GEOTECHNICAL INVESTIGATION REPORT

OLD STONE RANCH

APNs: 008-792-11, -95, 008-831-77, -02

FALLON, CHURCHILL COUNTY, NEVADA

Prepared For

NevDev LLC
Mr. Kim McCreary

Prepared By

WESTEX
Consulting Engineers

File No.: 2170.003-A
May 20, 2022

WESTEX
Consulting Engineers

P.O. Box 18871
Reno, Nevada 89511
Locally Owned & Operated

May 20, 2022

Mr. Daniel McCreary
NevDev LLC

Re: Geotechnical Investigation Report
Old Stone Ranch
APNs: 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada
File No.: 2170.003-A

Mr. McCreary,

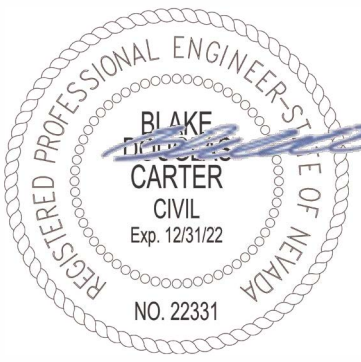
Westex Consulting Engineers, LLC (Westex) is pleased to present this report containing the results of our geotechnical investigation performed at the referenced property.

As presented in the attached report, based on the results of our investigation, knowledge of the project area, and understanding of the project, we conclude that from a geotechnical standpoint the site is suitable for development. The primary geotechnical concerns include:

- Proper moisture conditioning and compaction of foundation and subgrade soils,
- Groundwater seepage may be experienced in deeper excavations and trenches, as groundwater levels were encountered within test pit excavations, TP-1, TP-5, TP-6 and TP-7 at depths ranging from 6.5 feet to 9.5 feet below original ground elevation,
- Potential sloughing of sandy soils may require benching and/or shoring to provide stable and safe excavations.

We appreciate your selecting Westex Consulting Engineers to perform this investigation and trust that the results will fulfill project design requirements. If you, any design consultants, or plan reviewers have any questions, please contact me directly at (775) 771-9539 or blake@westexconsulting.com.

Respectfully submitted,
WESTEX Consulting Engineers, LLC



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Blake D. Carter, P.E.
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RE Number 22331
Expires 12/31/2022

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I INTRODUCTION

This report presents the results of our geotechnical investigation performed for the Old Stone Ranch site located in Fallon, Churchill County, Nevada. The property location is shown on the attached *Site Vicinity Map*, Plate 1. This investigation was conducted in general accordance with our March 2, 2022 proposal and work order, authorized on March 15, 2022.

The conclusions and recommendations contained in this report are founded on selected points of exploration, an engineering analysis of the data acquired during our investigation, and our experience with similar site characteristics. If during grading and construction, site conditions or project plans are found to vary from those described in this report, we should be contacted immediately to verify that the recommendations contained herein remain applicable to the final project design. Accordingly, this report may be revised at any time. To provide project continuity and observe that the provided geotechnical recommendations are followed, we recommend retaining Westex for construction testing and inspection services.

A. Purpose and Scope of Services

The purpose of this geotechnical engineering investigation is to characterize the site subsurface soil and groundwater conditions and provide appropriate and economic design-level engineering conclusions and recommendations pertaining to these conditions. Our scope of services included:

1. Field reconnaissance of the site,
2. Review of published geologic information,
3. Exploration of the subsurface conditions by excavating, logging, and sampling within seven (7) test pits,
4. Soil percolation testing for a general indication of drainage,
5. Two geophysical measurements of shear wave velocity to a depth of 100-feet to determine seismic Site Class,
6. Laboratory testing on select samples acquired from the exploratory test pits,
7. Engineering evaluation and preparation of this geotechnical engineering report addressing current project design and construction recommendations.

Included in this report are conclusions and recommendations regarding:

1. Local soil and groundwater conditions,
2. Potential geologic hazards,
3. Earthquake site response,
4. Site grading and structural design,
5. Fill placement and compaction specifications,
6. Soil properties for drainage,
7. Trench excavation, utility line bedding, and trench backfilling,
8. Foundation and slab-on-grade support,
9. Lateral resistance and loads,
10. Exterior concrete flatwork,
11. Pavement section recommendations,
12. Additional geotechnical engineering services.

This report is geotechnical in nature and not intended to identify other site constraints such as environmental hazards, wetlands determinations and/or the potential presence of buried utilities. Recommendations included in this report are specific to development within the limits of the property and are not intended for off-site development. Proposed development outside the limits of our investigation or any conceptual changes to site development, such as the use of alternative foundations or grade changes, could require additional subsurface exploration, laboratory tests and engineering analyses.

B. Site Location and Description

Our site description is based on our site visits conducted in March 2022 and Churchill County Assessor mapping information.

The project site is located on the south side of Casey Road and on the south side of Birch Lane in Fallon, Churchill County, Nevada and occupies Assessor parcel number's (APN) 008-792-11, -95, 008-831-77, -02. According to the Public Land Survey System (PLSS), the project site is located in Section 35, Township 19 North, Range 28 East, Mt. Diablo Meridian.

The relatively flat, approximately 107.2-acre property is currently undeveloped land with multiple dirt roads crossing through the northern portion of the site. The site is bordered by residential properties along the west and east side, farmland to the south, and Casey Road to the north. Site access is from Casey Road or Pine Road from the north and from Birch Lane to access the southern half of the property. The site appears relatively undisturbed from a grading perspective, besides a large dirt mound near the center of the property and some random dirt trails. Vegetation includes many shrubs and a few trees to the north as well as shrubs, grasses and trees to the south. A canal runs through the southeastern portion of the site, parallel to Birch Lane.

Based on data from Google Earth, the maximum site elevation is approximately 3,984 feet above mean sea level (MSL, NAVD88 vertical datum). The minimum elevation is approximately 3,970 MSL, for a relief of about 14 feet across the site in some areas. The property slopes slightly down from north to south at approximately 0.2 percent.

C. Proposed Development

The proposed development may include residences that are wood-framed structures of typical residential construction. The structures are anticipated to be supported by either concrete footings and stem-wall with raised wood floors, or a concrete slab-on-grade. Mass grading is anticipated to include fills and/or cuts on the order of about six feet to obtain design grades. Standard septic systems are anticipated to be a suitable option for any individual on-site sewage disposal system.

At the time of investigation, vertical structural loading information was relatively unknown; however, we anticipate that foundation loads will be light to moderate for the proposed structures and loading scenarios will be typical for the region. Additionally, we assume that foundations will bottom at least 18 inches below the lowest adjacent exterior ground surface for frost protection, and that structural design will be in accordance with the 2018 edition of the

International Building Code, 2018 International Residential Code, and Northern Nevada Code Amendments.

Civil improvements shall be constructed in accordance with the latest edition of the Standard Specifications for Public Works Construction "Orange Book" or as required by Churchill County.

II FIELD EXPLORATION AND LABORATORY TESTING

A. Field Exploration

Exploratory Test Pits

Subsurface soil conditions were explored in March 2022 by excavating seven (7) exploratory test pits to depths ranging from six-and-a-half to ten feet below the existing ground surface (BEG). The test pits were excavated with a track-mounted Cat 306 excavator.

The test pits were located in the field based on an *Old Stone Ranch Master Plan*, drawn by Phelps Engineering, knowledge of the project, existing underground and above-ground utility locations, and accessibility, and are depicted on Plate 2, *Geotechnical Exploration Map*. Our field engineer recorded the location of each test pit using a hand-held Global Positioning System (GPS) receiver. All locations are approximate and considered accurate to within ±15 feet. No greater accuracy is inferred.

Bulk soil samples were collected from the exploratory test pits from specific soil layers. The soils were visually classified and logged by our engineer in the field in accordance with the Unified Soil Classification System (USCS) and ASTM D2488. Logs of the exploratory test pits are presented in Plate 5 through Plate 11.

Test pits were backfilled with native soils to the extent possible with the excavator bucket, but not to compaction levels specified for improvements. During grading the test pits shall be located and re-compacted to limit disturbance to newly constructed improvements.

Field Infiltration and Percolation Testing

Percolation testing was performed at two test pit locations near representative areas of proposed detention/retention during our field investigation. During this investigation, field tests were performed in accordance with NAC 444. The measured infiltration rates below can be used to aid in septic design or retention basin sizing:

Location	Test Method	Depth	Measured Rate
TP-5	Infiltration	2-feet BEG	1 minute per inch
TP-5	Percolation	4-feet BEG	2 minutes per inch
TP-7	Infiltration	2-feet BEG	1 minute per inch
TP-7	Percolation	6-feet BEG	3.5 minute per inch

During our field investigation, TP-5 was excavated to a depth of 8.5-feet BEG with groundwater encountered at 8.5-feet BEG. Further excavation was not able to occur due to the loose nature of the sandy soil and possibly unsafe trench conditions. However, based on the layered sandy soil types and results of the infiltration testing within the proposed basin area, the soil layers do not indicate a slower or limiting infiltration rate that tested during our field investigation. The

bottom layer encountered is composed of a silty sand and is similar in density to the layers tested at 2-feet depth. Field investigation was not performed deeper than 6-feet during our geotechnical field investigation due to standard trench safety precautions, sloughing sandy soils, as well as our field engineering judgment knowing that the sandy stratified soil layers produced extremely quick infiltration results, and that the majority of the absorption area of a retention pond is composed of the sidewalls and not the bottom of the basin. In our experience, the limiting infiltration rate of a retention basin is often due to years of sediment and debris build-up without proper maintenance. If design verification of infiltration rates is desired for initial design purposes, we recommend that the testing be performed during grading of the project site and construction of the retention basin.

The tested rates represent the field conditions when and where tested. Periodic inspection and sufficient maintenance of septic fields and/or retention ponds shall be supported to ensure the desired level of performance is sustained.

Geophysical Surveys

The approximate location of the geophysical alignments is included on Plate 2, *Geotechnical Exploration Map.* Seismic refraction microtremor (ReMi®) measurements were performed in accordance with ASTM D5777, Standard Guide for Using the Seismic Refraction Method for Subsurface Investigation, and result in a one-dimensional shear wave velocity profile representative of the proposed structures' foundation soils. A multi-channel seismograph using 12 geophones was spaced at 14-feet and 27-feet to develop a line creating a total geophone spread of 154-feet and 300-feet, respectively.

Results from geophysical measurements are included in Plate 24 and 25.

B. Laboratory Testing

Bulk representative samples from the exploratory test pits were selected for laboratory testing. Index tests were performed which were in turn correlated with typical engineering design parameters for similar soils. The following tests were performed:

- Particle size analysis (ASTM D422)
- Atterberg Limits (ASTM D4318)
- Soil Classification (ASTM D2487)

III SUBSURFACE SOILS AND GROUNDWATER CONDITIONS

A. Soils

All test pits encountered granular blends of sand ranging from non-plastic, poorly-graded sand, and non-plastic silty sand. Test Pit TP-2 encountered a layer of sandy lean clay with moderate plasticity from 9 to 10 feet BEG. All soils encountered were in a dry to damp moisture state, increasing in moisture content as depth increased to 6.5 to 10 feet.

In general, sands from all test pits are classified as poorly-graded sand (SP) or silty sand (SM). For all sands, the fines content passing the #200 sieve was less than 49 percent with the silty sand having more fines in comparison.

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According to mapping by the U. S. Department of Agriculture, Soil Conservation Service (*Web Soil Survey of Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties*), both the northern and southern portion of the site is underlain by Isolde-Appian clay substratum complex, 0 to 4 percent slopes (#101) and Dia loam, slightly saline, 0 to 1 percent slopes (#135). #101 consists of three subsoil groups: Isolde, sodic, and two types of Appian clay substratum. Isolde, sodic consists of fine sand to a depth of 6 inches, with a fines content ranging from 9 to 14 percent and a plasticity index ranging from non-plastic (NP) to 2. 6 to 60 inches deep consists of fine sand, sand with a fines content ranging from 9 to 14 percent and a plasticity index of NP to 2. Appian, clay substratum consists of fine sand for the first 3 inches with a fines content ranging from 8 to 14 and a plasticity index ranging from NP to 2. 3 to 11 inches deep consists of sandy clay loam, clay loam with a fines content ranging from 60 to 75 percent and a plasticity index ranging from 19 to 25. 11 to 46 inches deep consists of stratified gravelly coarse sand to fine sand with a fines content ranging from 7 to 12 percent and a plasticity index ranging from NP to 2. 46 to 60 inches deep consists of clay , silty clay with a fines content ranging from 86 to 100 percent and a plasticity index of 29 to 44. The second Appian, clay substratum consists of clay loam 3 inches deep with a fines content ranging from 60 to 75 percent and a plasticity index ranging from 19 to 25. 3 to 11 inches deep consists of clay loam, sandy clay loam with a fines content ranging from 60 to 75 percent and a plasticity index ranging from 19 to 25. 11 to 46 inches deep consists of stratified gravelly coarse sand to fine sand with a fines content ranging from 7 to 12 percent and a plasticity index ranging from NP to 2. 46 to 70 inches deep consists of silty clay, clay with a fines content ranging from 86 to 100 percent and a plasticity index ranging from 29 to 44. #135 consists of the soil subgroup Dia. Dia consists of loam for the first 5 inches with a fines content ranging from 57 to 70 percent and a plasticity index ranging from 10 to 17. 5 to 29 inches deep consists of stratified sandy loam to silty clay loam with a fines content ranging from 59 to 70 percent and a plasticity index ranging from 12 to 17. 29 to 60 inches deep consists of coarse sand, sand with a fines content ranging from 5 to 11 percent and a plasticity index ranging from NP to 2.

The northern portion of the site is underlain by Appian, clay substratum complex, 0 to 2 percent slopes (#102) and Sagouspe loamy sand, saline, 0 to 1 percent slopes (#197). #102 is underlain by two types of Appian, clay substratum. The first apian, clay substratum consists of fine sand to a depth of 3 inches with a fines content ranging from 8 to 14 percent and a plasticity index ranging form NP to 2. 3 to 11 inches deep consists of sandy clay loam, clay loam with a fines content ranging from 60 to 75 percent and a plasticity index ranging from 19 to 25. 11 to 46 inches deep consists of stratified gravelly coarse sand to fine sand with a fines content ranging from7 to 12 percent and a plasticity index ranging from NP to 2. 46 to 60 inches deep consists of silty clay, clay with a fines content ranging from 86 to 100 percent and a plasticity index ranging from 29 to 44. The second Appian clay substratum consists of clay loam to 3 inches deep with a fines content ranging from 60 to 75 percent and a plasticity index ranging from 19 to 25 percent. 3 to 11 inches deep consists of clay loam, sandy clay loam with a fines content ranging from 60 to 75 percent and a plasticity index ranging from 19 to 25. The soil type and properties 11 to 46 inches deep and 46 to 60 inches deep is identical to the previous Appian, clay substratum at those depths. #197 consists of the soil group Sagouspe. The first 6 inches is composed of loamy sand with a fines content ranging from 27 to 30 percent and a plasticity index ranging from NP to 2. 6 to 43 inches deep consists of loamy sand, fine sand with a fines content ranging from 27 to 30 percent and a plasticity index ranging from NP to 2. 43 to 58 inches deep consists of stratified coarse sand to silt loam with a fines content ranging from 35 to 45 percent and a plasticity index ranging from 2 to 10.

The southern portion of the site is underlain by Fernley sand, 0 to 1 percent slopes (#154) and Sagouspe loamy sand, 0 to 1 percent slopes (#196). #154 is underlain by the Fernley subsoil group. The first 7 inches of Fernley consists of sand with a fines content ranging from 5 to 11 percent and a plasticity index ranging from 0 to 2. 7 to 60 inches deep consists of stratified coarse sand to fine sand with a fines content ranging from 5 to 11 percent and a plasticity index ranging from NP to 2. #196 consists of the Sagouspe subsoil group. The first 6 inches consists of loamy sand with a fines content ranging from 27 to 30 percent and a plasticity index ranging from NP to 2. 6 to 43 inches deep consists of loamy sand, loamy fine sand with a fines content ranging from 27 to 30 percent and a plasticity index ranging from NP to 2. 43 to 58 inches deep consists of stratified coarse sand to silt loam with a fines content ranging from 35 to 45 percent and a plasticity index ranging from 2 to 10.

Based on our field observations of test pit excavations and laboratory evaluations, the on-site soils generally resemble a sandy material with low to non-plasticity with the appearance of some fine clay material.

We anticipate that soils will be excavatable with conventional grading equipment.

B. Groundwater

At the time of our exploration, ground water seepage was encountered in three of the test pits, the shallowest depth being 6.5 feet. Groundwater may affect construction of underground utilities at the site and precautions should be taken to manage subsurface flow. Based on a query of water wells in the area, an average depth to reported static water levels is 10.3 feet, ranging from 3 to 38 feet.

Depths to groundwater may vary significantly over time due to seasonal precipitation and snow fall/melt that may significantly affect surface and near-surface water seepage. Provisions should be made during construction to manage surface and subsurface water flows.

IV GEOLOGIC AND SEISMIC CONSIDERATIONS

To delineate possible faulting and to evaluate any other geological hazards on the site, our investigation included a review of available geological literature.

