GEOTECHNICAL INVESTIGATION REPORT

COMMUNITY LIVING CENTER
RENO VA MEDICAL CENTER
WASHOE COUNTY, NEVADA

Prepared for:

RBB ARCHITECTS INC
10980 Wilshire Blvd.
Los Angeles, CA 90024

Converse Project No. 10-25152-02

November 15, 2011

November 15, 2011

Arthur E. Border, AIA, LEED AP
Sr. Vice President
RBB ARCHITECTS INC
10980 Wilshire Blvd.
Los Angeles, CA 90024

Subject: **GEOTECHNICAL INVESTIGATION REPORT**
Community Living Center
Reno VA Medical Center
Washoe County, Nevada
Converse Project No. 11-25152-02

Mr. Border:

Converse Consultants (Converse) has prepared this Geotechnical Investigation Report to present the findings of our geotechnical exploration performed for the proposed project in Washoe County, Nevada. This report was prepared in accordance with your signed authorization.

It is our opinion that the subject site can be adequately developed from a geotechnical standpoint for the structure if the findings, conclusions, and recommendations presented in this report are incorporated in the final project design.

We appreciate this opportunity to be of service to you. If you should have any questions, please feel free to contact the undersigned at 775-856-3833.

Respectfully submitted,

CONVERSE CONSULTANTS

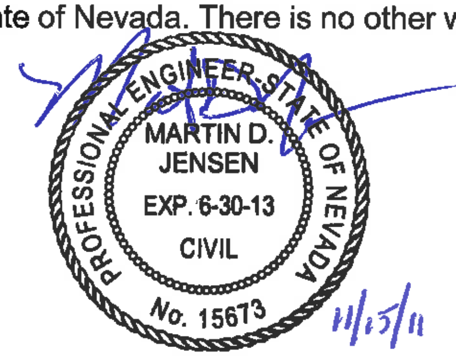
Kathi Brandmueller, P.E.
Senior Engineer

Martin D. Jensen, P.E.
Geotechnical Manager

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 engineering practice at this time in the State of Nevada. There is no other warranty, either expressed or implied.



Martin D. Jensen, P.E.
Geotechnical Manager

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 take precedence.

Based on our investigation, the project site can be developed to support the proposed structure provided the findings and conclusions presented in this geotechnical investigation report are considered in the next phase of project planning.

- This project consists of the construction of a Community Living Center. The facility consists of an 18,000 square-foot two story building on conventional spread and strip footings bearing on granular structural fill or native glacial outwash deposits.

- Our scope of work included the following tasks: Field exploration, laboratory testing, engineering analyses, and preparation of this report.

- There are no active faults crossing the site as presented in the Reno Folio Earthquake Hazards Map.

- Subsurface soils were investigated by three (3) hand excavated bore holes extended to refusal at a maximum depth of 4 feet below grade surface (bgs). Relatively undisturbed and bulk representative soil samples were collected and used for soil classification and testing to determine soil engineering properties.

- Laboratory and field-testing consisted of Atterberg limits and gradation analysis. The tests were performed for soil classification purposes and evaluation of certain physical characteristics and engineering properties.

- Groundwater was not encountered to the maximum depth explored of 4 feet below the existing ground surface in the borings excavated for this investigation. Borings conducted as part of a geotechnical investigation performed by other consultants did not encounter groundwater in borings that extended to approximately 20 feet. Accordingly, groundwater is not anticipated to pose a constraint to project development.

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

- The net allowable soil bearing pressure to be used for design of the Community Living Center is 2,450 psf for footings a minimum of 12 inches wide and embedded a minimum of 24 inches below grade bearing on at least 24 inches of engineered fill. Larger or deep footings may be designed for higher bearing pressures with an upper limit of 3,000 psf.

- For retaining walls, active pressures can be taken as 35 psf per foot of depth. An ultimate passive earth pressure of 375 psf per foot of depth may be used for the sides of footings poured against recompacted native soil. The maximum value of the passive earth pressure should be limited to 2,000 psf.

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1.0 INTRODUCTION

This report presents the findings of our Geotechnical Investigation performed for the Community Living Center foundation at the Department of Veterans' Affairs (VA) Medical Center in Reno, Washoe County, Nevada. The purpose of this investigation was to determine the nature and general engineering properties of the subsurface soils and to provide recommendations regarding general site grading and for design and construction of foundations for the proposed project.

The project site is located in Reno, Washoe County, Nevada. The site location is shown in Figure No. 1, *Site Map.*

This report is written for the project described herein and is intended for use solely by RBB Architects Inc. and their design team. 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 are responsible for making their own interpretation of the data contained in this report.

Our recommendations provided in this report did not include interpretations of environmental impacts and assumes no environmental concerns for the site.

2.0 PROJECT DESCRIPTION

It is our understanding that the project will consist of the demolition of a portion of the existing Building 10, and construction of a Community Living Center which is to abut the remaining portion of Building 10. The Community Living Center consists of an 18,000 square-foot two story building with a 200 square-foot enclosed vestibule. The facility consists of steel frame construction supported on conventional spread and strip footings.

3.0 SCOPE OF WORK

The scope of our present investigation included site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analysis, geological analysis and preparation of this report.

3.1 Field Exploration

Three (3) borings were hand excavated to a maximum depth of 4 feet bgs in order to evaluate the subsurface soils. Excavated bore holes were backfilled loosely (not compacted) with excavated materials.

