Addendum No. 1
Las Acequias de Las Trampas Flume Rehabilitation Project

This addendum is issued to reflect the following changes to the contract documents dated May 6, 2024. This Addendum is effective January 17, 2025. It shall be the responsibility of all bidders to adhere to any changes or revisions to the Las Acequias de Las Trampas Flume Rehabilitation Project as identified in Addendum No. 1. This documentation shall become a part of the Contract Documents.

1. The sign-in sheet for the mandatory pre-bid meeting for **Thursday, January 16, 2025, is attached.**
2. Question: Is a traffic control plan required?
3. Answer: Yes, please see page Spec2, Construction Specification 8 – Mobilization & Demobilization, 4. Items of work and construction details which includes traffic control requirements. On sheet G1 of the construction drawings, in the Bid Schedule, the specification number for Bid Item No. 3 – Traffic Control Plan shall be changed from 9 to 8.
4. Question: Is the proposed structure located in the existing right of way for State Highway 76?

   Answer: The proposed structures, including the outlet structure for the flume, are located approximately 31' from the highway centerline and are outside of the existing highway right of way (30' offset from road centerline, as shown in attached plat from NMDOT). However, it is anticipated that the Contractor may need to temporarily excavate into the highway right of way, to install the proposed outlet structure. At a minimum, the Contractor will need to obtain a Traffic Control/Roadway Work Permit for implementation of the Contractor's approved Traffic Control Plan. It will be the responsibility of the Contractor to contact NMDOT and obtain applicable permits if the Contractor must cause temporary disturbance to the highway right of way for completion of the work in the contract documents.

5. The geotechnical engineering study referenced in the construction drawings was performed by YeDoma Consultants LLC, dated January 15, 2024 and is attached to this Addendum.

6. A list of Contractor Required submittals is provided in the following summary table:

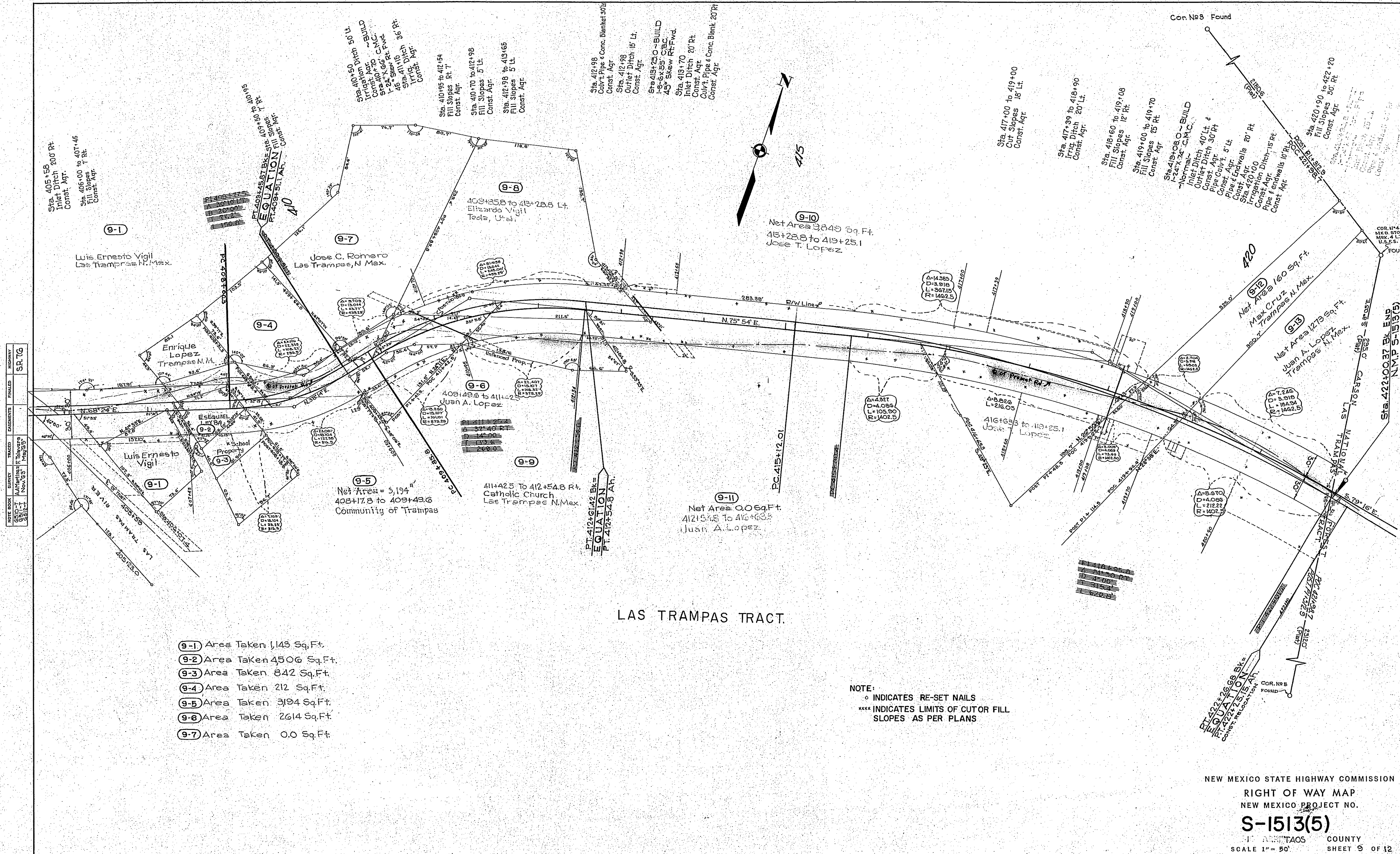
CONTRACTOR REQUIRED SUBMITTALS	
Spec. No.	**Submittal**
8	TRAFFIC CONTROL PLAN
483	LOG SOURCE
319	RIVER ROCK MATERIAL
319	MORTAR
S-IV	REINFORCING STEEL
S-IV	STRUCTURAL CONCRETE MIX
S-IV	STRUCTURAL CONCRETE (5 TEST CYLINDERS)
S-I.D	FOUNDATION COMPACTION TESTING
S-V	STRUCTURAL STEEL AND HARDWARE

SIGN-IN SHEET

PRE-BID MEETING
LAS ACEQUIAS DE LAS TRAMPAS
FLUME REHABILITATION PROJECT TRAMPAS, NM
11:00 AM @ SAN JOSE DE GRACIA CHURCH

NAME	AFFILIATION	EMAIL / PHONE
JOHN CRITCHFIELD	WJM ENGINEERS, INC.	john@wjmillerengineers.com / 505.983.7694
Tim Spalding /	C.J. Mead Const.	TimothySpalding2@gmail.com 505 944-6613
Robert Minnix	R. Minnix Const.	575 808 1304 silviaminnix@hotmail.com

MEETING ADJOURNED 1215 P



Cor. No 3 Found
Sta. 405+58 Inlet Ditch 200' Rt. Const. Agr.
Sta. 406+00 to 407+45 Fill Slopes 7' Rt. Const. Agr.
PT. 409+45.87 Bk.= EQUATION PT. 409+51.1 Ah.
Sta. 409+50 to 410+95 Fill Slopes 7' Rt. Const. Agr.
Sta. 410+95 to 412+54 Fill Slopes Rt. 7' Const. Agr.
Sta. 410+70 to 412+98 Fill Slopes 5' Lt. Const. Agr.
Sta. 412+98 to 413+65 Fill Slopes 5' Lt. Const. Agr.
Sta. 417+00 to 419+00 Cut Slopes 18' Lt. Const. Agr.
Sta. 417+39 to 418+90 Irrig. Ditch 20' Lt. Const. Agr.
Sta. 418+60 to 419+08 Fill Slopes 12' Rt. Const. Agr.
Sta. 419+00 to 419+70 Fill Slopes 25' Rt. Const. Agr.
Sta. 420+90 to 422+20 Fill Slopes 30' Rt. Const. Agr.
9-1 Luis Ernesto Vigil Las Trampas N. Mex.
9-7 Jose C. Romero Las Trampas, N Mex.
9-8 408+85.8 to 413+28.8 Lt. Elizardo Vigil Tada, Utah
9-10 Net Area 9,849 Sq. Ft. 413+28.8 to 419+25.1 Jose T. Lopez
9-4 Enrique Lopez Trampas N.M.
9-2 Esequiel
9-3 School Property
9-6 409+49.6 to 411+42.5 Juan A. Lopez
9-5 Net Area = 3,194 408+17.8 to 409+49.6 Community of Trampas
9-9 411+42.5 To 412+54.8 Rt. Catholic Church Las Trampas N.Mex.
PT. 412+61.42 Bk.= EQUATION PT. 412+54.8 Ah.
9-11 Net Area 0.0 Sq. Ft. 412+54.8 To 416+63.3 Juan A. Lopez
PC 415+12.01
N.75° 54' E.
R/W Line
9-12 Net Area 160 Sq. Ft. Max Cruz Trampas N. Mex.
9-13 Net Area 1,273 Sq. Ft. Juan A. Lopez Trampas N. Mex.
416+63.3 to 418+25.1 Jose T. Lopez
Sta. 422+00.37 Bk. End N.M.P. S-1513(5)
CARSON NATIONAL FOREST
LAS TRAMPAS RIVER
LAS TRAMPAS TRACT
PT. 422+26.68 Bk.= EQUATION PT. 422+25.15 Ah.
Cor. No 5 Found
9-1 Area Taken 1,143 Sq. Ft.
9-2 Area Taken 4506 Sq. Ft.
9-3 Area Taken 842 Sq. Ft.
9-4 Area Taken 212 Sq. Ft.
9-5 Area Taken 3194 Sq. Ft.
9-6 Area Taken 2614 Sq. Ft.
9-7 Area Taken 0.0 Sq. Ft.
NOTE:
o INDICATES RE-SET NAILS
xxxx INDICATES LIMITS OF CUT OR FILL SLOPES AS PER PLANS
NEW MEXICO STATE HIGHWAY COMMISSION
RIGHT OF WAY MAP
NEW MEXICO PROJECT NO.
S-1513(5)
TAOS COUNTY
SCALE 1" = 50'
SHEET 9 OF 12

Form No. A-66
New 03/13

NEW MEXICO DEPARTMENT OF TRANSPORTATION
(NMDOT)

TRAFFIC CONTROL/ROADWAY WORK PERMIT

NMDOT Project Number (If applicable):___________________________ **Control Number:** ___________

General Scope of work: ____

Contractor Name: ____

Contact Person: ____

Contact Telephone: (   )   - ________________________ Fax: (   )   - ________________________

Traffic Control Firm: ____

Certified Traffic Control Supervisor: ____________________

Contact Telephone: (   )   - ________________________ Fax: (   )   - ________________________

Work Zone Location Information:

Route: ____

Mile Post: From ____________________________ To: ____________________________________

Or Intersection: ____________________________ Intersection: ______________________________

Direction (NB, SB, EB, WB, or both): ____

☐ 2 lane Road ☐ 4 lane Road ☐ 6 lane Road ☐ 8 Lane Road ☐ Divided ☐ Undivided

Existing Speed limit in area: ___ MPH or Ranges from ___MPH to ___MPH

Proposed Speed Limit reduction within work zone (If Applicable):______________ MPH

Working Duration:

Start Date: ___________________________________ End Date :_______________________________

Daily Start Time_______________________________ End Time: _______________________________

Purpose of Permit:

- ☐ Roadway Construction/Rehab.
- ☐ Signal and Lighting Work
- ☐ Drainage/Excavation work
- ☐ Signing and Striping Placement
- ☐ Other: ____
- ☐ Shoulder Work
- ☐ Utility work
- ☐ Soil Testing

TCP Plan Enclosed ___ **(TC Permit will not be processed without a TCP plan)**

If no, describe why: ____

Approval is conditioned on the following terms that are deemed accepted by the Contractor upon submission of this Permit

1. Traffic Control for operations under this permit shall conform with the Manual on Uniform Traffic Control Devices (MUTCD).
2. The Contractor agrees to indemnify and hold harmless the NMDOT and its employees from liability, claims, damages losses or expenses due to any negligent act of the Contractor, the Contractor's employees, any agent acting on the Contractor's behalf, and anyone else engaged by the Contractor to work pursuant to this permit.
3. The Contractor shall provide the NMDOT a certified copy of the its insurance policy and certificate of insurance and shall include on the certificate of insurance the NMDOT as an additional-named insured, with notice that the coverage is primary over any other valid insurance.
4. Any additional conditions as attached and referenced below.

For Official Use:

☐ **Approved** (see conditions below) ☐ **Approved As Amended** ☐ **Not Approved**

☐ Contractor/TCP firm **SHALL** contact the District Office and confirm the actual start dates.

☐ TCP Firm and Contractor must adhere to the attached notes.