A. Geology

Regional Geology

The property is situated in the central Lahontan Valley and Carson Desert southeast of Soda Lake. The primary geologic deposit is composed of quaternary-aged alluvium sediments from the Holocene and Pleistocene epochs.

Based on the *Geologic Terrane Map of Nevada*, Nevada Bureau of Mines and Geology (NBMG, 2010), prepared by Crafford, the materials underlain the site are primarily composed of the following:

Alluvium, Undifferentiated (Qal)

B. Faulting, Seismicity, and Slope Stability

Faulting

The United States Geological Survey (USGS) publishes a Quaternary fault and fold database for use with Google Earth. This database allows the user to view possible faults at or near a location. The database shows a spread of the unnamed fault zone west of Carson Lake trending in a roughly north to south direction about 2.7 miles southwest of the project site. This fault is of latest Quaternary age and its traces are considered sufficiently inactive due to the age since last movement. Based on provisions of the 2018 IBC and Northern Nevada Amendments, it is our opinion that this fault zone requires no further investigation for consideration of building development on this property. Structures should generally maintain a minimum 100-foot setback from any mapped active Holocene faults, which the nearest, a trace of the Rainbow Mountain fault zone, is located approximately 10.3 miles east of the site and not trending through the site.

Seismicity

Active faults capable of generating large magnitude earthquakes have been identified within the region. Strong ground shaking associated with earthquakes should be expected to occur during the life of the project.

Literature prepared by A. Ryall and B. M. Douglas (NBMG, *Regional Seismicity*, 1976) indicates that earthquake recurrence curves predict a return period of 70 to 80 years for an earthquake of Magnitude 7.0 or greater within 62 miles of the Reno area. They also calculate that, on average, an earthquake of Magnitude 5.3 to 5.4 would be expected to occur regionally approximately once in 30 years, would have a maximum bedrock acceleration of 0.12 to 0.19g, and would involve about 6 seconds of strong shaking. The expected return period of rock accelerations greater than 0.5g at an average site in western Nevada associated with an earthquake of magnitude greater than 7.0 is on the order of 2,000 years.

Slope Stability

Based on the site topography and stiff soil profile, slope stability is not a concern for the development of this site.

C. Seismically-induced Liquefaction

Liquefaction, a loss of soil shear strength, is a phenomenon associated with loose, relatively clean, saturated granular soils (poorly graded sands and silty sands) subjected to earthquake shaking. Liquefaction can result in differential settlements of foundations and other structural elements supported by susceptible soils. Based on the increasing soil consistency with depth, as measured by shear wave velocity profile beneath the site, it is our opinion that the potential for liquefaction at this site is low and that no mitigation measures are necessary.

D. Tsunami or Seiche

A tsunami, or a seiche, is a great wave produced by an earthquake or by volcanic activity. A seiche is an oscillating tsunami that develops in enclosed bodies of water, like lakes or bays. The oscillation is typically triggered by variations in atmospheric pressure, wind, tidal currents, earthquakes, or a combination of these factors. Depending on the geometry of the basin, the

oscillation continues for some time after the triggering event has ended. There are no large bodies of water near the project site; therefore, the potential for tsunamis or seiches to impact the site is considered nil.

E. Radon

Radon, a colorless, odorless, radioactive gas derived from the natural decay of uranium, is found in nearly all rocks and soils. The Environmental Protection Agency (EPA) suggests that remedial action be taken to reduce radon in any structure with average indoor radon level of 4.0 pCi/L or more. Based on studies completed by the Nevada Bureau of Mines and Geology in cooperation with the Nevada Division of Health and the U.S. Environmental Protection Agency (*Radon In Nevada*, Nevada Bureau of Mines and Geology, Bulletin 108, 1994), the project site is considered within an area where average indoor radon concentrations could exceed 4.0 pCi/L. We recommend testing the site for radon upon completion of rough grade. Our office can be of assistance if radon testing is desired.

F. Flooding

Based on studies completed by the Federal Emergency Management Agency (FEMA), Community Panel Number 32001C1733F and 32001C1731F, effective September 26, 2008, the project site is within Flood Hazard Zone X (unshaded). *These are areas determined to be outside of the 0.2 percent annual chance floodplain (500-year flood).*

V CONCLUSIONS

Based on the results of our investigation, experience in the project area, and understanding of the proposed project, it is our opinion that the subject site is suitable for development provided the recommendations presented in this report and any subsequent reports are followed during the design and construction phases of the project. The primary identified geotechnical concerns are:

- Proper moisture conditioning and compaction of foundation and subgrade soils,
- Potential sloughing of trench soils may require benching and/or shoring.

Following are our conclusions.

1. Site soils consist predominately of silty sand and poorly-graded sand to a depth of 6.5 to 10 feet with moderate to low fines content. The site is relatively undisturbed from a grading perspective.
2. Percolation testing from our field investigation found that undisturbed native soils resulted in relatively fast draining conditions with a measured percolation rate of 1 minute per inch. This rate typically meets the requirements for a retention basin.
3. Based on the one-dimensional seismic (Shear-Wave) velocity profiles measured at the site, a Vs100 of 766 feet per second was calculated. A seismic Site Class D “Stiff Soil” is appropriate for structural design per ASCE 7-16.
4. The project site is within Flood Hazard Zone X (unshaded), which is classified as areas determined to be outside of the 0.2 percent annual chance floodplain (500-year flood).

5. There are no apparent geologic hazards that would place unusual constraints on the project; however, strong ground shaking associated with earthquakes should be expected to occur during the life of the project.

VI RECOMMENDATIONS

The following recommendations are based on present information; no detailed vertical loading information was available at the time of writing. When available, structural plans should be reviewed by Westex to evaluate whether or not the recommendations in this report remain valid, and to provide supplemental recommendations as necessary.

A. Site Preparation and Grading

Due to the predominant granular soil types encountered and expected minimal mass grading needed, an indiscriminate grading approach is anticipated to produce structural fill soils generated from the site. Any clay soil encountered at subgrade elevations should be separated or over-excavated from the upper the upper one foot of roadway subgrade soils within County right-of-way and two feet from building foundations.

Areas to be graded should be cleared of any existing and pre-existing improvements, debris, and vegetation. These materials should be removed from the site or may be stockpiled for re-use in deeper mass fills, basin liners, or landscape areas.

Minor root systems remaining after stripping may be disked or tilled in-place using a disk harrow or equivalent equipment. Stripped soil and any excavated soils that are not considered suitable for structural fill should be removed from the site or used in nonstructural areas. If expansive materials (clay soil), or any unusual soil conditions not addressed in this report are encountered, Westex should be notified immediately.

We presume the earthwork necessary to achieve design grades will result in fills and/or cuts on the order of less than six feet. Accordingly, we recommend supporting all structural elements and flatwork as follows:

- Continuous and Spread Footings: the existing native soil should be scarified a minimum of 24 inches below the existing grade, moisture conditioned to within two percent of optimum moisture content and re-compacted to a minimum of 90 percent modified proctor (ASTM D1557).
- Interior concrete slabs-on-grade: interior concrete slabs should be underlain by a minimum 12 inches of properly compacted non-expansive structural fill.
- Exterior Concrete Flatwork: underlain by a minimum 12 inches of properly compacted non-expansive structural fill.
- Driveway Sections: underlain by a minimum 18 inches of properly compacted non-expansive structural fill.
- Local Streets: underlain by a minimum 24 inches of properly compacted non-expansive structural fill.
- **Over-excavation depths do *not* include aggregate base sections.**

Over-excavation and compaction should extend laterally beyond foundation edges a minimum distance equivalent to the total depth vertically removed or separated from clay soil, two feet for this project site. The surfaces exposed by removal or over-excavation should be observed by a representative of Westex to document that the conditions are as anticipated and that no objectionable materials are present.

After excavation, all exposed subgrade soils should be scarified to a minimum depth of 8 inches, moisture conditioned within 2 percent of optimum moisture content, and compacted to a minimum 90 percent relative compaction, based on the maximum dry density determined by ASTM D1557.

Scarification and moisture conditioning may be waived by the Geotechnical Engineer (or their representative) if it is determined that the exposed materials exist at a suitable moisture content for attaining compaction or contain oversize material which will inhibit compaction procedures and result in a lesser density state. Surfaces which contain oversize material should be "proof-rolled" under the observation of the Geotechnical Engineer (or their representative) to ensure that adequate compaction has been attained. The Earthwork Contractor is responsible for obtaining approval for each prepared surface prior to proceeding with placement of structural components or fills.

B. Fill Placement and Compaction

To provide quality control where fill material is proposed to attain grades, structural zones are defined as the area three feet below and laterally away from foundations, 24 inches below streets, 12 inches below slabs-on-grade, exterior flatwork and driveway sections. Mass zones are defined as all areas outside the structural zones. Only approved, select material may be utilized within structural zones; however, materials which do not meet the requirements for structural fill may, in general, be used within mass zones with the prior approval of the Geotechnical Engineer (or representative in the field). Mass grading and structural fill shall be tested for conformance with specifications and minimum compaction at a minimum rate of one compaction test per 1,000 cubic yards of fill placed.

Suitability of On-site Soils

The native granular soils are considered suitable for use as properly compacted structural fill, provided any deleterious material, debris, vegetation, and/or particles larger than six-inch diameter are removed from the fill. We recommend that during the beginning of mass grading that stockpiles are able to be sampled, tested and approved for re-use to meet compliance standards for street and building pads.

Fill Material Specifications

Import soils used as structural fill should be free of organic matter and in general conform to the following requirements:

TABLE 1
IMPORT STRUCTURAL FILL SOIL REQUIREMENTS

Sieve Size	% Passing (by dry weight)
6-inch	100
3/4-inch	70 – 100
No. 4	50 – 100
No. 200	15 – 40

Liquid Limit = 40 maximum
Plasticity Index = 15 maximum
R-Value = 30 minimum
Non-deleterious to concrete (low sulfate)

The Earthwork Contractor shall ensure that all proposed fill materials are approved by the Geotechnical Engineer prior to use. Representative imported material samples shall be made available for testing one week prior to hauling to allow for material quality tests.

The recommendations for structural fill are intended as a guideline and define a readily attainable, acceptable material. Adjustments to the specified limits to address the use of other potentially acceptable materials, such as those containing oversize rock or which deviate from the classification requirements, can be made provided: 1) the Earthwork Contractor can demonstrate their ability to place and compact the material in substantial conformance with industry standards to achieve an equivalent finished product as that specified; 2) the Geotechnical Engineer gives their written approval; 3) the Geotechnical Engineer (or their representative) directly observes and approves the placement method; and 4) all parties understand that the Standard ASTM Compaction Test procedures may be invalid for certain material containing oversize aggregate. Compaction approval would only be achieved based on other criteria, such as a performance specification with on-site observation of compaction activity.

Fill Placement

All properly compacted structural fill shall be uniformly moisture conditioned to near optimum and compacted to at least 90 percent relative compaction based on the maximum dry density determined by ASTM D1557. Lift thickness shall be restricted to 8 inches (maximum loose lift) and individually tested unless the Earthwork Contractor can demonstrate their ability to uniformly achieve the required compaction for the entire placed layer.

C. Site Surface Drainage

Adequate drainage for surfaces adjacent to foundations and slopes should be provided to restrict water from infiltrating into the supporting soils. To allow water to drain away from the structure and prevent ponding against perimeter foundations, the ground surface should be

permanently sloped at least one-half percent for concrete, one percent for asphalt pavement, and two percent for soil. Landscape adjacent to structural areas should be limited and consist of native vegetation utilizing drip-type irrigation.

D. Foundation Support

Spread Footings

Conventional spread foundations can gain adequate support on the above specified approved, compacted, structural fill material. As previously mentioned, to control the potential for settlement, the supporting materials within spread footings should consist of a uniform 12-inch layer of approved, moisture-conditioned, compacted structural fill material. Monolithic slab-on-grade is another option with thickened edges and thickened foundation at load bearing walls and or columns.

In preparation for foundation construction, the earthwork contractor shall ensure that field density tests have been performed to document the relative compaction of the upper 12 inches of exposed materials, and shall be responsible for maintaining the recommended moisture content during construction. Preparation of these materials shall be documented prior to placement of structural components.

For adequate confinement and frost protection, footings should be bottomed at least 18 inches below lowest adjacent exterior grade. **Footings supported in accordance with our recommendations can be designed for a net allowable bearing capacity of 2,000 pounds per square foot (psf). This pressure can be increased by one-third when considering total design loads, including wind or seismic forces.**

Estimated total and differential settlement for footings designed for these bearing capacities should be less than 1 inch and ½ inch, respectively.

Seismic Design Parameters

We obtained the site seismic design parameters using the *ATC Hazards by Location* application. The web-based application can be found at:

https://hazards.atcouncil.org

The mapping database is used for determining seismic design values according to ASCE 7-16 and the 2018 International Building Code. Design parameters are presented in Table 2:

TABLE 2
2018 IBC SEISMIC DESIGN PARAMETERS (ASCE 7-16)

Description	Value
Latitude	39.468635 deg
Longitude	-118.810410 deg
Site Class	D – "Stiff Soil"
Risk Category	II
Short-Period (0.2 sec) Spectral Response, S_S	0.706 g
Long-Period (1.0 sec) Spectral Response, S_1	0.248 g
Short-Period (0.2 sec) Site Coefficient, F_A	1.236
Long-Period (1.0 sec) Site Coefficient, F_V	*null
Short (0.2 sec) MCE Spectral Response, S_{MS}	0.872 g
Long (1.0 sec) MCE Spectral Response, S_{M1}	*null
Short (0.2 sec) Design Spectral Response, S_{DS}	0.581 g
Long (1.0 sec) Design Spectral Response, S_{D1}	*null
PGA_M Site Modified Peak Ground Acceleration	0.393 g
Seismic Design Category, IBC	*null
Seismic Design Category, Churchill County (2018 IRC)	D1

*null values shall be determined by the Structural Engineer in accordance with Section 11.4.8.

Site Classification

Based on our field exploration and knowledge of the site geology, a Site Classification of D "Stiff Soil" may be used for design. An average shear wave velocity of 766 feet per second is appropriate for the site.

E. Soil Parameters, Lateral Resistance and Loads

Soil Parameters

Representative native soils can be characterized with the following parameters:

- Soil Unit Weight, 115 pcf
- Internal Friction Angle, 30 degrees

Lateral Resistance

Resistance to lateral loads can be obtained from passive earth pressures and soil friction against the bottom of concrete foundation elements. For design, based on native soil types, we recommend the use of a coefficient of friction of 0.38 with a passive pressure of 275 pounds per cubic foot (equivalent fluid method) per foot of depth.

Lateral Loads

The granular native soils are considered suitable for use as retaining wall, foundation wall, or deep excavation backfill (within the zone of 10-feet behind back of wall), provided all deleterious material and material larger than six-inch diameter are removed. All backfill materials should meet the requirements of Table 1 *Import Structural Fill Requirements* and be limited to granular soils for native backfill soils. Accordingly, for level backfill using select granular materials, the recommended active pressure can be taken as 35 pounds per cubic foot (equivalent fluid pressure) and increased to 50 pcf for seismic design. For restrained retaining walls, the design at-rest pressure can be taken as 55 pounds per cubic foot (equivalent fluid pressure).

For surcharge lateral pressures with a backslope up to 2H:1V, the recommended active pressure should be increased to 60 pounds per cubic foot. For passive resistance founded on the toe slope down to a 2H:1V, lateral passive pressure should be reduced to 250 pounds per cubic foot.

F. Concrete Slab-On-Grade

In preparation for flatwork construction, the Earthwork Contractor shall ensure that soils have been prepared as recommended and that field density tests have been performed to document that the relative compaction of the slab subgrade is at least 95 percent relative compaction, based on the maximum dry density determined by ASTM D1557. Preparation of the native soils shall be documented prior to placement of structural fill, aggregate base or structural components.

Interior Concrete Slabs-on-Grade

Interior concrete slabs-on-grade should be supported on properly compacted structural fill meeting the requirements of Table 1, *Import Structural Fill Soil Requirements*. Structural slab design is the responsibility of the project structural engineer; however, we recommend a minimum thickness of 4-inches of aggregate base (virgin, not recycled materials) to provide a uniform base course.

For slab-on-grade design, a Modulus of Subgrade Reaction (k) of 175 pounds per square inch per inch (psi/in, or pci) may be used for materials meeting the requirement for structural fill.

Due to the potential for seasonal surface water and lateral vapor migration to occur, associated with seasonal moisture change and differences between the building interior and exterior ambient conditions, a vapor inhibitor should be considered if moisture sensitive floor coverings are proposed. Vapor barriers should be designed in accordance with current American Concrete Institute (ACI) guidelines, and placed in accordance with ACI 302.1R-15 Fig. 5.2.3.2.

Exterior Concrete Slabs-on-Grade

All dedicated exterior flatwork should conform to standards provided by the governing agency including section composition, supporting material thicknesses and any requirements for reinforcing steel, air entrainment, and fiber reinforcement.