Converse staff visually logged the subsurface conditions encountered in the excavation. Bulk samples and undisturbed samples of the subsurface materials were collected during excavation for the purpose of laboratory testing. A more detailed description of the field exploration procedures and the Logs of Excavations are presented in Appendix A, *Field Exploration*.

3.2 Laboratory Testing

Representative samples of the site soils were tested in the laboratory; 1) to aid in the soils classification and 2) to evaluate relevant engineering properties of the site soils. These tests included:

- Sieve Analysis (ASTM C136, C117, D1140)
- Atterberg Limits (LL & PI) (ASTM D4318)

For a description of the laboratory test methods and test results, see Appendix B, *Laboratory Testing Program*. Samples will be stored in our laboratory for at least 30 days after the report is completed. At that time, samples will be disposed of unless we receive notification to do otherwise.

3.3 Analysis and 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 development.

4.0 SITE CONDITIONS

4.1 Existing Surface Conditions

The site of the new Community Living Center is currently occupied with a paved parking lot immediately to the south of the Building 10 Canteen in the northwestern portion of the VA Medical Center campus. The main site of the VA Medical Center campus is generally bounded by Taylor Street on the north, Locust Street on the west, Burns Street on the south, and Kirman Avenue on the east, although additional facilities are located to the east of Kirman Avenue.

4.2 Subsurface Conditions

Our excavation encountered asphaltic concrete, aggregate base, and clayey sand, which is likely an imported fill material, overlying 1 to 2 feet of clay soils. Hand excavations were not able to be continued beyond depths ranging from 1½ to 4 feet below the existing ground surface. We have interpreted this excavation refusal as the top of the Donner Lake Outwash deposit.

Summaries of the subsurface conditions encountered during the exploration activities are described in detail on the boring logs, Drawing Nos. A-1 through A-3 in Appendix A.

Laboratory test results indicate that the near surface on-site soils generally have moderate to high plasticities that indicate the potential for expansive soil conditions. Laboratory test results are described in detail in Appendix B.

According to the Nevada Bureau of Mines & Geology, Reno Folio Hydrologic Map, the depth to groundwater at the site is approximately 25 feet. Groundwater was not encountered to the maximum depth explored of 4 feet below the existing ground surface in the borings excavated for this investigation. Borings conducted as part of a geotechnical investigation performed by other consultants did not encounter groundwater in borings that extended to approximately 20 feet. Accordingly, groundwater is not anticipated to pose a constraint to project development. Many factors contribute to fluctuations in groundwater levels. A detailed analysis of these factors is beyond the scope of this investigation.

The stratification lines shown on the enclosed boring logs represent the approximate boundary between soil types. The actual transition may be gradational. Due to the nature and depositional characteristics of the native soils, care should be taken in interpolating and extrapolating subsurface conditions between and beyond the boring locations.

4.3 Geologic Setting

Reno, Nevada lies in the northeastern portion of the Basin and Range Geologic Province in an area that is surrounded, for the most part, by a series of mountain chains and associated valleys. These ranges and basins were the result of parallel normal faults, which produced a series of horsts and grabens in the Province. This basic topographic pattern extends from eastern California to central Utah and from southern Idaho into Mexico.

4.4 Site Geology

The Reno VA Medical Center is underlain by the Donner Lake Outwash (Qdo) deposit. This deposit is characterized by boulder to cobble gravel, sandy gravel, and gravely sand. It contains giant boulders. Rock clasts are rounded to subrounded and, in decreasing order of abundance, are granitic, volcanic, and metamorphic.

5.0 FAULTING AND SEISMICITY

5.1 Faulting

The faulting associated with The Basin and Range Province is caused by extensional forces that produce normal faults. There are no active faults within 1 mile of the VA Medical Center. An active fault is defined as the one that has had surface displacement within Holocene time (about the last 11,000 years).

5.2 Other Effects of Seismic Events

Aside from generating damaging ground motion, a nearby seismic event may impact a project by inducing landslides, earthquake-induced flooding, seiches, soil liquefaction, differential settlement and ground lurching. A site-specific discussion on factors that may affect the site is provided below:

Landslides: Seismically induced landslides and slope failures are common occurrences during or soon after large earthquakes. Because of the site characteristics, the landslide potential is considered nil.

Earthquake-Induced Flooding: This is flooding caused by failure of dams or other water-retaining structures as a result of earthquakes. Review of the area adjacent to the site indicates that there are no significant up-gradient lakes or reservoirs with the potential of flooding the site.

Soil Liquefaction: Liquefaction is defined as the phenomenon in which a soil mass suffers a loss of shear strength due to the development of excess pore - water pressures. During earthquakes, excess pore pressures in saturated soil deposits may develop as a result of induced cyclic shear stresses, resulting in liquefaction. Based on the dense nature of the subsurface materials, the proposed site is not considered susceptible to liquefaction.

Differential Settlement and Ground Lurching: Because of the nature of the subsurface materials, the potential of significant differential settlement and ground lurching during earthquakes is considered to be low at the site.

5.3 Seismic Design Parameters

Based on the results of a geophysical study conducted at the site by Black Eagle Consulting, Inc. (2008), a seismic Site Class of "C," as defined by the 2006 IBC Table 1613.5.2, may be used for the project seismic design. A Seismic Design Category of D is appropriate for the project. Based on Section 1613 of the 2006 IBC, VA seismic design requirements H-18-8, and the following site coordinates, the design acceleration parameters to be used for seismic design are presented below. Note that the acceleration parameters presented below are in percent of gravity (g).