Permit Number: ______________ - ______________

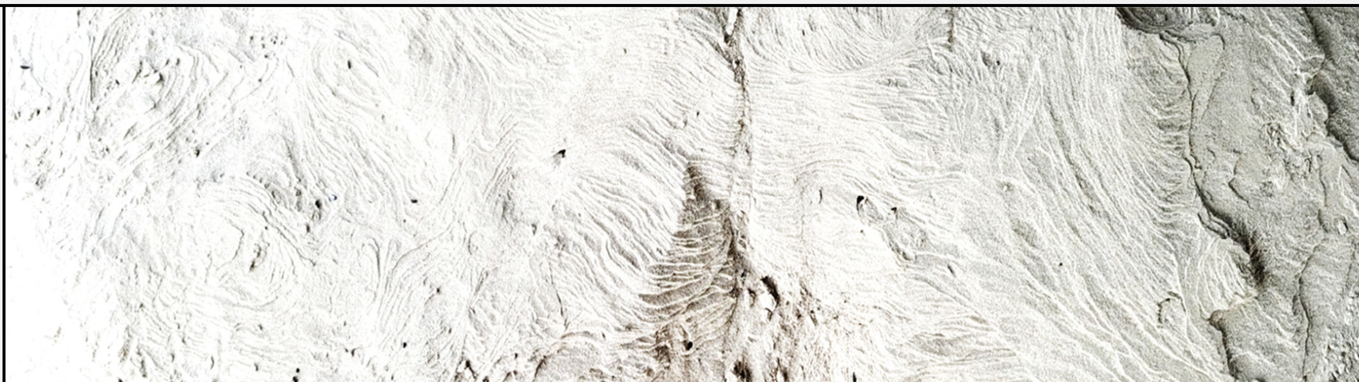
Approved By ____

NMDOT District Office – Traffic Section

Submitted to the District Public Information Officer By:____________________________ On:____/_____/_____

ACEQUIA DE LAS TRAMPAS GEOTECHNICAL REPORT
GEOTECHNICAL REPORT
TAOS COUNTY, NEW MEXICO

Publish Date: 1/15/2024



Submitted to:

William J Miller Engineers, Inc.
1511 3rd St, Santa Fe, NM 87505

Submitted By:

YeDoma Consultants, LLC

523 Louisiana Blvd SE

Albuquerque, NM 87108

1/15/2024

Attn: Mr. John Critchfield
Project Manager
William J Miller Engineers, Inc.
1511 3rd St, Santa Fe, NM 87505

Subject: Acequia de las Trampas Log Flume Rehabilitation Project

Dear Mr. Critchfield,

YeDoma Consultants, LLC (YeDoma) has completed our subsurface site investigations and soil report for the subject project. The geotechnical report herein is our final deliverable for the authorized Scope of Services.

Once again, we appreciate the opportunity to support this important water resource project. Should you have any questions or require additional information, please do not hesitate to contact me directly at 505-633-6841 or by email at jesse.reinikainen@akurta.com.

Respectively Submitted,

YeDoma Consultants, LLC.

JESSE REINIKAINEN
NEW MEXICO
19544
PROFESSIONAL CIVIL ENGINEER

Jesse Reinikainen, PE
Principal Geotechnical Engineer

Copies: Addressee (1)

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APPENDIX

1.0 INTRODUCTION

YeDoma Consultants, LLC. (YeDoma) was authorized by William J Miller Engineers, Inc. through a professional service contract to conduct geotechnical services. The project includes rehabilitating the Acequia de las Trampas Log Flume. The flume is located in Trampas, Taos County, NM. Refer to a Vicinity Map presented in the Appendix. The subsurface work conducted by YeDoma included probing, sampling, and geophysics. YeDoma considers the project to be feasible from a geotechnical viewpoint.

2.0 PROJECT DESCRIPTION

The project includes rehabilitating a two-span log flume spanning the Rio de las Trampas channel. The existing flume is characterized as a hand-hewn log open channel structure (log flume). The log flume is seated on a column of railroad ties (crib column). The column rests on a concrete spread footing substructure. A geotechnical project summary is presented in Table 1 for use as the basis of our geotechnical and foundation design analyses.

Table 1 Geotechnical Project Summary

Project Name: Acequia de las Trampas Log Flume Rehabilitation Project		
Type of Construction: Acequia Rehabilitation Project		
Client: William J Miller Engineers, Inc.	**Latitude**:36.131827	**Longitude:** -105.75542
Investigation Summary: Probing adjacent to Pier, Seismic Refraction Array along toe of roadway embankment. Subgrade sampling and laboratory testing of native soil material.		
Project Improvements (Major Features): **1.** Reconstruction of Acequia Segment /Grade Separated Log Flume		
Foundation Type Selection: Shallow footings are recommended with provisions for scour protection and maintaining positive drainage to divert water away from substructures.		
Classification System and Criteria	**Site Specific Descriptions**	Geotechnical Profile silty clayey sand overlying quartz monzonite bedrock.
OSHA	Soil Type B	
Unified Soil Classification	SC	
Corrosivity	Soils are moderately corrosive to corrosive	
Seismic Site Class	Type B (Weak Rock)	
Geotechnical/Foundation Design Criteria: 2021 International Building Code (IBC)		
S**ummary Information included in Geotechnical Report** **1.** Shallow footings with continuous reinforced slab is the preferred foundation type. **2.** Frost depth of 42 inches, which can be reduced to 30 inches by replacing the lower 12" of the subgrade with non-frost-susceptible structural backfill detail. **3.** Compaction Requirements: 95% of Standard Proctor (D698) conditioned at -2% to +3% of Optimum Moisture Content **4.** 12" Subbase composed of Crushed Aggregate Base Course (Free Draining). **5.** Native soils have deleterious material, oversize cobbles, and expansive clays (Not Suitable for Reuse). **6.** Seismic Site Classification:		
Construction Phase (Geotechnical Special Inspections Recommended): 1. Verify that construction excavations are at the proper depth and have reached proper subgrade material. 2. Compliance construction material testing to verify densities, lift thickness during placement and compaction of compacted fill. 3. Classify and test compacted fill material (Proctor, Index testing) 4. Verify adequacy of bottom of footings to meet design bearing resistance. 5. Inspect reinforcement and formwork for shape, location, and dimensions. 6. Verify use of required design mix, prepare concrete cylinders for strength testing, determine slump, volumetric air content, temperature of concrete brought to the site.		
Project Schedule: Subsurface investigation completed on December 18th, **Acquia Rehabilitation Construction:** TBD		

3.0 EXISTING SITE CONDITIONS

The existing conditions are included below.

3.1 Climate

A climatic summary is presented in Table 2. Seasonal variability and climatic factors (environmental effects) are key factors in design, construction, and future performance. For this project, the climate data from the Taos Station (Western Regional Climate Center, Station Number 298668) is referenced. This station is close to the project area and is only slightly lower in elevation compared to the project site (6,9890 ft).

The period of record is from 1892 to 2016. Average daily temperatures below freezing (accumulating freezing degree-days) are common during the months of January, February, and December.

Table 2: Climate Summary

Month	Average Total Precipitation (inches)	Average Total Snowfall, (inches)	Average Max. Temperature (°F)	Average Min. Temperature (°F)	Average Daily Temperature (°F)
January	0.68	6.8	40.2	10.1	25.2
February	0.64	5.7	45.6	16.6	31.1
March	0.83	4.5	53.5	23.3	38.4
April	0.91	1.8	63.1	29.8	46.5
May	1.18	0.5	72.2	37.7	55.0
June	0.91	0.0	82.2	45.7	64.0
July	1.65	0.0	58.7	51.1	54.9
August	1.84	0.0	83.6	50.0	66.8
September	1.28	0.0	76.8	42.7	59.8
October	1.06	0.7	66.1	32.0	49.1
November	0.72	2.9	52.8	21.1	37.0
December	0.65	6.6	41.6	12.1	26.9
Annual	**12.35**	**29.5**	**63.6**	**31.0**	**47.3**
Note: Data from the Western Regional Climate Center, based on unofficial values for station 298668.					

The precipitation increases from July to October relative to the rest of the year (monsoon season). Freezing temperatures may occur during the months of October to April. YeDoma developed a design freezing degree day index based on the National Operational Hydrologic Remote Sensing Center (NOHRSC) data set (refer to Appendix). We considered a 10-year historic period and based on the location; we estimated that the design accumulated air freezing degree-day for the project location is about 1350 °F-Days which had a peak in 2013.

YeDoma used a correction factor to convert the air freezing index to a surface index and determined the active layer for frost (design frost depth) is 42 inches.

3.2 Soils

Available Taos County soil maps were reviewed in our desktop study. The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) mapped the entire Taos County. A copy of the site-specific soil report was prepared for the project and included in the Appendix. The mapping occurred at a scale of 1:24,000 and was accessed by YeDoma staff through an online portal (Web Soil Survey) for the Acequia de las Trampas project location.

In our review, two main soil types, Chimayo-Rock outcrop complex, very steep and Manzano clay loam have been mapped in the study area. It is noted that the Chimayo-Rock outcrop complex is an indication of shallow bedrock conditions, and the clayey material is a weak strength material. Table 3 below gives a summary of the soil report.

Table 3: Soil Report Summary

Map Unit Name	Chimayo-Rock outcrop complex, very steep		Manzano clay loam
Complex Component	Chimayo	Rock Outcrop	Manzano
Slope	40 – 60%	N/A	3 – 5%
Symbol	CHG	CHG	MnC
Parent Material	Colluvium derived from granite and/or residuum weathered from granite	Colluvium derived from granite and/or residuum weathered from granite	Alluvium derived from igneous and metamorphic rock
Landforms	Mountain slopes	Mountain slopes	Arroyos
Drainage, Runoff	Well drained, very high runoff	Very high runoff	Well drained, medium runoff
Transmissivity	Very low to moderately low (0.00 – 0.06 in/hr.)	Very low to moderately low (0.00 – 0.06 in/hr.)	Moderately High (2.00 – 6.00 in/hr.)
Salinity	Nonsaline to very slightly saline	N/A	Nonsaline to very slightly saline
Depth the restrictive feature	12 – 20 inches to lithic bedrock	0 inches to lithic bedrock	>80 inches
Plasticity	Low plasticity with PI Range (5 – 10)	N/A	Low to High plasticity with PI Range (12 – 25)
AASHTO Classification	A-2 / A-4	N/A	A-7-6 / A-6
Unified Classification System	CL-ML / SC-SM	N/A	CL / SC
Note: PI=Plasticity Index, NP=Sample Nonplastic, N/A=Data Not Available, ft= Feet, bgs=Below Ground Surface			

3.3 Groundwater

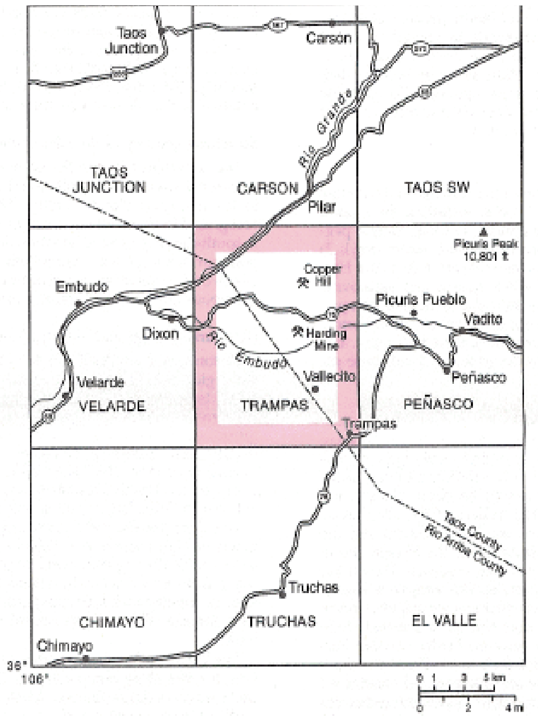
The State Engineer Office (OSE) well records were reviewed for the project. The OSE database has records of several wells within the project area. Four of the wells were considered for our review. Table 4 below presents a summary of the wells chosen for the Acequia de las Trampas project.

Table 4: OSE Well Summary

Water Right File No.	RG-49505	RG-50869	RG-62214	RG-78502
Borehole Proximity	350 ft SW of Site	200 ft SE of Site	500 ft NW of Site	1,000 ft South of Site
Date of Completion	07/1988	04/1990	05/1995	06/2003
Depth of Well, *ft bgs*	80	120	130	100
Depth to Static Water Level, *ft bgs*	20	70	84	32
Water-Bearing Formation	Sand & Gravel (50-80 ft bgs)	Sedimentary Rock (80-110 ft bgs)	Fractured Limestone (126-130 ft bgs)	Clay, sand & gravel (32-63 ft bgs)
Other Types of Material Encountered	Clay & Cobbles (0-25 ft bgs)	Caliche (2-16 ft bgs)	Gravel (0-23 ft bgs) Shale (46-86 ft bgs)	Decomposed granite & quartz (63-100 ft bgs)
Estimated Yield, *GPM*	15	10	7	12
Note: ft=Feet, bgs=Below Ground Surface, GPM=Gallons per Minute, N/A=Not Available				

3.4 Geologic Setting

Figure 1 Geologic Map area



Our desktop review of mapping of the area included a New Mexico Bureau of Mines and Mineral Resources map (Bauer, P.W and Helper, M.A, 1994) mapped at a scale of 1:24 000 or 1" =2000 feet. A vicinity map illustrating the mapped area in 1994 is presented in Figure 1-1 and an excerpt of the geologic map within the study area is presented in the Appendix. Typically, engineering projects are mapped at a much more detailed scale, therefore the mapping is considered general for use on the Trampas project used for context of understanding the geologic units present. In our experience Precambrian plutonic rocks, including monzonite and granodiorite are massive crystalline units that provide for a high bond strength.

af Artificial fill (latest Holocene)—Roadway compacted embankment fill. Unit **af** locally includes roadway corridor where the land surface was modified by earth-moving equipment. In these areas, the original geologic material cannot be recognized. Estimated thickness is 3-15 feet.

Qal Alluvium- unconsolidated clayey silty sand with gravel on floodplains and valley bottoms along modern drainages.

Td Santa Fe Group- Tesuque Formation- Dixon Member
Interbedded conglomerate, sandstone and mudrock, contains alluvial-fan and braided stream deposits.

p€pgp Puntiagudo granite porphyry- (Precambrian granitic plutonic rocks)- Quartz monzonite to granodiorite. Contact with Vadito Group schists.