Exterior concrete flatwork should be supported on properly compacted structural fill meeting the requirements of Table 1, *Import Structural Fill Soil Requirements*. Lightly loaded exterior flatwork, such as walkways, should consist of at least 4 inches of Type II Portland cement

concrete with a minimum 28-day compressive strength of 4,000 pounds per square inch (psi) with entrained air, underlain by at least 6 inches of compacted (95 percent relative compaction) aggregate base material.

Concrete mix proportions and construction techniques, including the addition of water and improper curing, can adversely affect the finished quality of the concrete and result in cracking and spalling of the slabs. We recommend that all placement and curing be performed in accordance with procedures outlined by the American Concrete Institute and Portland Cement Association. Special considerations should be given to concrete placed and cured during hot or cold weather conditions. Proper control joints and reinforcing should be provided to minimize any damage resulting from shrinkage.

G. Permanent Cut-and-Fill Slopes

Permanent slopes are not anticipated on the project site. Any storm drain basins should be constructed with a maximum inclination of 3 horizontal to one vertical (3:1) and should be re-vegetated or lined with rip-rap to prevent soil erosion.

H. Corrosion

The native soils in the area are mapped in the USDA Soil Features database ranging from low to high corrosion to concrete, and moderate to high corrosion to uncoated steel.

The native soils are not considered detrimental to normally formulated concrete per ACI guidelines.

I. Utilities, Trench Excavation, and Backfilling

The Earthwork Contractor must comply with the "Safety and Health Regulations for Construction" as directed by the Occupational Safety and Health Act (OSHA Standards, Volume III, Part 1926, Subpart P) while excavating and backfilling. The Earthwork Contractor is also responsible for providing a competent person, as defined by OSHA standards, to ensure excavation safety.

Pipe bedding and trench backfill materials should be moisture conditioned to slightly over optimum and compacted to 90 percent relative compaction, or local requirements, based on the maximum dry density determined by ASTM D1557. The upper 24 inches of trench backfill within asphalt or concrete paved areas should be compacted to a minimum 95 percent relative compaction as determined by ASTM D1557. The thickness of all lifts will be restricted to a maximum of 8 inches (loose) and individually tested unless the Earthwork Contractor can demonstrate their ability to uniformly achieve the required compaction for the entire layer of material placed.

For corrosion protection, where steel and/or metal pipes are proposed, the Contractor shall follow the pipe manufacturer's recommendation regarding corrosion protection.

J. Pavement Sections

Based on the soil conditions encountered, minimum pavement sections for local streets will be applicable to the project site. Flexible pavement sections should be supported on a minimum 24 inches of properly compacted subgrade or native fill soils that qualify as structural fill as previously specified. To provide uniform pavement section support, subgrade soils shall exhibit a minimum Resistance Value of 30, and shall be scarified, moisture conditioned to within two percent of optimum moisture content, and compacted to at least 95 percent relative compaction. Pavement recommendations have been made considering the overall granular nature of the site soils; however, pockets of fine-grained or clay soil could be encountered and shall be segregated from the upper 24 inches of pavement subgrade soils.

Recommended 20-year pavement sections have been calculated using AASHTO 93 design methodology. These pavement sections have typically attained satisfactory performance measures in the region, and are presented in the following tables:

TABLE 3
MIN. RECOMMENDED ASPHALT CONCRETE PAVEMENT SECTIONS

Pavement Designation	Asphalt Concrete (inches)	Aggregate Base (inches)
Local Streets (SN 2.0)	4	6

The Earthwork Contractor shall ensure that field density tests have been performed to document the relative compaction of at least the upper 24 inches of subgrade soils prior to placing subsequent lifts. Preparation of the native soils shall be documented prior to placement of structural fill or aggregate base. All subgrade shall be compacted to a smooth non-yielding surface before placement of aggregate base. Aggregate base sections shall be compacted to a smooth non-yielding surface before placement of pavement sections.

All roadway construction shall be in accordance with the Standard Specifications for Public Works Construction.

Driveways can be composed of typical minimum thickness for the selected products. If pavers are selected, a higher degree of maintenance shall be expected to correct minor settlements. Product manufacturer's recommendations should be followed for installation, including setting pavers in concrete, as applicable.

K. Additional Engineering & Inspection Services

This report is geotechnical in nature and not intended to identify other site constraints such as environmental hazards, wetlands determinations and/or the potential presence of buried utilities. We can assist in evaluating these considerations should further information be requested. Moreover, this office should be retained to provide grading observation and testing as well as associated special inspection during all phases of construction.

All plans and specifications for projects should be reviewed for conformance with this geotechnical report and approved by the Geotechnical Engineer prior to submission to the building department for review.

The recommendations presented in this report are based on the assumption that sufficient field inspection and construction review will be provided during all phases of construction. A pre-construction conference should be scheduled to include, but not be limited to, the Owner, Architect, Civil Engineer, General Contractor, Earthwork and Materials Sub-Contractors, Building Official and Geotechnical Engineer. The recommendations presented in this report should be reviewed by all parties to discuss applicable specifications and testing requirements. At this time, any applicable material quality and mix design reports should be submitted for approval by the Geotechnical Engineer.

WESTEX Consulting Engineers, LLC has prepared this report based on certain assumptions concerning subsurface conditions at the Property. WESTEX Consulting Engineers, LLC should also provide on-site observations and testing during site preparations, grading, excavation, fill placement, foundation installation, and paving. These observations will allow us to document that the soil conditions are as anticipated, and that the contractor's work is in conformance with the intent of our recommendations and the approved plans and specifications. Our conclusions and recommendations may be invalidated, partially or in whole, by changes outside our control and by subsequent acts occurring on the site after field reconnaissance. This report may be subject to review and revision at any time. Opinions about the condition of the Property do not constitute a warranty of any kind, either express or implied.

VII DISTRIBUTION

One electronic-stamped copy via email to addressee:

NevDev LLC
Mr. Daniel McCreary
Via email: nevadaremax@yahoo.com

LIST OF PLATES

APPENDIX A
GEOTECHNICAL FIGURES

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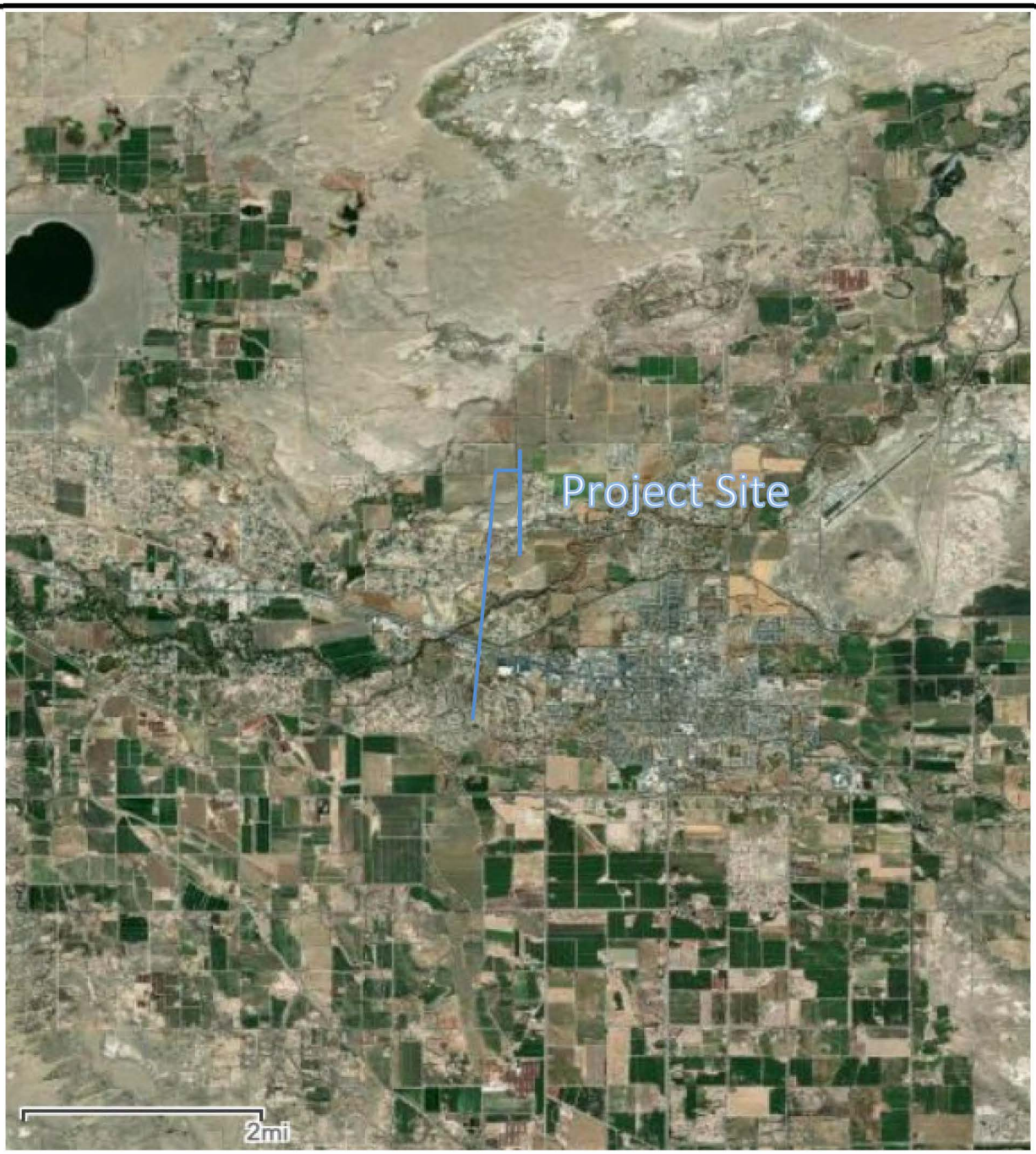
Consulting Engineers



Ref: Churchill County Assessors Map, Imagery Hybrid, accessed November 2021.

Property Information	
Parcel ID	008-792-11,-95, 008-831-77,-02
Acreage	107.2
Land Use	120 - Vacant - Single Family Residential
Zoning	R1, E1

WESTEX Consulting Engineers
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Phone: (775) 771-9539

SITE VICINITY MAP

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.: 2170.003-A
Date: 4/20/2022

PLATE 1

N

TP-1 Approximate Test Pit Location

L-1 Approximate Geophysical Alignment

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GEOTECHNICAL EXPLORATION MAP

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.:	2170.003-A	**PLATE**
Date:	4/20/2022	**2**

GEOLOGIC TERRANE MAP OF NEVADA

Quaternary Sediments and Rocks (Holocene and Pleistocene)

Sediments and Sedimentary Rocks

Qal — **Alluvium, undifferentiated**

A. Elizabeth Jones Crafford
2010

For sale by:
Nevada Bureau of Mines and Geology
2175 Raggio Pkwy.
Reno, Nevada 89512
ph. (775) 682-8766
www.nbmg.unr.edu, nbmg@unr.edu

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Phone: (775) 771-9539

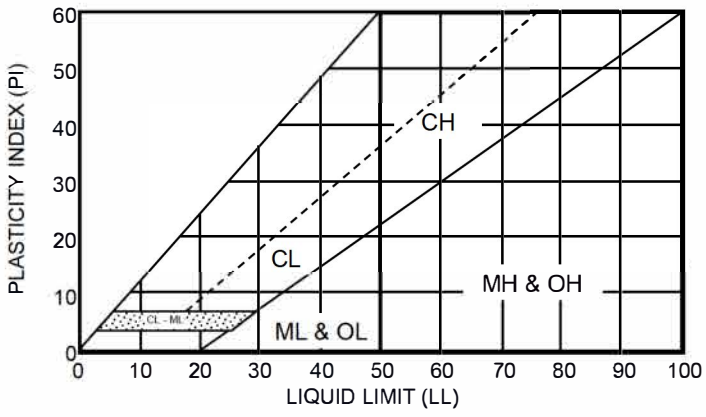
GEOLOGIC MAP

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.: 2170.003-A
Date: 4/20/2022

PLATE 3

MAJOR DIVISION				TYPICAL NAMES
COARSED-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVEL MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC	CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SAND MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP	POORLY GRADED SAND WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS WITH OR WITHOUT GRAVEL
			SC	CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILT AND CLAY LIQUID LIMIT 50% OR LESS		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL	ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILT AND CLAY LIQUID LIMIT GREATER THAN 50%		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOLID, ELASTIC SILTS
			CH	INORGANIC CLAYS OR HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC SILTS OR CLAYS MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS



CONSISTENCY		RELATIVE DENSITY	
SILTS & CLAYS	SPT BLOW* COUNTS (N)	SANDS & GRAVELS	SPT BLOW* COUNTS (N)
VERY SOFT	0 - 2	VERY LOOSE	0 - 4
SOFT	3 - 4	LOOSE	5 - 10
MEDIUM STIFF	5 - 8	MEDIUM DENSE	11 - 30
STIFF	9 - 15	DENSE	31 - 50
VERY STIFF	16 - 30	VERY DENSE	50 +
HARD	30 +		

* The Standard Penetration Resistance (N) In blows per foot is obtained by the ASTM D1585 procedure using 2" O.D., 1 3/8" I.D. samplers.

DESCRIPTION OF ESTIMATED PERCENTAGES OF GRAVEL, SAND, AND FINES	
TRACE	Particles are present but est. < 5%
FEW	5% - 10%
LITTLE	15% - 20%
SOME	30% - 45%
MOSTLY	50% - 100%

NOTE: Percentages are presented within soil description for soil horizon with laboratory tested soil samples.

DEFINITIONS OF SOIL FRACTIONS	
SOIL COMPONENT	PARTICLE SIZE RANGE
COBBLES	ABOVE 3 INCHES
GRAVEL	3 IN. TO NO. 4 SIEVE
COARSE GRAVEL	3 IN. TO 3/4 IN.
FINE GRAVEL	3/4 IN. TO NO. 4 SIEVE
SAND	NO. 4 TO NO. 200
COARSE SAND	NO. 4 TO NO. 10
MEDIUM SAND	NO. 10 TO NO. 40
FINE SAND	NO. 40 TO NO. 200
FINES (SILT OR CLAY)	MINUS NO. 200 SIEVE

S.6 Rev 2-6-10

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KEY TO SOIL DESCRIPTIONS

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.: 2170.003-A
Date: 4/20/2022

PLATE 4

WESTEX
Consulting Engineers

P.O. Box 18871
Reno, Nevada 89511
Locally Owned & Operated

Test Pit No.: TP-1
Project: Old Stone Ranch Casey Road Mixed Use
File No.: 2170.003-A
Location: Fallon, Nevada

Date: Friday, March 18, 2022
Excv. Method: Excavator
Excv. Type: CAT 306
Logged By: MD

GPS: 39.473825, -118.813091
Datum: EL 3,979 FT ~ NAV88

DEPTH (FEET)	SAMPLE TYPE: BULK	SAMPLE TYPE: Grab	SAMPLE TYPE: Drive Tube	Sample ID	Color	PENETROMETER (TSF)	CLAYEY SOILS: SOFT	CLAYEY SOILS: MED. STIFF	CLAYEY SOILS: STIFF	CLAYEY SOILS: VERY STIFF	CLAYEY SOILS: HARD	SAND OR GRAVEL: VERY LOOSE	SAND OR GRAVEL: LOOSE	SAND OR GRAVEL: MED. DENSE	SAND OR GRAVEL: DENSE	SAND OR GRAVEL: VERY DENSE	MOISTURE: DRY	MOISTURE: DAMP	MOISTURE: MOIST	MOISTURE: WET	MOISTURE: SATURATED	USCS SYMBOL	DESCRIPTION
0													X				X						
													X				X						
													X				X						
--1--													X				X						
													X				X						
													X				X						
													X				X						
--2--				1A	Light Brown								X				X					SM	Silty sand (SM) with some gravel and cohesive silty sand clumps. 48.7% non-plastic fines content.
														X			X						
														X			X						
														X			X						
--3--														X			X						
														X			X						
														X			X						
														X			X						
--4--														X			X						
														X				X					
														X				X					
														X				X					
--5--														X				X					
														X				X					
														X				X					
--6--														X				X					
														X				X					
				1B	Brown									X				X				SM	Silty sand (SM) with 19.5% non-plastic fines content.
														X				X					
--7--														X				X					
														X				X					
														X				X					
--8--														X				X					
														X				X					
														X				X					
--9--														X				X					
	X			1C	Brown									X				X				SM	Silty sand (SM) with 41.9% non-plastic fines content.
														X				X					
--10--																							

Total Depth: 9.5 feet

Groundwater: NFWE

Plate 5

WESTEX
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Reno, Nevada 89511
Locally Owned & Operated

Test Pit No.: TP-2 | **Date:** Friday, March 18, 2022
Project: Old Stone Ranch Casey Road Mixed Use | **Excv. Method:** Excavator
File No.: 2170.003-A | **Excv. Type:** CAT 306
Location: Fallon, Nevada | **Logged By:** MD