Approximate Location	
Latitude	39.5170° N
Longitude	119.8000° W
Mapped Acceleration Parameters	
S_S	150.2
S_1	60.3
Site Coefficients	
F_a	1.0
F_v	1.3
Maximum Considered Acceleration Parameters	
SM_S	150.2
SM_1	78.4
Design Acceleration Parameters	
SD_S	100.2
SD_1	52.3

6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

The following sections present a discussion of subgrade preparation, earthwork, foundations, and other geotechnical aspects of the project. Specific recommendations are presented in each section.

6.1 General

Based on the results of the field and laboratory investigation programs, it is our opinion that with overexcavation and recompaction, the native soils will provide suitable support for the proposed structure provided that the recommendations presented in *6.2 Site Grading and Earthwork* of this report are complied with during construction.

6.2 Site Grading and Earthwork

Grading should be performed in accordance with the recommended earthwork specifications presented below. Since foundation and floor slab design criteria are based upon the assumption that the grading specifications are complied with, it is essential that grading be performed in strict accordance with these specifications and under the observation and testing of the Geotechnical Engineer. Excavated native soils may be stockpiled for use as structural fill if the stockpiled soils meet the requirements for structural fill outlined in this section.

1. Clearing and grubbing shall consist of the removal from building areas to be graded, all concrete, surface trash, demolition debris, and vegetation (including but not limited to heavy weed growth, tree stumps, and large roots). Organic and inorganic materials resulting from demolition and the clearing and grubbing operations shall be hauled away from the areas to be graded.

2. Based on observations made during our field explorations, the on-site soils can be excavated with conventional earthwork equipment.

3. The contractor should be aware of the potential for vibrational damage to adjacent or nearby structures when using heavy impact equipment during removal of cemented materials.

4. All uncontrolled fills and disturbed, loose, soft or firm native soils shall be excavated from areas to be graded. The surface preparation should extend at least 2 feet beyond the exterior edges of building lines, exterior concrete flatwork, and pavement areas, or to a distance equal to the depth of structural fill, whichever is greater.

5. After the required removals have been made, the exposed native soils should be overexcavated to provide a zone of structural fill for the support of conventional footings, slabs-on-grade and exterior flatwork. Overexcavation may be terminated if soils characteristic of the Donner Lake Outfall are encountered. In addition, the lateral extent of overexcavation may be reduced to prevent undermining of the footings of adjacent structures.

*Depth below conventional footings	2	Feet
*Depth below slab-on-grade (excluding supportive gravel)	1.5	Feet
*Depth below exterior flatwork (excluding supportive gravel)	1.5	Feet
Minimum horizontal distance beyond exterior footings	2	Feet
Min. horizontal distance beyond exterior flatwork & pavements	2	Feet

*Depth includes 6 inches of scarified and recompacted subgrade.

6. The ground surface exposed after removal of unsuitable soils shall be scarified to a depth of at least 6 inches and moisture-conditioned (watered or dried) to within 2 percent of the optimum moisture content. Compaction of soils should be to at least 90 percent of the maximum laboratory dry density as determined by ASTM D1557. Scarification may be terminated if moderately hard to hard cemented soils are encountered.

7. All areas to receive compacted fill shall be observed and approved by the Geotechnical Engineer before the placement of fill.

8. Compacted fill placed for the support of footings, slabs-on-grade, exterior concrete flatwork, and pavements shall be considered structural fill. Structural fill shall consist of approved imported soils or processed on-site soils conforming to the following specifications:

a. All fill soils should not exceed 4 inches in nominal size, and should be free of organic matter and miscellaneous inorganic debris and inert rubble.

b. Fill materials shall have no more than 30 percent passing the number 200 sieve.

c. Imported fill materials should have less than 0.1 percent sulfate salts, if possible. If laboratory test results indicate import fill materials contain more than 0.1 percent sulfate salts, a concrete mix should be designed to resist the sulfate levels indicated by the laboratory test results.

9. Fill soils shall be evenly spread in maximum nine-inch lifts, watered or dried as necessary, mixed and compacted to at least the density specified below. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer.

10. Soils in compacted fills shall be compacted to at least 95 percent of the maximum laboratory density (ASTM D1557). On-site soils shall be compacted at a moisture content within 2 percent of optimum.

11. Placement of fill near the top of slopes shall be done in such a manner that loose soils do not slough over the slope and are not allowed to build up on the slope surface.

12. Fill exceeding five feet in height shall not be placed on native slopes that are steeper than 5 to 1 (horizontal to vertical). Where native slopes are steeper than 5 to 1, and the height of fill is greater than five feet, the fill shall be benched into competent materials. The height of the benches shall not exceed two feet.

13. Representative samples of materials being utilized in the compacted fill shall be analyzed in the laboratory by the Geotechnical Engineer to determine their physical properties. Maximum laboratory density of each soil type used in the compacted fill shall be determined by the ASTM D1557 compaction method.

14. Fill materials shall not be placed, spread, or compacted while the ground is frozen or during unfavorable weather conditions. When site grading is interrupted by heavy rain, filling operations shall not resume until the Geotechnical Engineer approves the moisture and density conditions of the previously placed fill.

15. It shall be the Grading Contractor's obligation to take all measures deemed necessary during grading to provide erosion control devices in order to protect slope areas and adjacent properties from storm damage and flood hazard originating on this project. It shall be the contractor's responsibility to maintain

slopes in their as-graded form until all slopes are in satisfactory compliance with job specifications, all berms have been properly constructed, and all associated drainage devices meet the requirements of the Civil Engineer.