4.0 SUBSURFACE INVESTIGATIONS

Subsurface investigations were conducted in December 2023. The work included probing, and sampling to determine subgrade strength and index properties of native soils. The subsurface probing conducted with a super heavy weight (DCP-SH) hammer was used to continuously log downhole conditions and depths of refusal, logging areas of weak loose/soft strata in the shallow subsurface. The probing equipment is referred to as a "Grizzly," it is a small track rig that is equipped with tooling that includes a standard penetration (140-pound hammer with 30" drop height) equivalent to 4200-lbs-inch of theoretical energy (DCP-SH) deployed with each consecutive blow. The Anvil is made of high strength steel and the fixed three-square inch cone has an apex angle of 90° The technique is referred to as "dynamic probing" and is standardized under British Standard BS 22476-2. The number of blows required to drive the penetrometer over 8" (N20) is used by YeDoma to log discrete layers in the subsurface, quantify the in-situ shear strength based on penetration resistance and determine depths for discrete sampling intervals for determining geotechnical parameters. Probing refusal is logged when bouncing hammer conditions prevail or if 20 consecutive blows penetrate less than four inches.

4.1 Geotechnical Dynamic Probing Investigation

YeDoma conducted a ground probing and sampling investigation on December 18th, 2023. The workplan was developed based on client communication, considering local, state, and regional standards and guidance documents and experience working on acequia projects in northern New Mexico. The probing work was conducted with a three-person crew under the oversight of a licensed geotechnical engineer. The work included continuous probing three locations (designated "GR-01") to refusal conditions and a twin hole to sample at various depths downhole with auger flights. Probing refusal was logged at 4.6 feet below the ground surface on bedrock. Table 5 presents a summary of the geotechnical investigation and the log is included in the Appendix.

Table 5: Subsurface Investigation Summary

ID	Elevation (feet)	Easting (Feet)	Northing (Feet)	Latitude (DD)	Longitude (DD)	Total Depth (feet)
GR-01	7452.7	1786441.5	1867630.7	36.1318517	-105.7554874	4.59
Note: Easting and Northing are Grid Coordinates (NAD 83) State Plane Coordinate Datum (3002) New Mexico Central Zone/Feet.						

5.0 LABORATORY TESTING

YeDoma's senior engineer provided final approval of the laboratory testing regime. The final testing regime was based on major soil type, and the local site conditions at the time of the investigation. The samples collected in the field were logged and transported to minimize disturbances and delivered to our AASHTO accredited laboratory in Albuquerque, New Mexico. The testing regime included AASHTO and ASTM test methods and standard procedures. The natural moisture content was preserved in the field using sealed tins and were evaluated per ASTM D2216. The index tests included determination of the particle size distribution per ASTM D6913, Atterberg limits including the Liquid and Plastic Limits per ASTM D4318. Evaluating the soil-moisture characteristics (soil subgrade strength and expansion pressure) was conducted under the R-value test per ASTM D2844. The drained shear strength was determined per ASTM D3080. Electrochemical testing per AASHTO T288 and T289.

5.1 Geotechnical Subgrade Testing

Material samples were collected in the field from auger flights and assigned to the ASTM and AASHTO test method regime to determine the index properties of the soil. Index properties (Sieve, PI, R-value, moisture content) are summarized in Table 6. Samples were collected at the surface up to four feet below existing profile grade elevations.

Table 6: Summary of Subgrade Test Results

Sample ID	Depth (feet)	Soil Description	LL (%)	PI	MC (%)	Soil Type (USCS)	Gravel (%)	Coarse Sand (%)	Med-Fine Sand (%)	Silt and Clay (%)
GR-01 222-01	0 to 3	Clayey sand with gravel	31	13	5.8	SC	36.1	8.0	30.9	25.0
GR-01 OKN	4	-	-	-	3.1	-	-	-	-	-
Note: MC=Moisture Content, PI=Plasticity Index, LL= Liquid Limit, NV=No Value, SNP=Sample Nonplastic										

5.1.1 R-Value Testing

YeDoma's R-value equipment includes a James Cox and Sons kneading compactor and 50-kip press. YeDoma conducted R-value tests per ASTM 2844, to evaluate the compressive and lateral resistance of native subgrade material. We rely on the R-value in evaluating the lateral strength of subgrade soil under a compressive load in determining settlement potential, bond strength, and expansion pressure. The test has multiple stages over three days, which includes prepping the sample, curing 12 hours, compacting, and testing the exudation test, placing the molds in frames for an additional 12-hour period to determine the expansion pressure of the compacted specimen, and finally on the third day, extracting the sample into the stabilometer and loading compressive force while logging the horizontal pressures and lateral strength at saturated conditions. The tests are conducted using LabVIEW software developed by Caltrans. The R-Value test summary is presented in Table 7 below and included in the Appendix.

Table 7: R-Value Summary

Sample ID	Location	Depth (feet)	R-Value
222-03	GR-01	0.5 to 3	48

5.1.2 Electrochemical Testing

The relative level of corrosiveness, commonly accepted by the engineering community (FHWA NHI-09-087) as indicated by resistivity levels, is included in Table 8 . The resistivity range is in the moderately corrosive to mildly corrosive ranges are chosen as lower bound values (assuming the material is assessed per AASHTO T288). Researchers have established a corelated increase in corrosion rate of 25 percent in each successive aggressiveness range (assuming all other environmental conditions remaining similar). It is noted that corrosive soil with respect to concrete cover over rebar is applicable to soil that has greater than 500 parts per million (ppm) of the chloride ions.

Table 8: Effect of Resistivity on Corrosion

Aggressiveness	Resistivity (Ω-cm)
Very Corrosive	<700
Corrosive	700 – 2,000
Moderately Corrosive	2,000 – 5,000
Mildly Corrosive	5,000 – 10,000
Non-Corrosive	> 10,000

As part of YeDoma's evaluation of site conditions, the soil resistivity and pH were assessed on representative subsurface samples, refer to Table 9 and individual test reports in the Appendix. The AASHTO T288 test method for resistivity includes saturating the soil sample with increasing moisture until the lowest resistivity value is reported. The pH was determined based on the AASHTO T289 test method. AASHTO T290 measures the water-soluble sulfate ion content in soil. AASHTO T291 measures the water-soluble chloride ion content in soil. The native soils are moderately corrosive to corrosive.

Table 9: Electrochemical Summary

Sample ID	ID	Soil Description	Depth (feet)	pH (SU)	Min. Resistivity (Ω-cm)
222-05	GR-01	Clayey sand with gravel	0 to 4	8.3	3290
***Note: SU=Standard Units*, Ω =ohm**					

5.1.3 Direct Shear Strength under Consolidated Loading

The drained shear strength was determined in the laboratory per ASTM D3080. The sand material was reconstituted, and three points were assessed by YeDoma's senior engineer to determine the failure envelope, apparent cohesion intercept and angle of shear resistance. The laboratory soil tests were prepared at a dry density of 118 pcf based on our experience with similar soils. The results are summarized in Table 10. The detailed test reports are included in the Appendix. The angle of shear resistance determined by YeDoma is consistent with published values for granular sand material.

Table 10: Direct Shear Test summary

Sample ID	ID	Laboratory Soil Test Initial Specimen Conditions	Depth (feet)	Angle of Shear Resistance (°)	Cohesion (psi)
222-04	GR-01	Silty Sand, Initial Dry Density 118 pcf at 9% MC	3 to 4	33.1	0.12

6.0 PRELIMINARY DESIGN ANALYSES, FINDINGS AND CONSTRUCTION CONSIDERATIONS

The foundation design conducted by YeDoma considered site specific conditions, information from the in-situ probing, laboratory testing, findings from our desktop study and experience with similar soils. In our evaluation, there is about 2.5 feet of subsurface material (bottom elevation of 6847 feet) which may be prone to shifting ground condition. We recommend that the

6.1 Seismic Design Parameters

The seismic design category and site class parameters were evaluated by YeDoma. Refer to a summary presented in Table 11. The upper 100 feet of soil is classified as Site Class "B", noted as S_B. We used a NAD83 Lat/Long Decimal

Degree coordinate for the site to determine the parameters for use in building code-based seismic design. Our evaluation is based on AASHTO 2009 Seismic Design Reference for 7% Probability of Exceedance in 75 years (1,000-year Return Period). The seismic risk at the site is minor, and the bridge is classified as within Seismic Zone 1 based on our understanding of the local site conditions.

Table 11: Seismic Design Parameters

PARAMETER	DESCRIPTION	VALUE
SITE COORDINATES	Latitude, decimal degrees	36.131827
	Longitude, decimal degrees	-105.75542
SITE CLASS	Soil Classification (Upper 100 feet)	Site Class "B"
PGA	Mapped Horizontal Peak Ground Acceleration, in units of g	0.094
F_{PGA}	Site coefficient from PGA	1.0
A_S	Design Peak Ground Acceleration, in units of g	0.094
S_S	mapped short-period (0.2 second) spectral acceleration, in units of g	0.222
S_1	Mapped One-second spectral acceleration, in units of g	0.071
F_V	Site coefficient for S1	1.0
S_{D1}	Design One-second spectral acceleration, in units of g	0.071
S_{DC}	Seismic Design Category	A
$S_{D1 < 0.15}$	Seismic Zone	1

6.2 Frost Depth

The design frost depth for the site based on climate data is twenty-four inches below the ground surface based on the AFI determined by YeDoma. Per IBC 2021 and ASCE 32-01 guide specifications, a portion of the depth to frost can be offset by removal of the frost susceptible material and replacement with non-frost susceptible (NFS) material in the subgrade. YeDoma recommends NFS material be used at the site and that the bottom of footing rest 30 inches below the adjacent ground surface. We recommend that structural foundations (footings) be protected from frost by one or more of following methods:

1. Extending footing below the frost line (42-inches)
2. Extending bottom footing to minimum depth (30-inches) and resting footing on NSF layer (12 inches of structural backfill).

6.3 Geotechnical Parameters for Design of Walls and Structures

In our evaluation of the existing soils, clayey material is present in the shallow subsurface condition. Our subsurface profile includes construction recommendations to remove and replace 12 inches of the material beneath the bottom of footing. Ultimate sliding resistance (friction) generated at the interface of concrete foundations and compacted onsite soils can be computed by multiplying the total dead weight structural load by a coefficient of 0.3. Ultimate passive resistance developed from lateral bearing of below-grade walls or foundations bearing against compacted backfill or undisturbed native soil can be estimated using the equivalent fluid pressure (EFP). Sliding resistance and passive pressure may be used together without reduction, when used with the safety factors recommended below. For static conditions, minimum factors of safety of 1.5 and 2.0 are recommended for foundation overturning and sliding, respectively. The factor of safety for sliding can be reduced to 1.5 if passive resistance is neglected. The factor of safety for transient (seismic, wind) conditions should be at least 1.1. We determined that there are two separate types of material within the project corridor, The soil units are discussed in the subsections below:

6.3.1 Subunit A

Subunit A material type is gravelly clayey sand, typically it is very loose to medium dense clayey sand.

6.3.2 Subunit B

Subunit B material is moderate to high strength bedrock.

Table 12: Geotechnical Design Parameters

Subunit	Estimated Thickness (feet)	Moist Unit Weight (pcf)	ϕ (º)	c' (psf)	K_o EFP (psf)	K_a EFP (psf)	K_p EFP (psf)	Description
Structural Backfill	1	135	32	0	60	40	425	Import aggregate base with up to 8% fines
Subunit A	4	130	33	-	55	35	278	Native Soil, loose to medium dense clayey sand
Subunit B	-	150	-	-	-	-	-	Quartz Monzonite/ Granodiorite Bedrock
F=angle of internal friction, c'=apparent friction, K_o=at rest pressure, K_a=active pressure, Kp=passive pressure, EFP=equivalent fluid pressure								

6.4 Foundation Selection

Shallow spread footings are commonly specified for grade separated structures and typically a viable method to resist design loads, footings are at the top of a hierarchy of selection type. The advantages of shallow footings include ease of construction using traditional earth moving equipment without the need for a specialty contractor. In addition, materials are readily inspected and tested, construction material testing and agency compliance is practical, adequacy of bearing conditions can be readily observed for agency compliance. In areas of poor subgrade conditions, details can be developed to stabilize and reinforce the bottom of footing with an engineered fill detail included in the contract. The weight of the slab embedded in the ground also provides increased stability of the entire structure and can improve slope stability by extending the bottom of footing deeper into the subsurface. The disadvantages of a spread footing foundation are that it will require a considerable amount of excavation, reinforcement, and concrete to be used for the monolithic construction. The concrete is susceptible to edge corrosion if not properly protected. Another disadvantage is that eccentric loading reduces the bearing resistance of the foundation. Similarly, constructing footings on slopes will lead to a reduction in the bearing resistance of the foundation system. A pad and pier type of spread footing is commonly used to support communication towers and may provide added stability for the center pier. The pad and pier type of foundation with spread footing base would reduce the amount of concrete compared to monolithic footing.

Figure 2 Pad and Pier Foundation

Deep foundation systems typically include driven piles, drilled shafts, auger-cast piles, micropiles and rammed aggregate type of shafts. These systems are ideal in locations of shifting ground or when expansive soils are prevalent. The method uses a ground-to-grout or ground-to-steel bond as well as tip resistance to resist design loads. These types of foundations are specified when there is a weak soil unit that has unacceptable deformation behavior characteristics under increased loads. The deep foundation sockets into a more resilient layer at depth. At the site, the monzonite bedrock will require coring or downhole hammer to cut into the rock. We assume that a minimum of three-foot socket would be needed. Access constraints may need to be further considered for constructing a deep foundation. Micropiles would be a constructible option, however, the cost would be relatively high compared with spread footing.