GPS: 39.473117, -118.810269
Datum: EL 3,983 FT~ NAV88

DEPTH (FEET)	SAMPLE TYPE: BULK / Grab / Drive Tube	Sample ID	Color	PENETROMETER (TSF)	CLAYEY SOILS: SOFT / MED. STIFF / STIFF / VERY STIFF / HARD	SAND OR GRAVEL: VERY LOOSE / LOOSE / MED. DENSE / DENSE / VERY DENSE	MOISTURE: DRY / DAMP / MOIST / WET / SATURATED	USCS SYMBOL	DESCRIPTION
		2A	Tan			LOOSE	DAMP	SM	Silty sand (SM) with 22.4% non-plastic fines content.
--1--						MED. DENSE	DRY		
--2--		2B	Tan			MED. DENSE	DRY	SM	Silty Sand (SM) with 12.1% non-plastic fines content.
--3--						MED. DENSE	DRY		
--4--						MED. DENSE	DRY		
--5--						MED. DENSE	DRY		
--6--						MED. DENSE	DRY		
--7--						MED. DENSE	DRY		
--8--						MED. DENSE	DRY		
--9--						MED. DENSE	DRY		
		2C	Dark Brown			MED. DENSE	DRY	CL	Sandy lean clay (CL) with 53.7% fines content.
--10--						MED. DENSE	DRY		

Total Depth: 10.0 feet | Groundwater: NFWE

Plate 6

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P.O. Box 18871
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Locally Owned & Operated

Test Pit No.: TP-3
Project: Old Stone Ranch Casey Road Mixed Use
File No.: 2170.003-A
Location: Fallon, Nevada

Date: Friday, March 18, 2022
Excv. Method: Excavator
Excv. Type: CAT 306
Logged By: MD

GPS: 39.470640, -118.810197
Datum: EL 3,979 FT ~ NAV88

DEPTH (FEET)	SAMPLE TYPE: BULK	SAMPLE TYPE: Grab	SAMPLE TYPE: Drive Tube	Sample ID	Color	PENETROMETER (TSF)	CLAYEY SOILS: SOFT	CLAYEY SOILS: MED. STIFF	CLAYEY SOILS: STIFF	CLAYEY SOILS: VERY STIFF	CLAYEY SOILS: HARD	SAND OR GRAVEL: VERY LOOSE	SAND OR GRAVEL: LOOSE	SAND OR GRAVEL: MED. DENSE	SAND OR GRAVEL: DENSE	SAND OR GRAVEL: VERY DENSE	MOISTURE: DRY	MOISTURE: DAMP	MOISTURE: MOIST	MOISTURE: WET	MOISTURE: SATURATED	USCS SYMBOL	DESCRIPTION
0				3A/ 5A	Tan								X				X						Poorly-graded sand (SP) with 3.8% non-plastic fines content.
--1--													X				X						
--2--													X				X						
--3--														X				X					
--4--														X				X					
--5--														X				X					
--6--														X				X					
--7--														X				X					
--8--														X				X					
--9--														X				X					
--10--														X				X					

Total Depth: 10.0 feet

Groundwater: NFWE

Plate 7

WESTEX
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P.O. Box 18871
Reno, Nevada 89511
Locally Owned & Operated

Test Pit No.: TP-4
Project: Old Stone Ranch Casey Road Mixed Use
File No.: 2170.003-A
Location: Fallon, Nevada

Date: Friday, March 18, 2022
Excv. Method: Excavator
Excv. Type: CAT 306
Logged By: MD

GPS: 39.471858, -118.813030
Datum: EL 7,463 FT~ NAV88

DEPTH (FEET)	SAMPLE TYPE: BULK	SAMPLE TYPE: Grab	SAMPLE TYPE: Drive Tube	Sample ID	Color	PENETROMETER (TSF)	CLAYEY SOILS: SOFT	CLAYEY SOILS: MED. STIFF	CLAYEY SOILS: STIFF	CLAYEY SOILS: VERY STIFF	CLAYEY SOILS: HARD	SAND OR GRAVEL: VERY LOOSE	SAND OR GRAVEL: LOOSE	SAND OR GRAVEL: MED. DENSE	SAND OR GRAVEL: DENSE	SAND OR GRAVEL: VERY DENSE	MOISTURE: DRY	MOISTURE: DAMP	MOISTURE: MOIST	MOISTURE: WET	MOISTURE: SATURATED	USCS SYMBOL	DESCRIPTION
													X					X					
													X					X					
													X					X					
--1--													X					X					
														X				X					
														X				X					
														X				X					
--2--														X				X					
														X				X					
														X				X					
														X				X					
--3--														X				X					
														X				X					
														X				X					
														X				X					
--4--														X				X					
														X				X					
														X				X					
				4A	Brown									X				X				SM	Silty sand (SM) with 19.7% non-plastic fines content.
--5--														X				X					
														X				X					
														X				X					
--6--														X				X					
														X				X					
														X				X					
--7--														X				X					
														X				X					
														X				X					
														X				X					
--8--														X				X					
														X				X					
														X				X					
--9--														X				X					
														X				X					
--10--																							

Total Depth: 9.5 feet

Groundwater: NFWE

Format: GROUP NAME: cementation; grain size; modifiers

Plate 8

WESTEX
Consulting Engineers

P.O. Box 18871
Reno, Nevada 89511
Locally Owned & Operated

Test Pit No.: TP-5
Project: Old Stone Ranch Casey Road Mixed Use
File No.: 2170.003-A
Location: Fallon, Nevada

Date: Friday, March 18, 2022
Excv. Method: Excavator
Excv. Type: CAT 306
Logged By: MD

GPS: 39.468840, -118.810803
Datum: EL 3,977 FT~ NAV88

DEPTH (FEET)	SAMPLE TYPE: BULK	SAMPLE TYPE: Grab	SAMPLE TYPE: Drive Tube	Sample ID	Color	PENETROMETER (TSF)	CLAYEY SOILS: SOFT	CLAYEY SOILS: MED. STIFF	CLAYEY SOILS: STIFF	CLAYEY SOILS: VERY STIFF	CLAYEY SOILS: HARD	SAND OR GRAVEL: VERY LOOSE	SAND OR GRAVEL: LOOSE	SAND OR GRAVEL: MED. DENSE	SAND OR GRAVEL: DENSE	SAND OR GRAVEL: VERY DENSE	MOISTURE: DRY	MOISTURE: DAMP	MOISTURE: MOIST	MOISTURE: WET	MOISTURE: SATURATED	USCS SYMBOL	DESCRIPTION
													X				X						
													X				X						
													X				X						
--1--													X				X						
													X	X			X						
														X			X						
--2--														X			X						
														X			X						
														X			X						
														X			X						
--3--														X			X						
														X			X						
														X			X						
														X			X						
--4--				3A/										X			X						
				5A	Tan									X			X					SP	Poorly-graded sand (SP) with 3.8% non-plastic fines content. Groundwater at 8.5 feet BEG.
														X			X						
														X			X						
--5--														X			X						
														X			X						
														X			X						
--6--														X			X						
														X			X						
														X			X						
--7--														X				X					
														X				X					
														X					X				
														X					X				
--8--														X						X			
														X						X			
														X							X		
--9--																							
--10--																							

Total Depth: 8.5 feet

Groundwater: 8.5 feet

Format: GROUP NAME: cementation; grain size; modifiers

Plate 9

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P.O. Box 18871
Reno, Nevada 89511
Locally Owned & Operated

Test Pit No.: TP-6
Project: Old Stone Ranch Casey Road Mixed Use
File No.: 2170.003-A
Location: Fallon, Nevada

Date: Friday, March 18, 2022
Excv. Method: Excavator
Excv. Type: CAT 306
Logged By: MD

GPS: 39.465617, -118.806163
Datum: EL 3,971 FT ~ NAV88

DEPTH (FEET)	SAMPLE TYPE: BULK	SAMPLE TYPE: Grab	SAMPLE TYPE: Drive Tube	Sample ID	Color	PENETROMETER (TSF)	CLAYEY SOILS: SOFT	CLAYEY SOILS: MED. STIFF	CLAYEY SOILS: STIFF	CLAYEY SOILS: VERY STIFF	CLAYEY SOILS: HARD	SAND OR GRAVEL: VERY LOOSE	SAND OR GRAVEL: LOOSE	SAND OR GRAVEL: MED. DENSE	SAND OR GRAVEL: DENSE	SAND OR GRAVEL: VERY DENSE	MOISTURE: DRY	MOISTURE: DAMP	MOISTURE: MOIST	MOISTURE: WET	MOISTURE: SATURATED	USCS SYMBOL	DESCRIPTION
													X				X						
													X				X						
													X				X						
--1--													X				X						
													X				X						
													X				X						
--2--													X				X						
													X				X						
													X				X						
													X				X						
--3--				6A/	Dark								X				X						Silty sand (SM) with 23.3% non-plastic fines content.
				7A	Brown									X			X					SM	Test pit is unstable with large pieces of dirt falling to the
														X			X						bottom of the pit. Groundwater found at 6.5 feet BEG.
--4--														X			X						
														X			X						
														X			X						
--5--														X			X						
														X			X						
														X						X			
--6--														X						X			
														X						X			
														X							X		
--7--																							
--8--																							
--9--																							
--10--																							

Total Depth: 6.5 feet

Groundwater: 6.5 feet

DESCRIPTION

Format: GROUP NAME: cementation; grain size; modifiers

Plate 10

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P.O. Box 18871
Reno, Nevada 89511
Locally Owned & Operated

Test Pit No.: TP-7
Project: Old Stone Ranch Casey Road Mixed Use
File No.: 2170.003-A
Location: Fallon, Nevada

Date: Friday, March 18, 2022
Excv. Method: Excavator
Excv. Type: CAT 306
Logged By: MD

GPS: 39.465674, -118.809212
Datum: EL 3,973 FT ~ NAV88

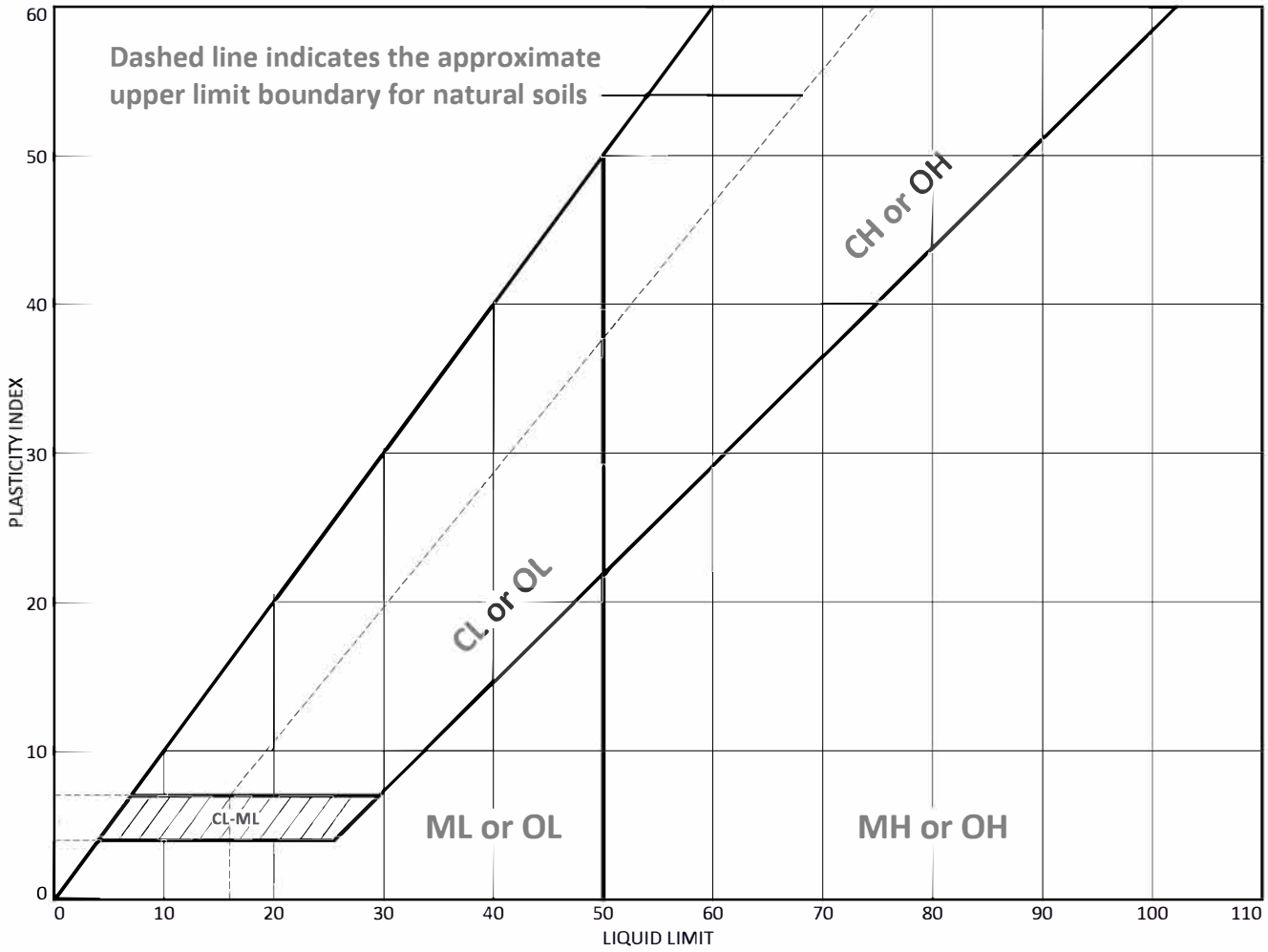
DEPTH (FEET)	SAMPLE TYPE: BULK	SAMPLE TYPE: Grab	SAMPLE TYPE: Drive Tube	Sample ID	Color	PENETROMETER (TSF)	CLAYEY SOILS: SOFT	CLAYEY SOILS: MED. STIFF	CLAYEY SOILS: STIFF	CLAYEY SOILS: VERY STIFF	CLAYEY SOILS: HARD	SAND OR GRAVEL: VERY LOOSE	SAND OR GRAVEL: LOOSE	SAND OR GRAVEL: MED. DENSE	SAND OR GRAVEL: DENSE	SAND OR GRAVEL: VERY DENSE	MOISTURE: DRY	MOISTURE: DAMP	MOISTURE: MOIST	MOISTURE: WET	MOISTURE: SATURATED	USCS SYMBOL	DESCRIPTION
0								X									X						
								X									X						
								X									X						
--1--								X									X						
								X									X						
								X									X						
--2--								X									X						
								X									X						
								X									X						
								X									X						
--3--				6A/	Dark				X								X						Silty sand (SM) with 23.3% non-plastic fines content.
				7A	Brown				X								X					SM	Test pit sidewalls are unstable. Groundwater found at 9
									X								X						feet BEG.
									X								X						
--4--									X								X						
									X								X						
									X								X						
									X								X						
--5--									X								X						
									X								X						
									X								X						
									X											X			
--6--									X											X			
									X											X			
									X												X		
--7--																							
--8--																							
--9--																							
--10--																							

Total Depth: 9.0 feet

Groundwater: 9 feet

Plate 11

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	NV	NP	NP	64.9	48.7	SM
■	Silty sand	NV	NP	NP	81.5	19.5	SM
▲	Silty sand	NV	NP	NP	62.1	41.9	SM

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

●**Source of Sample:** TP-1 **Depth:** 0-4' **Sample Number:** 1A

■**Source of Sample:** TP-1 **Depth:** 4'-9' **Sample Number:** 1B

▲**Source of Sample:** TP-1 **Depth:** 9'-9.5' **Sample Number:** 1C

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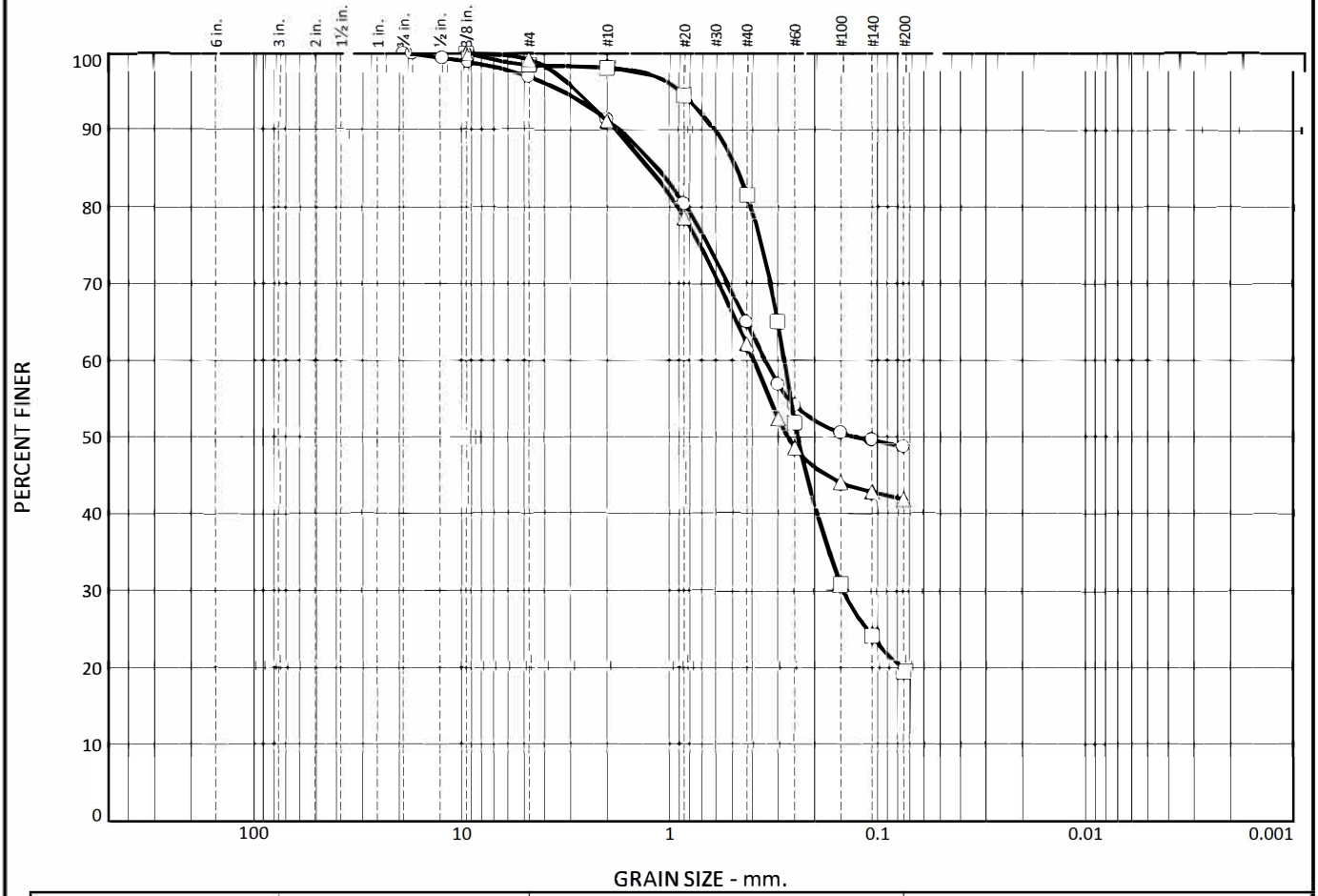
Figure 12

