

ADDENDUM NO. 001
DATE: May 26, 2023
OWNER: Grant County
PROJECT NAME: Little Walnut Road Roadway & Drainage Improvements
PROJECT NO. Bid No. B23-04
20210361(BHI)

voice: 505.823.1000
facsimile: 505.798.7988
toll free: 800.877.5332

TO: ALL PROSPECTIVE BIDDERS

This Addendum forms a part of the Contract Documents and modifies or supplements the Project Manual or the Drawings as indicated below. All other provisions of the Contract Documents shall remain unchanged. This Addendum is hereby made a part of the Contract Documents to the same extent as those provisions contained in the original documents and all itemized listings thereof. Bidders shall acknowledge receipt of this Addendum in the appropriate space on the Bid Proposal form.

General:

1. A Non-Mandatory Pre-Bid was held virtually on Wednesday May 11, 2023, at 2:00 P.M. See the attached Agenda and sign-in sheet.

Questions:

1. *Has a surveyor checked connection points at both ends of project (Stantec had issues with missing a curve)?*

Response: Yes, the existing centerline is a best fit of existing conditions based on the topographic survey completed by Allsup Land Surveying, LLC located in Sliver City, NM. Survey Control and Geometric Layouts are available within the plans on DWG NO. 3-0.

2. *Do you have cores for asphalt thickness? (The section we did last year was 10-14" thick.) scheduled at 5.5" thick.*

Response: Yes, Existing Pavement Borings are available within the plans on DWG NO. 2-01. This information is based on the boring logs from the



Grant County

Little Walnut Road Roadway & Drainage Improvements
PROJECT NO. 5173-CIF
Bid No. 23-04
BHI PROJECT NO.: 20210361

Non-Mandatory Pre-Bid Conference
Thursday May 11, 2023, at 2:00PM
Via Virtual Meeting

Meeting Agenda

I. BHI Project Team

- Vernon Racehorse – Engineer of Record
- Claude Romero- Project Manager
- Nicole Shaw – Project Administrator

II. General Review of Project

a. Overview

- The purpose of this project is to provide roadway improvement to 2,400 Lineal Feet of Little Walnut Road. Improvements include reconstruction and widening of the roadway to 11 feet, new, 5-foot-wide paved shoulders, drainage improvements, and signing and striping.
- Contractor's responsibility to visit the project site and review contract documents before bidding the project.

b. Site Conditions:

- The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

III. Procurement Details

a. Bid Opening

- Bids Due to Grant County via BHITracker NO LATER THAN 1:00 p.m., local time, Wednesday May 31, 2023.

IV. Drawings (accessible via BHITracker)

V. Contract Documents (accessible via BHITracker)

a. Governing Specification

▪ Bid Form

1. Bid bond
2. Subcontractors listing
3. Certification Regarding Debarment
4. Non-Collusion Affidavit
5. Campaign Contribution Disclosure Form
6. Bidders Qualification Statement

▪ SWPPP

▪ Minimum Wage Rates State

VI. Project Schedule

a. 05/11/2023: 2:00PM - Non-Mandatory Pre-Bid Conference

b. 05/23/2023: 12:00 pm - Deadline for submission of questions by bidders

c. 05/26/2023: Final Addendum issued by 12:00 PM

d. Calendar Days

▪ Substantial Completion: 150 **Consecutive Calendar Days** - Liquidated Damages - \$2,000/day

▪ Final Completion: 30 **Consecutive Calendar Days** after Substantial Completion – Liquidated Damages \$2,000/day

VII. Question and Answer – Additional questions shall be submitted to the Project Consultant in writing via BHITracker to be addressed as Addenda.



Geotechnical Engineering Report

**Little Walnut Road Reconstruction Project
Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico**

April 6, 2021

Terracon Project No. 68205028

Prepared for:

Bohannon Huston, Inc.
Albuquerque, New Mexico

Prepared by:

Terracon Consultants, Inc.
Las Cruces, New Mexico



April 6, 2021

Bohannon Huston, Inc.
7500 Jefferson Street NE
Albuquerque, New Mexico 87109



Attn: Mr. Logan Brandenburg
Project Manager

**Re: Geotechnical Engineering Report
Little Walnut Road Reconstruction Project
Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico
Terracon Project No. 68205028**

Dear Mr. Brandenburg:

Terracon Consultants, Inc. (Terracon) is pleased to submit our Geotechnical Engineering Report for the above referenced project in Silver City, New Mexico. The study was performed in general accordance with Terracon Cost Estimate Document No. P68205028 dated July 13, 2020. This project was authorized through Bohannon Huston's Authorization Letter, dated December 29, 2020 provided by Mr. Albert M. Thomas.

We trust that this report is responsive to your project needs, and we appreciate the opportunity to be of service to you on this project. We look forward to providing additional construction materials testing services in the near future. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.
New Mexico PE Firm License No. 362650

A handwritten signature in blue ink, appearing to read "D. Castrillo".

Daniel Castrillo
Geotechnical Staff

Ivan Avelar, P.E.
Geotechnical Services Manager

Michael E. Anderson, P.E.
Principal

Enclosures
Copies Submitted: Addressee (1) Electronic

Terracon Consultants, Inc. 4450 Bataan Memorial East Las Cruces, New Mexico 88011
P [575] 527 1700 F [575] 527 1092 www.terracon.com

REPORT TOPICS

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Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the **GeoReport** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS
FIGURES
SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report
Little Walnut Road Reconstruction Project
Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico
Terracon Project No. 68205028
April 6, 2021

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Little Walnut Road Reconstruction Project to be located between Trail Ridge Road to Cleveland Mine Road in Silver City, New Mexico.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Removal of existing pavement.
- Site and subgrade preparation.
- Pavement design and construction.
- Pavement material specifications.
- Other earthwork-related aspects of construction

The geotechnical engineering Scope of Services for this project included the advancement of 12 test borings to depths varying from approximately 5 to 6½ feet below existing site grade.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Project Description	The project consists of the reconstruction of an approximately 3.0-mile long stretch of Little Walnut Road. We understand that the reconstruction will include subgrade preparation, base course replacement and hot mix asphalt (HMA) surface course replacement.
Construction Type	Flexible (hot mix asphalt) pavement over base course.

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Item	Description
Grading, Cut/Fill Earthwork and Slopes	We have assumed the finished roadway grade elevation (FGE) will differ from existing grades by no more than about 1 foot. We anticipate shallow rock could be encountered during construction.
Pavements	Average Daily Traffic (ADT) = 962 (one way) Growth Rate = 1% Percent Truck Traffic = 2%

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Location and Parcel Information	The project site is located along Little Walnut Road from Trail Ridge Road to Cleveland Mine Road in Grant County, New Mexico
Existing Improvements	Little Walnut Road is a two-lane, two-way road. The existing road is currently surfaced with asphaltic concrete pavement and is approximately 22 feet wide (two 11-foot wide driving lanes) with no shoulders.
Current Ground Cover	Asphalt paved roadway
Existing Topography	The site sloped downward from north to south.
Geology	Specific geologic conditions mapped at the location of the project include <i>Mancos Shale and Beartooth and Sarten Formations (Cenomanian and Albian)</i> .

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed *GeoModel*, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options.

Subsurface conditions on the project site can be generalized as medium dense to very dense clayey sand with varying amounts silt and gravel and clayey gravel with sand. Conditions observed at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types. In-situ, the transition between materials may be gradual.

Details for each of the borings can be found in the individual logs of borings in the **Exploration Results** section. A visual side-by-side compilation showing the general subsurface profile observed in our Borings B-1 through B-12 is presented as *Subsurface Profile* and *GeoModel*, which can be found in the **Figures** section of this report.

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Model Layer	Layer Name	General Description
1	ASP	Asphalt (2 to 7 inches thick)
2	BC	Aggregate Base Course (3 to 4 inches thick)
3	SC	Clayey Sand with varying amounts of gravel (Medium Dense to Very Dense)
4	SC-SM	Silty, Clayey Sand with Gravel (Medium Dense to Very Dense)
5	GC	Clayey Gravel with Sand (Dense to Very Dense)

Groundwater

The borings were advanced using dry auger drilling techniques to their termination depths (approximately 5 to 6½ feet below existing grade) in an effort to evaluate groundwater conditions while drilling and immediately after completion of our drilling operations. Groundwater was not observed in the borings during or upon completion of our drilling operations. The absence of groundwater at the time of the field exploration may not be indicative of other times, circumstances (such as perched water conditions), or at other locations.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project and should be evaluated prior to construction.

GEOTECHNICAL OVERVIEW

Based on the information obtained from our subsurface exploration, the site can be developed for the proposed project. A summary of our findings and recommendations is provided below.

- Groundwater was not observed in the borings during or upon completion of our drilling operations. These observations represent conditions at the time of the field exploration and may not be indicative of other times, circumstances (such as perched conditions), or at other locations.
- The near surface soils predominantly consist of native, medium dense to very dense clayey sands with varying amounts of silt and gravel and clayey gravel with sand which are suitable for re-use as engineered fill based on soil classification. The on-site soils exhibit low to moderate plasticity ranges and exhibit a low expansion potential.
- Removal of existing pavements will be performed to facilitate the construction of the proposed development. Special care should be exercised to remove the existing

pavements to minimize disturbance of the subgrade and potential detrimental effects on construction of the proposed roadway at this site. Recommendations for demolition and removal of existing pavements are provided in the *Removal of Existing Pavements* subheading of the **Earthwork** section of this report.

- Effective drainage should be completed early in the construction sequence and maintained after construction. Additional site preparation recommendations, including subgrade improvement, fill placement, and excavations are provided in the **Earthwork** section of this report.
- Based on our experience with similar projects in similar site conditions, flexible (asphaltic concrete) pavement systems may be considered for this site. The **Pavements** section addresses design of pavement systems.

This summary should be used in conjunction with the entire report for design purposes. Details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **General Comments** should be read for an understanding of the report limitations.

EARTHWORK

The following presents recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including pavements are contingent upon following the recommendations outlined in this section. The NMDOT "*Standard Specifications for Highway and Bridge Construction (2019 Edition)*", referred hereafter as the Specifications, should be used for the project.

Earthwork, site preparation, and excavations should be performed in accordance with Section 200, "*Earthwork*" of the Specifications.

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

Site Preparation

Site preparation should be performed in accordance with Section 201, "*Clearing and Grubbing*" (where applicable) and Section 213, "*Obliterating Old Road*" of the Specifications.

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

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Stripped materials consisting of vegetation and organic materials should be wasted from the site or used to revegetate landscaped areas or exposed slopes after completion of grading operations. If it is necessary to dispose of organic materials on-site, they should be placed in non-structural areas, and in fill sections not exceeding five (5) feet in height. The existing pavement could be reused and incorporated into the existing subgrade if adequately processed and blended.

The site should be initially graded to create a relatively level surface to receive fill (if applicable), and to provide for a relatively uniform thickness of fill beneath proposed pavements and/or structures.

Evidence indicating the potential presence of underground utilities adjacent to and within the project alignment was observed during the field operations. If utilities or fills or other underground facilities are encountered, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Excavation and Embankment

Excavation and embankment construction should be performed in accordance with Section 203, "*Excavation, Borrow, and Embankment*" of the Specifications. Utility installation should be performed in accordance with Section 660, "*Excavation, Trenching, and Backfilling for Utilities*" of the Specifications.

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. Based upon the subsurface conditions determined from the geotechnical exploration, excavations into the on-site soils will likely encounter caving soils.

Based on the results from the soil borings, we do not anticipate groundwater control measures will be necessary in excavations up to about 6½ feet below existing site grades.

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

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Subgrade Preparation

Subgrade preparation should be conducted in accordance with Section 207, “*Subgrade Preparation*”, of the Specifications.

We anticipate that the subgrade soils will be relatively stable. However, elevated moisture contents were encountered within the subgrade at some boring locations. Therefore, drying and/or stabilization may be required in some areas along the project alignment. The stability of the subgrade may also be affected by precipitation, repetitive construction traffic or other factors. If unstable conditions develop, workability may be improved by scarifying and drying. Overexcavation of wet zones and replacement with granular materials may be necessary. Lightweight excavation equipment may be required to reduce subgrade pumping.

Fill Materials and Placement

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than six (6) inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

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

- general site grading
- backfill
- pavement areas
- utilities

On-site or imported soils for use as fill material should conform to low volume change materials as indicated in the following specifications:

<u>Gradation</u>	<u>Percent Finer by Weight (ASTM C 136)</u>
6"	100
3"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	35 (max)
■ Liquid Limit	40 (max)
■ Plasticity Index	25 (max)
■ Minimum R-value	9

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed eight (8) inches loose thickness.

Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill or backfill materials per Sections 203, 206, 207, and 660 of the Specifications are as follows:

Material Type and Location	Per the Modified Proctor Test (AASHTO T180/ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction	
		Minimum	Maximum
On-site granular or approved imported fill soils:			
Roadway Embankments	95	-5%	0%
Beneath Pavements (top 6 inches)	95	-2%	+2%
Aggregate Base Course	96	-3%	+1%
Minor Structure or Utility Trench Backfill	95	-5%	0%

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the project. Infiltration of water into utility trenches or excavations should be prevented during construction. Backfill in utility and irrigation line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

PAVEMENTS

Design Recommendations

Design of the pavement thickness has been performed based on AASHTO procedures as outlined and approved in the New Mexico Department of Transportation (NMDOT) Design Directive, and our local experience and understanding of the project.

California Bearing Ratio (CBR) tests were performed for this project to evaluate the support and characteristics of the subgrade. Based on laboratory testing the CBR values of 13, 10, and 21, correlated R-values of 45, 42, and 57 were determined. However, it is our opinion that these test results are not representative of the soils at this project site. Therefore, based upon the AASHTO Soil Classification of A-2-6, NMDOT correlated R-values, we recommend using a more conservative R-value of 17.

Input design parameters for this project are based on the average annual daily traffic (AADT) and truck percentages provided to us by BHI. The traffic data is summarized below:

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ROADWAY	TRAFFIC DATA		
	ADT (2021)	Percent Growth	Percent Heavy Trucks
Little Walnut Road from Trail Ridge Road to Cleveland Mine Road	962 (one-way)	1	2

Using the traffic data above, the Equivalent Single Axle Load (ESAL) was developed for the section outlined above. The ESALs are as follows:

ROADWAY SECTION	EQUIVALENT SINGLE AXEL LOAD (ESAL) DESIGN LANE
Little Walnut Road from Trail Ridge Road to Cleveland Mine Road	102,198

A detailed summary of the ESAL calculations are included in the Attachments.

The following parameters were used in the design of the pavement section:

- Local drainage characteristics were classified as good, resulting in an overall design drainage coefficient (C_d) of 1.0,
- Regional factor of 0.9 (Silver City, NM)
- An initial serviceability of 4.2 along with terminal serviceability index of 2.0 was utilized with an inherent reliability of 65%,
- Layer structural coefficients of 0.44 and 0.11 for new hot mix asphalt and untreated base course materials,
- R-value of 17,
- Pavement criteria are based on a 20-year design life with design equivalent axle loads.

Based on the design criteria outlined above, AASHTO design methodology, and the subgrade soils, the recommended pavement section thickness is as follows:

Recommended Pavement Section Thickness (inches)	
Material	Little Walnut Road from Trail Ridge Road to Cleveland Mine Road
Asphalt Concrete Surface	4.5

Recommended Pavement Section Thickness (inches)	
Material	Little Walnut Road from Trail Ridge Road to Cleveland Mine Road
Aggregate Base Course	6.0
Total	10.5

The AASHTO pavement structural design computation forms are included in the Attachments.

The existing pavement could also be reused as engineered fill and/or incorporated into the existing subgrade if adequately processed and blended with on-site soils.

Pavement Materials Specifications

Presented below are our recommended material specifications for the various pavement sections.

Hot Mix Asphalt Surface Course: The hot mix asphalt surface course should be plant mixed, hot laid, meeting the requirements in the New Mexico Department of Transportation (NMDOT) 2019 Standard Specifications for Highway and Bridge Construction, Section 423.

Aggregate Base Course Material: Base material should be composed of crushed limestone or crushed concrete meeting the requirements of NMDOT 2019 Standard Specifications for Highway and Bridge Construction, Section 303, Type I. The base material should be compacted to at least 96 percent of the Modified Effort (ASTM D1557) maximum dry density at moisture content within 2 percent of the optimum moisture content as determined by ASTM D1557.

Prime Coat Material: Prime coat should be in conformance with NMDOT 2019 Standard Specifications for Highway and Bridge Construction, Section 408, and applied after compaction of aggregate base course layers.

Pavement Drainage

Pavement performance is affected by its surrounding environment and should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. Additionally, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular bases and subbase layers.

The civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from edges at a minimum 2%.

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- The subgrade and pavement surface should have a minimum 2% slope to promote proper surface drainage.
- Install joint sealant and seal cracks promptly.
- Line the bottom of landscaped areas in or adjacent to pavements with clay soils reduce moisture migration to the pavement subgrade soils or base course.
- Place properly compacted backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on the prepared subgrade soils rather than on unbound granular base course materials.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment.

Maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Please note that even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

GENERAL COMMENTS

Our work was conducted with the understanding of the project as described in the proposal, and incorporated collaboration with the design team prior to completing our services. The design team collaborated with Terracon to confirm our project assumptions. Revision of our assumptions and understanding of the project to reflect actual conditions was based on those verifications and are reflected in this final report.

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of

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pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

The following borings and tests were advanced at this site according to the following table:

Number of Borings	Boring Depth (feet)	Planned Location
6 Borings (B-1 through B-6)	5 to 6½	Northbound lane of Little Walnut Road
6 Borings (B-7 through B-12)	5 to 6½	Southbound lane of Little Walnut Road

The general site vicinity and locations of our soil borings within the project site are provided on the [Site Location and Exploration Plans](#) section of this report. The locations and elevations shown on the [Exploration Plan](#) and on the borings should be considered approximate.

Boring Layout and Elevations: The boring locations were laid out in the field by a Terracon representative using a scaled site plan and a recreational-grade, hand-held GPS equipment (estimated horizontal accuracy of about ±10 feet). Ground surface elevations indicated on the boring logs were estimated from available topographic maps published by the US Geological Survey (USGS). If more precise elevations and boring location coordinates are desired, we recommend our borings be surveyed (by others).

Subsurface Exploration Procedures: We advanced the soil borings with a truck-mounted CME 75 drilling equipment using continuous flight augers (hollow stem, 8-inch outside diameter) up to the aforementioned boring termination depths. We obtained non-continuous soil samples by the split-barrel sampling procedure, where a standard, 2-inch outside-diameter, split-barrel sampler was driven 18 inches into the exposed soil layer at the proposed sampling depths. The sampler penetrates the soils with the kinetic energy of a 30-inch vertical fall strike by a 140-pound automatic SPT (Standard Penetration Test) hammer weight.

We recorded the number of blows required to advance the soil sampler the last 12 inches of the 18-inch sampling interval as the standard penetration resistance value (N-value). This value was used to estimate the in situ relative density of cohesionless soils and consistency of cohesive soils. Our SPT hammers are calibrated in accordance with Terracon's quality standards to document the efficiency of the hammer system on our drill rig. Additional N-value definitions and interpretation information are presented in the [Supporting Information](#).

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. For safety considerations, borings were backfilled immediately upon the completion of drilling with drill cuttings and capped at the surface with cold (asphaltic) concrete patch mixture.

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Our team prepared final boring logs based on the field logs after the completion of our drilling operations. The field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. The final boring logs are presented in **Exploration Results**, represent the engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Bulk Soil Sampling: During our drilling operations, we also obtained a composite bulk sample of the top 2½ feet of the surface soils from Borings B-1 through B-12 that was tested in our laboratory for pavement design parameters (California Bearing Ratio).

Property Disturbance: For safety considerations, we backfilled our borings with auger cuttings. Our services do not include restoration of the original site conditions beyond backfilling our borings. Excess auger cuttings are disposed of at the site in the general vicinity of each boring. The backfilled borings were patched at the surface with cold (emulsified) asphaltic patch mixture.

Because backfill material may settle within the boring locations below the surface after some time, we recommend borings be checked periodically, and backfilled, if necessary.

Laboratory Testing

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

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

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

- ASTM D2488-09 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
- ASTM D2216-10 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D6913/6913M-17 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
- ASTM D4318-10e1 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D7263-09 Standard Test Methods for Laboratory Determination of Density (Unit Weight) of Soil Specimens

Geotechnical Engineering Report

Little Walnut Road Reconstruction Project ■ Silver City, New Mexico

April 6, 2021 ■ Terracon Project No. 68205028



- ASTM D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
- ASTM D1883-05 Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan

Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

Little Walnut Road Reconstruction Project ■ Silver City, New Mexico
April 6, 2021 ■ Terracon Project No. 68205028

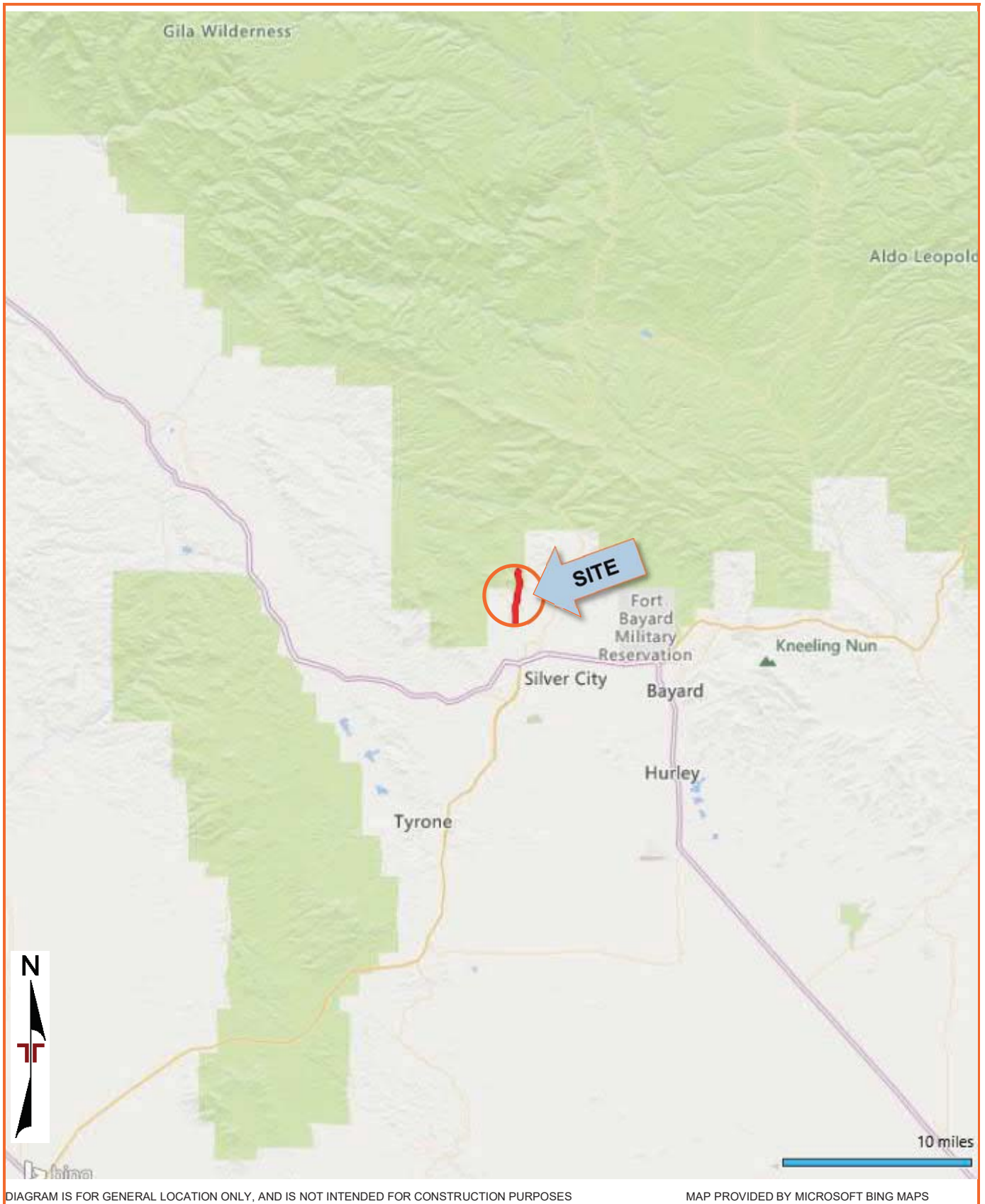
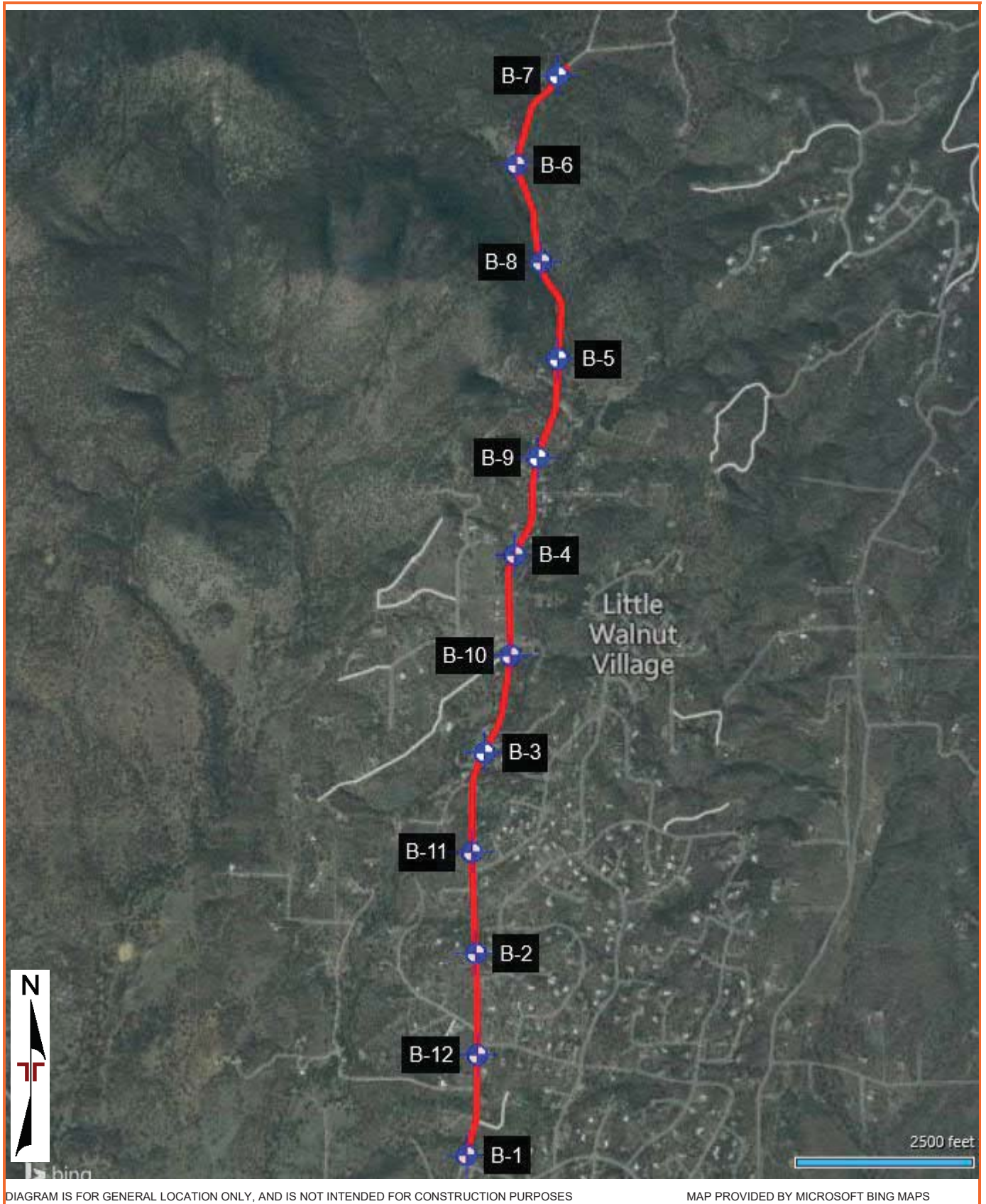