6.5 Bearing Capacity and Settlement

Structural input, such as calculated load cases, footing/mat type and dimensions, engineering plan with site layout and eccentricity data was not part of the information available to YeDoma at the time of the report. A summary of results is presented in Table 13. We considered a square footing with each side four feet in width and bottom of footing resting 30" below the ground surface on compacted engineered fill NFS base course. Refer to Table 14 for structural subgrade specifications.

Table 13: Allowable Stress Design-Estimated Bearing Capacity and Settlement

Type	Depth of Footing	Footing Dimension (B) (feet)	Ultimate Bearing Capacity (ksf)	Factor of Safety	Allowable Bearing Capacity (ksf)	Estimated Settlement (inches)
Spread Footing	30"	4	8.3	2.2	3.7	0.10

7.0 CONSTRUCTION RECOMMENDATIONS

YeDoma has prepared construction recommendations based on experience with similar projects. It is noted that this report was issued at the concept plan development stage. We recommend that construction phase testing include quality assurance compliance testing and verification. Refer to Table 1 of this report for verifications that we recommend be implemented. As this project has a small earthwork component, we recommend that a minimum of three tests be documented per lift and each concrete truck be assessed for compliance with specifications. Verification, special inspections, and material compliance reporting are essential components of the workplan.

7.1 Retaining Walls

The construction of retaining walls should include provisions for wall footings to meet one of the frost design options. Retained backfill should extend laterally from the back face of the wall out laterally towards the roadway, compacting material in 8" loose (6" compacted lifts) with provisions for wall drainage that extends the full width of the retained backfill designed to prevent hydrostatic force buildup behind the wall.

7.2 Subbase Material

We recommend that the builder use NFS material with specified particle size requirements of Table 14 to ensure that the material beneath the footing is non-frost susceptible. The bottom of excavation should be scarified and compacted to 95% of standard Proctor maximum dry density at +/-2% of OMC. and be underlain by a non-woven separation geotextile to avoid migration into the native soils. The prism of the structural backfill shall be continuous lifts through the full width and extend 3 feet laterally beyond the building footprint.

Table 14: Structural Backfill

Sieve Size	Percent Passing
3.0 inch	100
No.4 (4.74 mm)	25-70
No.40 (425 μm)	8-20
No.200 (75 μm)	2-8

7.3 Additional Services

The project should include hold points for geotechnical engineering representatives to review contractor submittals, verify and confirm the adequacy of bearing conditions, and test material for conformance with contract specifications. If the contract plans indicate that the plans are to conform with IBC specifications, than a program of testing and compliance should be considered mandatory. YeDoma offers this additional service, upon request.

7.4 Conclusions

The project is constructible from a geotechnical viewpoint. This project was on a fast-track schedule. Our report was issued without the development of final plans and specifications or a review to determine the extent that our recommendations are integrated correctly into the final plan details. We dispatch field technicians and conduct routine Quality Assurance/ Compliance Testing for soil, aggregate, and concrete material properties. YeDoma recommends site observations, photologs and test reports be collated into project compliance letters to document the construction phase testing.

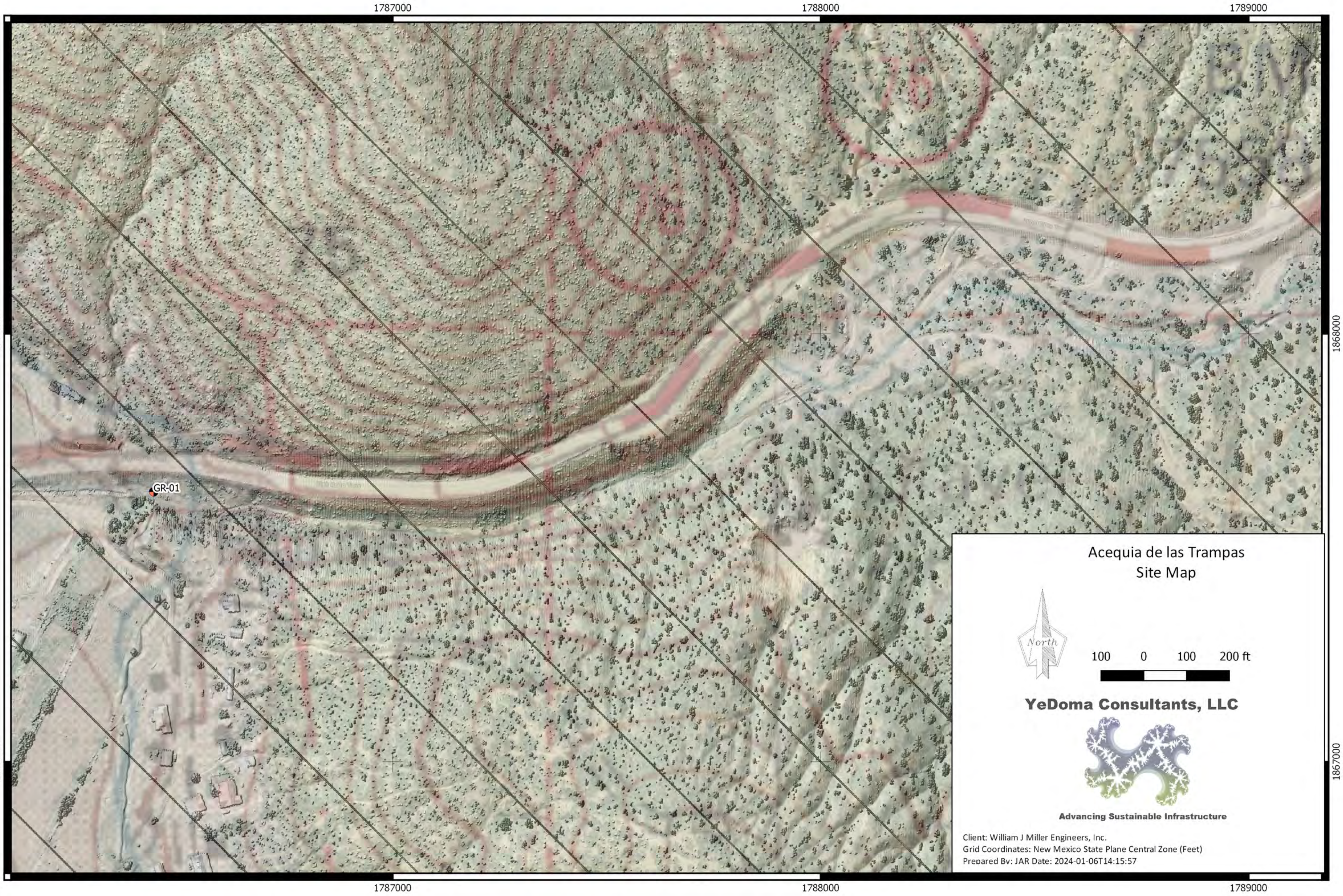
7.5 Limitations

This report should be read in its entirety and is intended solely for the Client, the owner, and construction subcontractors for the specific project use and in the context and for the express purpose for which it has been delivered. YeDoma makes no warranty whether stated or implied. Our conclusions are based on the time and date when the data was collected, and pertinent information made available to us at the time of reporting. Recommendations are based on information made available at the time of our evaluation and adheres to accepted professional engineering principles and regional practices. Any other use or reliance on this document by any third party is at that party's sole risk and responsibility.

8.0 REFERENCES

	Reference	Website
1.	Earth Explorer	https://earthexplorer.usgs.gov/
2.	Bauer, P., Helper, M. 1994 Geology of Trampas quadrangle, Picuris Mountains Taos and Rio Arriba Counties, New Mexico, New Mexico Bureau of Mines & Mineral Resources, Socorro NM	https://pubs.usgs.gov/sim/2005/2896/
3.	National Geologic Map Database	https://ngmdb.usgs.gov/ngm-bin/ngm_compsearch.pl
4.	Office of the State Engineer Well Data	https://gis.ose.state.nm.us/gisapps/ose_pod_locations/
5.	Bauer, P. W., Lucas, S. G., Mawer, C. K., McIntosh, W. C., eds., 1990, Tectonic Development of the Southern Sangre de Cristo Mountains, New Mexico New Mexico Geological Society, 41st Fall Field Conference Guidebook, 450 pages.	https://geoinfo.nmt.edu/tour/provinces/southern_rocky_mountains/home.cfml
6.	Seismic Hazard Maps	https://earthquake.usgs.gov/ws/designmaps/aashto-2009.json?latitude=34&longitude=-118&siteClass=C&title=Example
7.	USGS (1995, August). Quaternary Fault and Fold Database of the United States. Retrieved from Earthquake Hazard Program, Quaternary Faults	https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=5a6038b3a1684561a9b0aadf88412fcf
8.	Web Soil Survey	https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
9.	Western Regional Climate Center	https://wrcc.dri.edu/

