subsurface Materials

Our evaluation of the geotechnical characteristics of subsurface materials at the project site is based on observation of cuttings and soil samples from exploratory borings, and on the result of laboratory tests conducted on selected samples.

The surficial natural soils consist generally of silty sands, sandy silts, sandy clays and clays. The coarse grained materials are loose to dense and the fine grained materials are very stiff to hard in the upper 40± feet. The coarse grained materials appear to become denser below 40 feet.

4.3 Groundwater

Groundwater was encountered during drilling at the locations of our exploratory borings on December 7, 2005. Groundwater observations were made in the exploratory borings at a depth of 10 feet (3.05 meters) in B-1 and 11.5 feet (3.51 meters) in B-2. It should be noted that fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, irrigation, and other factors. Temporarily perched groundwater conditions could also occur during or closely following the rainy season.

4.4 Excavatability

Based on the results of our field exploration, the earth materials at the site should be excavatable with conventional heavy-duty earth moving equipment.

4.5 Soil Corrosivity Evaluation

Two representative soil samples, B-1 @ 10 feet (3.048 meters) and B-1 @ 30 feet (9.14 meters) were tested to determine minimum electrical resistivity, pH, and chemical content, including soluble sulfate concentrations. The purpose of this test is to determine the corrosion potential of site soils when placed in contact with common construction materials. Western Environmental Testing Laboratory, Reno, Nevada, performed the test.

Sulfate concentrations in the native soil are 96 ppm and 77 ppm, for B-1 @ 10 feet (3.048 meters) and B-1 @ 30 feet (9.14 meters), respectively. Sulfate concentrations of 96 and 77 ppm in the soil are not considered corrosive to normally formulated concrete. Chloride concentrations in the native soil are <15 ppm and <15 ppm for B-1 @ 10 feet (3.048 meters) and B-1 @ 30 feet (9.14 meters), respectively. These values are not considered corrosive to normally formulated concrete. Therefore, Type I or II Portland cement should be adequate for concrete design. Concrete should be placed with a maximum 10.16 cm (4-inch) slump. Concrete should have a low water cement ratio and good densification procedures should be used during placement to prevent honeycombing. The use of fly ash and air entrainment should also be considered.

The measured value of the electrical resistivity when saturated was 4100 ohm-cm in B-1 @ 10 feet (3.048 meters) and 4500 ohm-cm in B-1 @ 30 feet (9.14 meters). These values indicate that the on-site soil is heavily to severely corrosive to ferrous metals. Metal conduit should be wrapped or otherwise protected as recommended by your corrosion engineer.

4.6 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. If, during construction, subsurface conditions different from those presented in this report are encountered, this office should be notified immediately so that recommendations can be revised and modified as needed.

5.0 FAULTING AND SEISMICITY

5.1 Faulting

Based on review of the Fault Activity Map of California (Jennings, 1994), there are several faults that are located within approximately 0.6 mile (1 kilometer) to the east of the subject bridge. The faults are part of the Honey Lake Fault Zone and include the Fort Sage Fault. The Honey Lake Fault Zone trends northwest to southeast within Long Valley, while the Fort Sage fault trends in a north to south orientation, splaying off the Honey Lake Fault Zone. The Fort Sage fault was responsible for a 5.6 magnitude earthquake northeast of Doyle in 1950. A 5.2 magnitude earthquake southeast of Doyle occurred in 1977, along the Honey Lake Fault Zone. Ground shaking from earthquakes associated with nearby and distant faults may occur during the lifetime of the project.

5.2 Seismicity

Based on "Peak Acceleration from Credible Earthquakes in California", (Mualchin, L. and Jones, A. L., 1992), the peak ground acceleration shown is approximately 0.6g for a 7.25 magnitude earthquake occurring on the Honey Lake Fault.and 0.6g. The soil profile is identified as Type "D", because of the significant thickness of soft sediments (approximately 40 feet).

5.3 Other Effects of Seismic Activities

In addition to ground shaking, effects of seismic activity on a project site may include surface fault rupture, soil liquefaction, landsliding, lateral spreading, tsunamis, and earthquake induced flooding. Results of a site-specific evaluation of each of the above secondary effects are explained below:

Surface Fault Rupture Because of the close proximity of the site to active faults, surface fault rupture cannot be ruled out. No evidence of surface fault rupture was observed during our field investigation and site reconnaissance.

Liquefaction Liquefaction is the sudden decrease in shearing strength of cohesionless soils due to vibration. During dynamic or cyclic shaking, the soil mass is distorted, and interparticulate stresses are transferred from the sand grains to the pore water. When the pore water pressure increases to the point that the interparticulate effective stresses are reduced to zero, the soil behaves temporarily as a viscous fluid (liquefaction) and, consequently, loses its capacity to support the structures founded thereon.

Liquefaction potential has been found to be the greatest where the groundwater level and loose sands occur within a depth of about 50 feet (15.25 meters) or less. The potential for liquefaction decreases with increasing clay and gravel content, but increases as the ground acceleration and duration of shaking increase.

In boring B-1, the depth interval from approximately 10 to 28 feet below ground surface is considered to have the potential for seismically-induced liquefaction. In boring B-2, soils considered to have the potential for seismically-induced liquefaction were encountered from approximately 21 to 31 feet in depth below ground surface. Accordingly, a somewhat higher factor of safety (3.5) was used in our capacity calculation. The recommended depth of the piers is such that they will penetrate any potentially liquefiable strata encountered in our borings.

Landslides Seismically induced landslides and other slope failures are common occurrences during or after earthquakes in areas of significant relief. The project site is not adjacent to any steep slopes. In the absence of significant ground slopes, the potential for seismically induced landslides to affect the proposed site is considered to be very low.

Lateral Spreading Seismically induced lateral spreading involves primarily lateral movement of earth materials due to ground shaking. It differs from the slope failure in that complete ground failure involving large movement does not occur due to the relatively smaller gradient of the initial ground surface. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The topography at the project site and in the immediate vicinity of the site is located on a ridge underlain with relatively shallow weathered bedrock. Under these circumstances, the potential for lateral spreading at the subject site is considered low, however some slumping of the side banks of the channel may occur.

Tsunamis Tsunamis are tidal waves generated in large bodies of water by fault displacement or major ground movement. Based on the location of the site, tsunamis do not pose a hazard to this site.

Earthquake-Induced Flooding This is flooding caused by failure of dams or other water-retaining structures up gradient of the site as a result of an earthquake. Review of the site indicates that there are no dams or water-retaining structures adjacent to the site.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The project site, from a geotechnical standpoint, is suitable for the proposed plant expansion, provided that the recommendations presented in this report are incorporated in preparation of the grading plan, foundation design, and construction of the project.

7.0 RECOMMENDATIONS

7.1 General

This section contains our general recommendations regarding earthwork for the proposed development. These recommendations are based on the results of our field exploration, laboratory testing, and data evaluation as presented in the preceding sections. These recommendations may need to be modified based on observation of the actual field conditions during grading.

We understand that there will be no grade change from the existing bridge elevations to the new bridge elevations. Therefore, no grading or earthwork is anticipated. However, if plans change and additional earthwork or paving is required, it should be performed in accordance with Lassen County requirements.

The proposed bridge may be founded on capacity 18-inch (0.457 meters) closed end pipe piles founded at an approximate depth of 42 feet (12.8 meters) below ground surface. These piles are expected to have a minimum allowable capacity in compression of 625 kiloNewtons.

The contractor must understand that project characteristics include high groundwater, possible water flowing in the stream bed, and near surface soils that are loose and may be prone to slumping.

8.0 PARAMETERS USED FOR DESIGN

8.1 Scour Depth

It is our understanding that an evaluation of scour depth will be performed by Lassen County. Moreover, the pier capacities are based on support from deeper soils below any anticipated scour depth.

8.2 Soil Strength Characteristics

Shear strength tests were performed on relatively undisturbed soil samples obtained during our field investigation. Test results are presented in Appendix A. Accordingly, based on these results and correlations from the Naval Facilities Design Manual, we have used an angle of internal friction of 24 degrees and cohesion of 430 pounds per square foot for the upper clayey soils and an angle of internal friction of 34 degrees for the sand.

The effects of soil cohesion were not included in our analysis. A soil bulk density of 120 pounds per cubic foot (18.8 kN/m^3) and 47.6 pounds per cubic foot (7.5 kN/m^3) buoyant weight was used for determining the effective stress along the pier length.

9.0 FOUNDATION RECOMMENDATIONS

9.1 General

Provided that the recommendations contained in this report are implemented during design and construction, it is our opinion that the proposed bridge can be founded on closed end pipe piles, founded in dense materials underlying the surficial strata.

Lateral design is not included in our scope of services. Lateral pile capacities can be provided upon request.

The geotechnical constraints identified during our investigation included high groundwater, possible surface flow, and near surface loose/soft soils.

This report has been prepared to aid in the evaluation of the subject site and to assist in the design of this project. This office should be provided the opportunity to review the final grading plans, design drawings, and specifications in order to determine whether the recommendations presented in this report have been implemented. Review of the final grading plan, design drawings, and specifications should be noted in writing and become a supplement to this report. It is considered essential that this review be performed prior to project bidding.

Soil samples taken and tested and observations made are assumed to be representative of the site. Variations in soil conditions may be encountered during construction of this project. In order to permit correlation between the field conditions encountered in this investigation, the actual conditions encountered during construction, and to confirm recommendations presented herein, this office should be retained to perform sufficient review during construction of this project.

9.2 Closed End Pipe Piles

It is our understanding that the new bridge will be supported on 18-inch (0.457 m) closed-end pipe piles. The primary design consideration was to establish the bearing strata below any potentially liquefiable strata.

For a 625 kN capacity pile, we recommend that the minimum tip elevations be 28.5 feet (8.69 meters) below the existing ground elevation. Pre-drilling, if required, should be no closer than 5 feet (1.53 meters) from the final tip elevation, and should also be limited to no more than 80 percent of the pile diameter.

For piles spaced at least 2.5 pile diameters on center, no reduction for group effect is required.

10.0 GEOTECHNICAL SERVICES DURING CONSTRUCTION

This report has been prepared to aid in the evaluation of the site and to assist the civil and structural engineers in the design of the proposed structures.

Recommendations presented herein, are based upon the assumption that adequate earthwork monitoring will be provided by Converse. Excavation bottoms should be observed by a Converse representative. Structural fill and backfill should be placed and compacted during continuous observation and testing by this office. Pile excavations should be observed by Converse prior to placement of steel and concrete so that the piles are founded on satisfactory materials and excavations are free of loose and disturbed materials.