16. During the earthwork phases of the project, our personnel should be present to observe fill placement for lift thickness and density, and fill materials for suitability and consistency. In particular, careful observation of grading operations for the building pads should be performed to confirm that footings rest on properly placed and compacted structural fill and that any undocumented fill soils are completely removed and replaced with structural fill. In no event should undocumented fill soils remain within the building pad areas. A documented testing program should be conducted to determine that soil compaction is in accordance with requirements.

17. There will be shrinkage losses or bulking when excavating and compacting the on-site, uncemented soils. An estimated shrinkage factor of 10 to 20 percent is applicable for the natural surficial soils within 5 feet of the existing ground surface.

18. The outwash deposit which the VA Medical Center is underlain by are potentially unstable, subject to pronounced slumping and ground disturbance along trenches, steep cuts or embankments, and may locally manifest amplified ground motion during a major seismic event. Therefore, utility trench excavations should be laid back to safe slopes or properly shored. Trenching and shoring operations should be conducted in accordance with Section Nos. 1926:650 through 1926:653 of the *State of Nevada Occupational Safety and Health Standards for the Construction Industry* as currently amended. Safety of construction personnel is the Contractor’s responsibility.

6.3 Spread Footings and Slabs-on-Grade

The proposed structures may be supported by conventional spread footings founded on properly placed and compacted structural fill. Spread footings designed for the recommended allowable bearing pressures that bear on structural fill are expected to experience total settlements on the order of 1 inch. Differential settlements are anticipated to be approximately one-half of the total settlement. Specific design recommendations are provided as follows:

1. Spread footings, placed a minimum of 24 inches below lowest adjacent finished grade, and a minimum of 12 inches wide that bear on properly placed and compacted structural fill may be designed for a maximum allowable bearing pressure of 2,450 pounds per square foot (psf). This allowable value may be increased by 350 psf for each additional foot of width, and 1,050 psf for each

additional foot of embedment up to a maximum of 3,000 psf. A one-third increase in allowable bearing pressures may be used for short duration loads such as wind or seismic.

2. Resistance to lateral loads can assume to be provided by friction at the base of foundations and by passive earth pressure. An ultimate coefficient of friction 0.67 between concrete and soil may be used with the dead load forces. An ultimate passive earth pressure of 375 psf per foot of depth may be used for the sides of footings poured against recompacted native soil. An appropriate factor of safety shall be used against the ultimate values. The maximum value of the passive earth pressure should be limited to 2,000 psf. If the coefficient of friction and the passive pressure are used in combination, the coefficient of friction should be reduced by 50 percent.

3. Concrete slabs-on-grade and exterior flatwork should be supported by a 4-inch minimum layer of compacted gravel overlying at least 18 inches of structural fill (reworked native soils) overlying undisturbed native soils. The gravel may consist of Aggregate Base and should be uniformly placed and compacted.

4. If moisture sensitive flooring will be used, moisture protection should be provided by a relatively impervious vapor barrier/retarder placed beneath interior slabs. The vapor barrier/retarder should be at least 10 mils in thickness and should conform to and be placed in accordance with the requirements of the project structural engineer or architect.

5. Steel reinforcement for concrete slabs-on-grade and exterior flatwork should be provided in accordance with the recommendations of the project structural engineer.

6. Concrete placement, curing operations, and control joint spacing should be in accordance with American Concrete Institute (ACI) recommendations.

7. Footings shall not be cast on soft, loose, organic, disturbed, or frozen soil or on soil fully or partially covered with ice or standing water. A representative of Converse should be retained to observe all foundation bearing soils before any concrete is poured in order to verify that they have been adequately prepared.

8. For slab design, the coefficient of subgrade reaction, k, to be used in the flexible method of design is 250 pounds per cubic inch (pci) based on correlation between the soil types present and the 1-foot plate load test.

6.4 Lateral Earth Pressures

Assuming that retaining wall backfill consists of structural fill that conforms to and has been placed and compacted in accordance with the grading recommendations of this report, unrestrained (cantilevered) retaining walls should be designed for an active lateral earth pressure of 35 pcf equivalent fluid density. Lateral pressures imposed by adjacent uniform surcharge loads may be estimated using a pressure coefficient of 0.28. For seismic conditions, a lateral earth pressure of 54 pcf equivalent fluid density shall be added to the static lateral earth pressure.

The design values indicated above assume that retaining walls will have a height not exceeding about 10 feet and that the build-up of hydrostatic pressure will be prevented by “weep holes” or a footing drain system.

Wall backfill should consist of granular soil, should be placed in accordance with the grading recommendations of this report, and should be compacted to between 90 and 95 percent relative compaction as determined by ASTM D1557. Compaction of the retaining wall backfill should not exceed 95 percent relative compaction to minimize the lateral earth pressures against the walls. Compaction of backfill within a horizontal distance of 5 feet behind the wall should be completed using lightweight, hand operated compaction equipment to avoid overstressing the walls.

6.5 Moisture Protection and Surface Drainage

Due to the moderately expansive soils at the site, it is very important that soils below foundations and floor slabs not experience increases in moisture content after construction is complete. Satisfactory results from the foundation system depend on preventing moisture from reaching the subgrade soil below foundations and floor slabs. Structural and cosmetic distresses could occur if the moisture protection recommendations of this report are not followed.

Positive drainage away from buildings and other structures should be incorporated into the design and construction of the project to channel surface water away from the structures and their foundations. A minimum slope of 5 percent should be maintained in unpaved areas within 5 feet of the building pads. Paved areas adjacent to buildings should have a minimum slope of 1 percent.