Appendix A: Figures

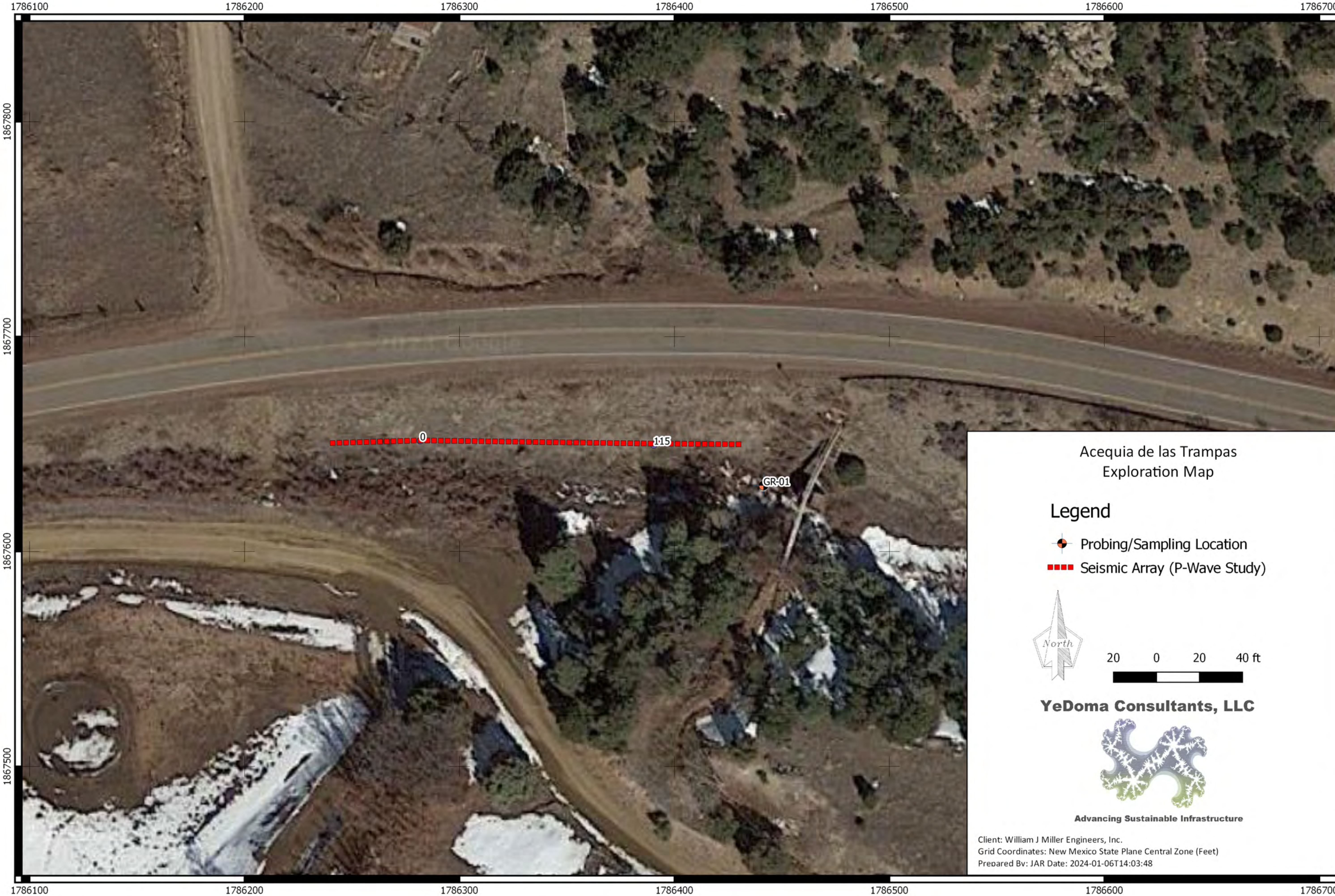


Acequia de las Trampas
Site Map

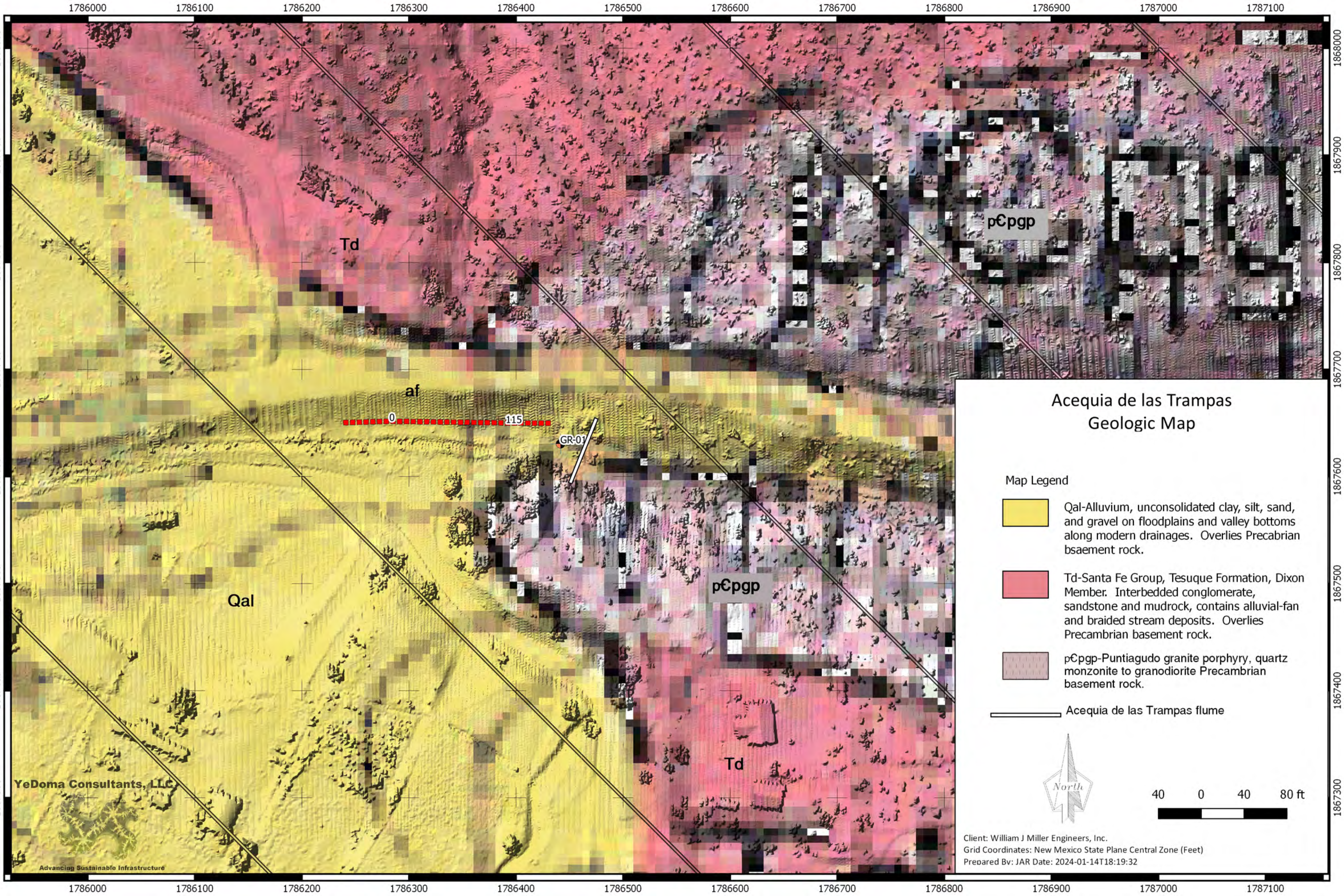
YeDoma Consultants, LLC

Advancing Sustainable Infrastructure

Client: William J Miller Engineers, Inc.
Grid Coordinates: New Mexico State Plane Central Zone (Feet)
Prepared By: JAR Date: 2024-01-06T14:15:57



G:\Shared drives\222-Acequia de las Trampas\02 Design\GIS\TRAMPAS.qgs



G:\Shared drives\222-Acequia de las Trampas\02 Design\GIS\TRAMPAS-FIG2.qgs

Appendix B: Climate Data

National Operational Hydrologic Remote Sensing Center

Interactive Snow Information

Quick Query Links

Get Time Series for Station ID: Go Listing
Get Time Series for Basin ID: ABRFC Go Listing
Get Basin Averages for RFC Go Listing
Get Climatology for Station ID: Go Listing

Home Help Comments

Navigation Tools

36.2058 N, 105.5632 W Zoom

Query

Station (2002-present)

Redraw Map

Select Physical Element

Freezing Degree Days

Select Date

2013 May
27 23:00 UTC
-- - + ++
☑ Snap to nearest time

Select Overlays

Hydrologic Features
☐ RFC Basins ○ Label
☐ Other Basins ○ Label
☐ HUCs (6-digit)
☐ RFC Boundaries
☐ Rivers and Streams
☐ Lakes and Reservoirs

Political Features
☐ County Boundaries
☐ CWA Boundaries
☑ State Boundaries
☐ National Boundaries
☐ Fed. Indian Land Areas

Point Features
☑ Stations ○ Label
☑ Cities ○ Label
☐ Flight Lines ○ Label
☐ Climate Stns. ○ Label
☐ Skiing ○ Label

Transportation Features
☑ Roads and Highways

Other features
☐ NSA Disc. Regions
☐ NSA Disc. Subregions
☐ NSA Modelling Tiles

Map Preferences

English units

☐ Legend below map
☑ Background image
☑ Hill shading
☑ High-contrast palette
☑ Title on image

800 pixels map width
450 pixels map height

Show all observations

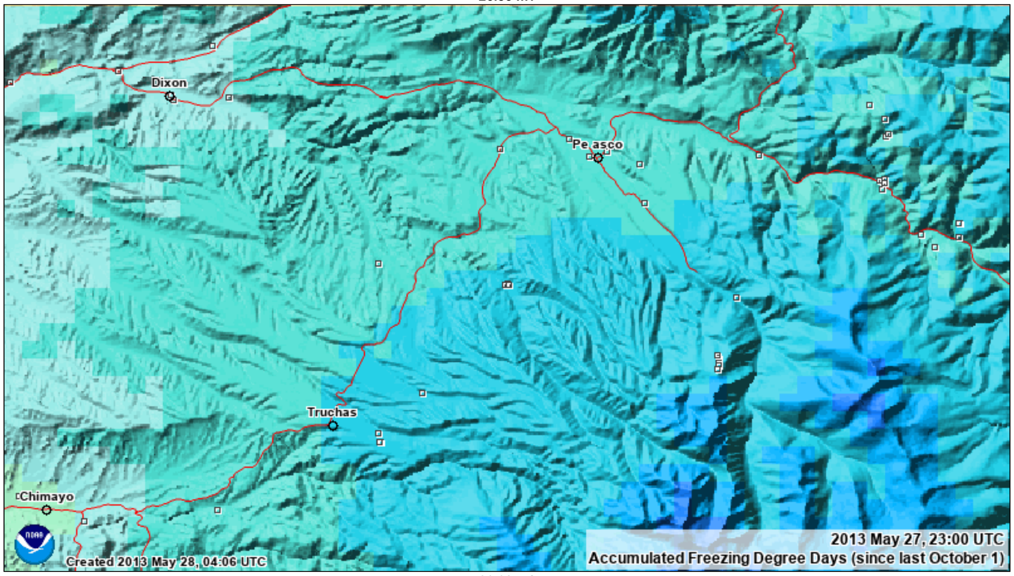
Small text

Javascript is on
Cookie use is off

Link to this image
Link to latest image
Link to latest page

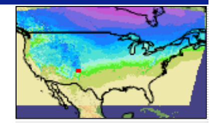
Accumulated Freezing Degree Days (since last October 1) for 2013 May 27, 23:00 UTC

26.53 mi



18.39 mi | 18.39 mi

26.62 mi



Cumulative Fahrenheit degree days

> 6300
5400 to 6300
4500 to 5400
3600 to 4500
2700 to 3600
1800 to 2700
1350 to 1800
900 to 1350
500 to 900
400 to 500
300 to 400
200 to 300
100 to 200
0 to 100
0

Not Estimated

Elevation in feet

> 13124
8203 to 13124
3281 to 8203
3 to 3281
< 3

- Gridded observed snowfall images, seasonal totals, and data downloads in several formats can now be found on the National Gridded Snowfall Analysis page.

SNODAS Model Adjustments:

An assimilation was performed April 24th for the Western and Central United States plus some parts of Canada. Throughout the Western United States the model has performed relatively well with only a few areas requiring adjustments. In the Northern Rockies and Cascades the model has been overestimating snowmelt requiring between 1 to 6 inches of water to be added back into the snowpack. In the Sierra Nevadas, Yellowstone Region, and Colorado Rockies up to 2 inches of water was removed due to the model underestimating snowmelt. The same is true for the Central United States where the model underestimated snowmelt requiring water to be removed. In the Dakotas and Minnesota up to 3 inches of water was removed. Recent snow surveys in Ontario and Quebec were also used to adjust SWE levels in the southern portions of each respective province where between 1 to 2 inches of water was removed. Throughout much or the modeling region warmer temperatures are expected which will increase the snowmelt. Changes in the snowpack will continue to be monitored as we progress towards the end of the snow season. Additional assimilations will be performed as needed.

Directions:

- Select a physical element to view, select a date, select overlays, and click "Redraw Map."
- Clicking on the map while the Recenter button is selected (red) will recenter the map on that point.
- Clicking on the Zoom Control slider will zoom into or out of the map.
- Clicking on the map and dragging with the button held down while the Recenter button is selected (red) will zoom to a rectangle when the button is released.
- Stations and regions can be queried using the Query button and menu.

Vector GIS Datasets used by this page
Raster GIS Datasets used by this page

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Snow Information | National Analyses | Interactive Maps | 3D Visualization | Airborne Surveys | Satellite Obs | Forecasts | Data Archive | SHEF Products
Science/Technology | NOHRSC | GIS Data Sets
About The NOHRSC | Staff
NOAA Links | Snow Climatology | Related Links
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National Weather Service
National Operational Hydrologic Remote Sensing Center
Office of Water Prediction
1735 Lake Drive W.
Chanhassen, MN 55317

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Appendix C: Soil Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Taos County and Parts of Rio Arriba and Mora Counties, New Mexico

December 20, 2023

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,180 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CHG	Chimayo-Rock outcrop complex, very steep	3.6	64.5%
MnC	Manzano clay loam, 3 to 5 percent slopes	2.0	35.5%
Totals for Area of Interest		**5.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Taos County and Parts of Rio Arriba and Mora Counties, New Mexico

CHG—Chimayo-Rock outcrop complex, very steep

Map Unit Setting

National map unit symbol: k1dp
Elevation: 7,000 to 9,500 feet
Mean annual precipitation: 16 to 21 inches
Mean annual air temperature: 41 to 50 degrees F
Frost-free period: 80 to 110 days
Farmland classification: Not prime farmland

Map Unit Composition

Chimayo and similar soils: 50 percent
Rock outcrop: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chimayo

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from granite and/or residuum weathered from granite

Typical profile

H1 - 0 to 5 inches: stony sandy loam
H2 - 5 to 15 inches: very stony sandy loam
R - 15 to 19 inches: bedrock

Properties and qualities

Slope: 40 to 60 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R048AY004NM - Mountain Loam
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from granite and/or residuum weathered from granite

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Mirabal

Percent of map unit:
Ecological site: F048AY925CO - Ponderosa Pine Forest
Hydric soil rating: No

MnC—Manzano clay loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: k1g1
Elevation: 6,500 to 7,500 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 135 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Manzano and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manzano

Setting

Landform: Arroyos

Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 10 inches: clay loam
Bw1 - 10 to 30 inches: clay loam
Bw2 - 30 to 43 inches: clay loam
C - 43 to 60 inches: clay loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R036XB006NM - Loamy
Hydric soil rating: No

Minor Components

Caruso

Percent of map unit: 5 percent

Tenorio

Percent of map unit: 5 percent

Gravelly soils

Percent of map unit: 5 percent

Table—AASHTO Group Classification (Surface) (621222 - Acequia de las Trampas)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CHG	Chimayo-Rock outcrop complex, very steep	A-4	3.6	64.5%
MnC	Manzano clay loam, 3 to 5 percent slopes	A-7-6	2.0	35.5%
Totals for Area of Interest			**5.5**	**100.0%**

Rating Options—AASHTO Group Classification (Surface) (621222 - Acequia de las Trampas)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

Unified Soil Classification (Surface) (621222 - Acequia de las Trampas)

The Unified soil classification system classifies mineral and organic mineral soils for engineering purposes on the basis of particle-size characteristics, liquid limit, and plasticity index. It identifies three major soil divisions: (i) coarse-grained soils having less than 50 percent, by weight, particles smaller than 0.074 mm in diameter; (ii) fine-grained soils having 50 percent or more, by weight, particles smaller than 0.074 mm in diameter; and (iii) highly organic soils that demonstrate certain organic characteristics. These divisions are further subdivided into a total of 15 basic soil groups. The major soil divisions and basic soil groups are determined on the basis of estimated or measured values for grain-size distribution and Atterberg limits. ASTM D 2487 shows the criteria chart used for classifying soil in the Unified system and the 15 basic soil groups of the system and the plasticity chart for the Unified system.

The various groupings of this classification correlate in a general way with the engineering behavior of soils. This correlation provides a useful first step in any field or laboratory investigation for engineering purposes. It can serve to make some general interpretations relating to probable performance of the soil for engineering uses.

For each soil horizon in the database one or more Unified soil classifications may be listed. One is marked as the representative or most commonly occurring. The representative classification is shown here for the surface layer of the soil.