11.0 CLOSURE

The findings and recommendations of this report were prepared in accordance with the generally accepted professional engineering and engineering geologic principles and practice within our profession in effect at this time in Northern California. Our conclusions and recommendations are based on the results of field and laboratory investigations, combined with an interpolation of subsurface conditions between and beyond exploration locations.

As the project evolves, Converse should be retained to provide continued consultation and construction monitoring, which should be considered an extension of geotechnical investigation services performed to date. We 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.

This report was written for Lassen County and their design team, and only for the proposed development described herein. We are not responsible for technical interpretations made by others of our exploratory information, which has not been described or documented in this report. Specific questions or interpretations concerning our findings and conclusions may require written clarification to avoid future misunderstandings.

12.0 REFERENCES

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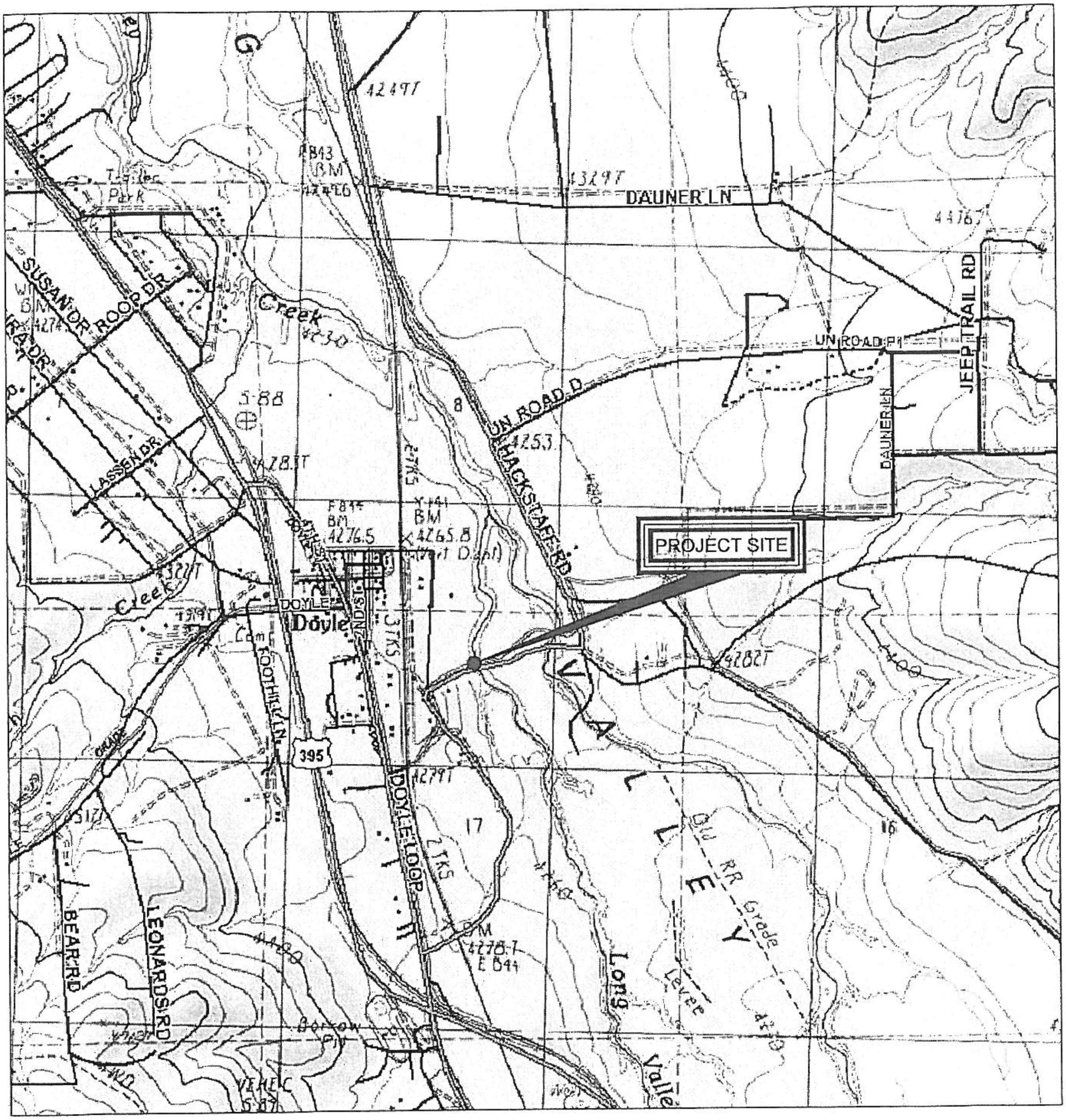
UNITED STATES GEOLOGIC SURVEY, Earthquake Hazards Program, Interpolated Probablistic Ground Motion for Conterminous 48 States by Longitude/Latitude.



DOYLE AND VICINITY

FOUNDATION INVESTIGATION
LONG VALLEY CREEK OVERFLOW BRIDGE
LASSEN COUNTY, CALIFORNIA

Scale	NTS
Date	01-11-06
Drafted By	DR
Checked By	BRO
Approved By	
File No.	
Project No.	05-13163-01
Drawing No.	1

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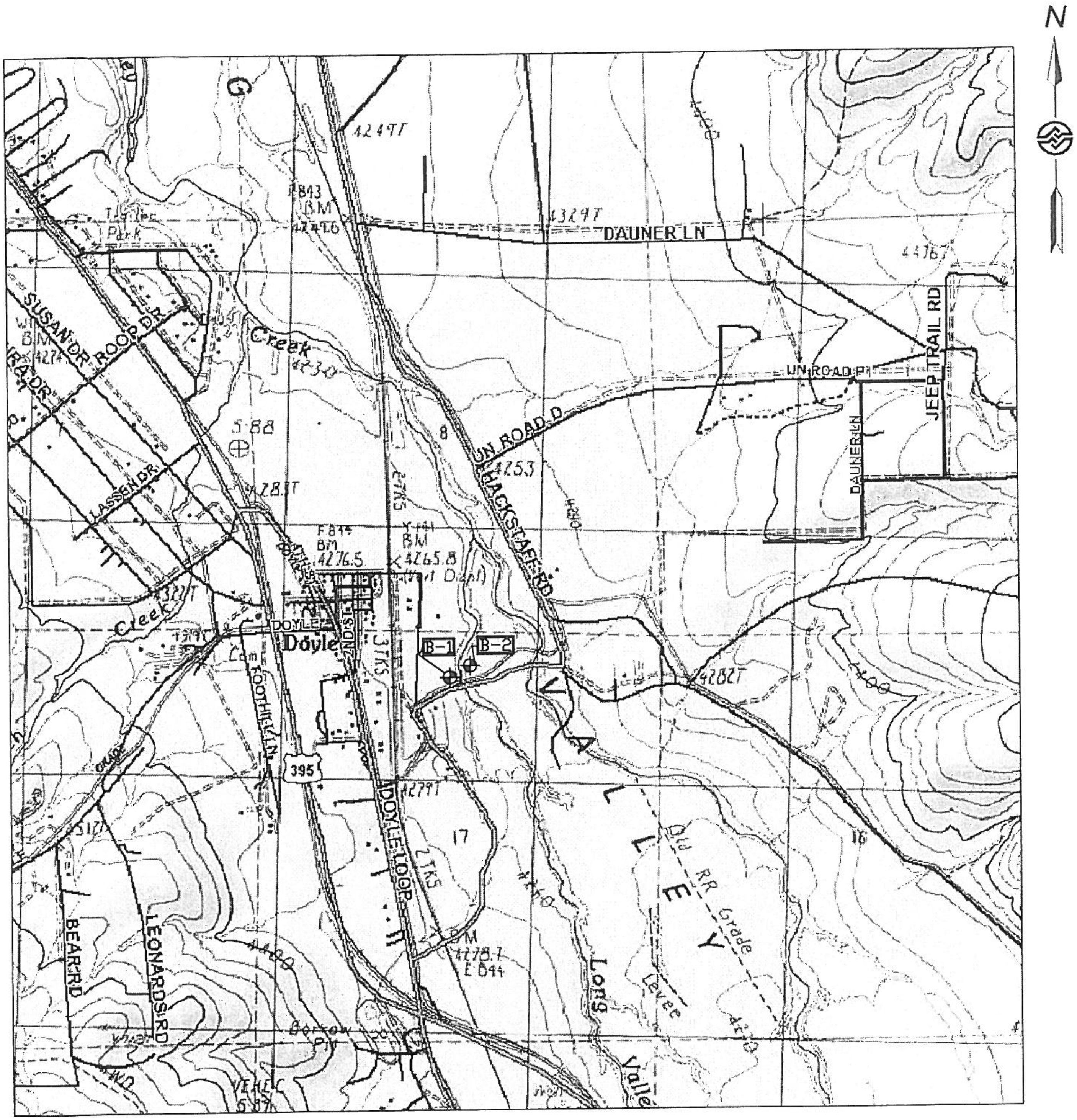
Over 50 Years of Dedication
in Engineering and
Environmental Sciences