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

Little Walnut Road Reconstruction Project ■ Silver City, New Mexico
April 6, 2021 ■ Terracon Project No. 68205028



FIELD EXPLORATION AND LABORATORY RESULTS

Contents:

Boring Logs (B-1 through B-12)
Geomodel (2 pages)
Grain Size Distribution (4 pages)
Atterberg Limits
Summary of Laboratory Testing Results
Proctor (3 pages)
CBR (3 pages)
ESAL Calculations
Pavement Design

Note: All attachments are one page unless noted above.

BORING LOG NO. B-1

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		PERCENT FINES
		Latitude: 32.8101° Longitude: -108.2788°	Approximate Surface Elev.: 6125 (Ft.) +/-							LL-PL-PI		
		DEPTH	ELEVATION (Ft.)									
1		0.3	6124.5+/-	ASPHALT , 4" thick								
2		0.7	6124.5+/-	AGGREGATE BASE COURSE , 4" thick								
4				SILTY CLAYEY SAND WITH GRAVEL, A-2-4 (SC-SM) , yellow - very dense								
5		5.0	6120+/-	Hammer Type: Automatic								
		5.3	6119.5+/-									
		Boring Terminated at 5.333 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-02-2021

Boring Completed: 02-02-2021

Drill Rig: CME-75

Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT_ROA.GPJ_TERRACON_DATATEMPLATE.GDT_4/6/21


BORING LOG NO. B-2

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 32.8178° Longitude: -108.2784° Approximate Surface Elev.: 6263 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		ASPHALT , 5" thick	0.4 6262.5+/-							
2		AGGREGATE BASE COURSE , 4" thick	0.8 6262.5+/-		✋					
5		CLAYEY GRAVEL WITH SAND, A-2-6 (GC) , yellow - very dense	5.9 6257+/-		✂	50/1"				
		Boring Terminated at 5.917 Feet			✂	8-50/5"	5		29-13-16	20

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-01-2021

Boring Completed: 02-01-2021

Drill Rig: CME-75

Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT ROA.GPJ_TERRACON_DATATEMPLATE.GDT 4/6/21

BORING LOG NO. B-3

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 32.8256° Longitude: -108.278° Approximate Surface Elev.: 6256 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		ASPHALT , 7" thick	0.6							
2		AGGREGATE BASE COURSE , 4" thick	0.9		✋					
4		SILTY CLAYEY SAND, A-2-4 (SC-SM) , trace gravel, brown								
			2.5							
3		CLAYEY SAND WITH GRAVEL, A-2-4 (SC) , brown, - dense - medium dense			✕	12-16-15 N=31				
			6.5		✕	5-12-11 N=23				
		Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-01-2021

Boring Completed: 02-01-2021

Drill Rig: CME-75

Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT ROA.GPJ_TERRACON_DATATEMPLATE.GDT_4/6/21

BORING LOG NO. B-4

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 32.8332° Longitude: -108.2766° Approximate Surface Elev.: 6326 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		ASPHALT , 7" thick	0.6							
2		AGGREGATE BASE COURSE , 4" thick	0.9		☞					
3	- dense	CLAYEY SAND WITH GRAVEL, A-2-6 (SC) , tan	6.5		X	9-20-17 N=37				
			5		X	7-18-27 N=45	5		26-15-11	17
		Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-01-2021

Boring Completed: 02-01-2021

Drill Rig: CME-75

Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT ROA.GPJ_TERRACON_DATATEMPLATE.GDT_4/6/21

BORING LOG NO. B-5

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 32.8407° Longitude: -108.2746° Approximate Surface Elev.: 6381 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		ASPHALT , 5" thick	0.4 6380.5+/-							
2		AGGREGATE BASE COURSE , 4" thick	0.8 6380.5+/-	☞						
3		CLAYEY SAND WITH GRAVEL, A-2-4 (SC) , brown - very dense	6.5 6374.5+/-		X	10-37-50/1"				
		Boring Terminated at 6.5 Feet			X	13-33-50 N=83				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-01-2021

Boring Completed: 02-01-2021

Drill Rig: CME-75

Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT ROA.GPJ TERRACON_DATATEMPLATE.GDT 4/6/21

BORING LOG NO. B-6

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 32.8482° Longitude: -108.2765° Approximate Surface Elev.: 6438 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		ASPHALT , 4" thick 6437.5+/-								
2		AGGREGATE BASE COURSE , 4" thick 6437.5+/-			✎					
4		CLAYEY SAND WITH GRAVEL, A-2-4 (SC) , brown - very dense - light brown, medium dense 6431.5+/-	5		✕	11-35-20 N=55				
		Boring Terminated at 6.5 Feet			✕	7-12-13 N=25	9		26-17-9	25

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-01-2021

Boring Completed: 02-01-2021

Drill Rig: CME-75

Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT ROA.GPJ_TERRACON_DATATEMPLATE.GDT_4/6/21

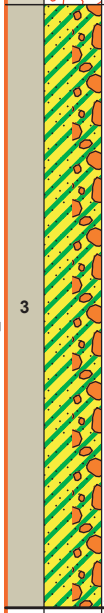
BORING LOG NO. B-7

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 32.8516° Longitude: -108.2746° Approximate Surface Elev.: 6471 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		0.2 ASPHALT , 2" thick	6471 +/-							
2		0.5 AGGREGATE BASE COURSE , 4" thick	6470.5 +/-							
		CLAYEY SAND WITH GRAVEL, A-2-4 (SC) , brown								
		- medium dense								
3		- very dense				8-10-14 N=24				
		5.6 Boring Terminated at 5.583 Feet	6465.5 +/-			35-50/1"				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-01-2021

Boring Completed: 02-01-2021

Drill Rig: CME-75

Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT ROA.GPJ_TERRACON_DATATEMPLATE.GDT_4/6/21




BORING LOG NO. B-8

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 32.8444° Longitude: -108.2754° Approximate Surface Elev.: 6411 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		ASPHALT , 3" thick 6411+/-	0.3							
2		AGGREGATE BASE COURSE , 4" thick 6410.5+/-	0.6							
5		CLAYEY GRAVEL WITH SAND, A-2-6 (GC) , brown - dense	5	X	X	11-23-20 N=43	5		40-16-24	15
		- very dense				50				
		Boring Terminated at 5.5 Feet 6405.5+/-	5.5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-02-2021

Boring Completed: 02-02-2021

Drill Rig: CME-75

Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT ROA.GPJ TERRACON_DATATEMPLATE.GDT 4/6/21


BORING LOG NO. B-10

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 32.8293° Longitude: -108.2768° Approximate Surface Elev.: 6280 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		ASPHALT , 7" thick	0.6							
2		AGGREGATE BASE COURSE , 4" thick	0.9		☞					
3		CLAYEY SAND WITH GRAVEL, A-2-6 (SC) , light brown - very dense - dense	6.5			10-22-32 N=54	9	33-13-20	19	
		Boring Terminated at 6.5 Feet	6.5			17-19-21 N=40				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-02-2021

Boring Completed: 02-02-2021

Drill Rig: CME-75

Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT ROA.GPJ TERRACON_DATATEMPLATE.GDT 4/6/21

BORING LOG NO. B-11

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 32.8217° Longitude: -108.2785° Approximate Surface Elev.: 6295 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		ASPHALT , 6" thick	0.5 6294.5+/-							
2		AGGREGATE BASE COURSE , 3" thick	0.8 6294.5+/-		✎					
3		CLAYEY SAND WITH GRAVEL, A-2-6 (SC) , yellow - very dense			✕	27-50/3"				
		Boring Terminated at 5.083 Feet	5.1 6290+/-		✕	50/1"	7		39-14-25	33

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-02-2021

Boring Completed: 02-02-2021

Drill Rig: CME-75

Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT ROA.GPJ_TERRACON_DATATEMPLATE.GDT_4/6/21

BORING LOG NO. B-12

PROJECT: Little Walnut Road Reconstruction Project

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico

Mr. Logan Brandenburg, P.E.
Project Manager

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 32.8139° Longitude: -108.2783° Approximate Surface Elev.: 6158 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		ASPHALT , 7" thick	0.6							
2		AGGREGATE BASE COURSE , 4" thick	0.9		✎					
3		CLAYEY SAND, A-6 (SC) , trace gravel, brown - medium dense			✕	6-8-10 N=18	10		30-13-17	48
5		CLAYEY GRAVEL WITH SAND, A-2-6 (GC) , yellow, very dense Boring Terminated at 5.167 Feet	5.0 5.2		✕	50/2"				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

1. Latitude/Longitude locations are approximate and were selected using a recreational-grade GPS device; format is Geodetic NAD 83 Datum, decimal degrees.
2. Surface elevations are only approximate and were estimated from available topographic plans published by USGS.