Landscape trees, shrubs, and other plants requiring regular watering should be planted at least 5 feet away from the foundations. Landscaping within 5 feet of the foundations should be desert landscaping such as decorative rocks or plants that have a shallow root system and do not need to be watered. No irrigation, including drip irrigation, should be located within 5 feet of foundations or should be allowed to spray onto the area within 5 feet of foundations.

All utility trenches within the pad and extending 5 feet beyond the structure footings and below pavements should be backfilled with structural fill consisting of on-site or similar soils that have at least 30 percent of material passing the No. 200 sieve. The backfill should be compacted to a compaction of at least 90 percent of the maximum dry density as determined by ASTM D1557.

Special care should be taken during installation of subfloor sewer and water lines and compaction of pipe bedding to reduce the possibility of future leakage and subsoil saturation, which could cause footings to settle or heave.

7.0 GEOTECHNICAL SERVICES DURING CONSTRUCTION

This report has been prepared to aid in the evaluation of the site to prepare site-grading recommendations, 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. A Converse representative should observe excavation bottoms. Structural fill and backfill should be placed and compacted during continuous observation and testing by this office. Footing excavations should be observed by Converse prior to placement of steel and concrete so that footings are founded on satisfactory materials and excavations are free of loose and disturbed materials.

8.0 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 Reno, Nevada. 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 RBB Architects, Inc. and their design team 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.

9.0 REFERENCES

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Converse Consultants
Over 60 Years of Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services

1 inch = 100 feet

0 50 100 200 300 400 500 Feet

VA Community Center.mxd

1 in = 1 miles

Legend

Boring Locations

SITE MAP

RENO VA COMMUNITY LIVING CENTER

1000 Locust Street
Reno, Nevada

Figure No. 1

Date Created: 11/14/11

Project No: 11-25152-02

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 three (3) exploratory borings to a maximum depth of 4 feet below the existing ground surface.

Converse field personnel performed the excavation using hand excavation equipment. Samples of the soils encountered were obtained by a Converse engineer 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.

A summary of the subsurface conditions encountered is presented on the boring logs, Drawing Nos. A-1 through A-3. A key to soil symbols and terms is found on Drawing No. A-4. A summary of ASTM D2487, *Classification of Soils for Engineering Purposes* is presented on Drawing No. A-5.

Log No. HB-1

DRAFTED BY KIB

Date of Drilling: 10/10/11
Driller: Converse
Logged By: KIB

Location: Northwest Parking Area
Borehole Diameter: 3"
Groundwater Depth (ft): Not Encountered

Ground Surface Elevation (ft): NA
Equipment: Hand Auger
Driving Wt. and Drop: NA

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		FILL: Asphalt (4") over Aggregate Base (4")							
1		CLAYEY SAND With GRAVEL (SC); brown, fine to medium grained sand, largest gravel 0.5", medium dense, moist		X					A,G
2		FAT CLAY With SAND (CH); trace gravel, redish brown, largest gravel 0.75, mediun stiff, moist		X					A,G
3		Boring Terminated Due to Refusal							
4									
5									
6									
7									
8									
9									
10									

End of Exploration at 3.0'

CA Modified Sampler (white symbol=no recovery) SPT Sampler (white symbol=no recovery)

Reno VA Community Living Center
1000 Locust Street
Reno, Nevada

Project No. 10-25152-02

Converse Consultants

Over 60 Years of Dedication in Engineering and Environmental Sciences

Drawing No. A-1

Log No. HB-2

Date of Drilling: 10/10/11
Driller: Converse
Logged By: KIB

Location: Northwest Parking Area
Borehole Diameter: 3"
Groundwater Depth (ft): Not Encountered

Ground Surface Elevation (ft): NA
Equipment: Hand Auger
Driving Wt. and Drop: NA

DRAFTED BY KIB

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	Samples: Blow Count	Drill Rate (sec/ft)	Moisture (%)	Dry Density (lb/cf)	Field or Lab Tests
0		FILL: Asphalt (3") over Aggregate Base (4")							
1		CLAYEY SAND With GRAVEL (SC); brown, fine to medium grained sand, well graded, largest gravel 0.5", medium dense, moist		X					
2–3		FAT CLAY (CH); trace sand, trace gravel, redish brown, largest gravel 0.75, mediun stiff, Moist							
4		WELL GRADED GRAVEL With SAND (GW), greyish brown, largest gravel 0.75, course grained sand, moist		X					
		Boring Terminated Due to Refusal							
5									
6									
7									
8									
9									
10									

End of Exploration at 4.0'

CA Modified Sampler (white symbol=no recovery)

SPT Sampler (white symbol=no recovery)

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1000 Locust Street
Reno, Nevada

Project No. 10-25152-02

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Drawing No. A-2

Log No. HB-3

DRAFTED BY KIB

Date of Drilling: 10/10/11
Driller: Converse
Logged By: KIB

Location: Northwest Parking Area
Borehole Diameter: 3"
Groundwater Depth (ft): Not Encountered

Ground Surface Elevation (ft): NA
Equipment: Hand Auger
Driving Wt. and Drop: NA

SUMMARY OF SUBSURFACE CONDITIONS

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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		FILL: Asphalt (4") over Aggregate Base (4")							
1		CLAYEY SAND With GRAVEL (SC); brown, fine to medium grained sand, largest gravel 0.75, medium dense, moist ---less gravel		X X					A,G
		Boring Terminated Due to Refusal							
2									
3									
4									
5									
6									
7									
8									
9									
10									

End of Exploration at 1.5'
CA Modified Sampler (white symbol=no recovery)
SPT Sampler (white symbol=no recovery)

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Drawing No.
A-3

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

COARSE GRAINED SOILS (major portion retained on No. 200 sieve) includes clean 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%

FINE GRAINED SOILS (major portion passing No. 200 sieve) includes inorganic 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

ROCK includes gravels, cobbles, rock, caliche, and bedrock materials. Hardness 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 FIELD OR LABORATORY TESTS

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

GROUNDWATER LEVEL KEY

- Water level during drilling
- Stabilized water level

BLOW COUNT KEY

NR Not Recorded (R) Refusal

SAMPLER TYPES

- California Modified Sampler (CMS)
- California Modified 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

CLASSIFICATION OF SOILS

ASTM Designation: D2487–00
(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 $Cu = \frac{D_{60}}{D_{10}}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

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.