LEGEND

B-2 ⊕ APPROXIMATE BORING LOCATIONS

DOYLE AND VICINITY

FOUNDATION INVESTIGATION
LONG VALLEY CREEK OVERFLOW BRIDGE
LASSEN COUNTY, CALIFORNIA

Scale NTS
Date 01–11–06
Drafted By DR
Checked By BRO
Approved By

File No.
Project No. 05-13163-01
Drawing No. 1

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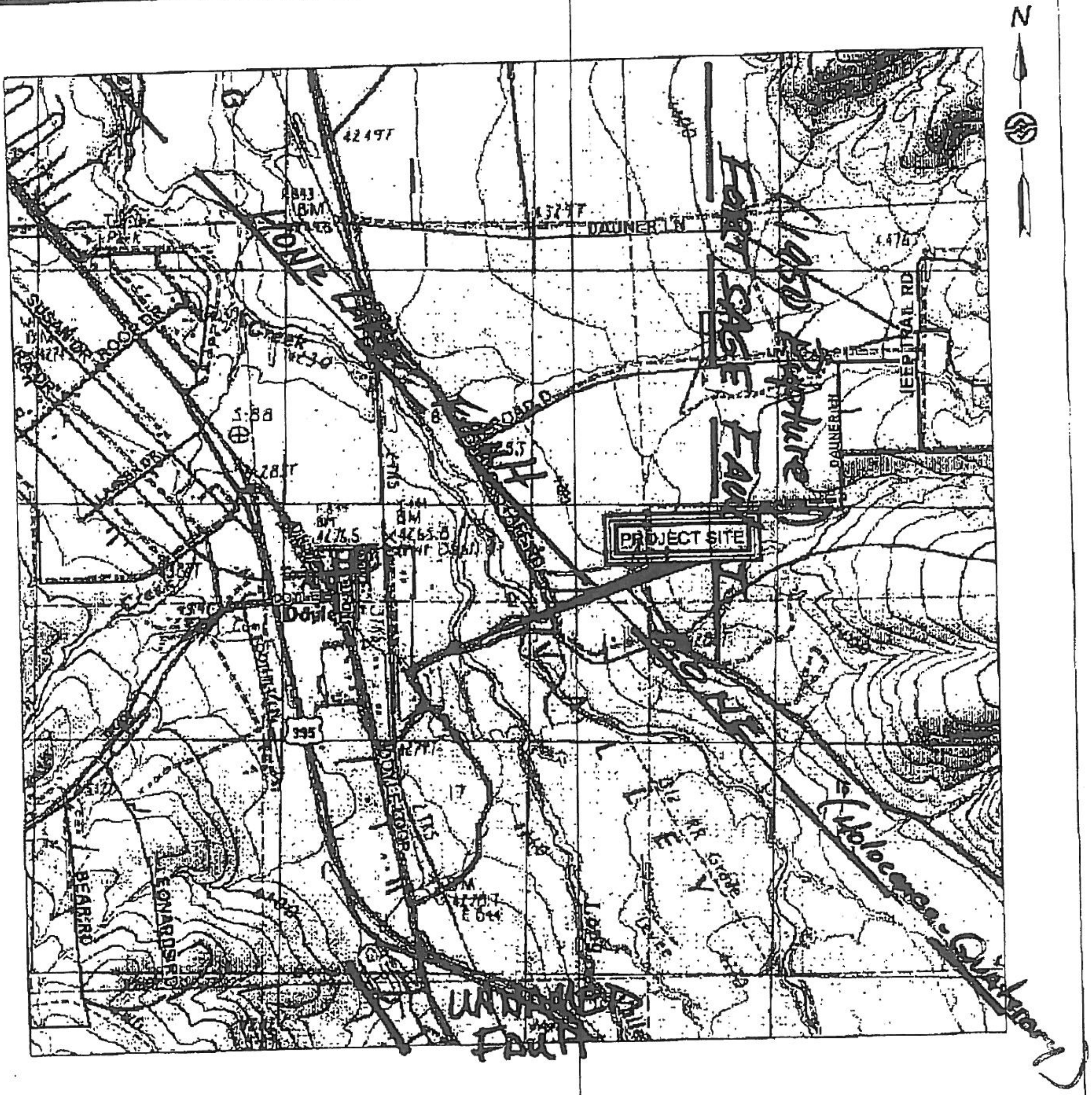
Environmental Sciences



DOYLE AND VICINITY

FOUNDATION INVESTIGATION
LONG VALLEY CREEK OVERFLOW BRIDGE
LASSEN COUNTY, CALIFORNIA

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Scale NTS
Date 01-11-06
Drafted By DR
Checked By BRO
Approved By
File No.
Project No. 05-13163-01
Drawing No. 1

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

Our field investigation included a site reconnaissance of the property and a subsurface exploration program consisting of drilling test borings. During the site reconnaissance, the surface conditions were noted and the locations of the test borings were determined. The test borings were located by pacing or by rough measurements relative to existing topography and boundary features and should be considered accurate only to the degree implied by the method used.

Borings:

The test borings were advanced using a truck-mounted rig equipped with 6-inch (0.152 meters) soild-stem auger and also the use of rotary wash for soil sampling. A total of 2 borings were drilled on December 6, 2005, to a maximum depth of 70.92 feet (21.63 meters). Soils encountered in the borings were logged by a Converse geologist and classified in the field by visual examination in accordance with the Unified Soil Classification System (ASTM 2488). The field descriptions have been modified where appropriate to reflect laboratory test results.

Relatively undisturbed ring and bulk samples of the subsurface soils were obtained at frequent intervals in the borings. The relatively disturbed samples were obtained at frequent intervals in the borings using Standard Penetration Tests.

The relatively undisturbed samples were obtained using a California drive sampler (2.4-inch inside diameter and 3-inch outside diameter) lined with thin sample rings. The sampler was driven into the bottom of the boreholes with successive drops of a 140-poound automatic trip hammer falling 30-inches (0.762 meters). The number of successive drops of the driving weight ("blows") required for each 6-inches of penetration of the sampler are shown in the Logs of Borings in the "Blow Count" column.

Standard Penetration Tests (SPT) were performed in some of the borings using a standard (1.4-inch inside diameter and 2-inch outside diameter) split-barrel sampler. The mechanically driven hammer for the SPT sampler was 140 pounds, falling 30-inches (0.762 meters) for each blow. The recorded blow counts for each 6-inches (0.762 meters) of sampler penetration are shown on the Logs of Borings in the "Blow Count" column. The standard penetration tests were performed in accordance with the ASTM Standard D1586-84 test method. Bulk samples retrieved inside the SPTs sampler were collected in zip lock plastic bags and shipped to our laboratory.

In addition to drive samples, representative bulk samples were collected from selected depths within the borings. Bulk samples were obtained from drill cuttings and placed in large plastic bags.

Samples were also collected for environmental testing. A description of the environmental testing and results are presented in a separate report by Converse.

Borings were backfilled with cutting upon completion of drilling each borehole.

It should be noted that the exact depths at which material changes occurs cannot always be established accurately. Unless a more precise depth can be established by other mean, changes in material conditions that occur between drive samples are indicated in the logs at the top of the next drive samples.

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-1 through A-7, *Logs of Borings*.

Log No. B-1

Date of Drilling: 12-6-05
Driller: Taber Consultants
Logged By: BRO

Location: NW Side of Ext. Bridge 25' from Abutment
Borehole Diameter: N/A
Groundwater Depth (ft): 10' (Static Level)

Elevation (ft):
Equipment: PA, Truck-mounted Rig
Driving Wt. and Drop: 140 lbs 30"

DRAFTED BY JMV

APPROVED BY ON

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read with the report. This summary applies only at the location and time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplified model of the actual conditions encountered.

Depth (ft)	Graphic Log	Summary of Subsurface Conditions	Samples: Drive	Samples: Bulk	Blow Count	Drill Rate (sec/ft)	Moisture (%)	Dry Density (lb/cf)	Field or Lab Tests
0		SILTY SAND (SM), Brown, Moist, Very Loose							
2			◨		4				
4									
5		CLAYEY SAND (SC), Dark Brown, Moist, Medium Dense	⧗		10		29.6	90.9	
6									
8									
10	▽	SAND WITH SILT (SP), Dark Brown, Wet, Very Loose, Sulfur Odor, Poorly Graded	◨		2				
12									
14									
15		SAND (SP), Trace Clay, Dark Brown, Gray, Wet, Fine-Grained, Very Loose	⧗		6				
16									
18									
20									

⧗ Converse Sampler (white symbol=no recovery)

◨ SPT Sampler (white symbol=no recovery)

Hackstaff Road Bridge 7C-12
Hackstaff Road
Doyle, CA

Project No. 05-13163-01

Drawing No. A-1

Converse Consultants

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Log No. B-1

DRAFTED BY JMV

Date of Drilling: 12-6-05
Driller: Taber Consultants
Logged By: BRO

Location: NW Side of Ext. Bridge 25' from Abutm
Borehole Diameter: N/A
Groundwater Depth (ft): 10' (Static Level)

Elevation (ft):
Equipment: PA, Truck-mounted Rig
Driving Wt. and Drop: 140 lbs 30"

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read with the report. This summary applies only at the location and time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplified model of the actual conditions encountered.

Depth (ft)	Graphic Log	Summary of Subsurface Conditions	Samples: Drive	Samples: Bulk	Blow Count	Drill Rate (sec/ft)	Moisture (%)	Dry Density (lb/cf)	Field or Lab Tests
		SAND (SP), Light Brown, Wet, Medium to Coarse Grained, Medium Dense, Well Sorted/Poorly Graded	▮		21				
22									
24									
			▮		16				
26		SAND WITH CLAY (SC), Light Grayish Brown, Wet, Medium Dense							
28									
30		CLAYEY SAND (SC), Greenish Gray, Wet, Medium Dense, Organic Smell	▮		21				PP=3.0-3.5 tpf PI=15
32									
34									
		SANDY CLAY (CL), Greenish Gray, Wet, Fine-Grained, Very Stiff, Organic Smell	▮		21				
36									
38									
40									

APPROVED BY ON

⊠ Converse Sampler (white symbol=no recovery)

◢ SPT Sampler (white symbol=no recovery)

Hackstaff Road Bridge 7C-12
Hackstaff Road
Doyle, CA

Project No.
05-13163-01

Converse Consultants

Over 50 Years of Dedication
in Engineering and
Environmental Sciences

Drawing No.
A-2

Log No. B-1

Date of Drilling: 12-6-05
Driller: Taber Consultants
Logged By: BRO

Location: NW Side of Ext. Bridge 25' from Abutment
Borehole Diameter: N/A
Groundwater Depth (ft): 10' (Static Level)

Elevation (ft):
Equipment: PA, Truck-mounted Rig
Driving Wt. and Drop: 140 lbs 30"

DRAFTED BY JMV

APPROVED BY ON

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read with the report. This summary applies only at the location and time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplified model of the actual conditions encountered.