Table—Unified Soil Classification (Surface) (621222 - Acequia de las Trampas)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CHG	Chimayo-Rock outcrop complex, very steep	SC-SM	3.6	64.5%
MnC	Manzano clay loam, 3 to 5 percent slopes	CL	2.0	35.5%
Totals for Area of Interest			**5.5**	**100.0%**

Rating Options—Unified Soil Classification (Surface) (621222 - Acequia de las Trampas)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

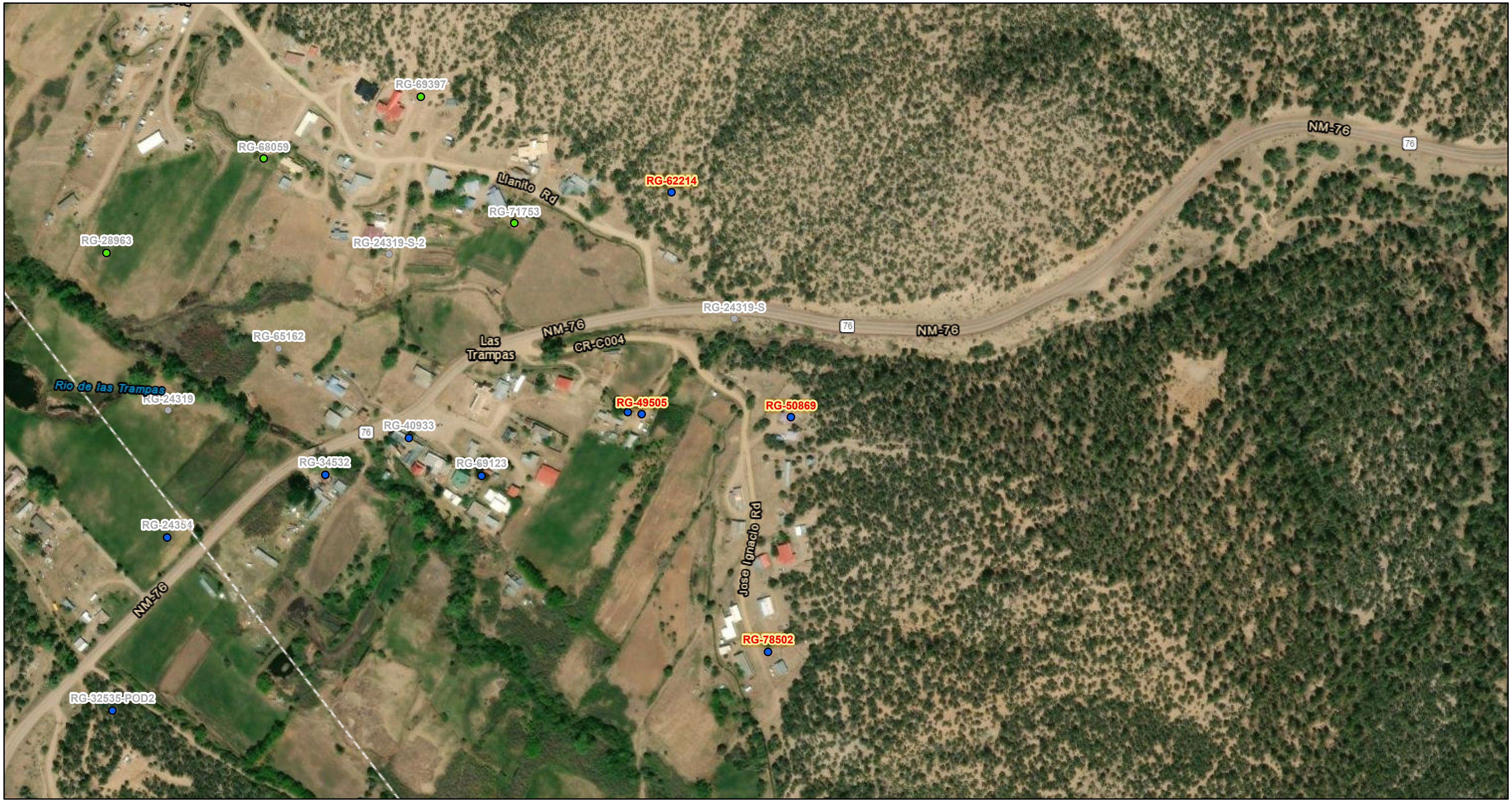
Chemical Soil Properties–Taos County and Parts of Rio Arriba and Mora Counties, New Mexico								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
CHG—Chimayo-Rock outcrop complex, very steep								
Chimayo	0-5	7.0-15	—	6.6-7.3	0	0	0.0-2.0	0-1
	5-15	6.0-15	—	6.6-7.3	0	0	0.0-2.0	0-1
	15-19	—	—	—	—	—	—	—
Rock outcrop	0-60	—	—	—	—	—	—	—
MnC—Manzano clay loam, 3 to 5 percent slopes								
Manzano	0-10	23-29	—	7.4-7.8	0-5	0	0.0-2.0	0-2
	10-30	15-28	—	7.4-7.8	0-5	0	0.0-2.0	0-2
	30-43	15-27	—	7.4-7.8	0-5	0-1	0.0-2.0	0-2
	43-60	15-27	—	7.4-7.8	0-5	0-1	0.0-2.0	0-2

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–Taos County and Parts of Rio Arriba and Mora Counties, New Mexico														
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*
CHG—Chimayo-Rock outcrop complex, very steep														
Chimayo	50	D	0-5	Stony sandy loam	CL-ML, SC-SM	A-2, A-4	0- 0- 0	25-30-35	85-90-95	80-85-90	55-70-85	30-45-60	20-23-25	5-8 -10
			5-15	Extremely stony loam, very stony sandy loam, very stony loam	CL-ML, SC-SM	A-2, A-4	0- 0- 0	50-65-80	85-90-95	80-85-90	55-70-85	30-45-60	20-23-25	5-8 -10
			15-19	Bedrock	—	—	—	—	—	—	—	—	—	—
Rock outcrop	30		0-60	Bedrock	—	—	—	—	—	—	—	—	—	—
MnC—Manzano clay loam, 3 to 5 percent slopes														
Manzano	85	C	0-10	Clay loam	CL, CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	96-98-100	73-75-80	42-45-51	19-21-25
			10-30	Clay loam, loam	CL, SC	A-7-6, A-6	0- 0- 0	0- 0- 0	84-90-100	65-78-100	56-77-100	42-60-81	31-44-49	12-21-24
			30-43	Loam, clay loam	CL, SC	A-7-6, A-6	0- 0- 0	0- 0- 0	85-90-100	65-78-100	56-77-100	43-61-81	29-41-46	12-20-24
			43-60	Clay loam, loam, silt loam	CL, SC	A-7-6, A-6	0- 0- 0	0- 0- 0	85-90-100	65-78-100	56-77-100	43-61-81	29-41-46	12-20-24

Appendix D: OSE Map

OSE POD Location Map



12/20/2023, 12:36:23 PM

GIS WATERS PODs

- Active
- Pending
- Inactive

1:4,514

0 | 0.04 | 0.09 | 0.18 mi

0 | 0.05 | 0.1 | 0.2 km

Esri, HERE, iPC, Esri, HERE, Garmin, iPC, Maxar

Online web user
This is an unofficial map from the OSE's online application.

Appendix E: Geotechnical Log

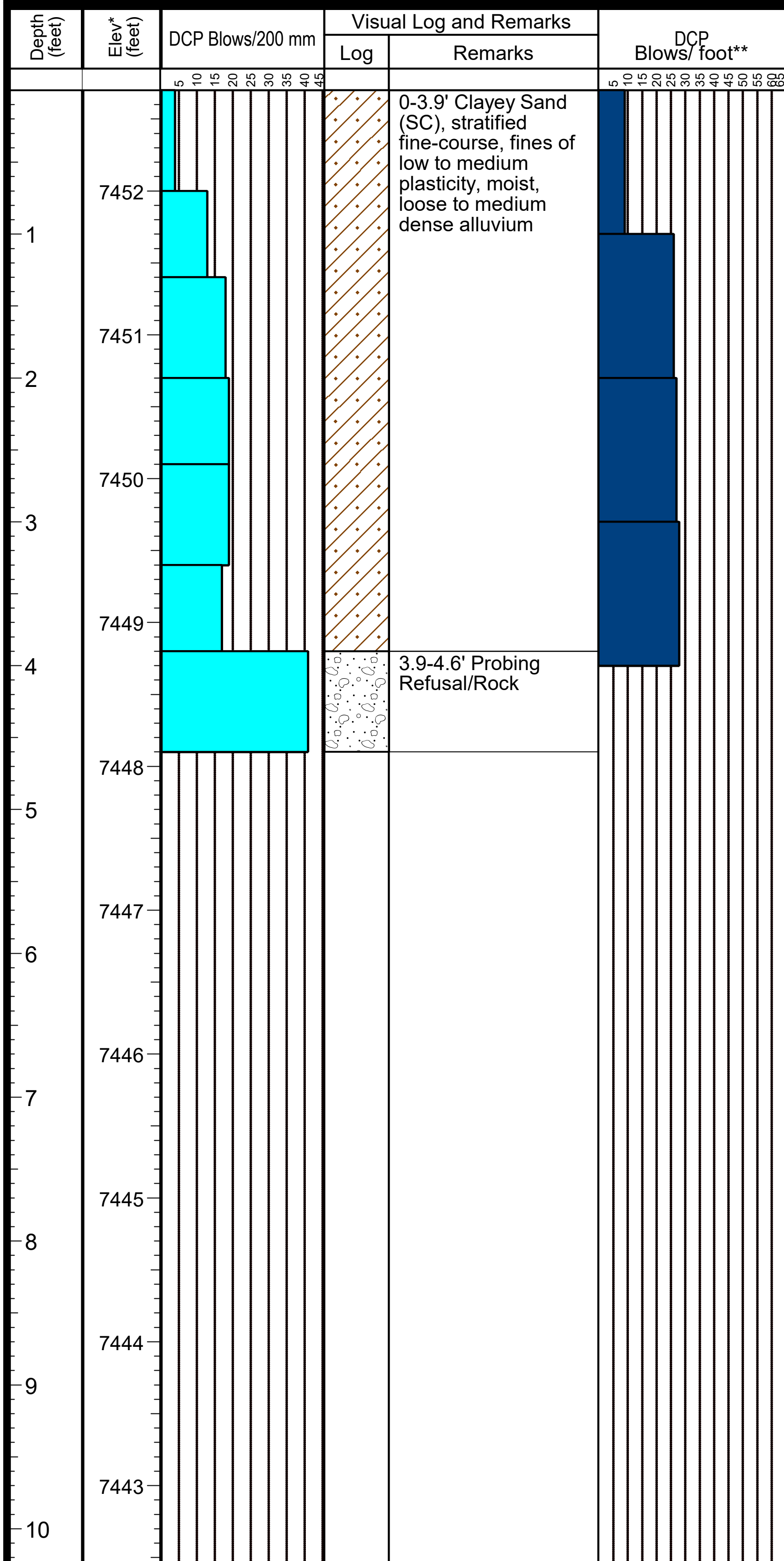
YeDoma Consultants, LLC

Client: William J Miller Engineers,Inc.
Project: Acequia de las Trampas Flume Improvement Project
Location: Refer to Site Map
Project Number: 621223
Date Drilled: 11/18/2023 0:00:00
Groundwater Depth (Feet): None
Logged By: JAR

Easting (feet): 1786441.5
Northing (feet): 1867630.7
Elevation (feet): 7452.7
Borehole Depth (feet): 4.59

DCPSH Log GR-01

***Elev is the nominal elevation. **Blows/foot is the sumation of hammer blows per foot increment**



Laboratory Test Summary

R-value	Moisture	PI	LL	P#4	P#10	P#200
48	5.8	13	31	64	56	25
	3.1					

Appendix F: Laboratory Test Reports

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Report Date:	12/20/2023	**Sample Date:**	12/18/2023	**Material Type:**	Native Subgrade
Report No.:	621222-MCReport-01	**Sampled By:**	YeDoma	**Sample Received:**	12/18/2023
Project Name:	Acequia de las Trampas	**Test Date:**	12/19/2023		
Project No.:	621222	**Tested By:**	JP		
Project Location:	Trampas, NM	**Client:**	William J Miller Engineers, Inc.		
Test Method:	**ASTM D2216-19**	**Client Address:**	1511 3rd St. Santa Fe, NM, 87505		

Method: B **Oven Temperature:** 230 F

Sample #	Sample Location	Depth	Moisture Content (%)
IRL	GR-01	1'	5.8
OKN	GR-01	4'	3.1

Notes/Comments/Deviations from Test Standard:

Reviewed By: Technical Manager
Jesse Reinikainen, PE

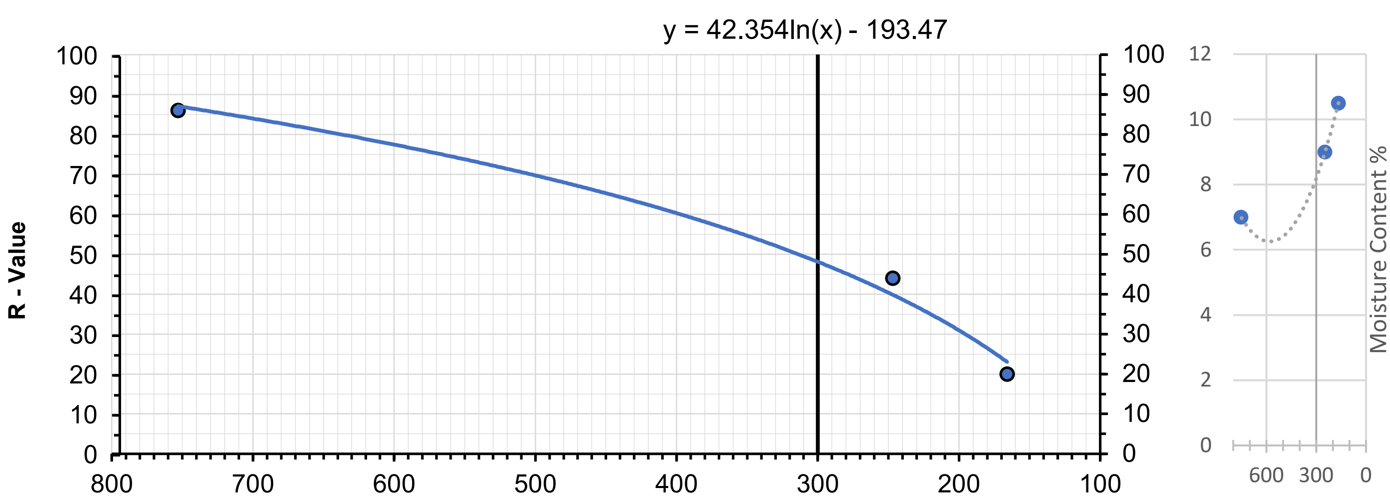
YeDoma Consultants, LLC
523 Louisiana Boulevard Southeast
Albuquerque, NM 87108