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Free water was not observed



Boring Started: 02-02-2021

Boring Completed: 02-02-2021

Drill Rig: CME-75

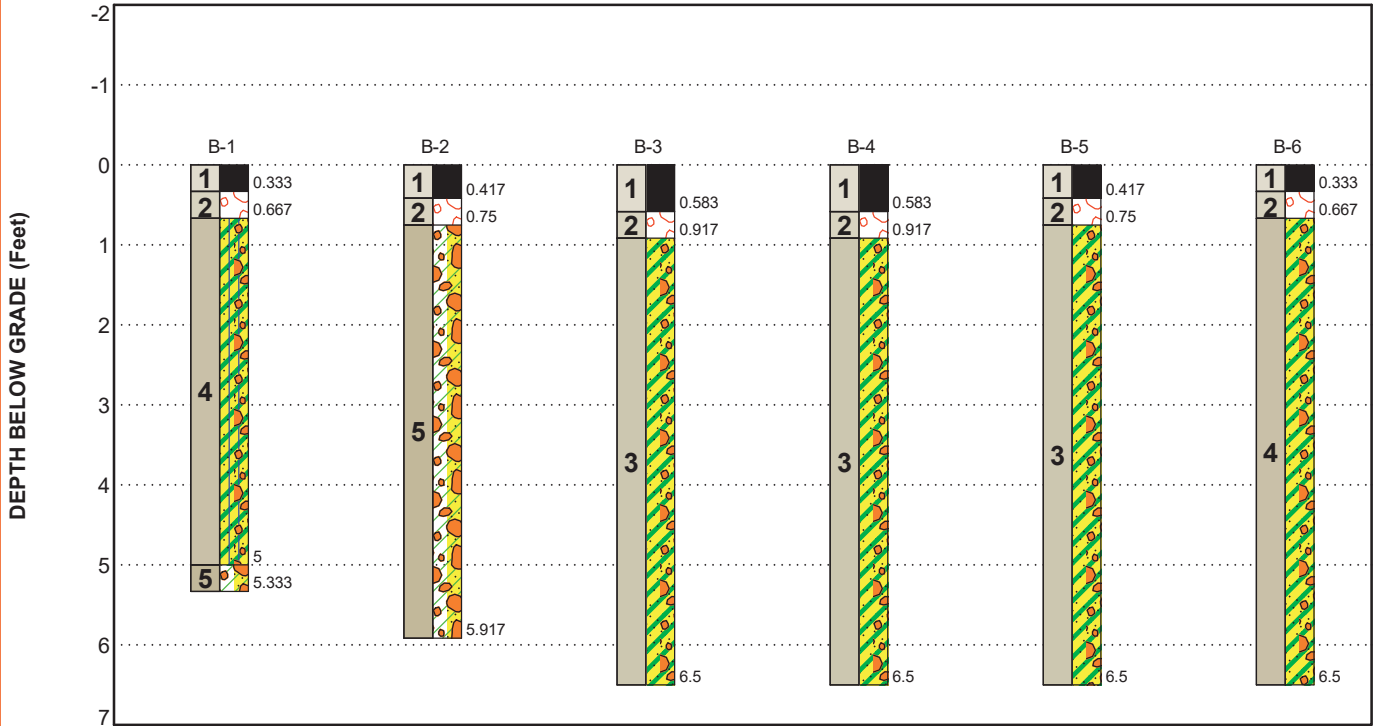
Driller: Southlands Engineering

Project No.: 68205028

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_68205028 LITTLE WALNUT ROA.GPJ_TERRACON_DATATEMPLATE.GDT_4/6/21

GEOMODEL

Little Walnut Road Reconstruction Project ■ Silver City, New Mexico
 Terracon Project No. 68205028



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	ASP	Asphalt (2 to 7 inches thick)
2	BC	Aggregate Base Course (3 to 4 inches thick)
3	SC	Clayey Sand with varying amounts of Gravel (Medium Dense to Very Dense)
4	SC-SM	Silty, Clayey Sand with varying amounts of Gravel (Medium Dense to Very Dense)
5	GC	Clayey Gravel with Sand (Dense to Very Dense)

LEGEND

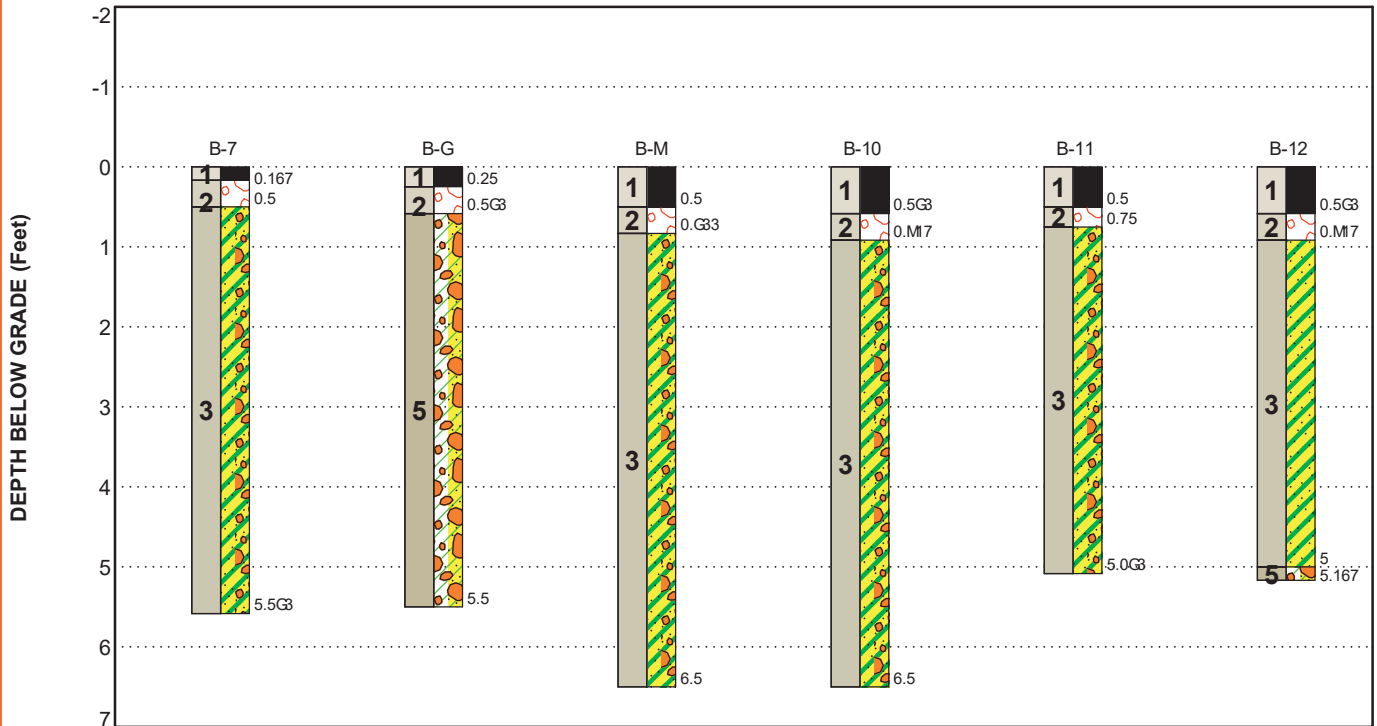
- Asphalt
- Clayey Gravel with Sand
- Aggregate Base Course
- Clayey Sand with Gravel
- Silty Clayey Sand with Gravel

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

Little Walnut Road Reconstruction Project ■ Silver City, New Mexico
Terracon Project No. 68205028



This is not a cross section. This is intended to display the Geotechnical (Model) only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	ASP	8 asphalt
2	BC	8 aggregate Base Course
3	SC	Layer Sand with varying amounts of Gravel (medium) (fine to, very) coarse
4	SC-SM	Silty Layer Sand with varying amounts of Gravel (medium) (fine to, very) coarse
5	GC	Layer Gravel with Sand (fine to, very) coarse

LEGEND

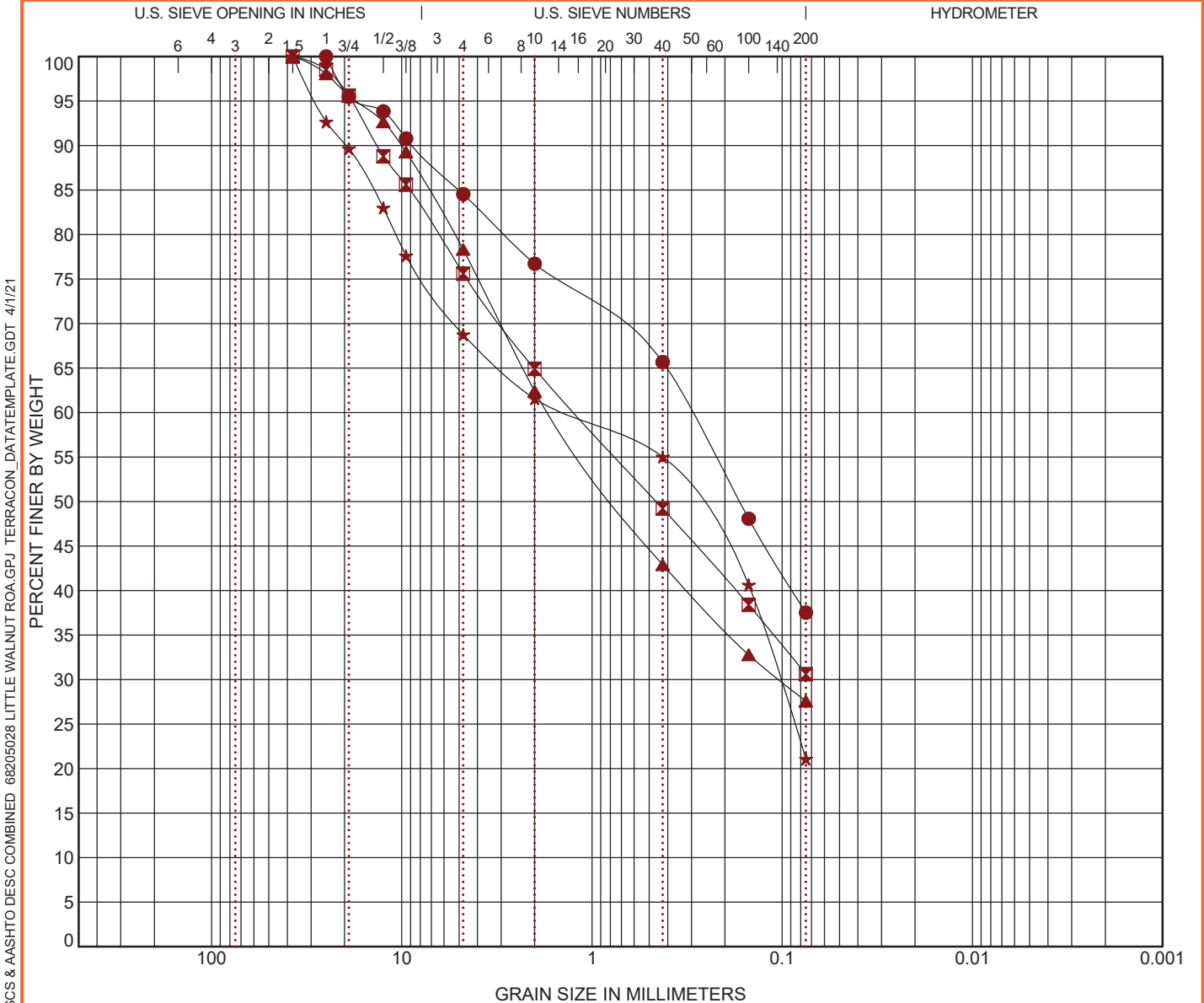
- 8 asphalt
- Layer Gravel with Sand
- 8 aggregate Base Course
- Layer Sand
- Layer Sand with Gravel

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	AASHTO Classification	WC (%)	LL	PL	PI	Cc	Cu
● CBR-1	0 - 5	CLAYEY SAND with GRAVEL (SC)	A-6 (2)	4	31	14	17		
■ CBR-2	0 - 5	CLAYEY SAND with GRAVEL (SC)	A-2-6 (1)	2	32	14	18		
▲ CBR-3	0 - 5	CLAYEY SAND with GRAVEL (SC)	A-2-6 (0)	6	27	15	12		
★ B-1	2.5 - 3.5	SILTY, CLAYEY SAND with GRAVEL (SC-SM)	A-2-4 (0)	4	25	18	7		

Boring ID	Depth	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Gravel	%Sand	%Silt	%Fines	%Clay
● CBR-1	0 - 5	25	0.304			15.5	47.0		37.5	
■ CBR-2	0 - 5	37.5	1.233			24.4	45.0		30.6	
▲ CBR-3	0 - 5	37.5	1.653	0.104		21.7	50.7		27.6	
★ B-1	2.5 - 3.5	37.5	1.383	0.103		31.2	47.7		21.1	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED 68205028 LITTLE WALNUT ROA.GPJ TERRACON_DATATEMPLATE.GDT 4/1/21