Depth (ft)	Graphic Log	Summary of Subsurface Conditions	Samples: Drive	Samples: Bulk	Blow Count	Drill Rate (sec/ft)	Moisture (%)	Dry Density (lb/cf)	Field or Lab Tests
	▨	CLAYEY SAND (SC), Greenish Gray, Wet, Fine Grained, Very Dense	■		58				
42	▨								
44	▨								
	▨	SANDY CLAY (CL), Greenish Gray, Wet, Fine to Medium Grained, Hard, Organic Smell	■		33				
46	▨								
48	▨								
50	⁘	SAND (SP), Trace Clay, Greenish Gray, Wet, Medium to Coarse Grained, Medium Dense	■		26				
		Bottom of Boring @ 51.5'							
52									
54									
56									
58									
60									

End of Exploration at 51.5'
⊠ Converse Sampler (white symbol=no recovery)
◢ SPT Sampler (white symbol=no recovery)

Hackstaff Road Bridge 7C-12
Hackstaff Road
Doyle, CA

Project No.
05-13163-01

Converse Consultants

Over 50 Years of Dedication
in Engineering and
Environmental Sciences

Drawing No.
A-3

Log No. B-2

DRAFTED BY JMV

Date of Drilling: 12-6-05
Driller: Taber Consultants
Logged By: BRO

Location: NE Side of Existing Bridge
Borehole Diameter: N/A
Groundwater Depth (ft): 12' (Static Level)

Elevation (ft):
Equipment: PA to 25'; Switched to Rotary Wash to Finish Boring
Driving Wt. and Drop: N/A

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read with the report. This summary applies only at the location and time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplified model of the actual conditions encountered.

Depth (ft)	Graphic Log	Summary of Subsurface Conditions	Samples: Drive	Samples: Bulk	Blow Count	Drill Rate (sec/ft)	Moisture (%)	Dry Density (lb/cf)	Field or Lab Tests
0	▨	SILTY CLAYEY SAND (SC), Brown, Moist		▨					PI=7
2	▨	SAND WITH CLAY (SP), Brown, Moist, Medium Dense	▮	▨	17				PP = 3.0 tpf
4	▨	SAND (SP), Brown, Light Brown, Moist, Poorly Graded		▨					
6	▨	SANDY LEAN CLAY (CL), Dark Brown, Moist to Wet, Fine Grained, Very Stiff	⧗		19				PI=20
10	▨	CLAYEY SAND (SC), Light Brown, Very Moist, Fine Grained, Medium Dense, Well Sorted/ Poorly Graded	▮		16				
12	▽								
14									
16	▨	SAND (SP), Light Brown, Wet, Medium to Coarse Grained, Dense, Arkosic	▮		30				
18									
20									

⧗ Converse Sampler (white symbol=no recovery)
◢ SPT Sampler (white symbol=no recovery)

APPROVED BY ON

Hackstaff Road Bridge 7C-12
Hackstaff Road
Doyle, CA

Project No.
05-13163-01

Converse Consultants

Over 50 Years of Dedication in Engineering and Environmental Sciences

Drawing No.
A-4

Log No. B-2

Date of Drilling: 12-6-05
Driller: Taber Consultants
Logged By: BRO

Location: NE Side of Existing Bridge
Borehole Diameter: N/A
Groundwater Depth (ft): 12' (Static Level)

Elevation (ft):
Equipment: PA to 25'; Switched to Rotary Wash to Finish Boring
Driving Wt. and Drop: N/A

DRAFTED BY JMV

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 with the report. This summary applies only at the location and time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplified model of the actual conditions encountered.**	Samples Drive	Samples Bulk	Samples Blow Count	Drill Rate (sec/ft)	Moisture (%)	Dry Density (lb/cf)	Field or Lab Tests
22 24		SAND (SP), Greenish Gray, Wet, Medium to Coarse Grained, Dense, Poorly Graded	◢		33				
26 28		SAND (SW), Greenish Gray, Wet, Very Fine to Very Coarse Grained Some Gravel, Trace Clay, Well Graded, Medium Dense	◢		18				
30 32		SAND (SP), Greenish Gray, Wet, Very Fine to Coarse Grained, Medium Dense	◢		23				
34		SANDY CLAY (CL), Greenish Gray, Wet							
36 38 40		SAND (SP), Greenish Gray, Wet, Very Fine Grained, Poorly Graded, Dense	◢		31				

⊠ Converse Sampler (white symbol=no recovery) ◢ SPT Sampler (white symbol=no recovery)

APPROVED BY ON

Hackstaff Road Bridge 7C-12
Hackstaff Road
Doyle, CA

Project No.
05-13163-01

Converse Consultants

Over 50 Years of Dedication
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Environmental Sciences

Drawing No.
A-5

Log No. B-2

DRAFTED BY JMV

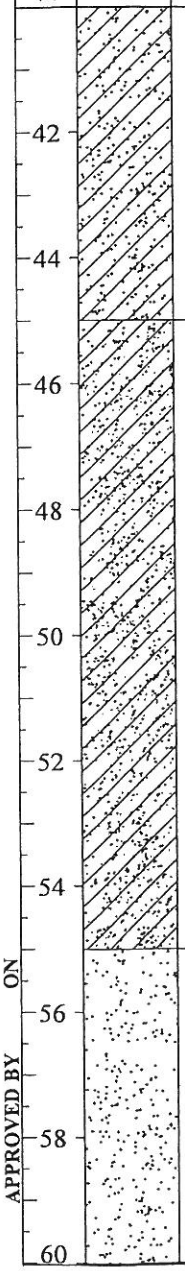
Date of Drilling: 12-6-05
Driller: Taber Consultants
Logged By: BRO

Location: NE Side of Existing Bridge
Borehole Diameter: N/A
Groundwater Depth (ft): 12' (Static Level)

Elevation (ft):
Equipment: PA to 25'; Switched to Rotary Wash to Finish Boring
Driving Wt. and Drop: N/A

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read with the report. This summary applies only at the location and time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplified model of the actual conditions encountered.



Summary of Subsurface Conditions	Samples: Drive	Samples: Bulk	Samples: Blow Count	Drill Rate (sec/ft)	Moisture (%)	Dry Density (lb/cf)	Field or Lab Tests
SANDY CLAY (CL), Greenish Gray, Wet, Hard	■		41				
CLAYEY SAND (SC), Greenish gray, Wet, Fine-Grained, Medium Dense	■		29				
	■		33				
SAND (SP), Light Brown, Wet, Medium to Coarse Grained, Dense	■		48				

APPROVED BY ON

⊠ Converse Sampler (white symbol=no recovery) ◣ SPT Sampler (white symbol=no recovery)

Hackstaff Road Bridge 7C-12
Hackstaff Road
Doyle, CA

Project No.
05-13163-01

Converse Consultants

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Drawing No.
A-6

Log No. B-2

DRAFTED BY JMV

Date of Drilling: 12-6-05
Driller: Taber Consultants
Logged By: BRO

Location: NE Side of Existing Bridge
Borehole Diameter: N/A
Groundwater Depth (ft): 12' (Static Level)

Elevation (ft):
Equipment: PA to 25'; Switched to Rotary Wash to Finish Boring
Driving Wt. and Drop: N/A

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 with the report. This summary applies only at the location and time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplified model of the actual conditions encountered.**	Samples Drive	Samples Bulk	Blow Count	Drill Rate (sec/ft)	Moisture (%)	Dry Density (lb/cf)	Field or Lab Tests
	▨	SANDY CLAY (CH), Light Reddish Brown, Wet, Very Hard, Iron Oxide Staining	■		74				
		Bottom of Boring @ 61.5'							
62									
64									
66									
68									
70									
72									
74									
76									
78									
80									

APPROVED BY ON

End of Exploration at 61.5' ⧗ **Converse Sampler (white symbol=no recovery)** ◢ **SPT Sampler (white symbol=no recovery)**

Hackstaff Road Bridge 7C-12
Hackstaff Road
Doyle, CA

Project No.
05-13163-01

Converse Consultants

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Drawing No.
A-7

CLASSIFICATION OF SOILS

ASTM Designation: D2487-93
(ASTM version of Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names using Laboratory Tests[a]				Soil Classification	
				Group Symbol	Group Name[b]
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on #4 sieve	Clean Gravels Less than 5% fines[c]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[e]	GW	Well-graded gravel[f]
			$Cu < 4$ and/or $Cc < 1$ or $Cc > 3$[e]	GP	Poorly graded gravel[f]
		Gravels with Fines More than 12% fines[c]	Fines classify as ML or MH	GM	Silty gravel[f,g,h]
			Fines classify as CL or CH	GC	Clayey gravel[f,g,h]
	Sands 50% or more of coarse fraction passes #4 sieve	Clean Sands Less than 5% fines[d]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[e]	SW	Well-graded sand[i]
			$Cu < 6$ and/or $Cc < 1$ or $Cc > 3$[e]	SP	Poorly graded sand[i]
		Sands with Fines More than 12% fines[d]	Fines classify as ML or MH	SM	Silty sand[g,h,i]
			Fines classify as CL or CH	SC	Clayey sand[g,h,i]
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI>7 and plots on or above "A" line[j]	CL	Lean clay[k,l,m]
			PI<4 or plots below "A" line[j]	ML	Silt[k,l,m]
		Organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay[k,l,m,n] Organic silt[k,l,m,o]
	Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay[k,l,m]
			PI plots below "A" line	MH	Elastic silt[k,l,m]
		Organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic clay[k,l,m,p] Organic silt[k,l,m,q]
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor			PT	Peat

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

[b] If field sample contained cobbles or boulders, or both, add "with cobbles" or "with boulders", or both to group name.

[c] GW-GM well graded gravel with silt
GW-GC well graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

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

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

[f] If soil contains $\geq$ 15% sand, add "with sand" to group name.

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

[h] If fines are organic, add "with organic fines" to group name.

[i] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.

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

[k] If soil contains 15-29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

[l] If soil contains $\geq$ 30% plus No. 200, predominantly sand, add "sandy" to group name.