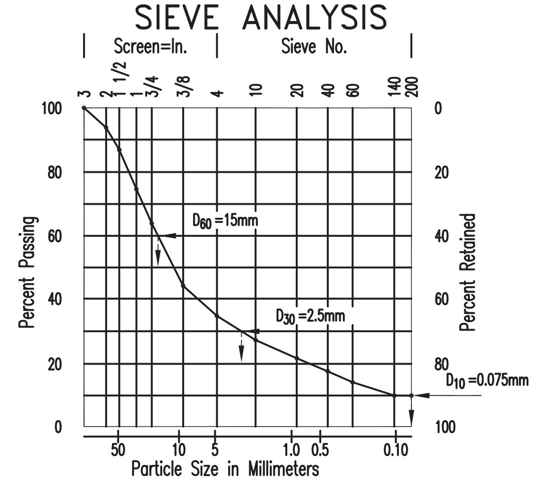
n PI $\geq$ 4 and plots on or above "A" line

o PI < 4 or plots below "A" line

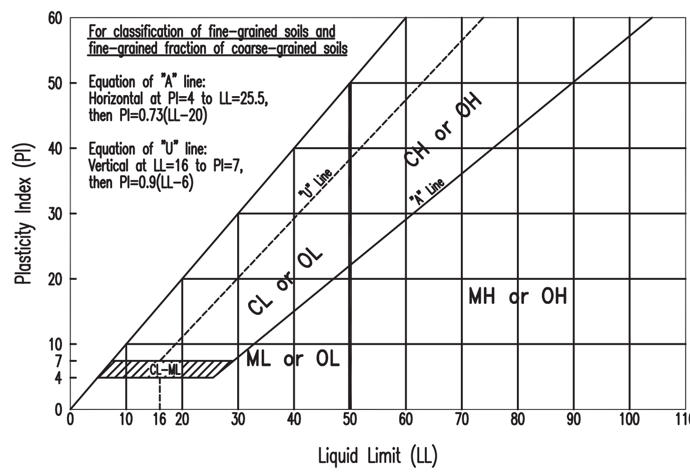
p PI plots on or above "A" line

q PI plots below "A" line

SIEVE ANALYSIS



$$Cu = \frac{D_{60}}{D_{10}} = \frac{15}{0.075} = 200 \qquad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = \frac{(2.5)^2}{0.075 \times 15} = 5.6$$



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, ASTM

To assist in classification of soils, mechanical grain-size analyses were performed on three (3) selected samples. Testing was performed in general accordance with the ASTM D422 method. Grain-size curves are shown in Drawing Nos. B-1 through B-3, *Grain Size Distribution Results*.