PROJECT: Little Walnut Road Reconstruction Project

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico



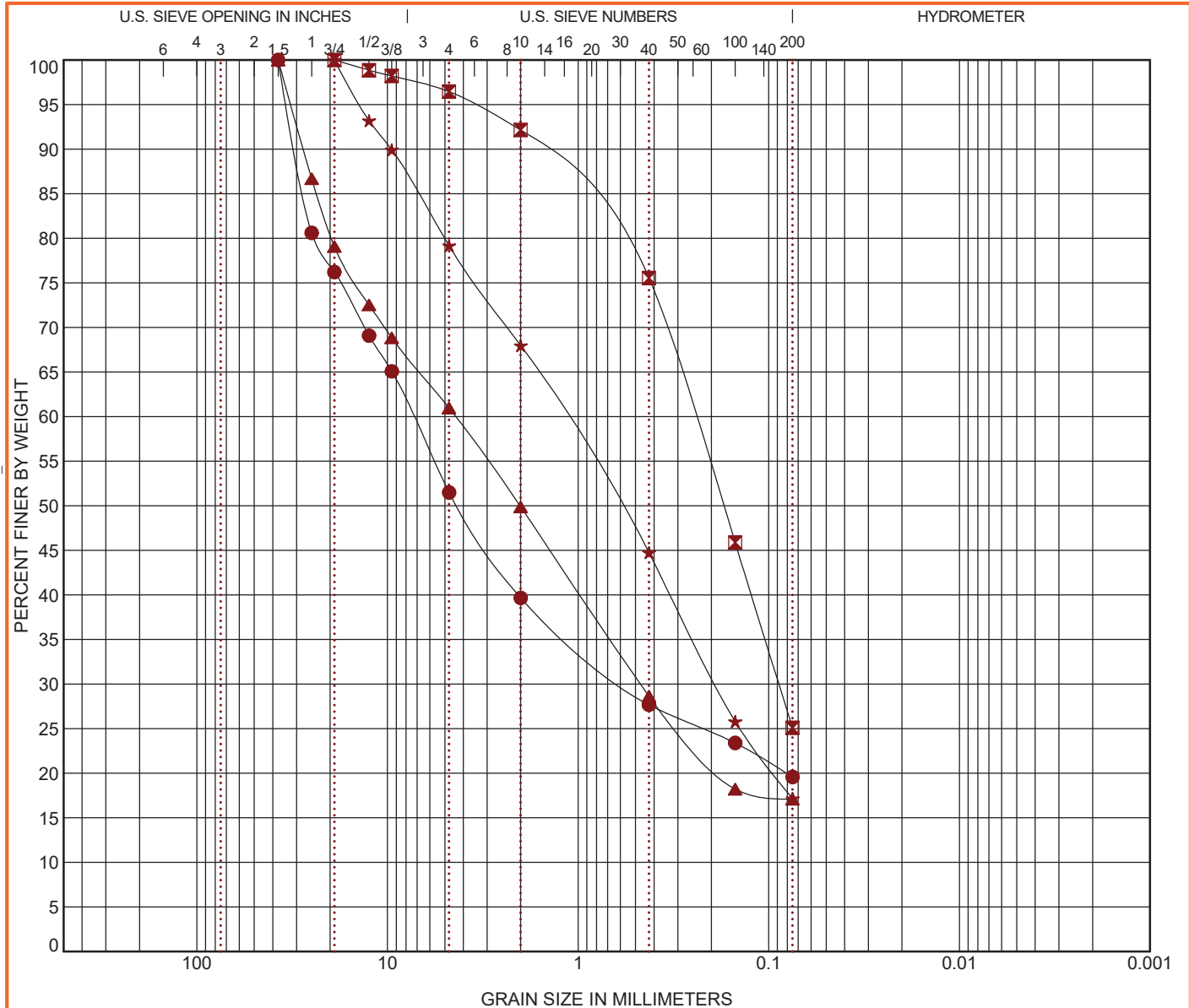
PROJECT NUMBER: 68205028

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136


LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED 68205028 LITTLE WALNUT ROA.GPJ TERRACON_DATATEMPLATE.GDT 4/1/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	AASHTO Classification	WC (%)	LL	PL	PI	Cc	Cu
● B-2	5 - 5.9	CLAYEY GRAVEL with SAND (GC)	A-2-6 (0)	5	29	13	16		
☒ B-3	0.6 - 0.9	SILTY, CLAYEY SAND (SC-SM)	A-2-4 (0)	6	20	14	6		
▲ B-4	5 - 6.5	CLAYEY SAND with GRAVEL (SC)	A-2-6 (0)	5	26	15	11		
★ B-5	0.4 - 0.8	CLAYEY SAND with GRAVEL (SC)	A-2-4 (0)	8	24	15	9		

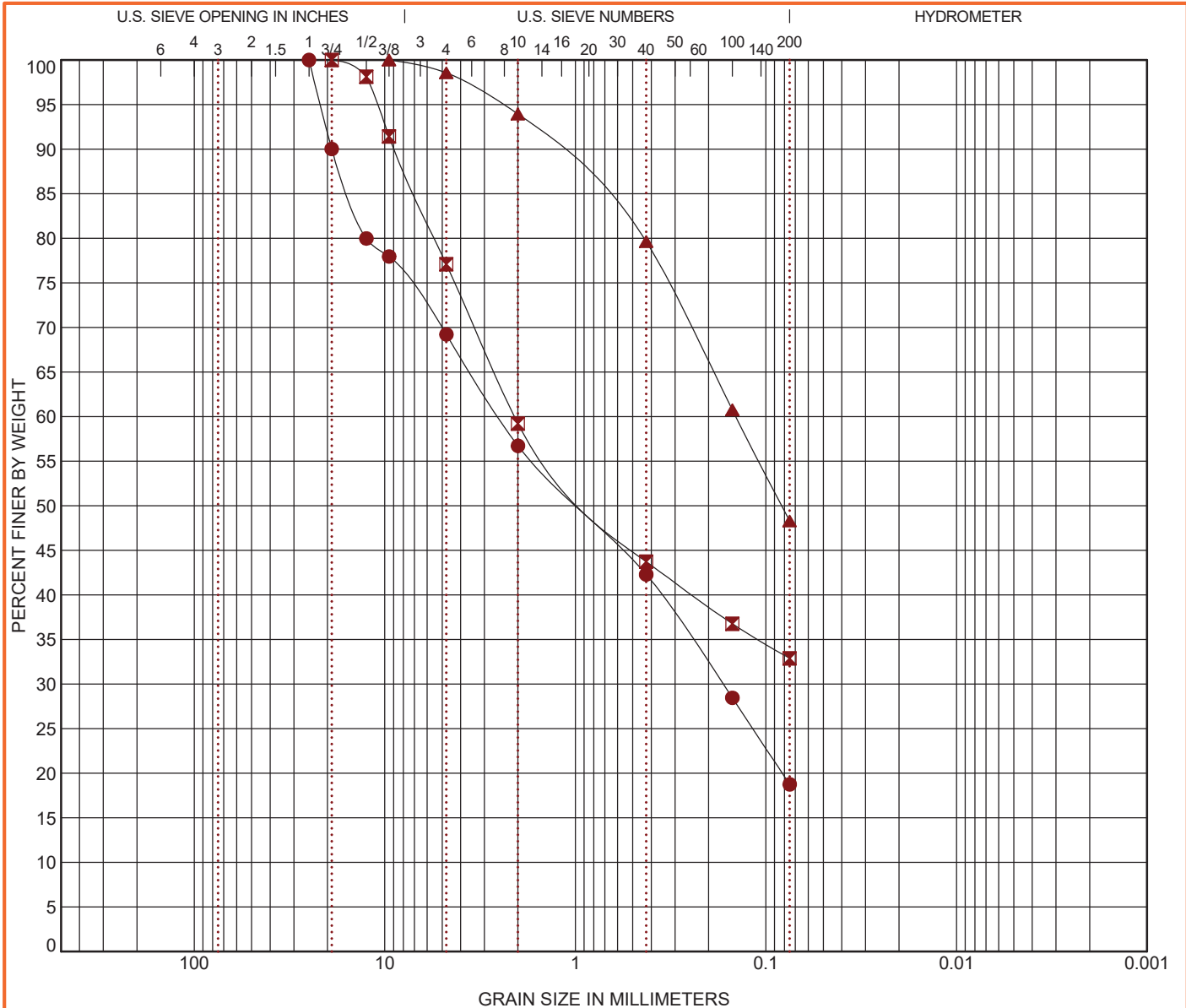
Boring ID	Depth	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Gravel	%Sand	%Silt	%Fines	%Clay
● B-2	5 - 5.9	37.5	7.333	0.574		48.5	31.9		19.6	
☒ B-3	0.6 - 0.9	19	0.246	0.088		3.5	71.4		25.1	
▲ B-4	5 - 6.5	37.5	4.404	0.469		39.0	43.9		17.1	
★ B-5	0.4 - 0.8	19	1.176	0.189		20.8	62.0		17.2	

PROJECT: Little Walnut Road Reconstruction Project	 4450 Bataan Memorial E Las Cruces, NM	PROJECT NUMBER: 68205028
SITE: Trail Ridge Road to Cleveland Mine Road Silver City, New Mexico		CLIENT: Bohannon-Huston Inc Las Cruces, New Mexico

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED 68205028 LITTLE WALNUT ROA.GPJ TERRACON_DATATEMPLATE.GDT 4/1/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	AASHTO Classification	WC (%)	LL	PL	PI	Cc	Cu
● B-10	2.5 - 4	CLAYEY SAND with GRAVEL (SC)	A-2-6 (0)	9	33	13	20		
■ B-11	5 - 5.1	CLAYEY SAND with GRAVEL (SC)	A-2-6 (3)	7	39	14	25		
▲ B-12	2.5 - 4	CLAYEY SAND (SC)	A-6 (4)	10	30	13	17		

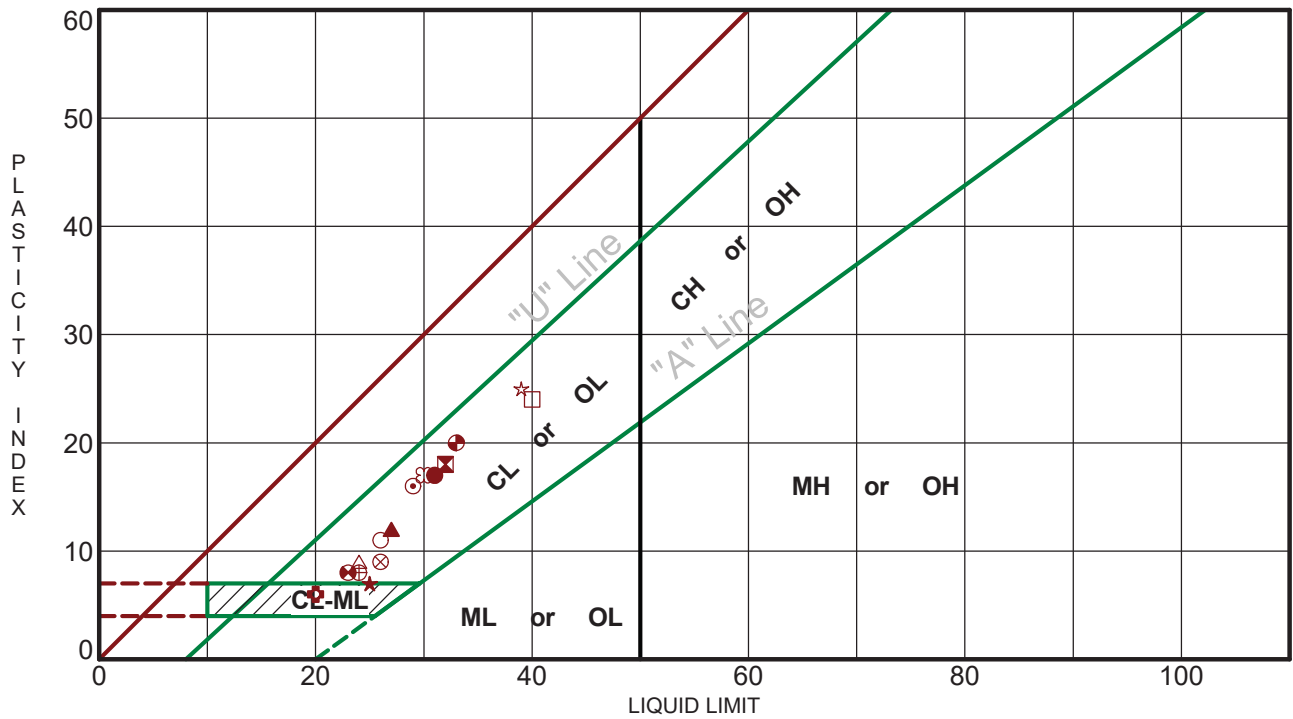
Boring ID	Depth	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Gravel	%Sand	%Silt	%Fines	%Clay
● B-10	2.5 - 4	25	2.51	0.168		30.8	50.5		18.8	
■ B-11	5 - 5.1	19	2.079			22.9	44.2		32.9	
▲ B-12	2.5 - 4	9.5	0.144			1.4	50.3		48.3	