[m] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

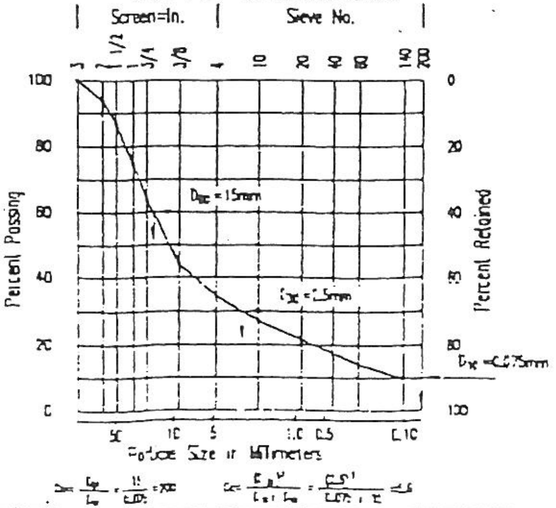
[n] PI $\geq$ 4 and plots on or above "A" line

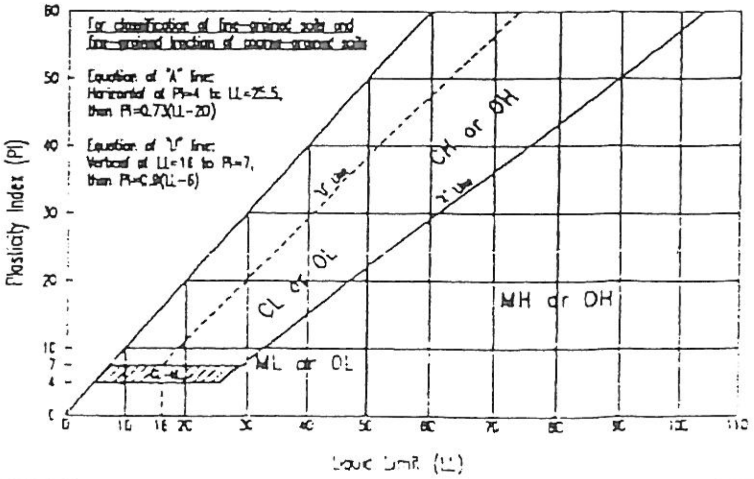
[o] PI < 4 or plots below "A" line

[p] PI plots on or above "A" line

[q] PI plots below "A" line

SIEVE ANALYSIS





KEY TO SOIL SYMBOLS AND TERMS

Terms used in this report for describing soils according to their texture and grain size distributions are generally in accordance with the UNIFIED SOILS CLASSIFICATION SYSTEM.

TERMS DESCRIBING CONDITION, CONSISTENCY, AND HARDNESS

OARSE GRAINED SOILS (major portion retained on No. 200 sieve) includes ean gravels, silty or clayey gravels, and silty, clayey, or gravelly sands. Consistency is rated according to relative density, as determined by laboratory tests.

DESCRIPTIVE TERM	RELATIVE DENSITY
very loose	0 to 15%
loose	15 to 40%
medium dense	40 to 70%
dense	70 to 85%
very dense	85 to 100%

NE GRAINED SOILS (major portion passing No. 200 sieve) includes organic and organic silts and clays, gravelly, silty, or sandy clays, and clayey silts. Consistency is rated according to shearing strength as indicated by penetrometer readings or by direct shear tests.

DESCRIPTIVE TERM	SHEAR STRENGTH (ksf)
very soft	less than 0.25
soft	0.25 to 0.50
firm	0.50 to 1.00
stiff	1.00 to 2.00
very stiff	2.00 to 4.00
hard	4.00 and up

OCK includes gravels, cobbles, rock, caliche, and bedrock materials. ardness is related to field identification procedures described below.

DESCRIPTIVE TERM	CRITERIA
soft	can be dug by hand and crushed with fingers
moderately hard	friable, can be gouged deeply with knife and will crumble readily under light hammer blows
hard	knife scratch leaves dust trace and will withstand a few hammer blows before breaking
very hard	scratched with knife with difficulty and is difficult to break with hammer blows

SIZE PROPORTIONS

DESIGNATION	PERCENT BY WEIGHT
trace	0 to 5
few	5 to 10
little	15 to 25
some	30 to 45
mostly	50 to 100

SOIL TYPE GRAPHIC KEY

▥	Silt	▨	Lean Clay
▥	Elastic Silt	▨	Fat Clay
⁘	Gravel	▒	Sand
▦	Caliche or Cemented Soil	≈	Gypsum
▦	Partially Cemented	▩	Fill

SOIL TYPE GRAPHIC KEY

MOISTURE CONTENT IS INDICATED BY:

dry
slightly moist
moist
very moist
wet

LEGEND OF LABORATORY TESTS

A	Liquid & Plastic Limits	G	Grain Size	R	Resistivity
	Consolidation	H	Horticultural Tests	RV	R–Value
h	Chemical	K	Permeability	S	Swell
Disp	Dispersion	N	Chemical Heave	Sol	Solubility
R	Drill Rate	P	Compaction	T	Triaxial
S	Direct Shear	pp	Unconfined Compressive Strength (tsf)	UC	Unconfined Compression

GROUNDWATER LEVEL KEY

▽	Water level during drilling
▼	Stabilized water level

SAMPLER TYPES

⧗	Converse Sampler	☒	Converse Sampler (no recovery)
◩	Standard Penetration Test (SPT)	▭	SPT Sampler (no recovery)
◨	Shelby Sampler	▩	Bulk Sample

WELL DESIGN GRAPHIC KEY

⁘	Grout	▮	Bentonite
▤	PVC Screen	▒	Silica Sand

CONVERSE CONSULTANTS

Over 50 Years of Dedication
in Engineering and
Environmental Sciences

Drawing No.

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 relevant physical characteristics and engineering properties. The amount and selection of tests were based on the geotechnical requirements of the project. Test results are presented herein and on the Logs of Boring logs in Appendix A, *Field Exploration*. The following is a summary of the various laboratory tests conducted for this project.

Sieve Analysis

To aid in classification of the soils, mechanical grain-size analysis was performed on 4 representative samples. Testing was performed in accordance with the ASTM Standard D422 method. For test results, see Appendix B, *Grain Size Distribution Results*.

Moisture Content and Dry Density

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

Soil Corrosivity

Two 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 is to determine the corrosion potential of site soils when placed in contact with common construction materials. Western Environmental Testing Laboratory, Reno, Nevada, performed the test. For test results, see the following table.

Table No. B-3, Soil Corrosivity Test Results

Boring No./Depth	pH	Chloride (ppm)	Sulfate (% by weight)	Min. Resistivity (as-received) (ohm-cm)
B-1 @ 10’	7.42	<15	96	4,100
B-1 @ 10’	7.99	<15	77	4,500

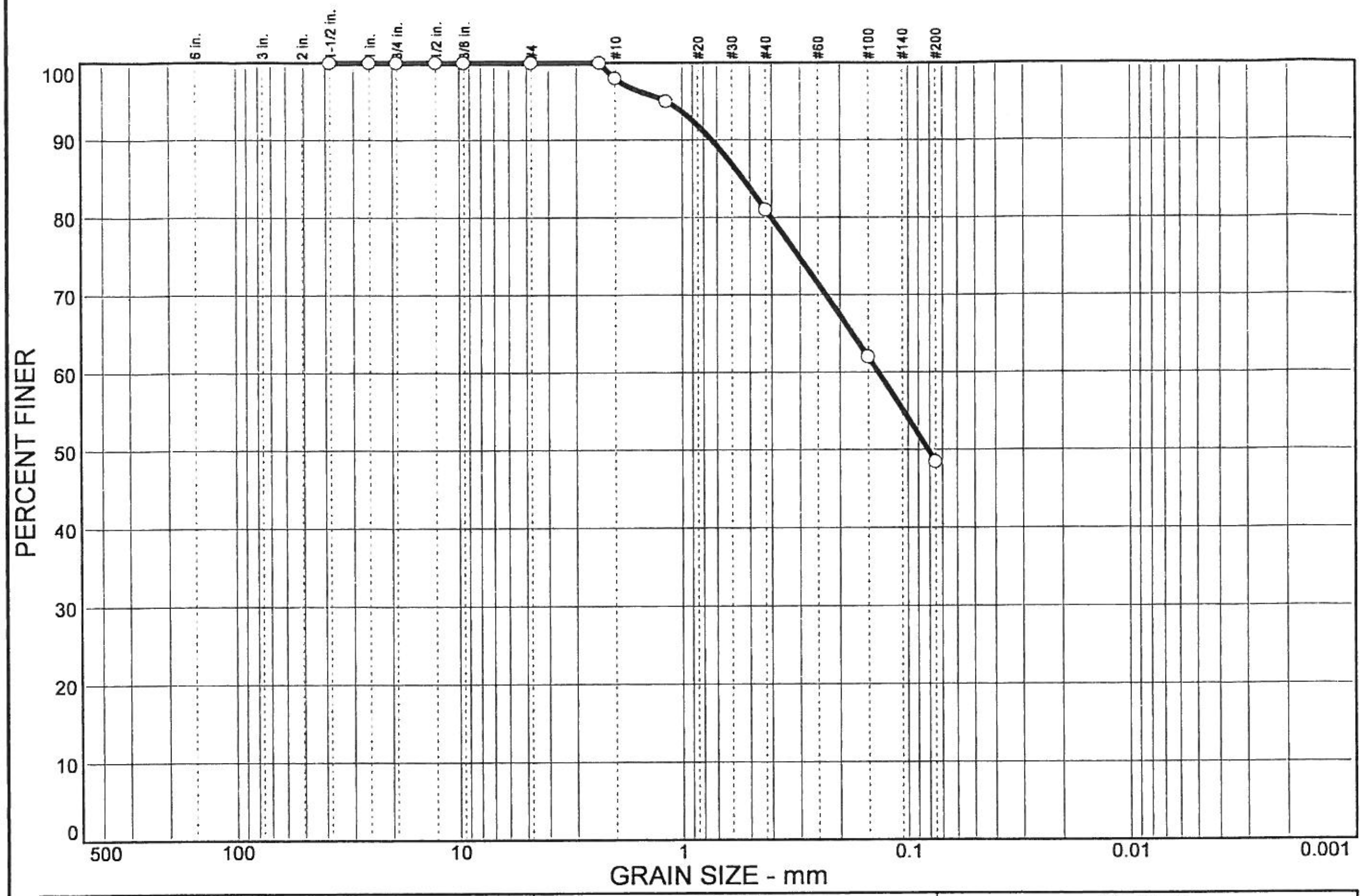
Direct Shear

One representative soil sample, B-2 @ 10 feet (3 meters), was tested for its shear strength characteristics. The test is performed by deforming a specimen at a controlled strain rate on or near a single shear plane determined by the configuration of the apparatus. Three points are tested, each under a different normal load, to determine the effects upon shear resistance and displacement and strength properties. Test results indicate that the soils are firm to stiff and have a low swell potential. The specimen has an internal friction angle (Φ) of 24 degrees with cohesion is 430 psf. For test results, see *Direct Shear Tests,* in Appendix B.

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.