Particle Size Distribution Report

ASTM D6913



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.1	5.5	26.5	16.2	48.7	
□	0.0	0.0	1.5	0.4	16.6	62.0	19.5	
△	0.0	0.0	0.8	8.0	29.1	20.2	41.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	1.1435	0.3472	0.1292					
□	NV	NP	0.4783	0.2796	0.2417	0.1460				
△	NV	NP	1.2470	0.3935	0.2702					

	Material Description	Test Date	USCS	NM
○	Silty sand	3/31/22	SM	
□	Silty sand	3/30/22	SM	
△	Silty sand	3/31/22	SM	

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

○ **Source of Sample:** TP-1 **Depth:** 0-4' **Sample Number:** 1A

□ **Source of Sample:** TP-1 **Depth:** 4'-9' **Sample Number:** 1B

△ **Source of Sample:** TP-1 **Depth:** 9'-9.5' **Sample Number:** 1C

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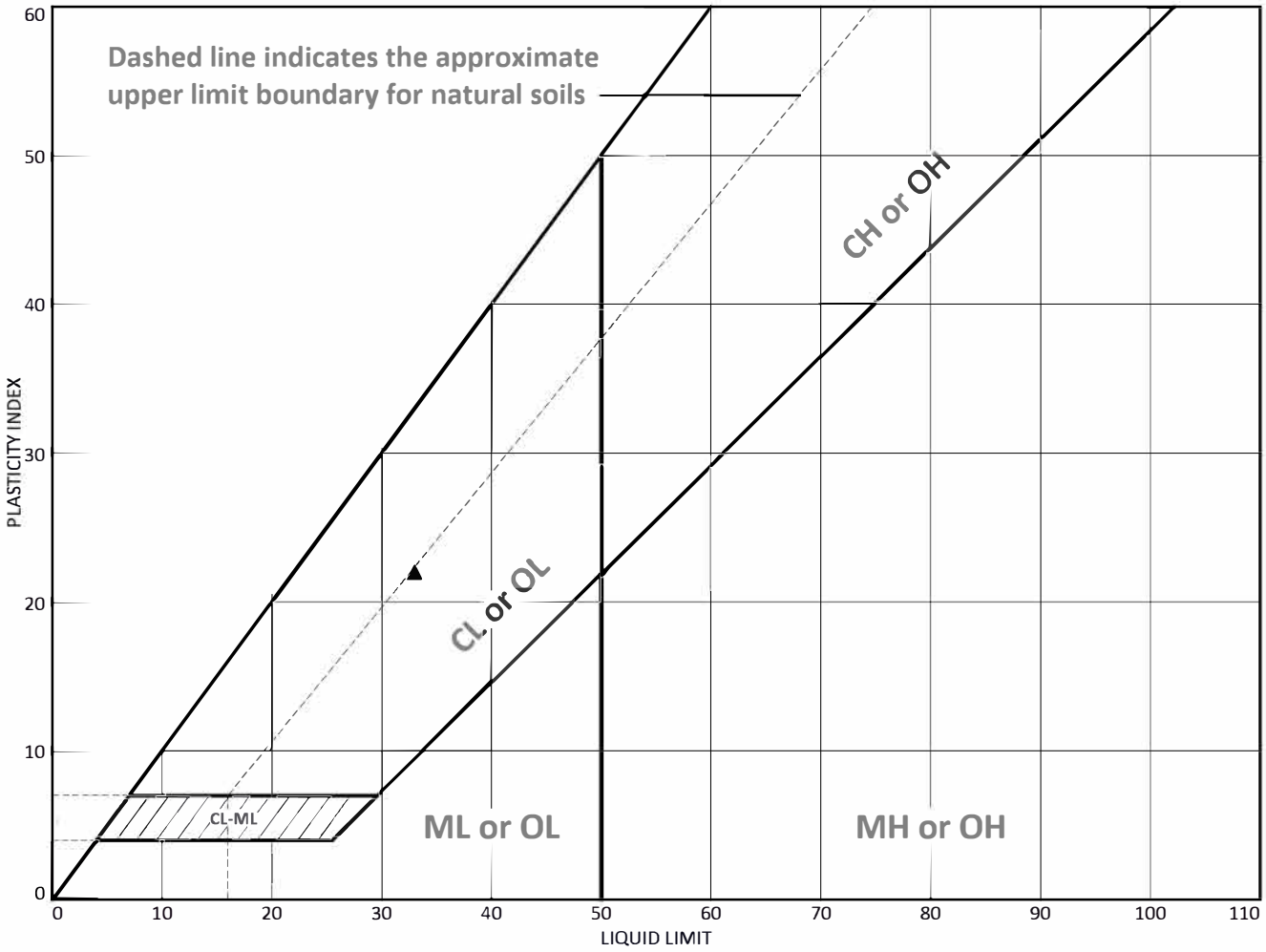
Figure 13

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	NV	NP	NP	83.0	22.4	SM
■	Silty sand	NV	NP	NP	89.3	12.1	SM
▲	Sandy lean clay	33	11	22	75.4	53.7	CL

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

●**Source of Sample:** TP-2 **Depth:** 0-1' **Sample Number:** 2A

■**Source of Sample:** TP-2 **Depth:** 1'-9' **Sample Number:** 2B

▲**Source of Sample:** TP-2 **Depth:** 9'-10' **Sample Number:** 2C

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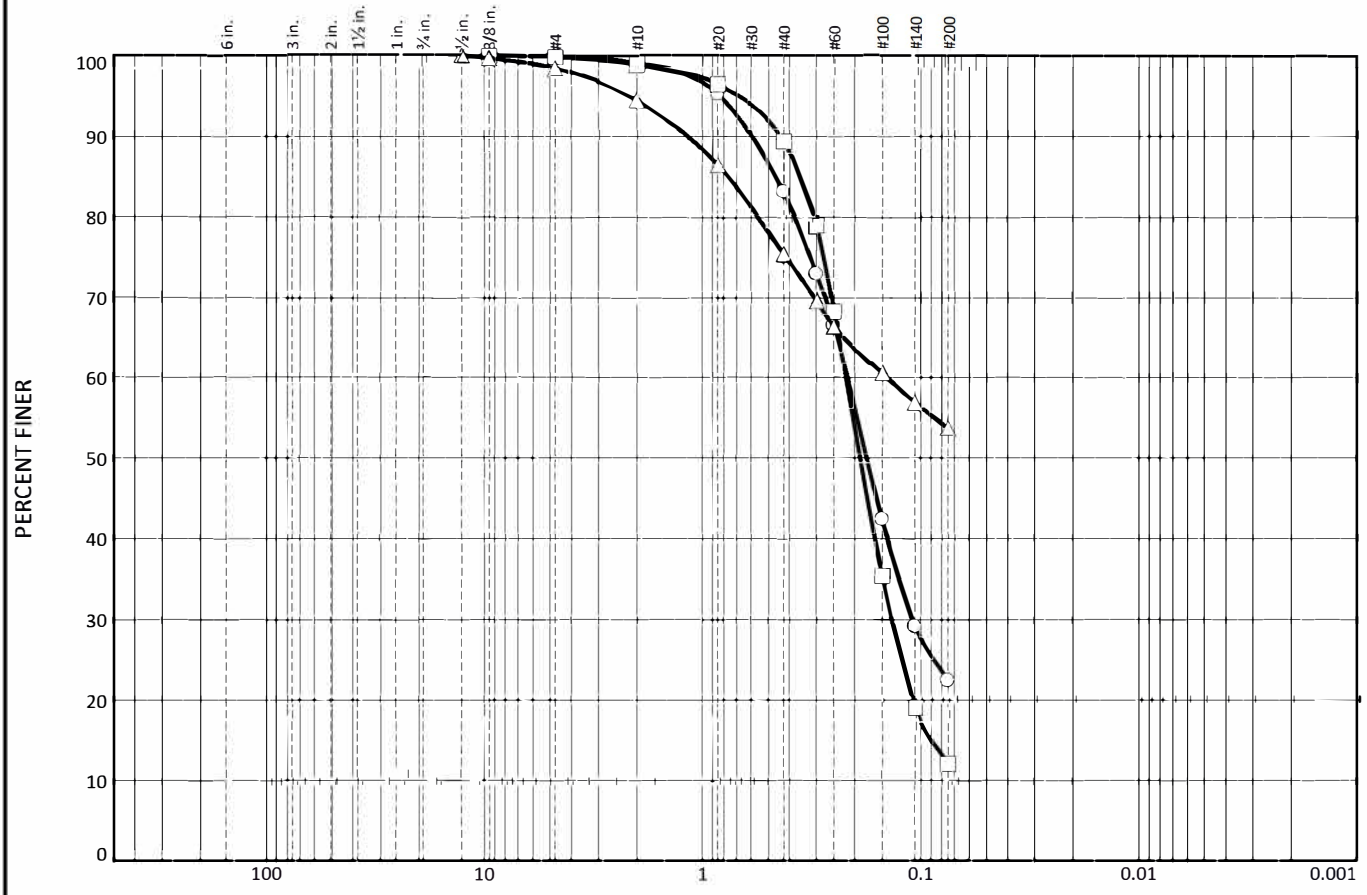
Figure 14

Particle Size Distribution Report

ASTM D6913



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.1	0.9	16.0	60.6	22.4	
□	0.0	0.0	0.2	0.9	9.6	77.2	12.1	
△	0.0	0.0	1.6	4.0	19.0	21.7	53.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.4632	0.2166	0.1771	0.1092				
□	NV	NP	0.3545	0.2201	0.1896	0.1359	0.0895			
△	33	11	0.7643	0.1422						

	Material Description	Test Date	USCS	NM
○	Silty sand	3/31/22	SM	
□	Silty sand	3/31/22	SM	
△	Sandy lean clay	3/31/22	CL	

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

○ **Source of Sample:** TP-2 **Depth:** 0-1' **Sample Number:** 2A

□ **Source of Sample:** TP-2 **Depth:** 1'-9' **Sample Number:** 2B

△ **Source of Sample:** TP-2 **Depth:** 9'-10' **Sample Number:** 2C

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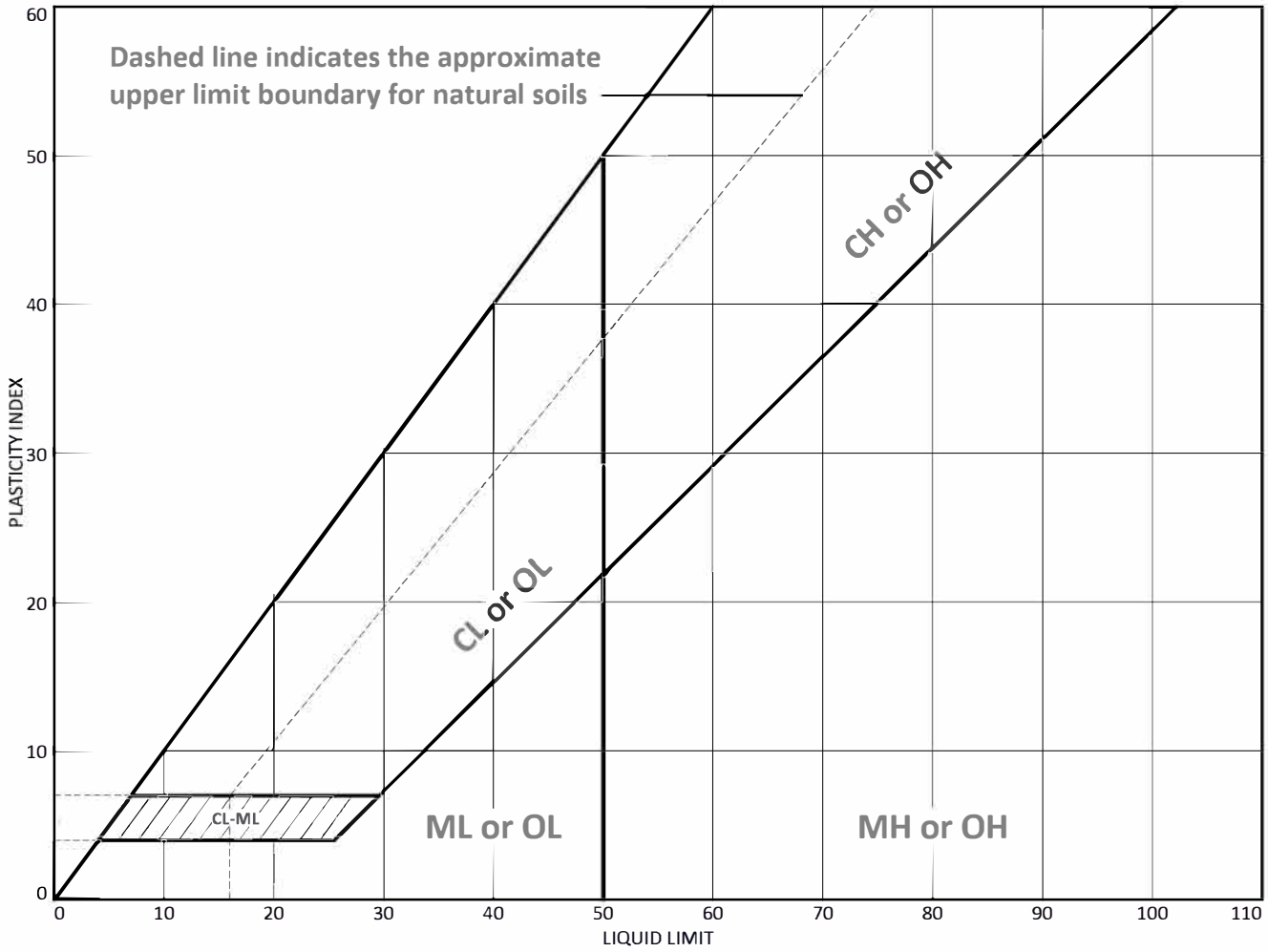
Figure 15

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Poorly graded sand	NV	NP	NP	50.7	3.8	SP