PROJECT: Little Walnut Road Reconstruction Project SITE: Trail Ridge Road to Cleveland Mine Road Silver City, New Mexico	4450 Bataan Memorial E Las Cruces, NM	PROJECT NUMBER: 68205028 CLIENT: Bohannon-Huston Inc Las Cruces, New Mexico
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ATTERBERG LIMITS RESULTS

ASTM D4318

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS-AASHTO 68205028 LITTLE WALNUT ROAD.GPJ TERRACON_DATATEMPLATE.GDT 4/1/21



Boring ID	Depth	LL	PL	PI	Fines	AASHTO	Description
● CBR-1	0 - 5	31	14	17	37.5	A-6 (2)	CLAYEY SAND with GRAVEL
⊠ CBR-2	0 - 5	32	14	18	30.6	A-2-6 (1)	CLAYEY SAND with GRAVEL
▲ CBR-3	0 - 5	27	15	12	27.6	A-2-6 (0)	CLAYEY SAND with GRAVEL
★ B-1	2.5 - 3.5	25	18	7	21.1	A-2-4 (0)	SILTY, CLAYEY SAND with GRAVEL
⊙ B-2	5 - 5.9	29	13	16	19.6	A-2-6 (0)	CLAYEY GRAVEL with SAND
⊕ B-3	0.6 - 0.9	20	14	6	25.1	A-2-4 (0)	SILTY, CLAYEY SAND
○ B-4	5 - 6.5	26	15	11	17.1	A-2-6 (0)	CLAYEY SAND with GRAVEL
△ B-5	0.4 - 0.8	24	15	9	17.2	A-2-4 (0)	CLAYEY SAND with GRAVEL
⊗ B-6	5 - 6.5	26	17	9	24.9	A-2-4 (0)	CLAYEY SAND with GRAVEL
⊕ B-7	0.2 - 0.5	24	16	8	20.8	A-2-4 (0)	CLAYEY SAND with GRAVEL
□ B-8	2.5 - 4	40	16	24	15.4	A-2-6 (0)	CLAYEY GRAVEL with SAND
⊕ B-9	0.5 - 0.8	23	15	8	22.0	A-2-4 (0)	CLAYEY SAND with GRAVEL
⊕ B-10	2.5 - 4	33	13	20	18.8	A-2-6 (0)	CLAYEY SAND with GRAVEL
★ B-11	5 - 5.1	39	14	25	32.9	A-2-6 (3)	CLAYEY SAND with GRAVEL
⊗ B-12	2.5 - 4	30	13	17	48.3	A-6 (4)	CLAYEY SAND

PROJECT: Little Walnut Road Reconstruction Project
 SITE: Trail Ridge Road to Cleveland Mine Road
 Silver City, New Mexico



PROJECT NUMBER: 68205028
 CLIENT: Bohannon-Huston Inc
 Las Cruces, New Mexico

Summary of Laboratory Results

BORING ID	Depth (Ft.)	Soil Classification USCS & AASHTO	Water Content (%)	Liquid Limit	Plasticity Index	% Fines	% Sand	% Gravel
CBR-1	0 - 5	CLAYEY SAND with GRAVEL(SC) / A-6 (2)	4	31	17	37.5	47.0	15.5
CBR-2	0 - 5	CLAYEY SAND with GRAVEL(SC) / A-2-6 (1)	2	32	18	30.6	45.0	24.4
CBR-3	0 - 5	CLAYEY SAND with GRAVEL(SC) / A-2-6 (0)	6	27	12	27.6	50.7	21.7
B-1	2.5 - 3.5	SILTY, CLAYEY SAND with GRAVEL(SC-SM) / A-2-4 (0)	4	25	7	21.1	47.7	31.2
B-2	5 - 5.917	CLAYEY GRAVEL with SAND(GC) / A-2-6 (0)	5	29	16	19.6	31.9	48.5
B-3	0.583 - 0.916	SILTY, CLAYEY SAND(SC-SM) / A-2-4 (0)	6	20	6	25.1	71.4	3.5
B-4	5 - 6.5	CLAYEY SAND with GRAVEL(SC) / A-2-6 (0)	5	26	11	17.1	43.9	39.0
B-5	0.417 - 0.75	CLAYEY SAND with GRAVEL(SC) / A-2-4 (0)	8	24	9	17.2	62.0	20.8
B-6	5 - 6.5	CLAYEY SAND with GRAVEL(SC) / A-2-4 (0)	9	26	9	24.9	46.8	28.3
B-7	0.167 - 0.5	CLAYEY SAND with GRAVEL(SC) / A-2-4 (0)	6	24	8	20.8	58.4	20.8
B-8	2.5 - 4	CLAYEY GRAVEL with SAND(GC) / A-2-6 (0)	5	40	24	15.4	38.5	46.0
B-9	0.5 - 0.833	CLAYEY SAND with GRAVEL(SC) / A-2-4 (0)	4	23	8	22.0	55.8	22.3
B-10	2.5 - 4	CLAYEY SAND with GRAVEL(SC) / A-2-6 (0)	9	33	20	18.8	50.5	30.8
B-11	5 - 5.083	CLAYEY SAND with GRAVEL(SC) / A-2-6 (3)	7	39	25	32.9	44.2	22.9
B-12	2.5 - 4	CLAYEY SAND(SC) / A-6 (4)	10	30	17	48.3	50.3	1.4

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT_68205028 LITTLE WALNUT ROA.GPJ TERRACON_DATATEMPLATE.GDT 4/1/21

PROJECT: Little Walnut Road Reconstruction Project

SITE: Trail Ridge Road to Cleveland Mine Road
Silver City, New Mexico



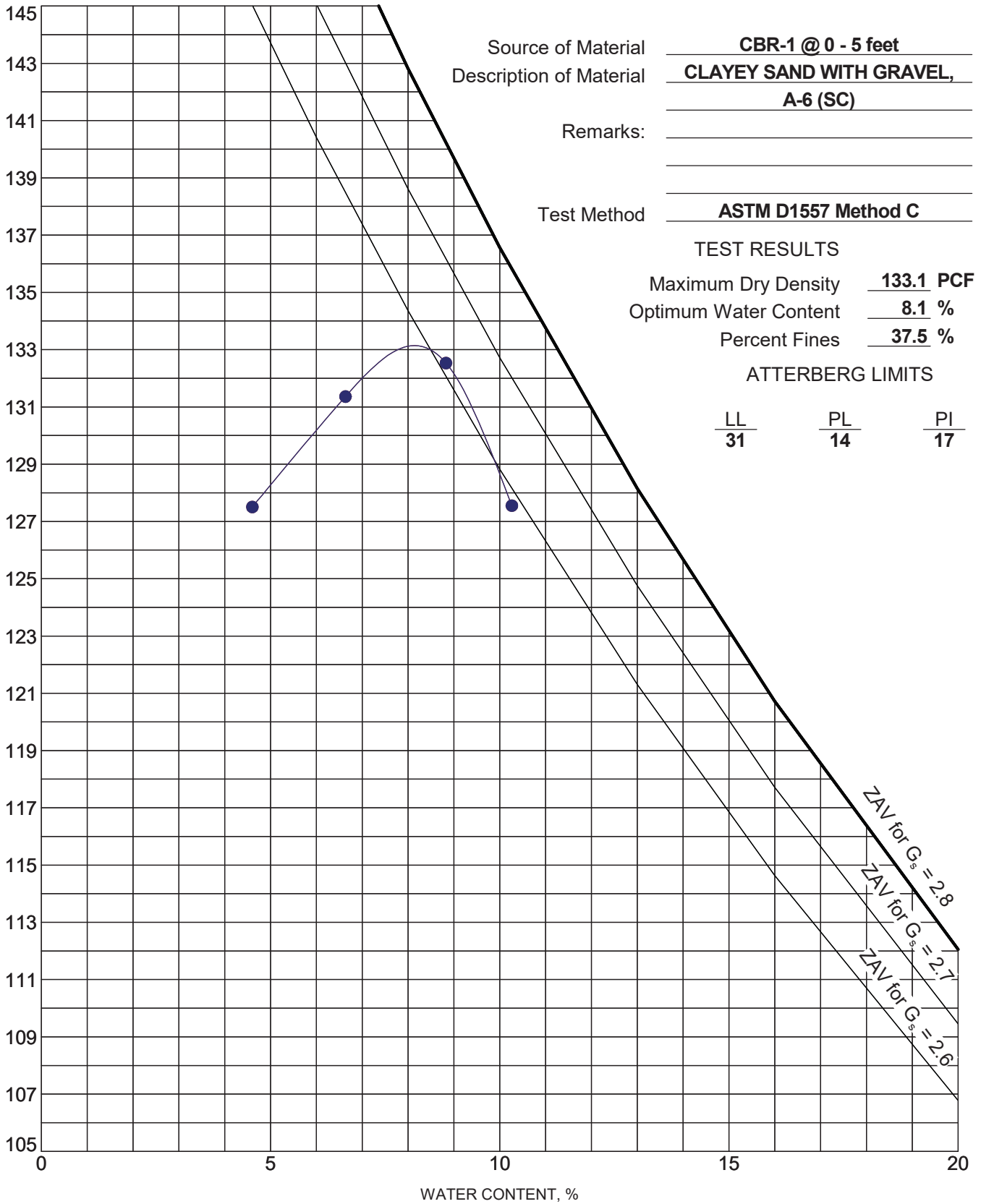
PROJECT NUMBER: 68205028

CLIENT: Bohannon-Huston Inc
Las Cruces, New Mexico

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V1 68205028 LITTLE WALNUT ROA.GPJ TERRACON_DATATEMPLATE.GDT 4/1/21



Source of Material CBR-1 @ 0 - 5 feet
 Description of Material CLAYEY SAND WITH GRAVEL, A-6 (SC)
 Remarks: _____
 Test Method ASTM D1557 Method C

PROJECT: Little Walnut Road Reconstruction Project

SITE: Trail Ridge Road to Cleveland Mine Road
 Silver City, New Mexico



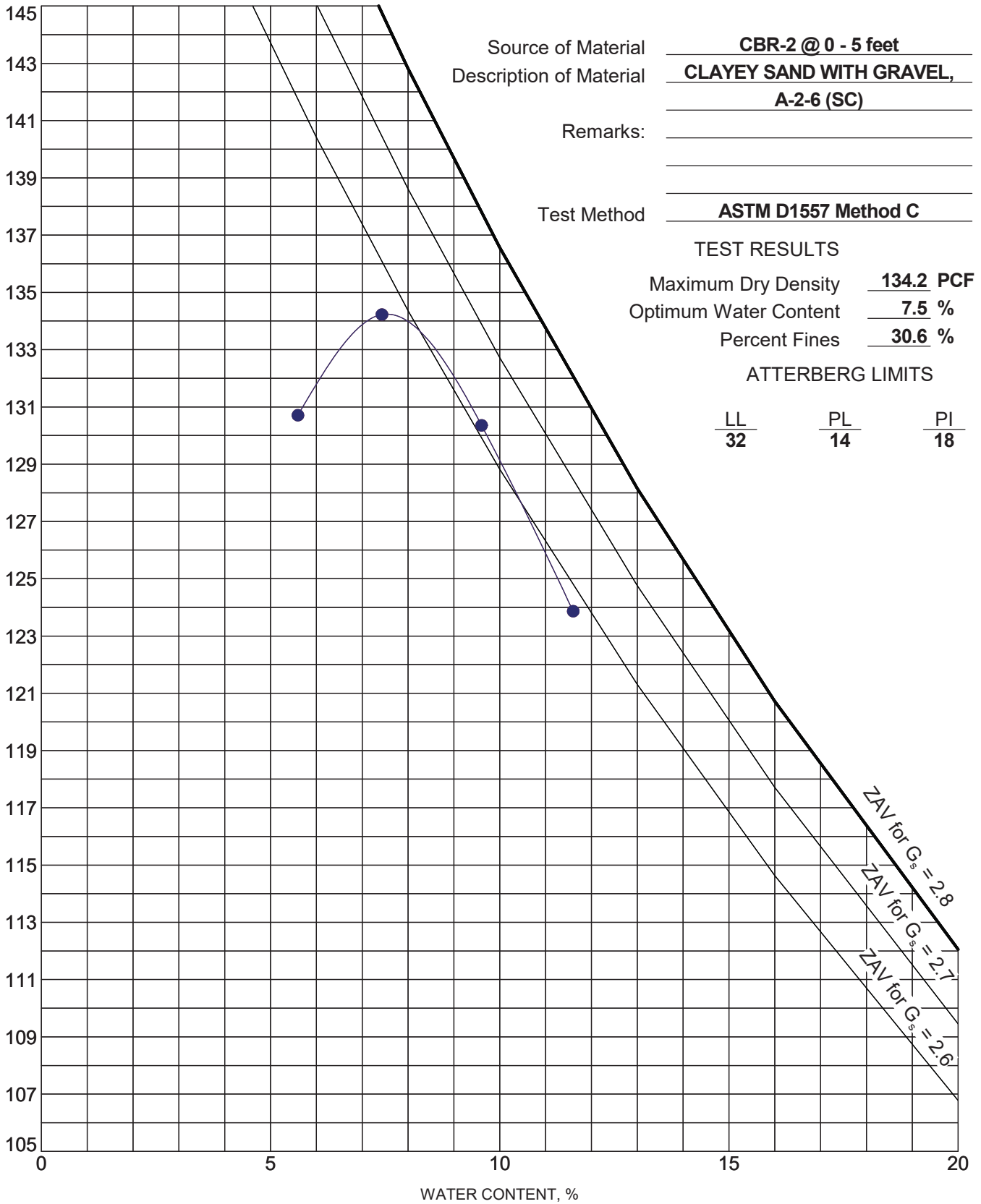
PROJECT NUMBER: 68205028

CLIENT: Bohannon-Huston Inc
 Las Cruces, New Mexico

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V1 68205028 LITTLE WALNUT ROA.GPJ TERRACON_DATATEMPLATE.GDT 4/1/21



Source of Material CBR-2 @ 0 - 5 feet
 Description of Material CLAYEY SAND WITH GRAVEL, A-2-6 (SC)
 Remarks: _____
 Test Method ASTM D1557 Method C