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0	0	0	2	17	33	49	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	100		
3/4 in.	100		
1/2 in.	100		
3/8 in.	100		
#4	100		
#8	100		
#10	98		
#16	95		
#40	81		
#100	62		
#200	49		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 17 LL= 32 PI= 15

Coefficients

D_{85}= 0.535 D_{60}= 0.135 D_{50}= 0.0809
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(4)

Remarks

F.M.=0.43

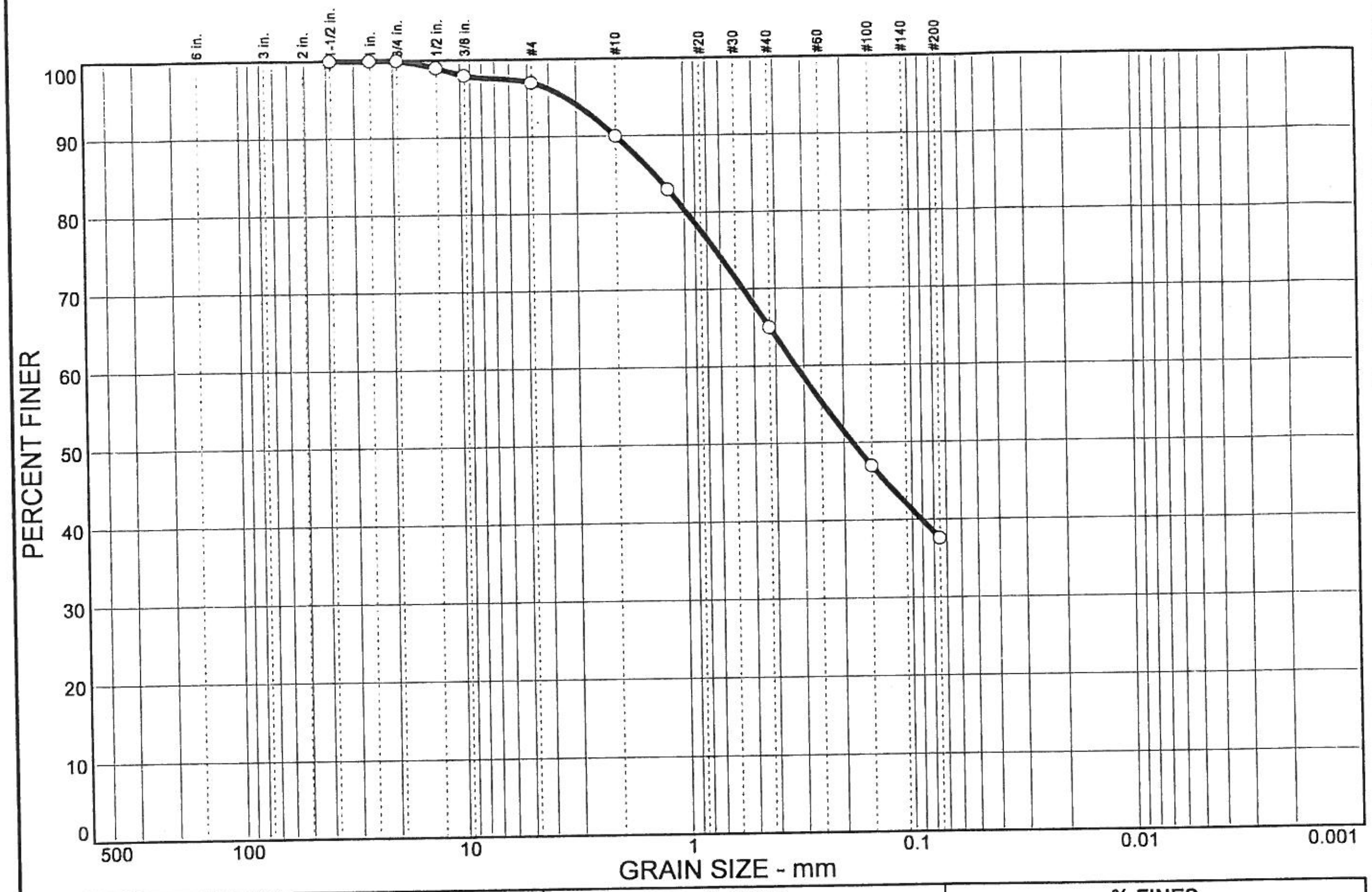
Sample No.: **Source of Sample:** B-1 **Date:** 12/12/5
Location: **Elev./Depth:** 30'

CONVERSE CONSULTANTS

Client: County of Lassen Department of Public Works
Project: Hackstaff Road Bridge 7C-12

Project No: 05-13163-01 **Figure** B-1

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0	0	3	7	25	27	38	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	100		
3/4 in.	100		
1/2 in.	99		
3/8 in.	98		
#4	97		
#10	90		
#16	83		
#40	65		
#100	47		
#200	38		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 19 LL= 26 PI= 7

Coefficients

D_{85}= 1.35 D_{60}= 0.324 D_{50}= 0.182
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

F.M.=0.75

Sample No.:
Location:

Source of Sample: B-2

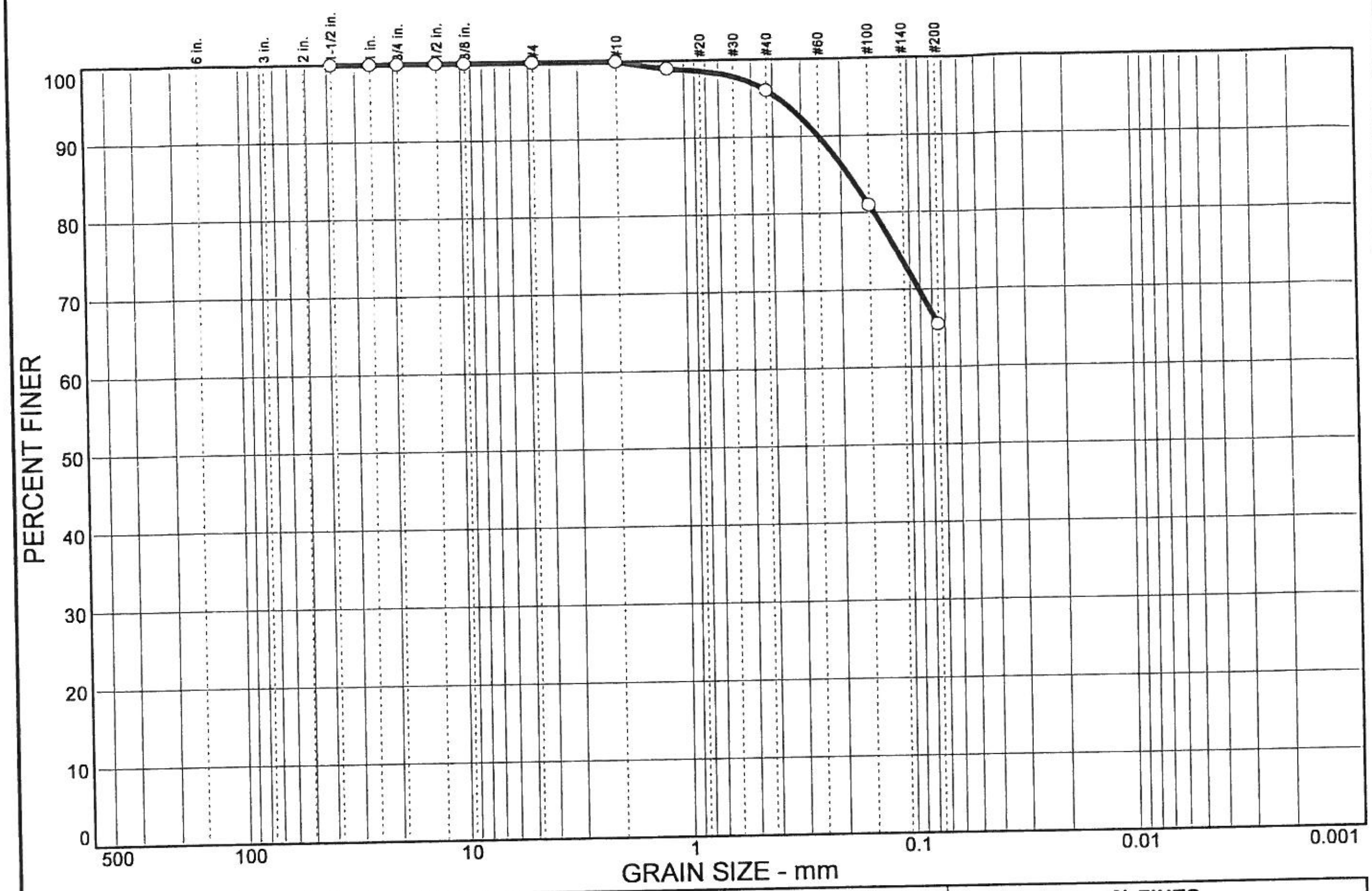
Date: 12/12/5
Elev./Depth: 0'

CONVERSE CONSULTANTS

Client: County of Lassen Department of Public Works
Project: Hackstaff Road Bridge 7C-12

Project No: 05-13163-01 **Figure** B-2

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0	0	0	0	4	31	66	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	100		
3/4 in.	100		
1/2 in.	100		
3/8 in.	100		
#4	100		
#10	100		
#16	99		
#40	96		
#100	81		
#200	66		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 20
LL= 40
PI= 20

Coefficients

D_{85}= 0.185
D_{60}=
D_{50}=
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= CL
AASHTO= A-6(11)

Remarks

F.M.=0.20

Sample No.:
Location:

Source of Sample: B-2

Date: 12/12/5
Elev./Depth: 5'