Standard Method of Test for Resistance R-Value and Expansion Pressure of Compacted Soils

Report Date:	12/26/2023	**Sample Date:**	12/18/2023	**Material Type:**	Native Subgrade
Project Name:	Acequia de las Trampas Flum	**Sample By:**	JP	**Station/Depth:**	0.5-3 feet
Report No.	222-03	**Test Date:**	12/26/2023	**Boring Number:**	GR-01
Project Location:	Trampas, New Mexi	**Tested By:**	JR	**Sample Received:**	12/18/2023
Project No.	621222	**Client:**	William J Miller Engineers, Inc.		
Test Method:	ASTM D2844-18	**Client Address:**	1511 Third St., Santa Fe, NM, 87505		
Work Order #:	1	***Subcontractor Test Results**	☐ YES	☒ NO	

Specimen ID: 222-03	1	2	3	4
Moisture (%):	9.0	10.5	7.0	
Dry Density (pcf):	128.5	125.4	128.4	
Kneading Compactor Pressure (psi):	145	90	350	
Specimen Height (mm):	63.5	64.5	64.8	
Horizontal Pressure @ 1000 lbs (psi):	30.3	49	6.27	
Horizontal Pressure @ 2000 lbs (psi):	91.1	126.9	17.2	
Displacement turns:	2.45	2.60	3.46	
Expansion Pressure (psf):	-16	-31	103	
Bond Strength (psi):	19	13	41	
R-Value:	44	20	86	
Exudation Pressure (psi):	247	166	753	
Corrected R-Value:	44	20	86	

STABILOMETER GRAPH



R-Value at 300 psi: 48

Notes/Comments/Deviations from Test Standard:

*If Checked "Yes" YeDoma used a subcontractor, in part, to develop final test results (notes will be issued with project deliverable, if checked)

Reviewed By: Technical Manager
Jesse Reinikainen, PE

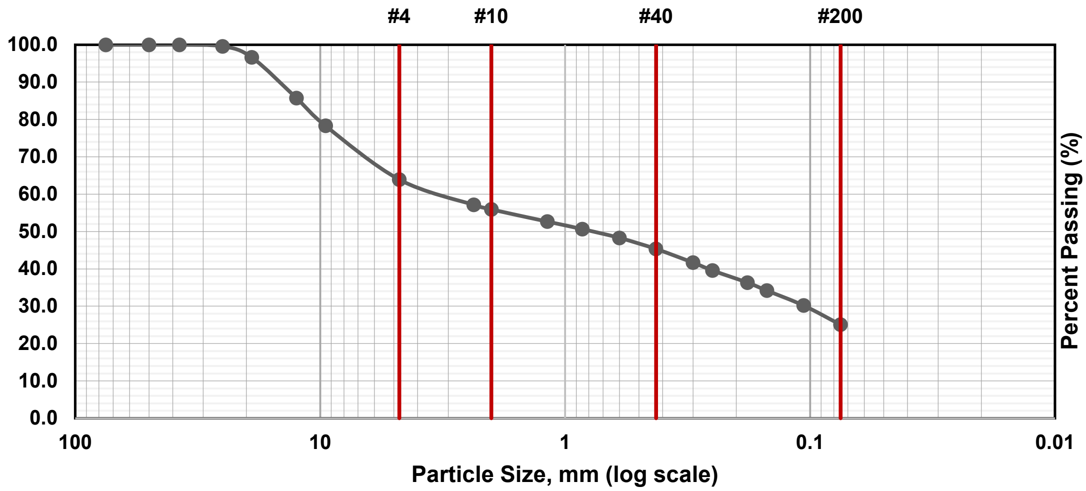
YeDoma Consultants, LLC
523 Louisiana Boulevard Southeast
Albuquerque, NM 87108

Standard Test Methods for Particle Size Distribution (Gradation) of Soils Using Sieve Analysis

Report Date:	12/21/2023	**Sample Date:**	12/18/2023	**Material Type:**	Native Subgrade
Report No.:	621221-SieveReport-01	**Sample By:**	YeDoma	**Depth:**	0'-3'
Project Name:	Acequia de las Trampas	**Test Date:**	12/21/2023	**Boring No.:**	GR-01
Project Location:	Trampas, NM	**Tested By:**	JP	**Sample Received:**	12/18/2023
Project No.:	621222	**Client:**	William J Miller Engineers, Inc.		
		Client Address:	1511 3rd St. Santa Fe, NM, 87505		
Test Method:	**ASTM D6913-17, ASTM D2487-17, ASTM D3282-15, ASTM D4318-17**				

Sample: 222-01 **Soak Time:** 2 Hours **Sample Prep Method:** Oven-dried

Soil Gradation



Gradation

Dispersion Process: ☐ Ultrasonic bath ☐ Shaking Apparatus ☒ None

ASTM D2487 Classification:

Group Name: Clayey sand with gravel

Group Symbol: SC

AASHTO Classification - ASTM D3282-15:

Group Name: A-2-6

Atterberg Limits: ASTM D4318-17

Liquid Limit: 31
Plastic Limit: 18
Plasticity Index: 13

Shape Parameters:

Fineness Modulus: 3.273
C_U: 31.47
C_C: 0.06

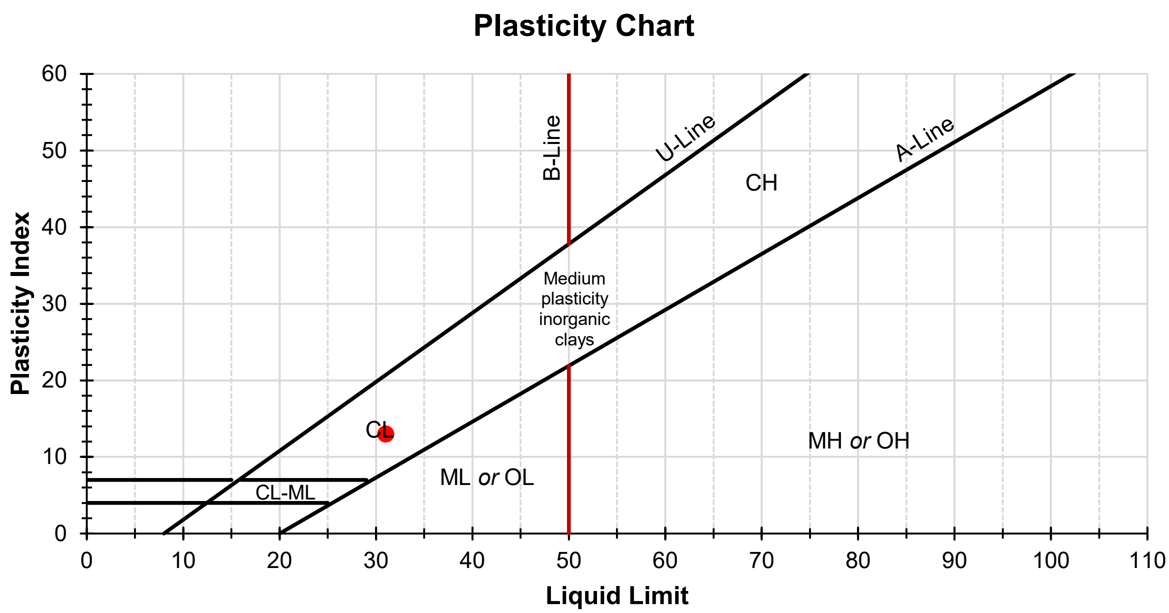
D_{60}: 2.360
D_{30}: 0.106
D_{10}: 0.075

Sieve Size	% Passing
3"	-
2"	-
1 1/2"	100
1"	100
3/4"	97
1/2"	86
3/8"	78
#4	64
#8	57
#10	56
#16	53
#20	51
#30	48
#40	45
#50	42
#60	40
#80	36
#100	34
#140	30
#200	25

YeDoma Consultants, LLC
523 Louisiana Boulevard Southeast
Albuquerque, NM 87108

Standard Test Methods for Particle Size Distribution (Gradation) of Soils Using Sieve Analysis

Report Date:	12/21/2023	**Sample Date:**	12/18/2023	**Material Type:**	Native Subgrade
Report No.:	621221-SieveReport-01	**Sample By:**	YeDoma	**Depth:**	0'-3'
Project Name:	Acequia de las Trampas	**Test Date:**	12/21/2023	**Boring No.:**	GR-01
Project Location:	Trampas, NM	**Tested By:**	JP	**Sample Received:**	12/18/2023
Project No.:	621222	**Client:**	William J Miller Er		
		Client Address:	1511 3rd St. Santa Fe, NM, 87505		
Test Method:	**ASTM D6913-17, ASTM D2487-17, ASTM D3282-15, ASTM D4318-17**				



Notes/Comments/Deviations from Test Standard:

Reviewed By: Technical Manager
Jesse Reinikainen, PE

YeDoma Consultants, LLC
523 Louisiana Boulevard Southeast
Albuquerque, NM 87108

Standard Method of Test for Determining Minimum Laboratory Soil Resistivity

Report No.: 621222-ResistivityReport-01
Report Date: 1/9/2024
Project No.: 621222
Project Name: Acequia de las Trampas Flume Project
Project Location: Trampas, NM
Test Method: **AASHTO T 288-12 (2016)**

Sample Date: 12/18/2024
Sample By: Yedoma
Test Date: 1/9/2024
Tested By: JP
Client: William J Miller Engineers, Inc.
Client Address: 1511 3rd St. Santa Fe, NM, 87505
***Subcontractor Test Results** ☐ YES ☒ NO

Material Type: Native Subgrade
Station/Depth: 0'-4'
Location: GR-01
Sample Received 12/18/2024

Sample ID: 222-05

Mass of sample, g: 1300.0

Soil Box Constant: 1.00

Test	1	2	3	4	5	6	7
Water Content, %	10.0%	16.7%	23.4%	-	-	-	-
Resistivity Reading, ohms	7800	3290	3700	-	-	-	-
Constant for soil box * Resistivity reading, ohms.cm	7800	3290	3700	-	-	-	-
Minimum resistivity, ohms.cm	3290						

Checklist	Yes	No
Sample Temperature does not exceed 60°C (140°F)	X	
Mass of sample passing sieve # 10 (Approx. 1500g)	X	
Resistivity meter: (AC) meter or 12-V direct current (DC) meter	X	

Notes/Comments/Deviations from Test Standard:

* If Subcontractor Test Results are used, see general notes provided with this report

Reviewed By: Technical Manager
Jesse Reinikainen, PE

Version 2, 06/07/2022

YeDoma Consultants, LLC
523 Louisiana Boulevard Southeast
Albuquerque, NM 87108

Standard Method of Test for Determinig pH of Soil for Use in Corrosion Testing

Report No.:	621222-pHReport-01	**Sample Date:**	12/18/2024	**Material Type:**	Native Subgrade
Report Date:	1/9/2024	**Sample By:**	Yedoma	**Station/Depth:**	0'-4'
Project No.:	621222	**Test Date:**	1/9/2024	**Boring No.:**	GR-01
Project Name:	Acequia de las Trampas Flume Project	**Tested By:**	JP	**Sample Received:**	12/18/2024
		Client:	William J Miller Engineers, Inc.		
Project Location:	Trampas, NM	**Client Address:**	1511 3rd St. Santa Fe, NM, 87505		
Test Method:	**AASHTO T-289-91 (2018)**	***Subcontractor Test Results**	☐ **YES**	☒ **NO**	

Sample ID: 222-05

Mass of soil sample uesd, g	50
pH value of soil measured	8.3

CHECKLIST	**Yes**	**No**
Sample Temperature does not exceed 60°C (140°F)	X	
Mass of sample passing sieve # 10 (Approx. 100g)	X	
A thermometer capable of reading 25 ± 10 °C, to the nearest 0.1°C	X	
Standardized Buffer solutions of known pH values (pH of 4, 7 or 10)	X	

Notes/Comments/Deviations from Test Standard:

*If Subcontractor Test Results are used, see general notes provided with this report