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

●**Source of Sample:** TP-3 & TP-5 **Depth:** 0-8.5' **Sample Number:** 3A/5A

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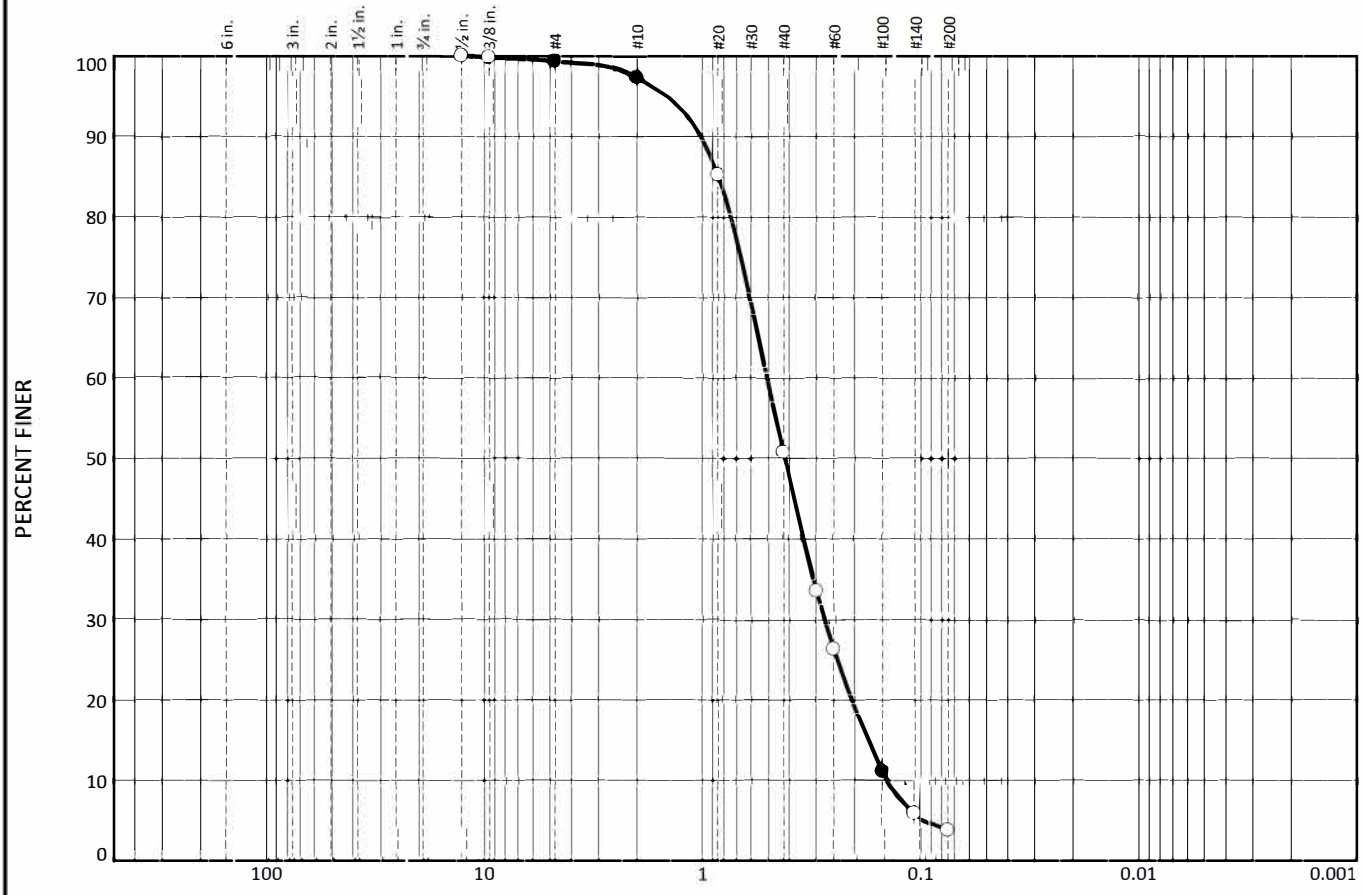
Figure 16

Particle Size Distribution Report

ASTM D6913



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.7	2.1	46.5	46.9	3.8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.8451	0.5064	0.4190	0.2760	0.1751	0.1422	1.06	3.56

Material Description	Test Date	USCS	NM
○ Poorly graded sand	3/31/22	SP	

Project No. 2170.003-A **Client:** NevDev LLC

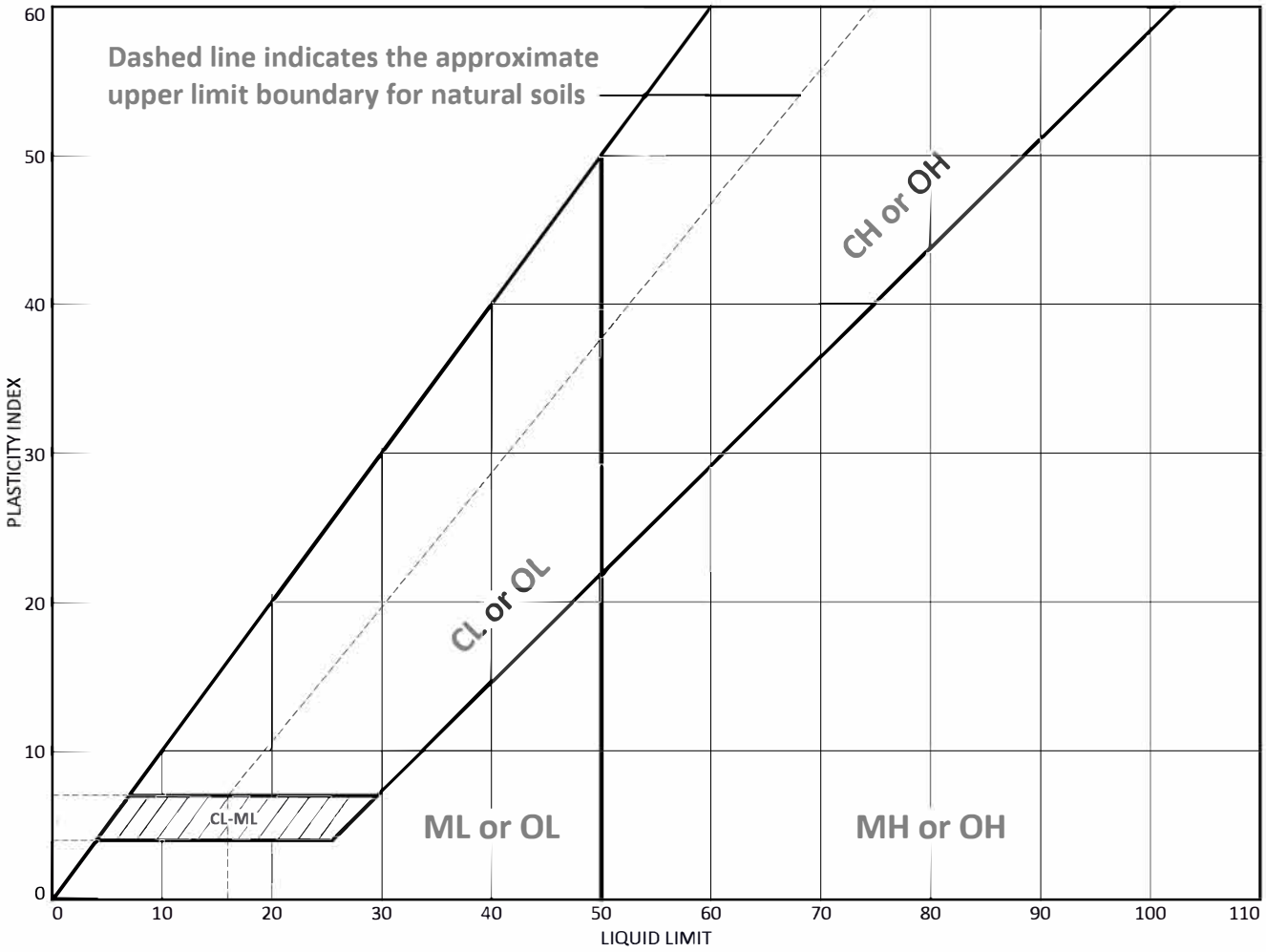
Project: Old Stone Ranch

○**Source of Sample:** TP-3 & TP-5 **Depth:** 0-8.5' **Sample Number:** 3A/5A

WESTEX
Consulting Engineers

Figure 17

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	NV	NP	NP	78.9	19.7	SM

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

●**Source of Sample:** TP-4 **Depth:** 5'-9.5' **Sample Number:** 4A

WESTEX
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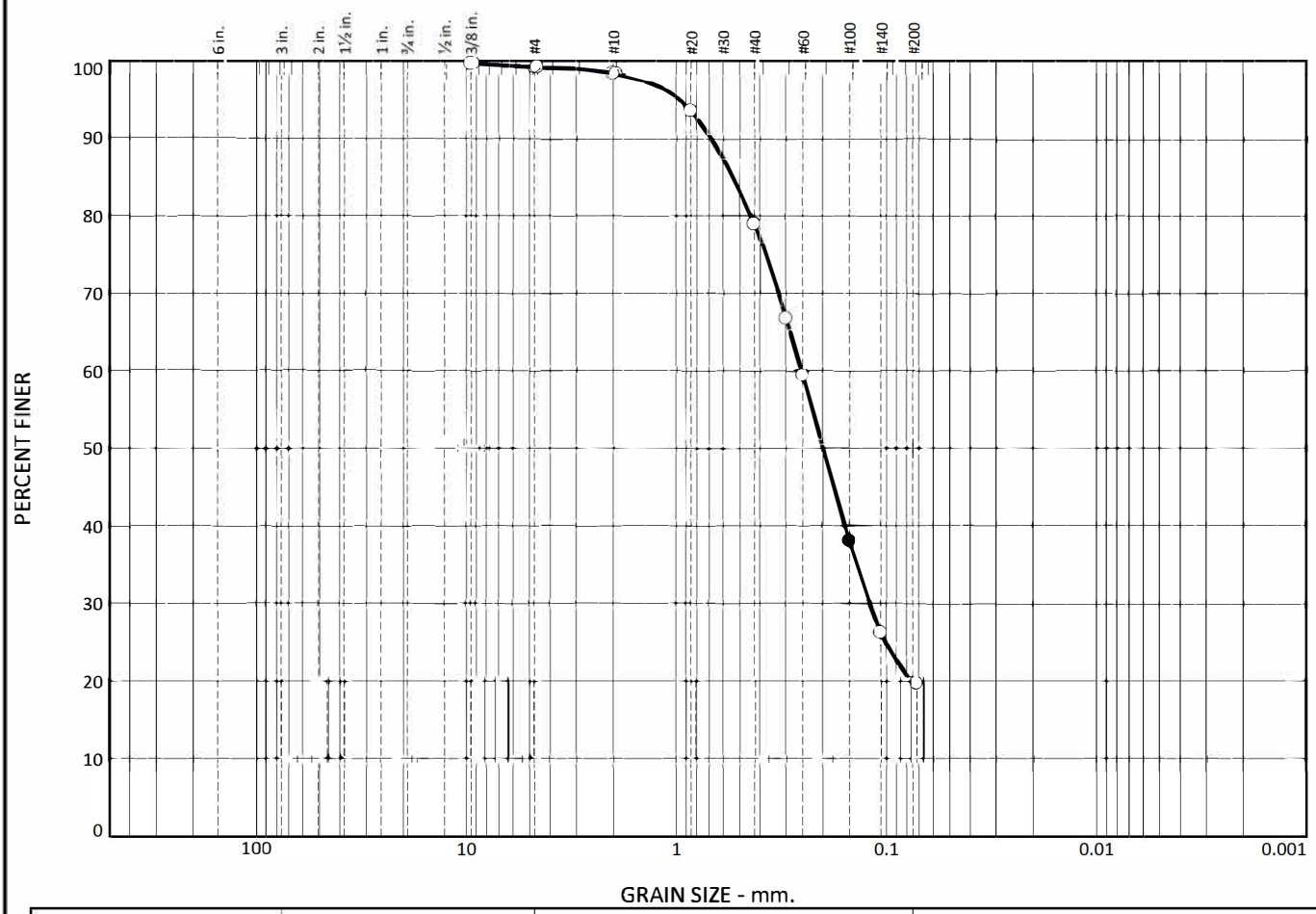
Figure 18

Particle Size Distribution Report

ASTM D6913



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				0.8	19.4	59.2	19.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.5381	0.2536	0.2004	0.1202				

Material Description	Test Date	USCS	NM
○ Silty sand	3/31/22	SM	

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

○**Source of Sample:** TP-4 **Depth:** 5'-9.5' **Sample Number:** 4A

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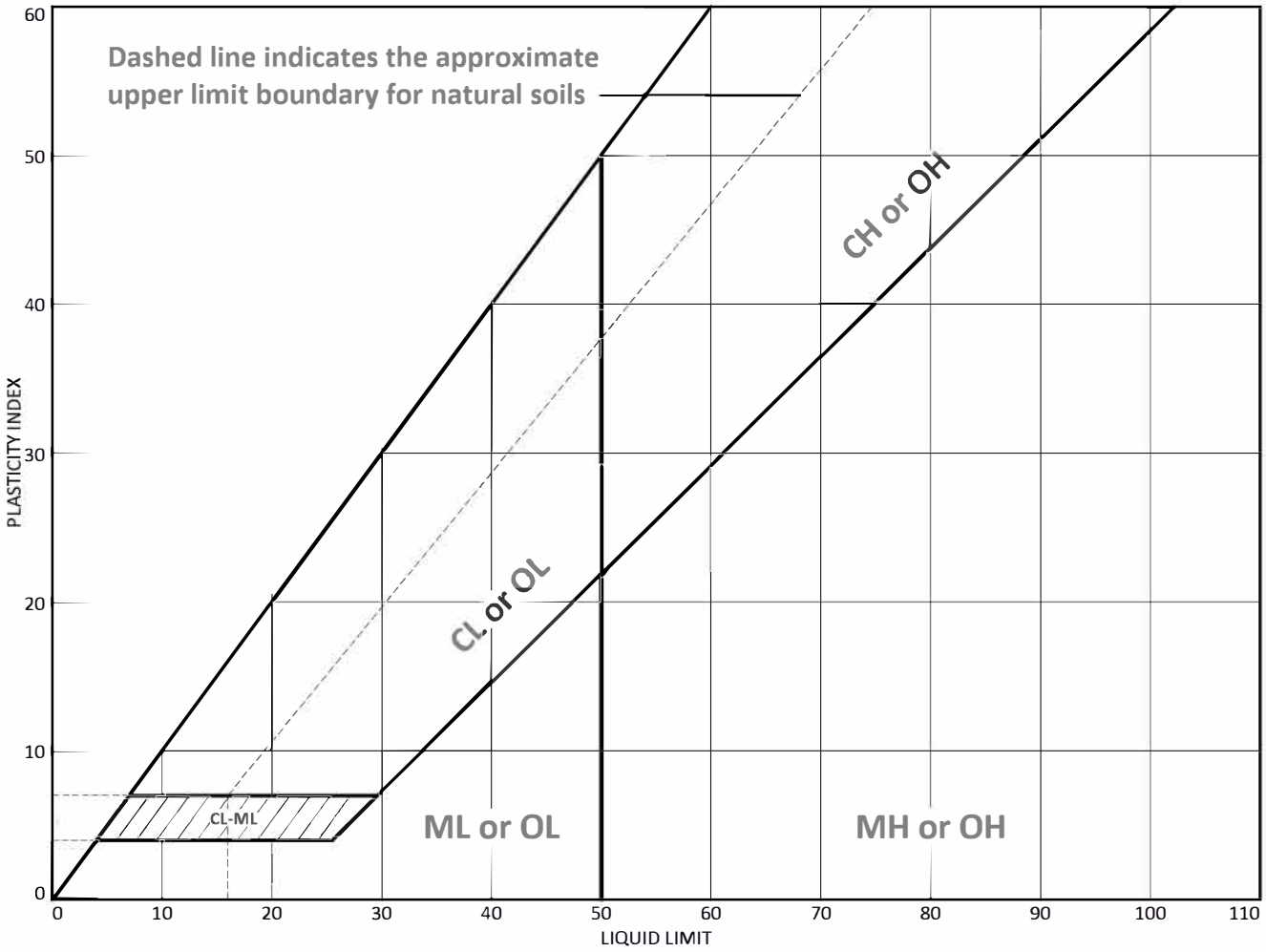
Figure 19