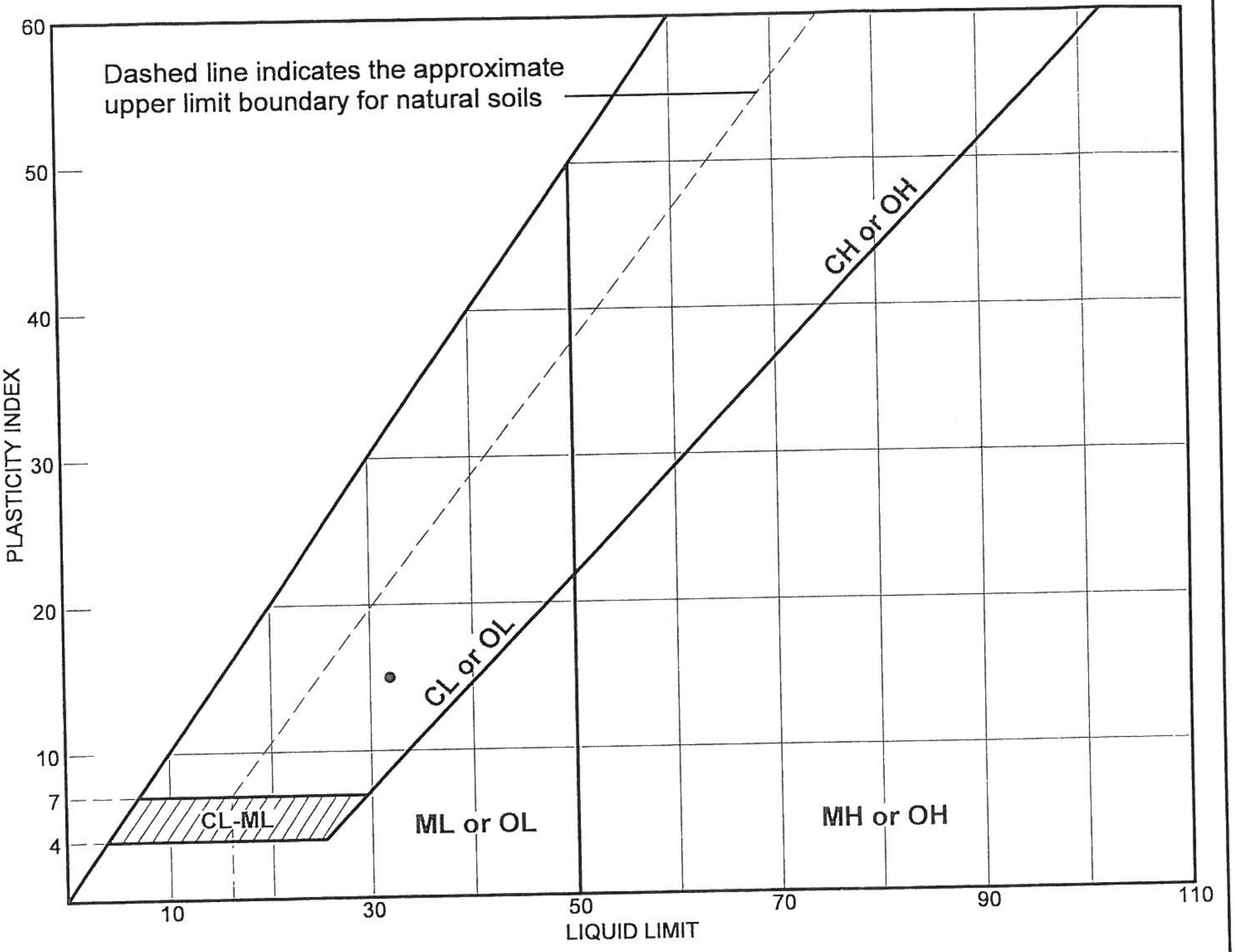
CONVERSE CONSULTANTS

Client: County of Lassen Department of Public Works
Project: Hackstaff Road Bridge 7C-12

Project No: 05-13163-01

Figure B-3

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-1		30'		17	32	15	SC

LIQUID AND PLASTIC LIMITS TEST REPORT

CONVERSE CONSULTANTS

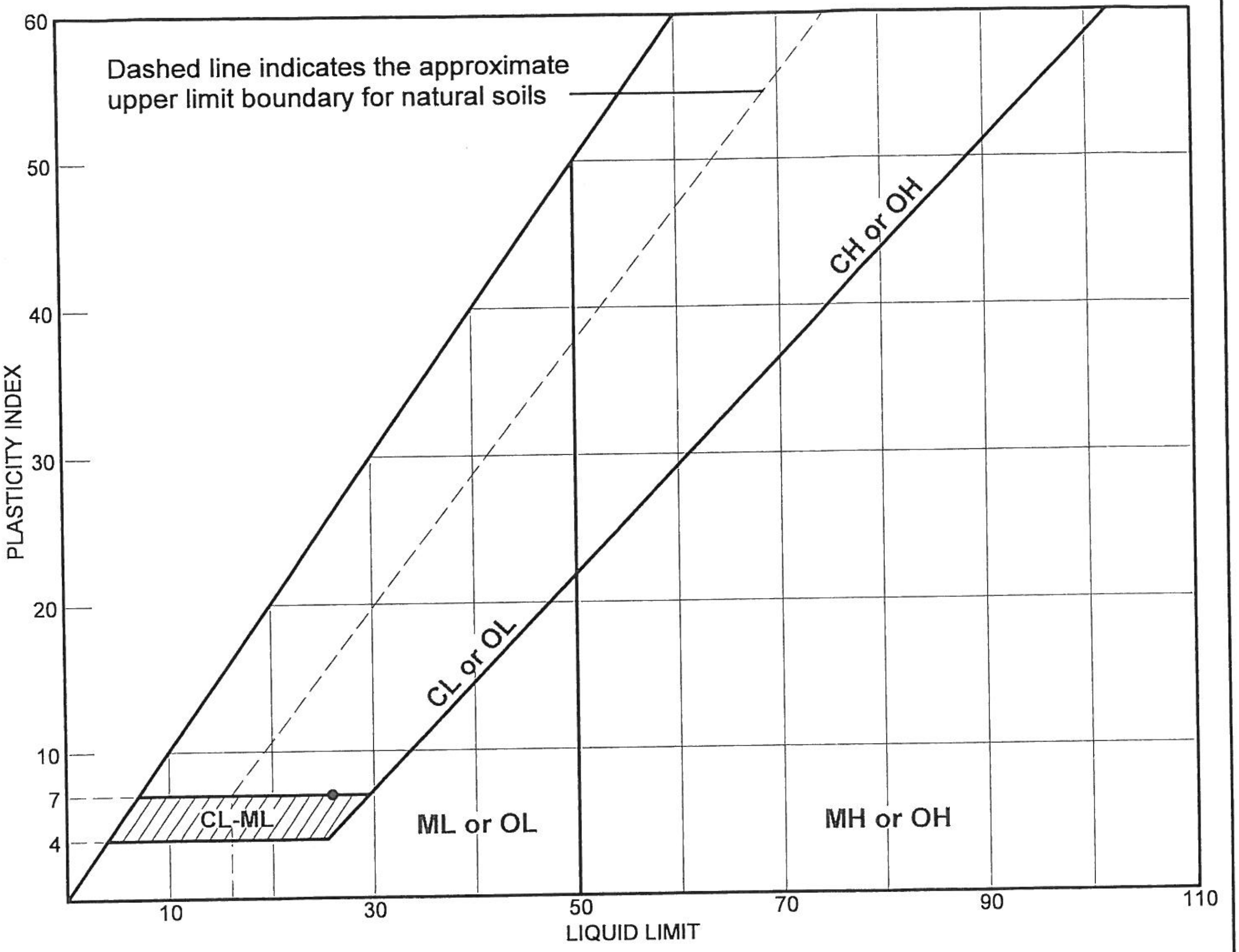
Client: County of Lassen Department of Public Works

Project: Hackstaff Road Bridge 7C-12

Project No.: 05-13163-01

Figure B-4

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-2		0'		19	26	7	SC-SM

LIQUID AND PLASTIC LIMITS TEST REPORT

CONVERSE CONSULTANTS

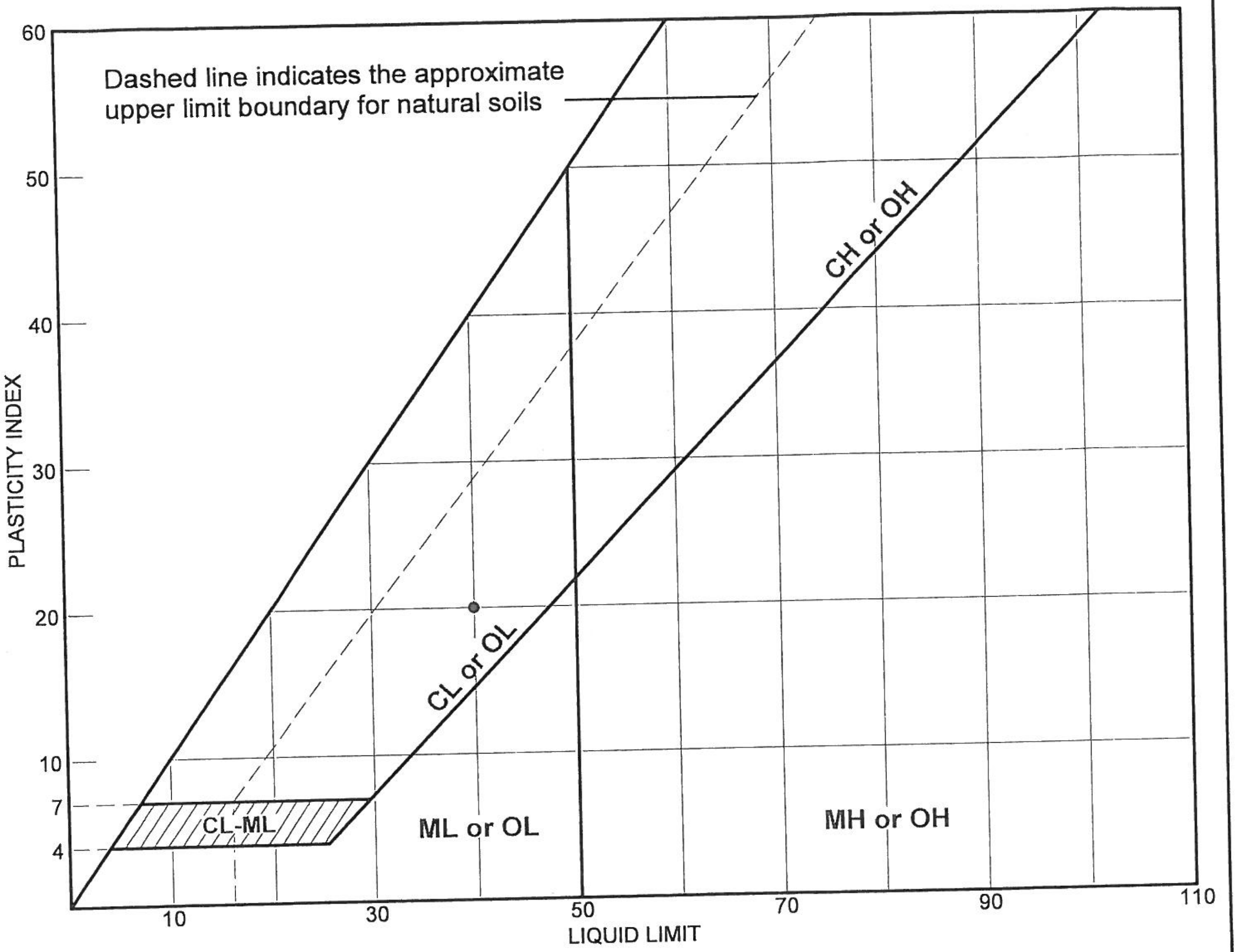
Client: County of Lassen Department of Public Works