TEST RESULTS

Maximum Dry Density 134.2 PCF
 Optimum Water Content 7.5 %
 Percent Fines 30.6 %

ATTERBERG LIMITS

LL	PL	PI
<u>32</u>	<u>14</u>	<u>18</u>

PROJECT: Little Walnut Road Reconstruction Project

SITE: Trail Ridge Road to Cleveland Mine Road
 Silver City, New Mexico



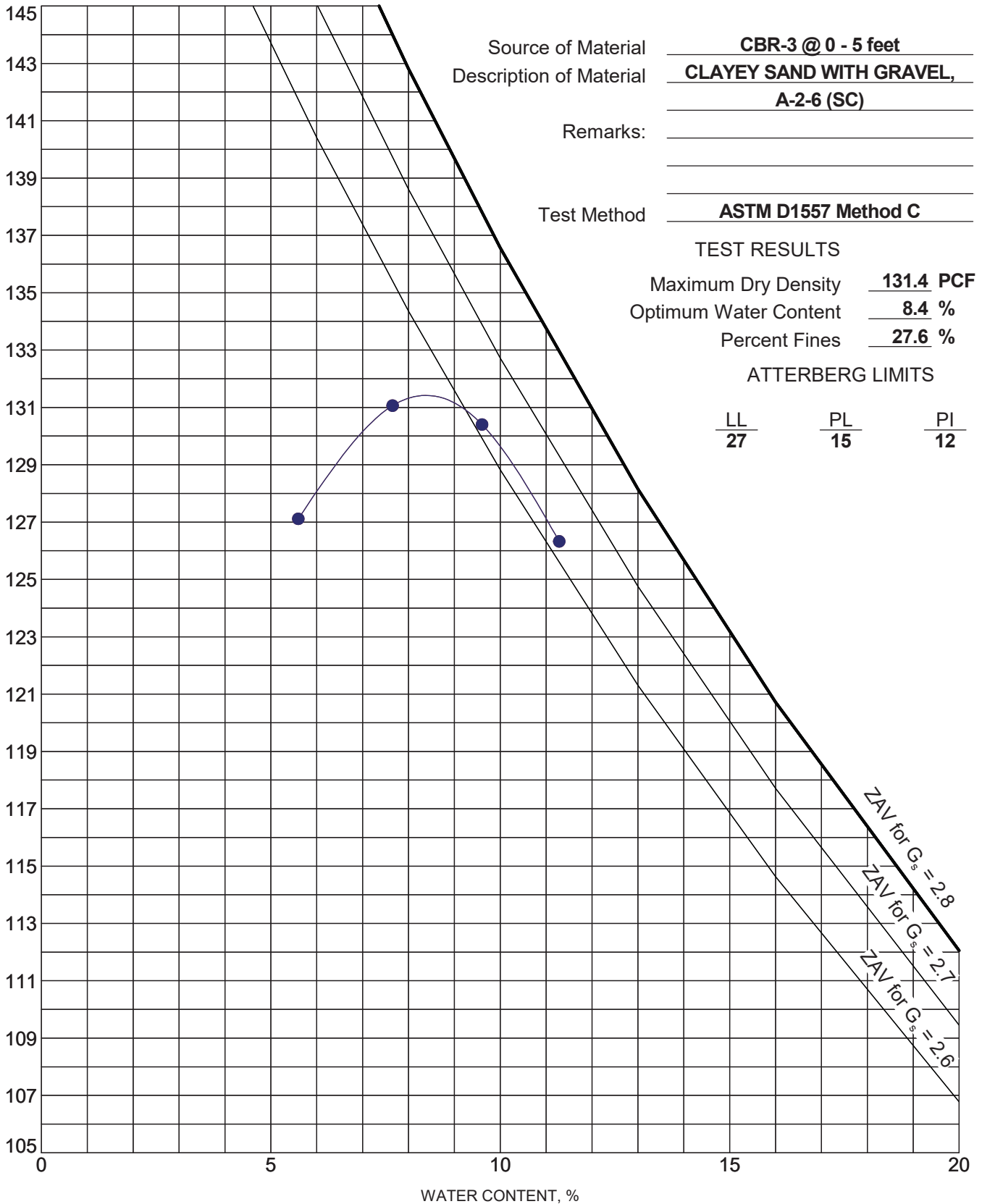
PROJECT NUMBER: 68205028

CLIENT: Bohannon-Huston Inc
 Las Cruces, New Mexico

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V1 68205028 LITTLE WALNUT ROA.GPJ TERRACON_DATATEMPLATE.GDT 4/1/21



Source of Material CBR-3 @ 0 - 5 feet
 Description of Material CLAYEY SAND WITH GRAVEL, A-2-6 (SC)
 Remarks: _____
 Test Method ASTM D1557 Method C

PROJECT: Little Walnut Road Reconstruction Project

SITE: Trail Ridge Road to Cleveland Mine Road
 Silver City, New Mexico



PROJECT NUMBER: 68205028

CLIENT: Bohannon-Huston Inc
 Las Cruces, New Mexico

REPORT OF CALIFORNIA BEARING RATIO TEST (ASTM D1883-07)

SAMPLE ID: CBR-1
 SAMPLE LOCATION:
 DATE SAMPLED: 2/2/2021
 SAMPLE DEPTH: 0' to 5'
 SOIL DESCRIPTION: Clayey Sand with Gravel

MOISTURE-DENSITY RELATIONSHIP DETERMINED BY:

ASTM D1557 Method C
 ASTM D698 Method

CBR SAMPLE PREPARATION PROCEDURE:

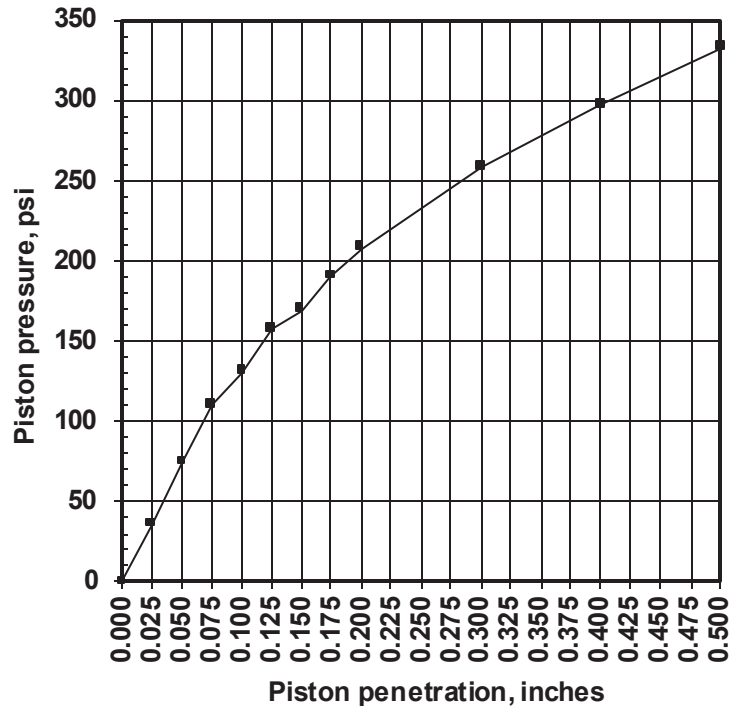
At 100% of maximum dry density and w_{opt}
 At 95% of maximum dry density and w_{opt}

USCS Classification: SC

CBR TEST RESULTS (UNCORRECTED)

Soil Pen. (in)	Load (lbs)	Stress (psi)
0.000	0	0
0.025	112	36
0.050	233	74
0.075	345	110
0.100	411	131
0.125	495	158
0.150	532	169
0.175	598	190
0.200	654	208
0.300	812	259
0.400	934	297
0.500	1046	333

Penetration Curve
 Correction (in) = 0



PROCTOR INFORMATION

MAXIMUM DRY DENSITY (MDD): 133.1 pcf
 OPTIMUM MOISTURE CONTENT (OMC): 8.1 %

CBR RESULTS

CBR DATE TESTED: 3/15/2021
 CBR COMPACTION EFFORT: 16 blows per lift
 CBR SPECIMEN PRE-SOAK DRY DENSITY: 127.6 pcf
 PERCENT COMPACTION OF PRE-SOAK CBR SPECIMEN: 95.9 % of MDD
 CBR SPECIMEN PRE-SOAK MOISTURE: 8.1 %
 POST-SOAK DRY DENSITY (96-hr): 125.3 pcf
 POST-SOAK MOISTURE (96-hr): 11.8 %
 ONE-DIMENSIONAL SWELL (96-hr): 0.46 %
 ONE-DIMENSIONAL CONSOLIDATION (96-hr): 0.00 %
 CBR at 0.1" PENETRATION: 13 (UNCORRECTED)
 CBR at 0.2" PENETRATION: 13
DESIGN CBR (CORRECTED): 13



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 El Paso, Texas 79925
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 915-779-8301 FAX
terracon.com

CBR TEST RESULTS (ASTM D1883-07)

TERRACON PROJECT NUMBER 68205028
 LITTLE WALNUT ROAD RECONSTRUCTION PROJECT
 LITTLE WALNUT ROAD FROM TRAIL RIDGE ROAD TO
 CLEVELAND MINE ROAD
 SILVER CITY, NEW MEXICO

REPORT OF CALIFORNIA BEARING RATIO TEST (ASTM D1883-07)

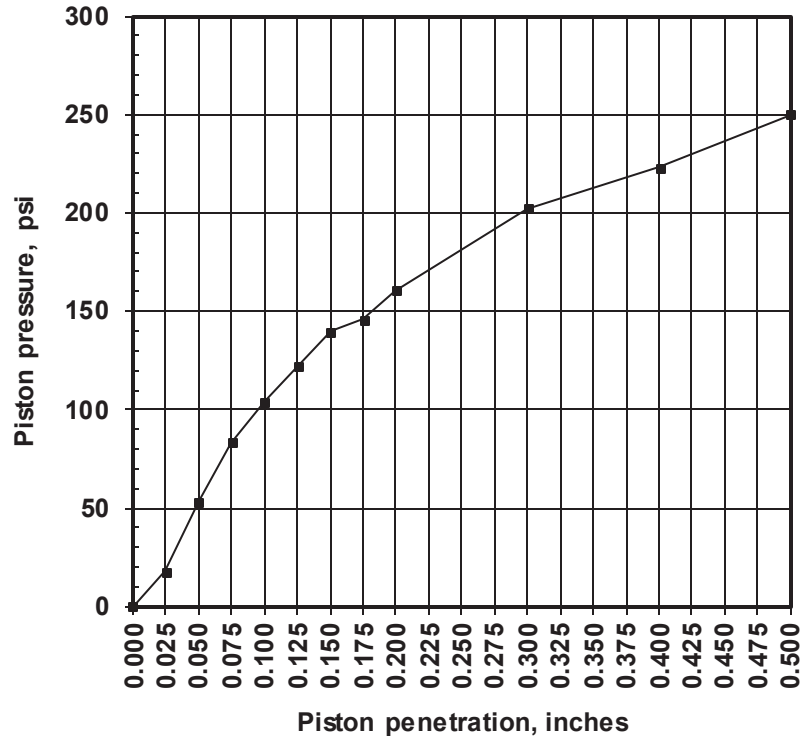
SAMPLE ID: CBR-2
 SAMPLE LOCATION:
 DATE SAMPLED: 2/2/2021
 SAMPLE DEPTH: 0' to 5'
 SOIL DESCRIPTION: Clayey Sand with Gravel
 USCS Classification: SC