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	NV	NP	NP	94.9	23.3	SM

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

●**Source of Sample:** TP-6 & TP-7 **Depth:** 0-7' **Sample Number:** 6A/7A

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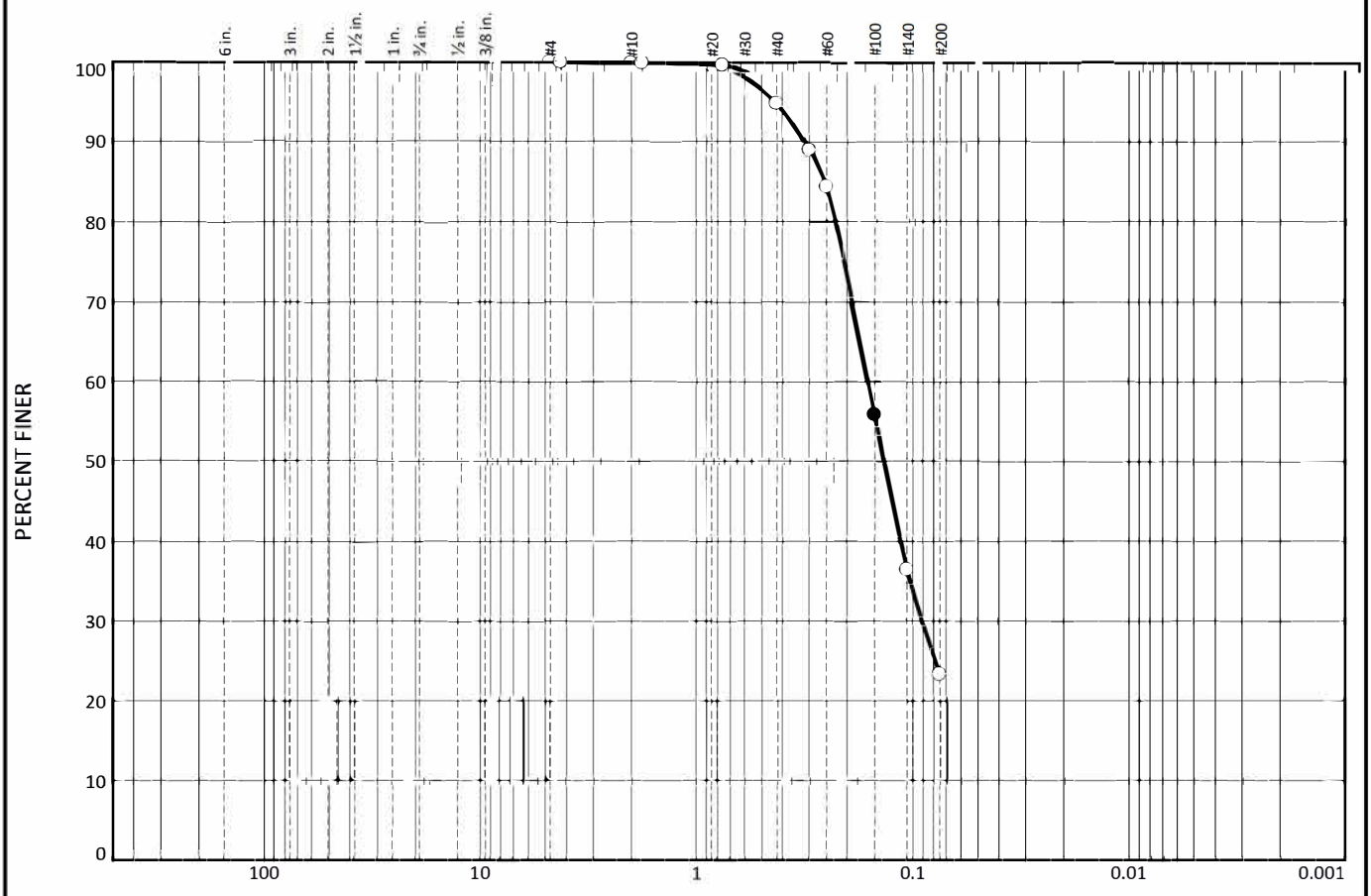
Figure 20

Particle Size Distribution Report

ASTM D6913



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.1	5.0	71.6	23.3	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.2547	0.1613	0.1356	0.0905				

Material Description	Test Date	USCS	NM
○ Silty sand	3/31/22	SM	

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

○**Source of Sample:** TP-6 & TP-7 **Depth:** 0-7' **Sample Number:** 6A/7A

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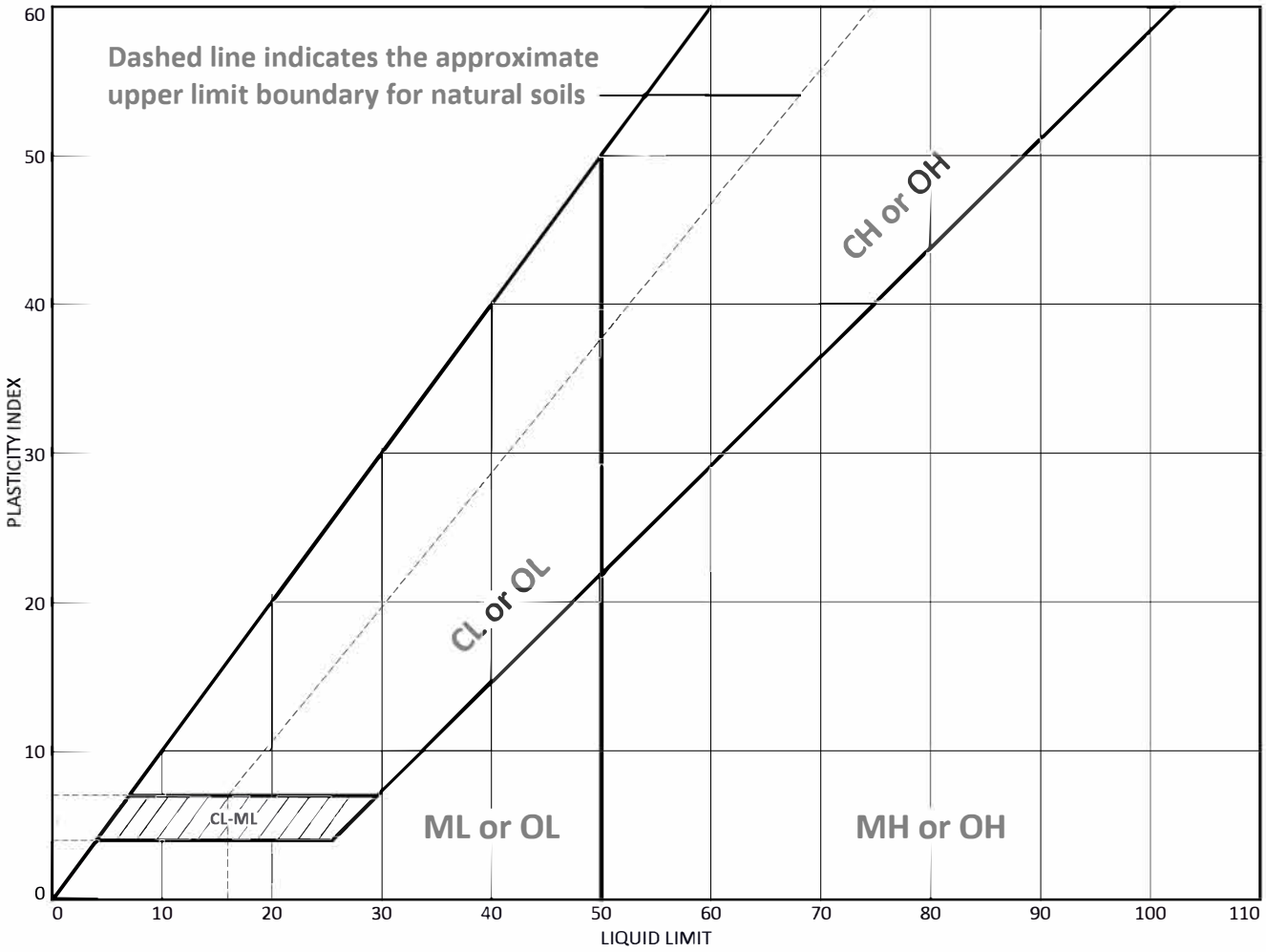
Figure 21

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	NV	NP	NP	68.5	24.6	SM

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

●**Source of Sample:** TP-All **Depth:** N/A **Sample Number:** A

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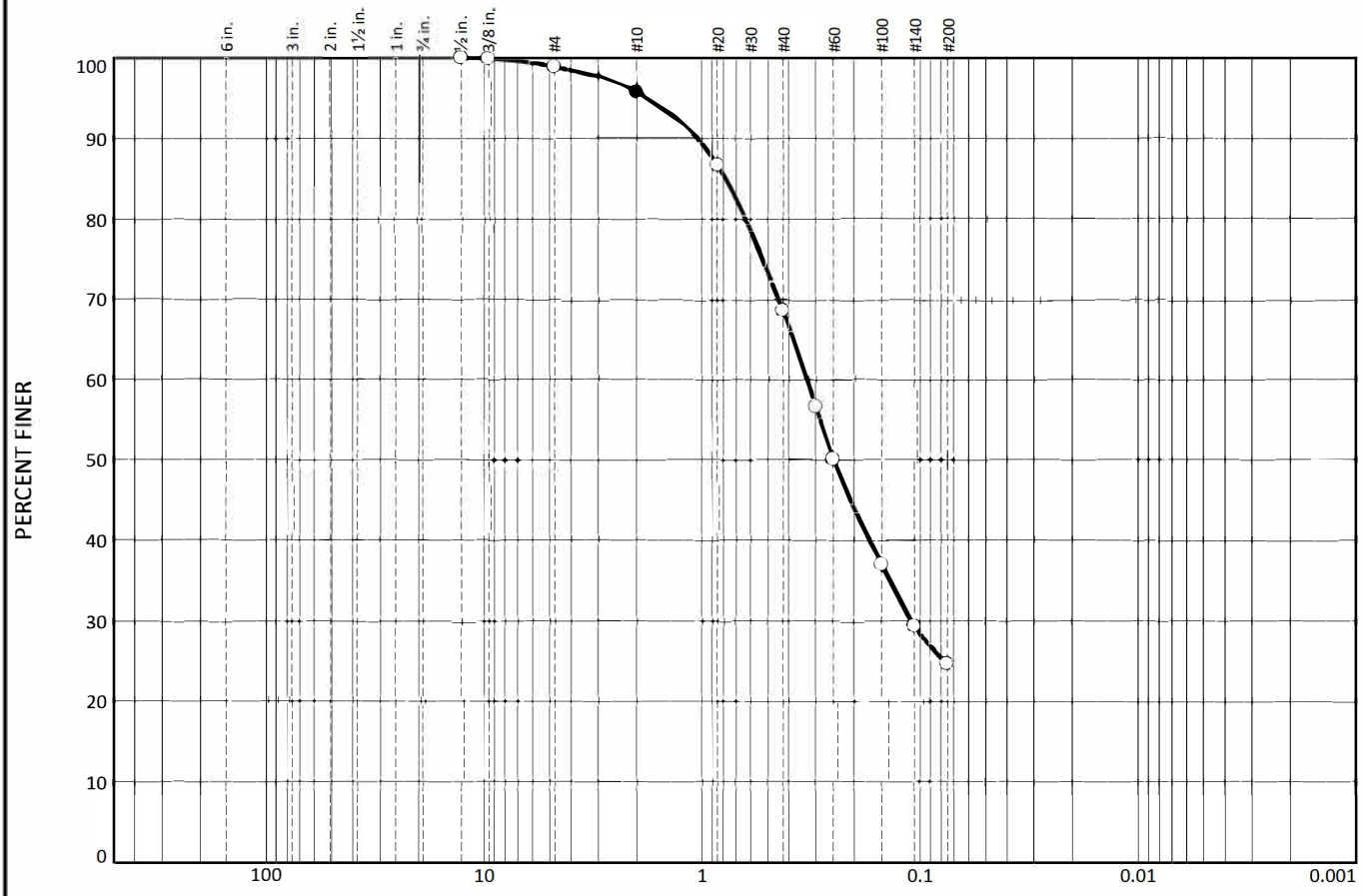
Figure 22

Particle Size Distribution Report

ASTM D6913



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.1	3.2	27.2	43.9	24.6	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.7802	0.3300	0.2496	0.1101				

Material Description	Test Date	USCS	NM
○ Silty sand	3/30/22	SM	9.5%

Project No. 2170.003-A **Client:** NevDev LLC

Project: Old Stone Ranch

○**Source of Sample:** TP-All **Depth:** N/A **Sample Number:** A

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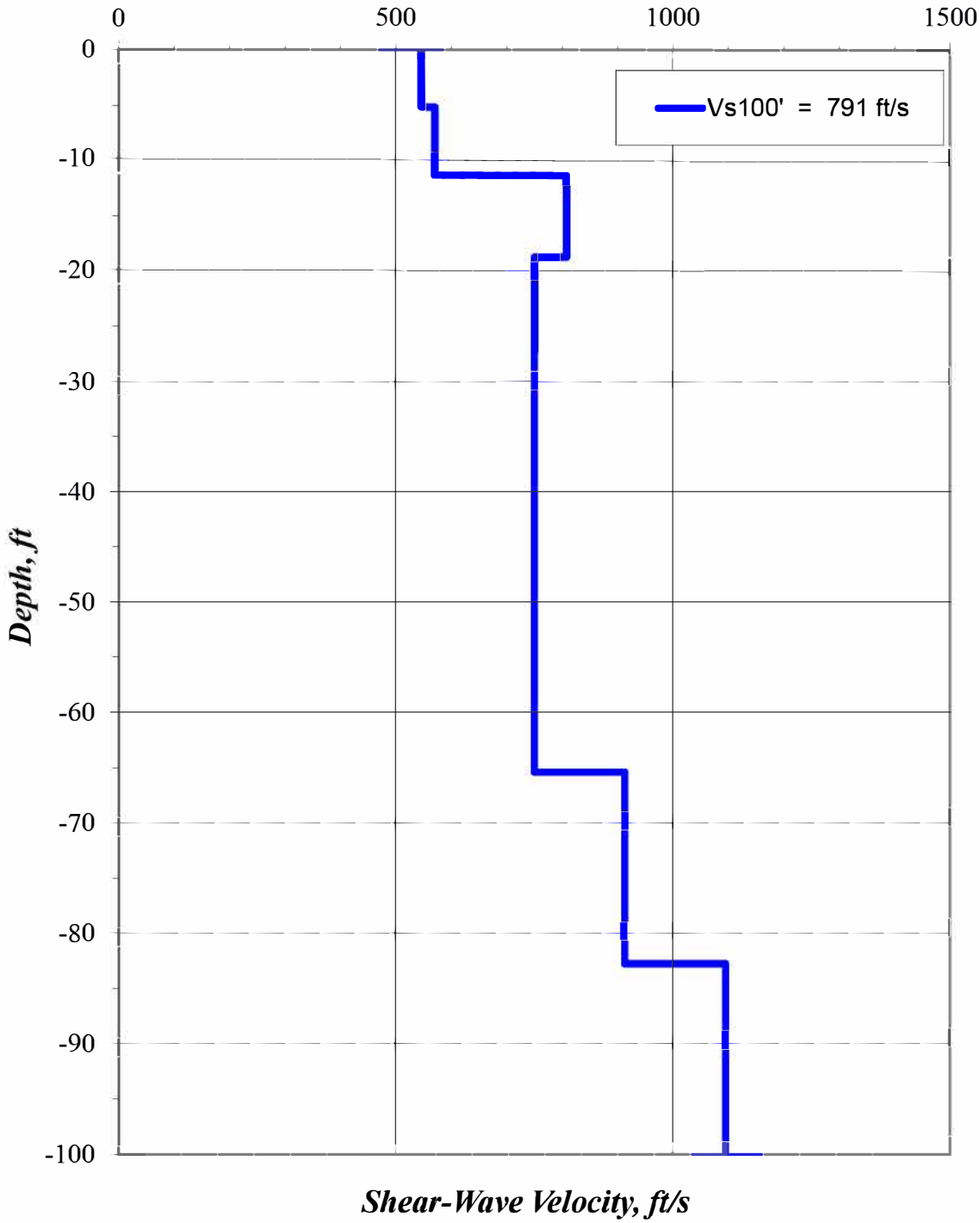
Figure 23

Old Stone Ranch, Line 1: Vs Model



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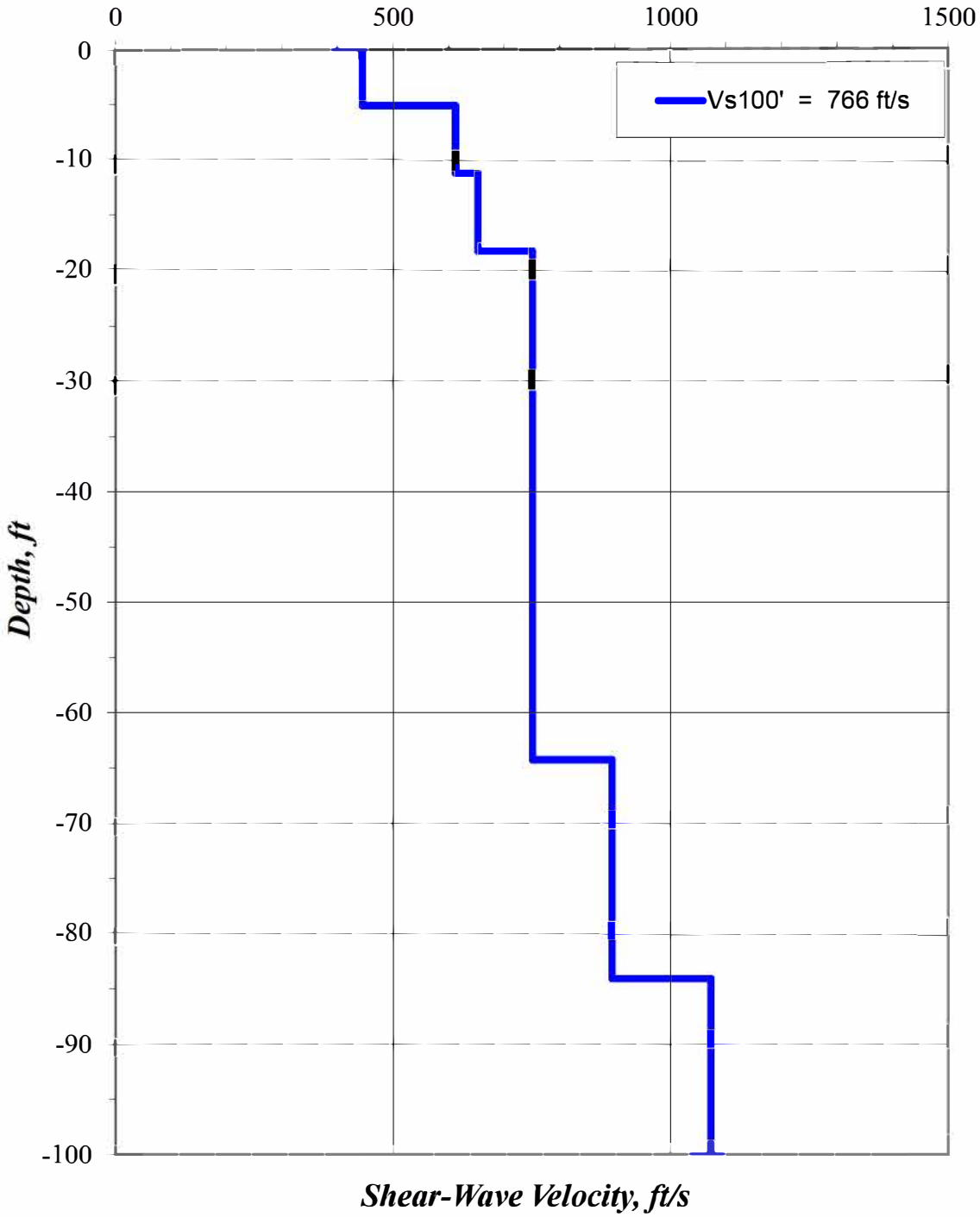
P.O. Box 18871, Reno, NV 89511
Phone: (775) 771-9539