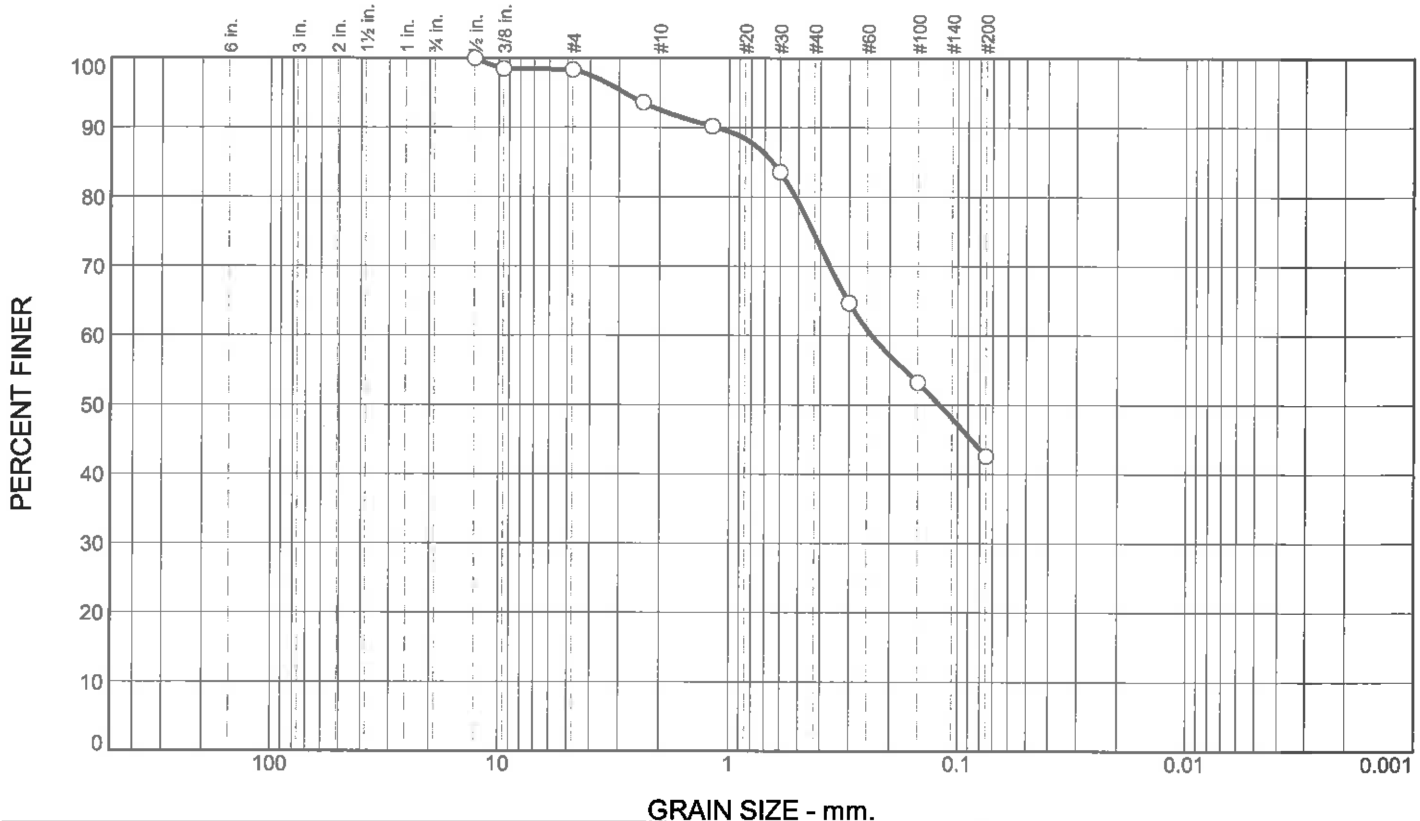
Atterberg Limits

Atterberg Limits tests were performed on three (3) selected samples. Testing was performed in accordance with ASTM D4318. The results are also presented on Drawing Nos. B-1 through B-3.

Sample Storage

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

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	5	18	32	43	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2	100		
3/8	98		
#4	98		
#8	94		
#16	90		
#30	84		
#50	65		
#100	53		
#200	43		

* (no specification provided)

Soil Description

clayey sand

Atterberg Limits

PL= 21 LL= 41 PI= 20

Coefficients

D_{85}= 0.6462 D_{60}= 0.2390 D_{50}= 0.1202
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-7-6(4)

Remarks

Location: HB-1 **Depth:** 1

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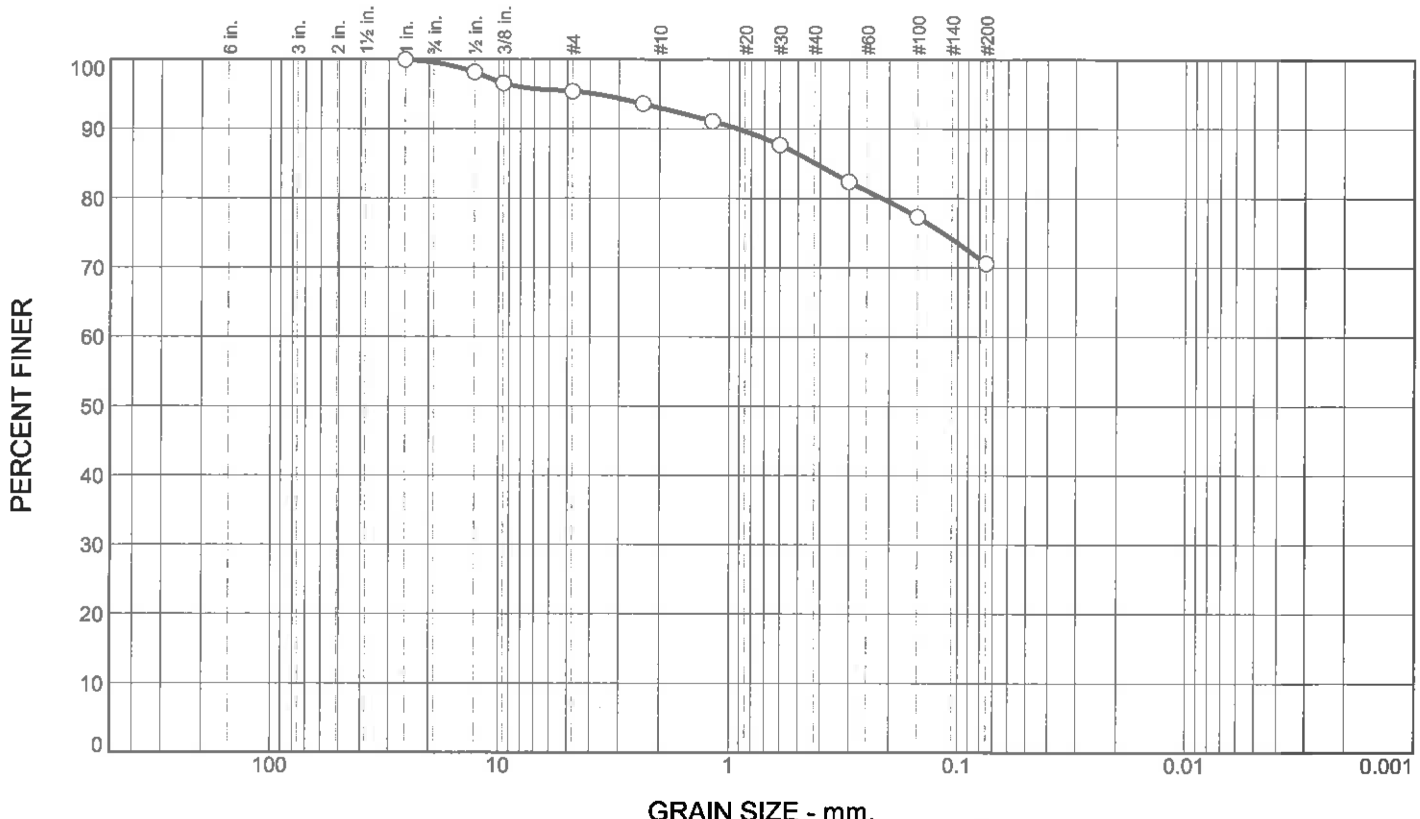
Figure B-1