MOISTURE-DENSITY RELATIONSHIP DETERMINED BY:
 ASTM D1557 Method C
 ASTM D698 Method _____

CBR SAMPLE PREPARATION PROCEDURE:
 At 100% of maximum dry density and w_{opt}
 At 95% of maximum dry density and w_{opt}

CBR TEST RESULTS (UNCORRECTED)

Soil Pen. (in)	Load (lbs)	Stress (psi)
0.000	0	0
0.025	56	18
0.050	168	54
0.075	261	83
0.100	327	104
0.125	383	122
0.150	439	140
0.175	458	146
0.200	504	161
0.300	635	202
0.400	700	223
0.500	784	250



Penetration Curve
 Correction (in) = 0

PROCTOR INFORMATION

MAXIMUM DRY DENSITY (MDD): 134.2 pcf
 OPTIMUM MOISTURE CONTENT (OMC): 7.5 %

CBR RESULTS

CBR DATE TESTED: 3/15/2021
 CBR COMPACTION EFFORT: 16 blows per lift
 CBR SPECIMEN PRE-SOAK DRY DENSITY: 126.9 pcf
 PERCENT COMPACTION OF PRE-SOAK CBR SPECIMEN: 94.5 % of MDD
 CBR SPECIMEN PRE-SOAK MOISTURE: 9.2 %
 POST-SOAK DRY DENSITY (96-hr): 125.4 pcf
 POST-SOAK MOISTURE (96-hr): 11.7 %
 ONE-DIMENSIONAL SWELL (96-hr): 0.35 %
 ONE-DIMENSIONAL CONSOLIDATION (96-hr): 0.00 %
 CBR at 0.1" PENETRATION: 10 (UNCORRECTED)
 CBR at 0.2" PENETRATION: 10
DESIGN CBR (CORRECTED): 10



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CBR TEST RESULTS (ASTM D1883-07)

TERRACON PROJECT NUMBER 68205028
 LITTLE WALNUT ROAD RECONSTRUCTION PROJECT
 LITTLE WALNUT ROAD FROM TRAIL RIDGE ROAD TO
 CLEVELAND MINE ROAD
 SILVER CITY, NEW MEXICO

REPORT OF CALIFORNIA BEARING RATIO TEST (ASTM D1883-07)

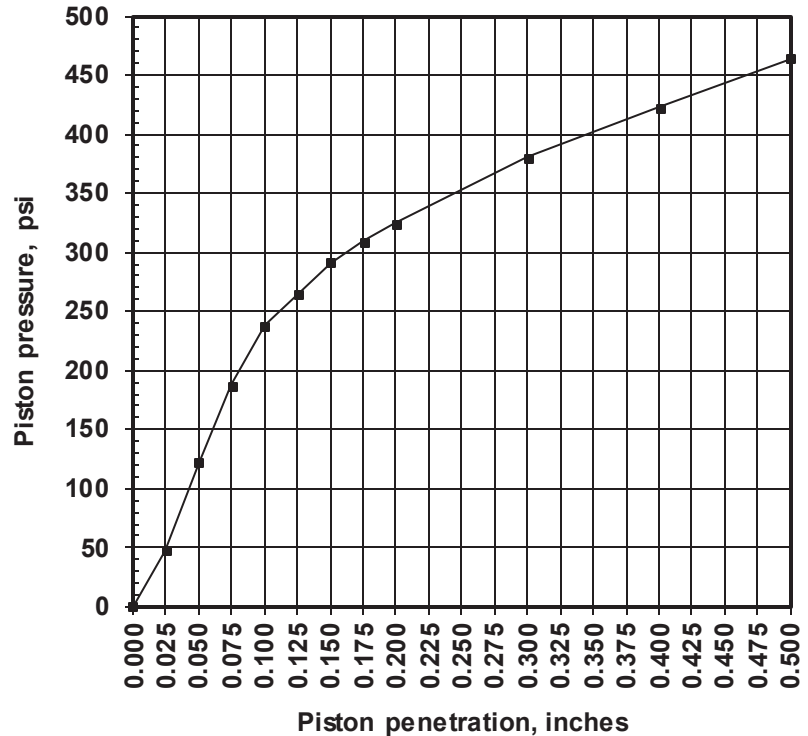
SAMPLE ID: CBR-3
 SAMPLE LOCATION:
 DATE SAMPLED: 2/2/2021
 SAMPLE DEPTH: 0' to 5'
 SOIL DESCRIPTION: Clayey Sand with Gravel
 USCS Classification: SC

MOISTURE-DENSITY RELATIONSHIP DETERMINED BY:
 ASTM D1557 Method C
 ASTM D698 Method _____

CBR SAMPLE PREPARATION PROCEDURE:
 At 100% of maximum dry density and w_{opt}
 At 95% of maximum dry density and w_{opt}

CBR TEST RESULTS (UNCORRECTED)

Soil Pen. (in)	Load (lbs)	Stress (psi)
0.000	0	0
0.025	149	48
0.050	383	122
0.075	588	187
0.100	747	238
0.125	831	265
0.150	915	291
0.175	971	309
0.200	1018	324
0.300	1195	380
0.400	1326	422
0.500	1457	464



Penetration Curve
 Correction (in) = 0

PROCTOR INFORMATION

MAXIMUM DRY DENSITY (MDD): 131.4 pcf
 OPTIMUM MOISTURE CONTENT (OMC): 8.4 %

CBR RESULTS

CBR DATE TESTED: 3/15/2021
 CBR COMPACTION EFFORT: 14 blows per lift
 CBR SPECIMEN PRE-SOAK DRY DENSITY: 124.5 pcf
 PERCENT COMPACTION OF PRE-SOAK CBR SPECIMEN: 94.7 % of MDD
 CBR SPECIMEN PRE-SOAK MOISTURE: 9.0 %
 POST-SOAK DRY DENSITY (96-hr): 123.9 pcf
 POST-SOAK MOISTURE (96-hr): 12.0 %
 ONE-DIMENSIONAL SWELL (96-hr): 0.35 %
 ONE-DIMENSIONAL CONSOLIDATION (96-hr): 0.00 %
 CBR at 0.1" PENETRATION: 23 (UNCORRECTED)
 CBR at 0.2" PENETRATION: 21
DESIGN CBR (CORRECTED): 21



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CBR TEST RESULTS (ASTM D1883-07)

TERRACON PROJECT NUMBER 68205028
 LITTLE WALNUT ROAD RECONSTRUCTION PROJECT
 LITTLE WALNUT ROAD FROM TRAIL RIDGE ROAD TO
 CLEVELAND MINE ROAD
 SILVER CITY, NEW MEXICO

AASHTO 1993 ESAL Calculator for Flexible Pavements

Vehicle Description	Traffic Volume			Analysis Period (years)	Axle Load and Type				Gross Weight (pounds)	Equivalency Factors			ESAL's		
	Quantity in the Design Lane	Days per Week	Weeks per Year		Axle 1 (kips)		Axle 2 (kips)			Axle 3 (kips)	Axle 1	Axle 2		Axle 3	
Passenger car	472	7	52	20	2	S	2	S		4,000	0.0002	0.0002	0	1,374	
Pick-up truck or van	472	7	52	20	2	S	4	S		6,000	0.0002	0.002	0	7,560	
Recreational vehicle					4	S	4	S		8,000	0.002	0.002	0	0	
School bus					6	S	14	S		20,000	0.011	0.354	0	0	
TARC bus	2	7	52	20	8	S	14	S		22,000	0.036	0.354	0	5,678	
Greyhound MC-12 bus					13.4	S	18.4	S	6	S	37,800	0.3045	1.112	0.011	0
Package delivery truck	14	7	52	20	4	S	14	S		18,000	0.002	0.354	0	36,284	
Beverage delivery truck					6	S	12	S	12	S	30,000	0.011	0.189	0.189	0
Garbage/dumpster truck					20	S	35	T		55,000	1.56	1.23	0	0	
Concrete truck (full)					20	S	48	R		68,000	1.56	1.015	0	0	
Dump truck (full)					20	S	48	R		68,000	1.56	1.015	0	0	
Semi-tractor (no trailer)					8	S	2	T		10,000	0.036	0	0	0	
Semi-tractor trailer (empty)					8	S	8	T	6	T	22,000	0.036	0.003	0.001	0
Semi-tractor trailer	3	7	52	20	12	S	34	T	34	T	80,000	0.189	1.08	1.08	51,302
User Defined					6	S	29	s	20	T	55,000	0.011	7.99	0.124	0
User Defined					8	S	8	T		T	16,000	0.036	0.003	0	0
Vehicle type H10					4	S	16	S			20,000	0.002	0.613	0	0
Vehicle type H15					6	S	24	S			30,000	0.011	3.43	0	0
Vehicle type H20					8	S	32	S			40,000	0.036	12.4	0	0
Vehicle type 3					16	S	34	T			50,000	0.613	1.08	0	0
Vehicle type HS15					6	S	24	S	24	S	54,000	0.011	3.43	3.43	0
Vehicle type HS20					8	S	32	S	32	S	72,000	0.036	12.4	12.4	0
Vehicle type 3S2					10	S	31	T	31	T	72,000	0.09	0.7445	0.7445	0

Terminal Serviceability, r_t	2.0
Assumed Structural Number, SN	3
Traffic Growth Rate, %/yr	0

Summary:	Total AASHTO ESAL's		102,198
	Superpave		ESAL Class 1
	Traffic Category	Little Walnut Road Reconstruction	

Project: Little Walnut Road Reconstruction Project

Location:

Silver City, New Mexico

Job No.: 68205028

Date:

4/1/2021



Pavement Design

(AASHTO 1993 Method)

Design Inputs

	<u>Asphalt</u>		<u>Concrete</u>
Sugrade Support	CBR = 2		
Reliability	Mr = 4000	psi	k = 90
Standard Deviation	So = 0.44	%	pci
Initial Serviceability	Po = 4.2		65
Terminal Serviceability	Pt = 2.0		65
Design Serviceability Loss,	Δ PSI = 2.2		3.35

Layer Coefficients:

AC Surface and Binder	a ₁ =	0.44
Aggregate Base	a ₂ =	0.11

Concrete Compressive Strength =	4000	psi
Modulus of Elasticity of Concrete =	3,600	ksi
Modulus of Rupture of Concrete: =	580	
Load Transfer ("J" Factor) =	3.2	
Drainage Coefficient =	1.0	

Asphalt Section Traffic (18 kip ESAL) = Little Walnut Road Reconstruction
102,198

Asphalt Pavement Section

	<u>Drainage, m</u>			
AC Surface + Binder		4.5	in.	
Aggregate Base	1.0	6.0	in.	

Structural Number: 2.64

Structural Number - Required 2.54

Concrete Section Traffic (18 kip ESAL) = Little Walnut Road Reconstruction Project
0

Concrete Pavement Section 5.0 in.

Project: Little Walnut Road Reconstruction Project Location: Silver City, New Mexico

Project No. 68205028

Date: 04/06/21



SUPPORTING INFORMATION

Contents:

General Notes







Unified Soil Classification System

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

Little Walnut Road Reconstruction Project ■ Silver City, New Mexico
Terracon Project No. 68205028



SAMPLING	WATER LEVEL	FIELD TESTS
 Grab Sample  Split Spoon	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	(N) Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer (UC) Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See [Exploration and Testing Procedures](#) in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (tsf)	Standard Penetration or N-Value Blows/Ft.
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^E	GW	Well-graded gravel ^F	
			$Cu < 4$ and/or $[Cc < 1$ or $Cc > 3.0]$ ^E	GP	Poorly graded gravel ^F	
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}	
			Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}	
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^E	SW	Well-graded sand ^I	
			$Cu < 6$ and/or $[Cc < 1$ or $Cc > 3.0]$ ^E	SP	Poorly graded sand ^I	
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G, H, I}	
			Fines classify as CL or CH	SC	Clayey sand ^{G, H, I}	
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	$PI > 7$ and plots on or above "A"	CL	Lean clay ^{K, L, M}	
			$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay ^{K, L, M, N}
			Liquid limit - not dried			Organic silt ^{K, L, M, O}
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above "A" line	CH	Fat clay ^{K, L, M}	
			PI plots below "A" line	MH	Elastic Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K, L, M, P}
			Liquid limit - not dried			Organic silt ^{K, L, M, Q}
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat	

^A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

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

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

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

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

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

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

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

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

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

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

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.