LINE 1 ONE-DIMENSIONAL SHEARWAVE VELOCITY

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.:	2170.003-A	PLATE
Date:	4/20/2022	24

Old Stone Ranch, Line 2: Vs Model



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P.O. Box 18871, Reno, NV 89511
Phone: (775) 771-9539

LINE 2 ONE-DIMENSIONAL SHEARWAVE VELOCITY

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.:	2170.003-A	PLATE
Date:	4/20/2022	25

ESAL RANGE	
High	700,000 - 1,000,000
Medium	400,000 - 600,000
Low	50,000 - 300,000

ESAL DETERMINATION		
Design Life (yrs)	L	20
Number of Lots	N	50
Average Daily Two Way Trips per Lot	T_d	5
Percent Heavy Trucks	T	2.0
Average Truck Factor	T_f	2.75
Construction Traffic (Trips per Lot)	T_c	125
Construction Truck Factor	T_{cf}	1.0
$ESAL_{20}$		56,438

STRUCTURAL NUMBER (CLIMATE ZONE V)			
Relative Quality of Roadbed Soil	Traffic Level	Reliability	
		50% SN	75% SN
Very Good (R>35)	High	2.4 - 2.6	2.7 - 2.8
	Medium	2.2 - 2.4	2.4 - 2.6
	Low	1.6 - 2.1	1.7 - 2.2
Good (R>15)	High	2.7 - 2.9	3.0 - 3.1
	Medium	2.5 - 2.7	2.6 - 2.9
	Low	1.8 - 2.4	2.0 - 2.5
Fair (R>10)	High	2.9 - 3.1	3.2 - 3.3
	Medium	2.6 - 2.8	2.8 - 3.1
	Low	1.9 - 2.5	2.1 - 2.7
Poor (R>7)	High	3.2 - 3.4	3.5 - 3.6
	Medium	2.9 - 3.2	3.1 - 3.4
	Low	2.2 - 2.8	2.3 - 2.9
Very Poor (R>5)	High	3.4 - 3.6	3.7 - 3.8
	Medium	3.1 - 3.3	3.3 - 3.6
	Low	2.3 - 3.0	2.5 - 3.1

Material Type	Reference	Structural Coefficient	Thickness (in)	Thickness (in)	Thickness (in)	Thickness (in)
Plantmix Surface	AC	0.35	4			
Plantmix Base	PB	0.32				
Cement Treated	CTB	0.20				
Type 2 Class B	AB	0.10	6			
Structural Fill (R-45)	SF	0.07				
Structural Number for Section			2.0	0.0	0.0	0.0

WESTEX Consulting Engineers
P.O. Box 18871, Reno, NV 89511
Phone: (775) 771-9539

HMA STRUCTURAL PAVEMENT SECTION DESIGN
(Low Volume Roads)

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.: 2170.003-A
Date: 4/20/2022
PLATE 26

APPENDIX B
USDA WEB SOIL SURVEY REPORTS

WESTEX
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Soil Map—Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties

Map Scale: 1:7,690 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties
Survey Area Data: Version 17, Sep 9, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Sep 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
101	Isolde-Appian clay substratum complex, 0 to 4 percent slopes	42.0	35.6%
102	Appian, clay substratum complex, 0 to 2 percent slopes	21.5	18.2%
135	Dia loam, slightly saline, 0 to 1 percent slopes	17.3	14.7%
154	Fernley sand, 0 to 1 percent slopes	2.9	2.5%
196	Sagouspe loamy sand, 0 to 1 percent slopes	4.4	3.8%
197	Sagouspe loamy sand, saline, 0 to 1 percent slopes	29.7	25.2%
Totals for Area of Interest		**117.9**	**100.0%**

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
101—Isolde-Appian clay substratum complex, 0 to 4 percent slopes														
Isolde, sodic	45	A	0-6	Fine sand	SP-SM, SP	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	92-94- 97	9-11- 14	0-0 -19	NP-0 -2
			6-60	Fine sand, sand	SP-SM, SP	A-3	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	92-94- 97	9-11- 14	0-0 -19	NP-0 -2
Appian, clay substratum	20	C	0-3	Fine sand	SM	A-2	0- 0- 0	0- 0- 0	90-95-1 00	90-95-1 00	82-89- 97	8-11- 14	0-0 -19	NP-0 -2
			3-11	Sandy clay loam, clay loam	CL, SC	A-7, A-6	0- 0- 0	0- 0- 0	90-95-1 00	90-95-1 00	78-86- 95	60-67- 75	37-41 -46	19-22-2 5
			11-46	Stratified gravelly coarse sand to fine sand	SP-SM, SM	A-1, A-2, A-3	0- 0- 0	0- 0- 0	76-83- 90	75-82- 90	68-77- 87	7- 9- 12	0-0 -19	NP-0 -2
			46-60	Clay, silty clay	CH	A-7	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	89-99-1 00	86-96-1 00	49-59 -69	29-36-4 4
Appian, clay substratum	20	C	0-3	Clay loam	CL	A-7, A-6	0- 0- 0	0- 0- 0	90-95-1 00	90-95-1 00	78-86- 95	60-67- 75	37-41 -46	19-22-2 5
			3-11	Clay loam, sandy clay loam	CL, SC	A-7, A-6	0- 0- 0	0- 0- 0	90-95-1 00	90-95-1 00	78-86- 95	60-67- 75	37-41 -46	19-22-2 5
			11-46	Stratified gravelly coarse sand to fine sand	SP-SM, SM	A-2, A-1, A-3	0- 0- 0	0- 0- 0	76-83- 90	75-82- 90	68-77- 87	7- 9- 12	0-0 -19	NP-0 -2
			46-60	Silty clay, clay	CH	A-7	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	89-99-1 00	86-96-1 00	49-59 -69	29-36-4 4

Engineering Properties–Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
102—Appian, clay substratum complex, 0 to 2 percent slopes														
Appian, clay substratum	45	C	0-3	Fine sand	SM	A-2	0- 0- 0	0- 0- 0	90-95-100	90-95-100	82-89-97	8-11- 14	0-0 -19	NP-0 -2
			3-11	Sandy clay loam, clay loam	CL, SC	A-7, A-6	0- 0- 0	0- 0- 0	90-95-100	90-95-100	78-86-95	60-67-75	37-41 -46	19-22-25
			11-46	Stratified gravelly coarse sand to fine sand	SP-SM, SM	A-2, A-1, A-3	0- 0- 0	0- 0- 0	76-83-90	75-82-90	68-77-87	7- 9- 12	0-0 -19	NP-0 -2
			46-60	Silty clay, clay	CH	A-7	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	89-99-100	86-96-100	49-59 -69	29-36-44
Appian, clay substratum	40	C	0-3	Clay loam	CL	A-7, A-6	0- 0- 0	0- 0- 0	90-95-100	90-95-100	78-86-95	60-67-75	37-41 -46	19-22-25
			3-11	Clay loam, sandy clay loam	CL, SC	A-7, A-6	0- 0- 0	0- 0- 0	90-95-100	90-95-100	78-86-95	60-67-75	37-41 -46	19-22-25
			11-46	Stratified gravelly coarse sand to fine sand	SP-SM, SM	A-1, A-2, A-3	0- 0- 0	0- 0- 0	76-83-90	75-82-90	68-77-87	7- 9- 12	0-0 -19	NP-0 -2
			46-60	Silty clay, clay	CH	A-7	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	89-99-100	86-96-100	49-59 -69	29-36-44
135—Dia loam, slightly saline, 0 to 1 percent slopes														
Dia	85	C	0-5	Loam	CL-ML, CL	A-4, A-6	0- 0- 0	0- 0- 0	100-100 -100	95-96-100	79-86-94	57-62-70	28-36 -43	10-14-17
			5-29	Stratified sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0- 0- 0	0- 0- 0	100-100 -100	94-96-100	82-85-94	59-62-70	30-33 -39	12-14-17
			29-60	Coarse sand, sand	SP-SM, SM	A-2, A-3	0- 0- 0	0- 0- 0	90-95-100	90-95-100	67-73-79	5- 8- 11	0-0 -19	NP-0 -2

Engineering Properties–Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
154—Fernley sand, 0 to 1 percent slopes														
Fernley	85	A	0-7	Sand	SP-SM, SM	A-2, A-3	0- 0- 0	0- 0- 0	90-95-100	90-95-100	67-73-79	5- 8- 11	0-0 -20	NP-0 -2
			7-60	Stratified coarse sand to fine sand	SW-SM, SM	A-2, A-1, A-3	0- 0- 0	0- 0- 0	86-92-100	86-92-100	64-71-79	5- 7- 11	0-0 -19	NP-0 -2
196—Sagouspe loamy sand, 0 to 1 percent slopes														
Sagouspe	85	A	0-6	Loamy sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	77-78-80	27-28-30	0-17 -20	NP-1 -2
			6-43	Loamy sand, loamy fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	77-78-80	27-28-30	0-16 -19	NP-1 -2
			43-58	Stratified coarse sand to silt loam	SM	A-2, A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	72-77-82	35-40-45	16-22 -27	2-6 -10
197—Sagouspe loamy sand, saline, 0 to 1 percent slopes														
Sagouspe	85	A	0-6	Loamy sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	77-78-80	27-28-30	0-17 -20	NP-1 -2
			6-43	Loamy sand, fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	77-78-80	27-28-30	0-16 -19	NP-1 -2
			43-58	Stratified coarse sand to silt loam	SM	A-2, A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	72-77-82	35-40-45	16-22 -27	2-6 -10

Data Source Information

Soil Survey Area: Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties
Survey Area Data: Version 17, Sep 9, 2021

APPENDIX C
ATC HAZARDS BY LOCATION
SEISMIC DESIGN PARAMETERS

WESTEX
Consulting Engineers

Hazards by Location

Search Information

Coordinates: 39.468635, -118.810410

Elevation: 3971 ft

Timestamp: 2022-04-19T22:40:28.355Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D

Basic Parameters

Name	Value	Description
S_S	0.706	MCE_R ground motion (period=0.2s)
S_1	0.248	MCE_R ground motion (period=1.0s)
S_{MS}	0.872	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	0.581	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.236	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.918	Coefficient of risk (0.2s)
CR_1	0.927	Coefficient of risk (1.0s)
PGA	0.303	MCE_G peak ground acceleration
F_{PGA}	1.297	Site amplification factor at PGA
PGA_M	0.393	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)

SsRT	0.706	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.769	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.248	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.268	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.5	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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APPENDIX D
EXPLORATION PHOTOS

WESTEX
Consulting Engineers

Test Pit TP-1

WESTEX Consulting Engineers
P.O. Box 18871, Reno, NV 89511
Phone: (775) 771-9539

EXPLORATION PHOTOS

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.:	2170.003-A	**PLATE**
Date:	4/20/2022	**D-1**

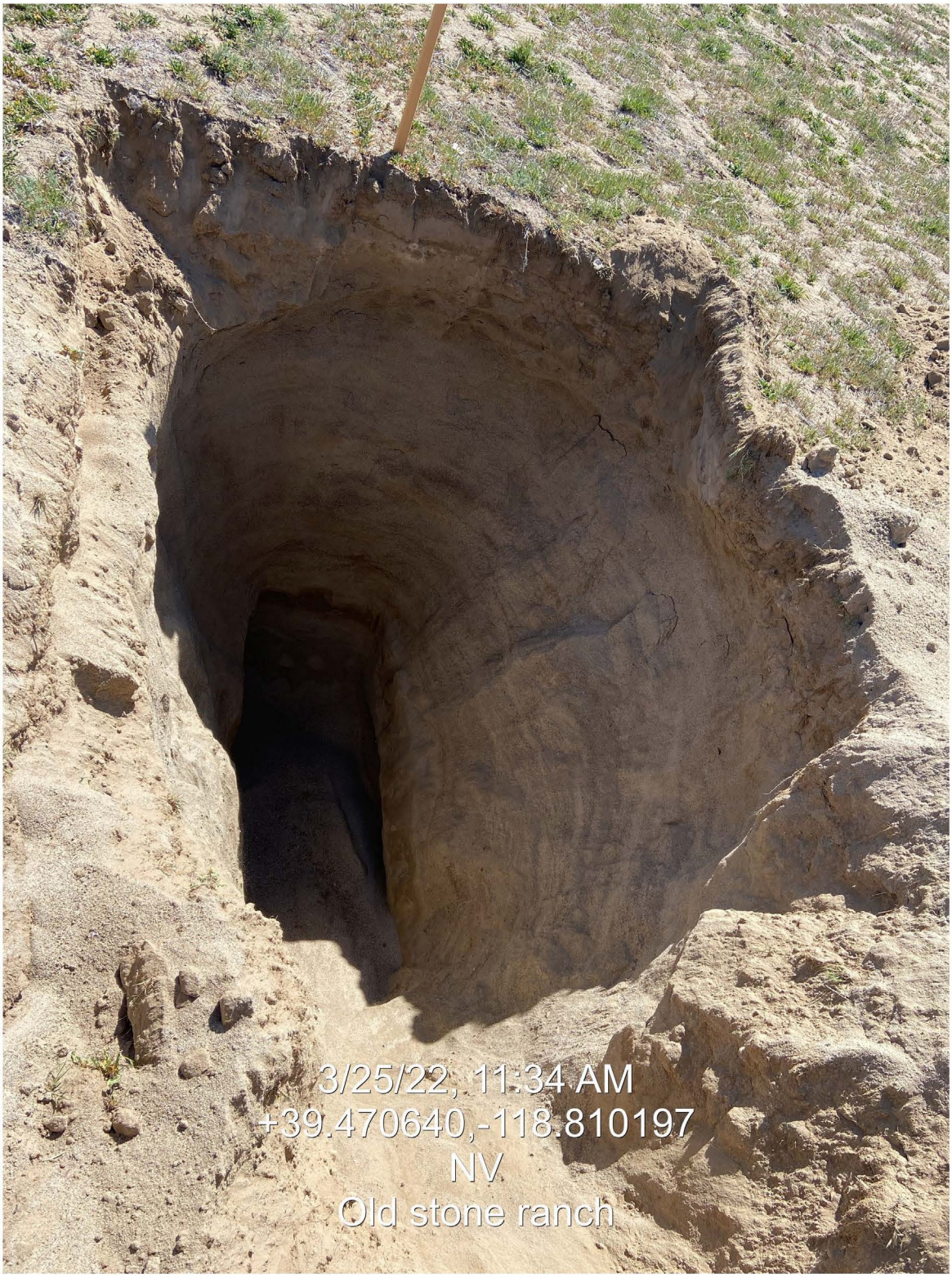
Test Pit TP-2

WESTEX
Consulting Engineers
P.O. Box 18871, Reno, NV 89511
Phone: (775) 771-9539

EXPLORATION PHOTOS

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.:	2170.003-A	**PLATE**
Date:	4/20/2022	**D-2**



Test Pit TP-3

WESTEX Consulting Engineers
P.O. Box 18871, Reno, NV 89511
Phone: (775) 771-9539

EXPLORATION PHOTOS

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.:	2170.003-A	**PLATE**
Date:	4/20/2022	**D-3**

Test Pit TP-5

WESTEX Consulting Engineers
P.O. Box 18871, Reno, NV 89511
Phone: (775) 771-9539

EXPLORATION PHOTOS

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.:	2170.003-A	**PLATE**
Date:	4/20/2022	**D-4**

Test Pit TP-6

WESTEX
Consulting Engineers
P.O. Box 18871, Reno, NV 89511
Phone: (775) 771-9539

EXPLORATION PHOTOS

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.:	2170.003-A	**PLATE**
Date:	4/20/2022	**D-5**

Test Pit TP-7

WESTEX Consulting Engineers
P.O. Box 18871, Reno, NV 89511
Phone: (775) 771-9539

EXPLORATION PHOTOS

Geotechnical Investigation
Old Stone Ranch
APN 008-792-11, -95, 008-831-77, -02
Fallon, Churchill County, Nevada

File No.:	2170.003-A	**PLATE**
Date:	4/20/2022	**D-6**