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	5	2	8	14	71	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
1/2	98		
3/8	97		
#4	95		
#8	94		
#16	91		
#30	88		
#50	82		
#100	77		
#200	71		

* (no specification provided)

Soil Description

fat clay with sand

Atterberg Limits

PL= 21 LL= 56 PI= 35

Coefficients

D_{85}= 0.4174 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(24)

Remarks

Location: HB-1 **Depth:** 2

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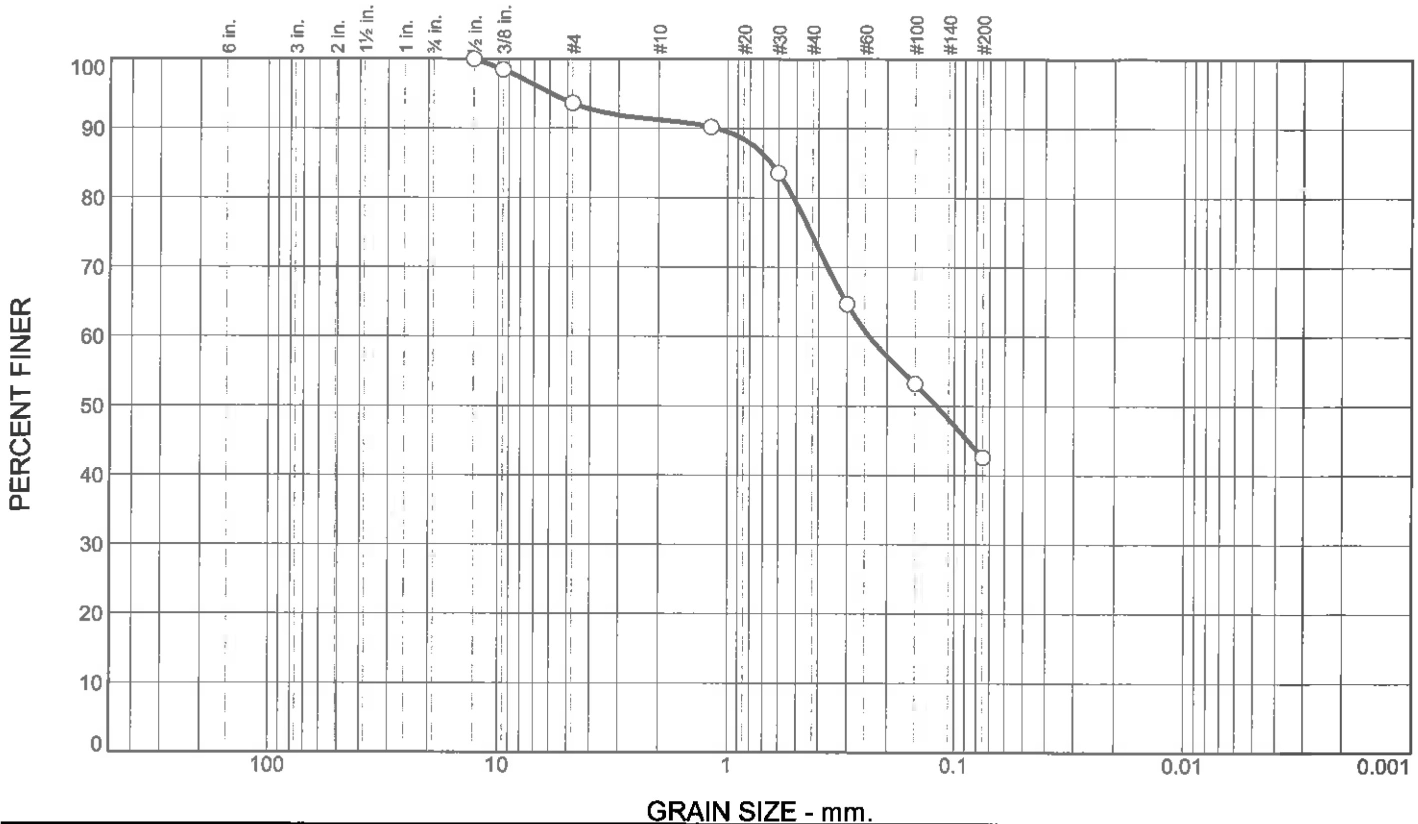
Figure **B-2**

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	6	3	17	31	43	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2	100		
3/8	98		
#4	94		
#16	90		
#30	84		
#50	65		
#100	53		
#200	43		

* (no specification provided)

Soil Description

clayey sand

Atterberg Limits

PL= 17 LL= 36 PI= 19

Coefficients

D_{85}= 0.6453 D_{60}= 0.2389 D_{50}= 0.1202
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(4)

Remarks

Location: HB-3 **Depth:** 1

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Figure **B-3**