Project: Hackstaff Road Bridge 7C-12

Project No.: 05-13163-01

Figure B-5

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-2		5'		20	40	20	CL

LIQUID AND PLASTIC LIMITS TEST REPORT

CONVERSE CONSULTANTS

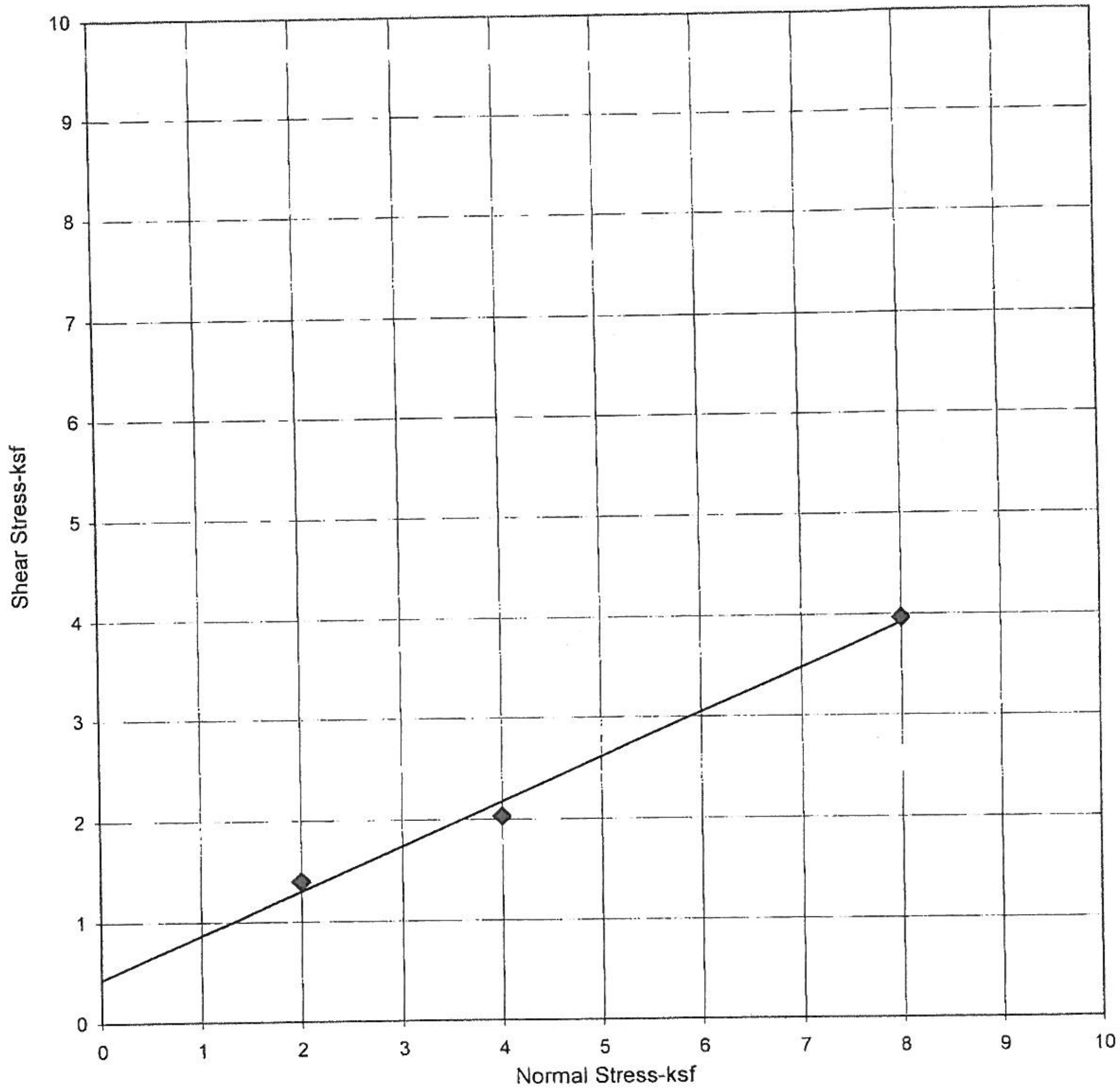
Client: County of Lassen Department of Public Works

Project: Hackstaff Road Bridge 7C-12

Project No.: 05-13163-01

Figure B-6

DIRECT SHEAR TEST



Boring No: B-2

Depth: 10

Soil Description: 0

Initial Dry Unit Weight (pcf): -7.3

Moisture Content Before (%): -1880.9

Moisture Content After (%): -1849.5

Sample Type: In Situ

Test Condition: Saturated

	Peak
Cohesion (psf):	430
Friction Angle (degrees):	24

0
0
0

Project No.
05-13163-01

Converse Consultants

Over 50 Years of Dedication
in Engineering and
Environmental Sciences

Drawing No.
0

Western Environmental Testing Laboratory
Analytical Report

Converse Consultants
4840 Mill St. #5
Reno, NV 89502
Attn: Brandy O'Neill

EPA Lab ID: NV004
Received: 12/13/05
Lab Sample ID: 512-123 01/02
Reported: 01/06/06

Phone: 775-856-3833 Fax: 775-856-3513

Project Name/Number: 05-13163-01
Sample ID: See Below
Date/Time Collected: 12/13/05
Sampled By: Client

Parameter	Method	Results	Units	Analyzed
B-1 @ 10'				
pH	9045B	7.42	SU	12/15/05
Soluble Chloride	300.0	<15	mg/Kg	01/06/06
Soluble Sulfate	300.0	96	mg/Kg	01/06/06
Resistivity	2510B	4100	ohm.cm	12/05/05
B-1 @ 30'				
pH	9045B	7.99	SU	12/15/05
Soluble Chloride	300.0	<15	mg/Kg	01/06/06
Soluble Sulfate	300.0	77	mg/Kg	01/06/06
Resistivity	2510B	4500	ohm.cm	12/05/05

Comment: The analyses for pH and Resistivity were performed on a saturated paste.

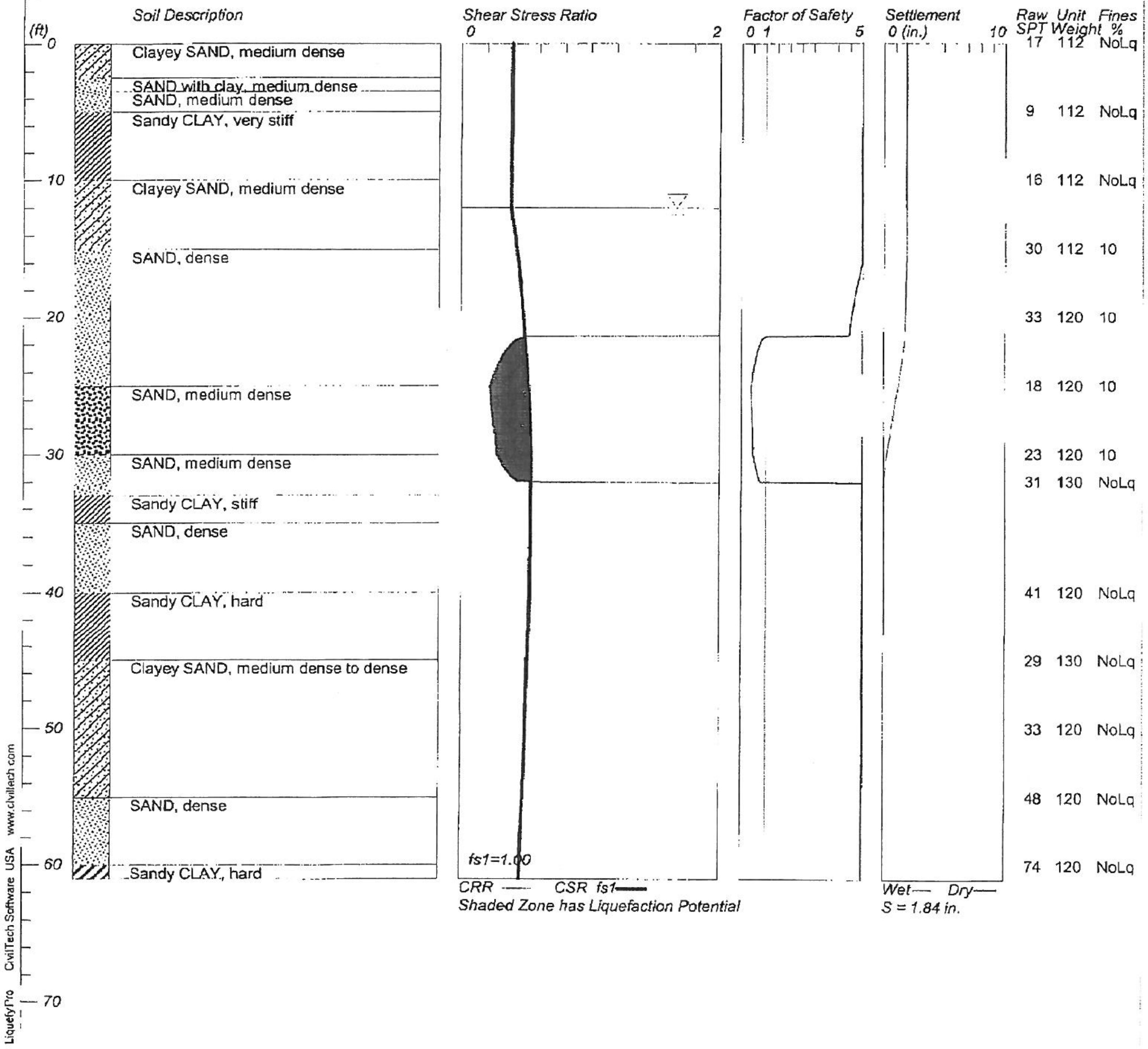
Andy Smith, Lab Manager
WET LAB

LIQUEFACTION ANALYSIS

Hackstaff Road Bridge

Hole No.=B-2 Water Depth=12 ft

Magnitude=7.25
Acceleration=0.6g



CivilTech Corporation **Proj No. 05-13150-01** **Plate A-1**

LIQUEFACTION ANALYSIS

Hackstaff Road Bridge

Hole No.=B-1 Water Depth=10 ft

Magnitude=7.25
Acceleration=0.6g