Reviewed By: Technical Manager
Jesse Reinikainen, PE

Version 2, 06/08/2022

YeDoma Consultants, LLC
5 23 Louisiana Boulevard Southeast
Albuquerque, NM 87108

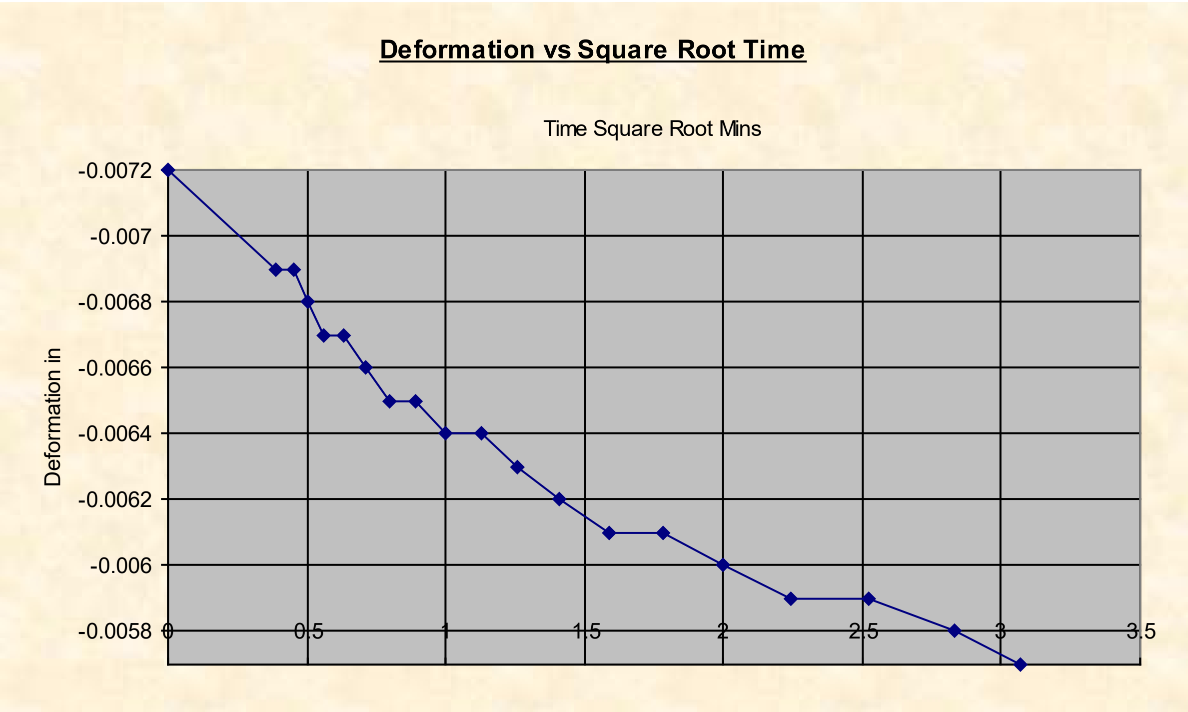
Shear Strength by Direct Shear (Small Shear Box)

Client	William J Miller Engineers	Lab Ref	
Project	Acequia de las Trampas	Job	621222
Borehole	GR-1	Sample	222-04

Test Details			
Standard	ASTM D3080-03 / AASHTO T236-92	**Particle Specific Gravity**	2.65
Sample Type	Small disturbed sample	**Single or Multi Stage**	Single Stage
Lab. Temperature	70.0 deg.F	**Location**	Trampas Taos County
Sample Description	Silty Sand		
Variations from procedure	None		

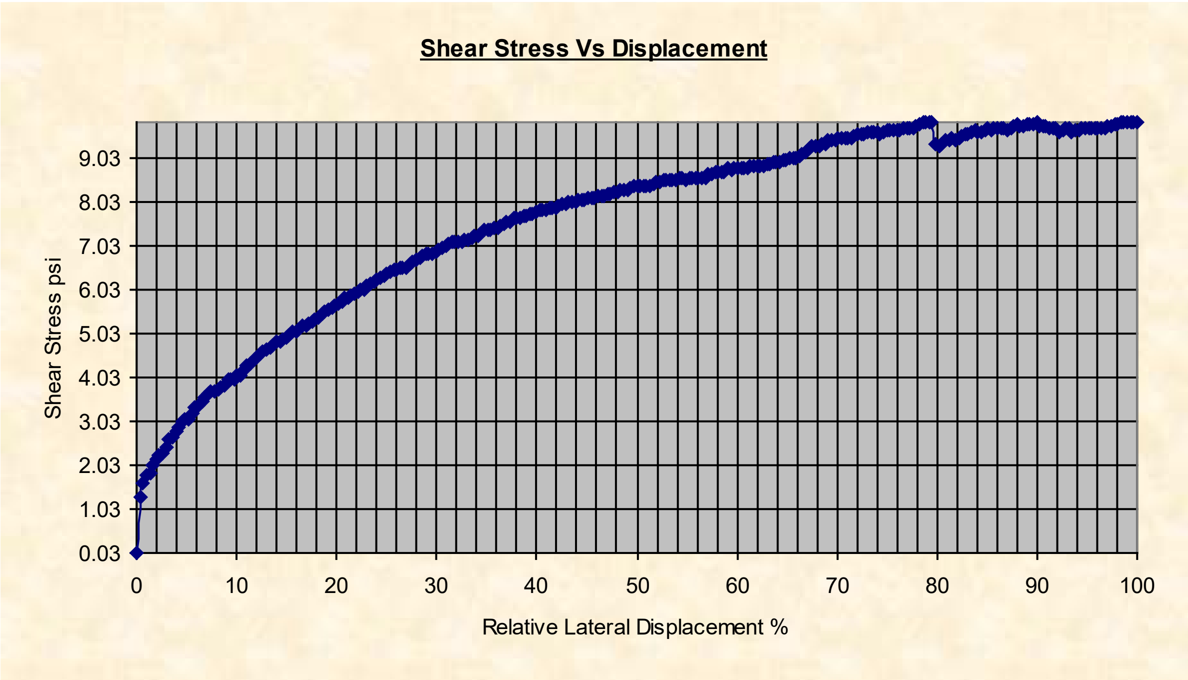
Specimen Details			
Specimen Reference	A	**Description**	
Depth within Sample	0.0000in	**Orientation within Sample**	
Initial Height	1.0000 in	**Area**	4.60820 in2
Structure / Preparation		**Initial Water Content***	9.02 % (trimmings: 9.00 %)
Initial Wet Unit Weight	126.94 lbf/ft3	**Degree of Saturation**	56.74 %
Initial Dry Unit Weight	116.44 lbf/ft3	**Initial Voids Ratio**	0.421
Final Wet Unit Weight	137.25 lbf/ft3	**Final Water Content**	14.27%
Final Dry Unit Weight	120.11 lbf/ft3	**Dry Mass**	0.3104 lb
Tested Dry or Submerged	Dry		
Comments			

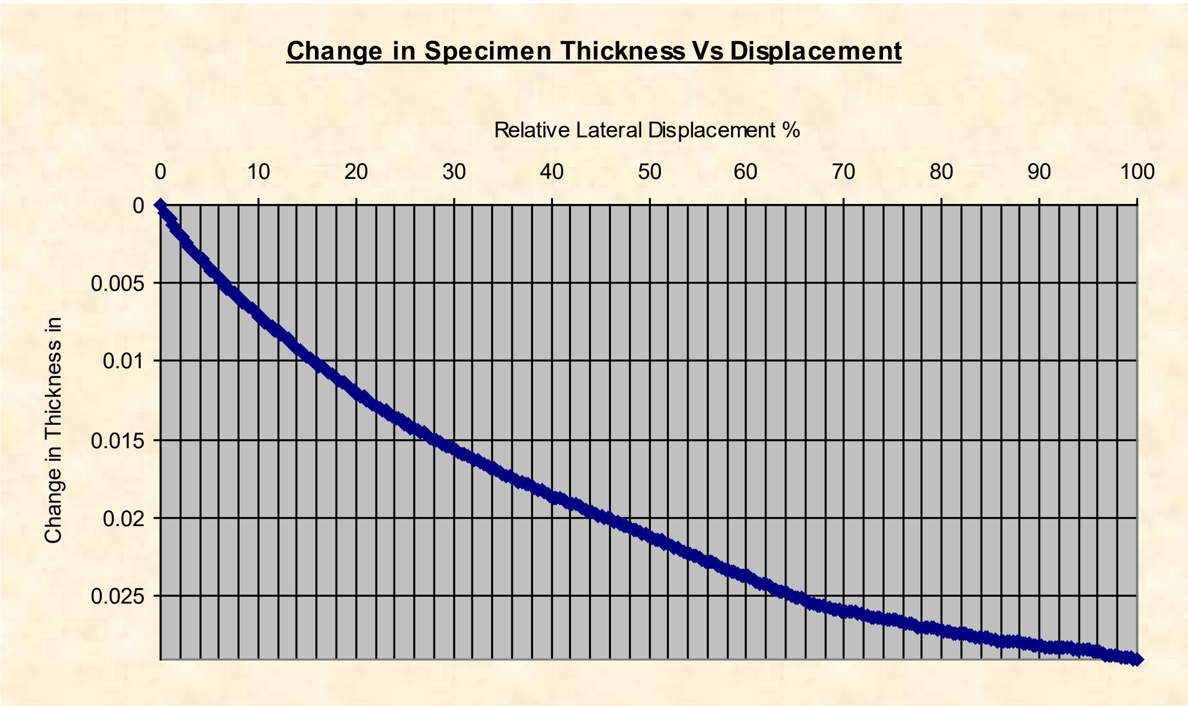
* Calculated from initial and dry weights of whole specimen



Shear Strength by Direct Shear
(Small Shear Box)

Client	William J Miller Engineers	**Lab Ref**	
Project	Acequia de las Trampas	**Job**	621222
Borehole	GR-1	**Sample**	222-04





Rate of Horizontal Displacement	Stage 1: 0.015750in/min

Shear Strength by Direct Shear
(Small Shear Box)

Client	William J Miller Engineers	**Lab Ref**	
Project	Acequia de las Trampas	**Job**	621222
Borehole	GR-1	**Sample**	222-04

Conditions at Failure	
Normal Stress	14.80 psi
Peak Strength	9.78 psi
Horizontal Deformation	0.2462 in
Residual Stress	0.00 psi
Vertical Deformation	0.0243 in

Tested By and Date:	12/23/2023

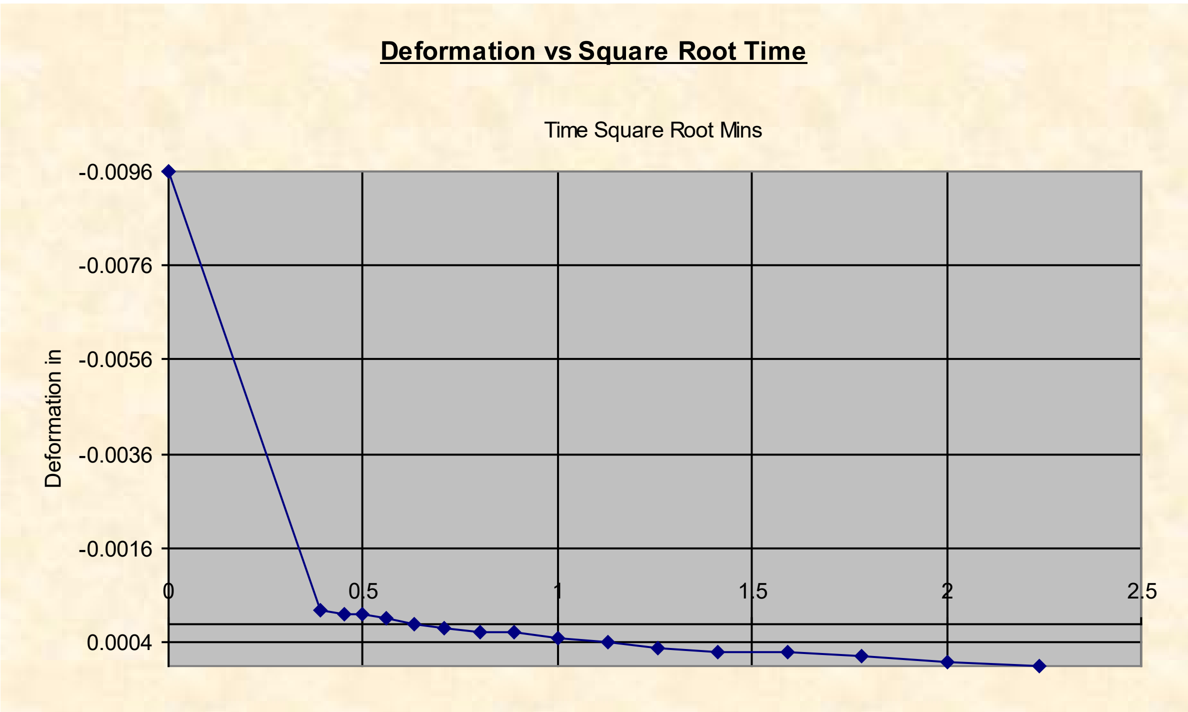
Shear Strength by Direct Shear (Small Shear Box)

Client	William J Miller Engineers	**Lab Ref**	
Project	Acequia de las Trampas	**Job**	621222
Borehole	GR-1	**Sample**	222-04

Test Details			
Standard	ASTM D3080-03 / AASHTO T236-92	**Particle Specific Gravity**	2.65
Sample Type	Small disturbed sample	**Single or Multi Stage**	Single Stage
Lab. Temperature	70.0 deg.F	**Location**	Trampas Taos County
Sample Description	Silty Sand		
Variations from procedure	None		

Specimen Details			
Specimen Reference	B	**Description**	
Depth within Sample	0.0000in	**Orientation within Sample**	
Initial Height	1.0000 in	**Area**	4.60820 in2
Structure / Preparation		**Initial Water Content***	9.02 % (trimmings: 9.00 %)
Initial Wet Unit Weight	129.23 lbf/ft3	**Degree of Saturation**	60.34 %
Initial Dry Unit Weight	118.54 lbf/ft3	**Initial Voids Ratio**	0.396
Final Wet Unit Weight	138.02 lbf/ft3	**Final Water Content**	13.10%
Final Dry Unit Weight	122.04 lbf/ft3	**Dry Mass**	0.3160 lb
Tested Dry or Submerged	Dry		
Comments			

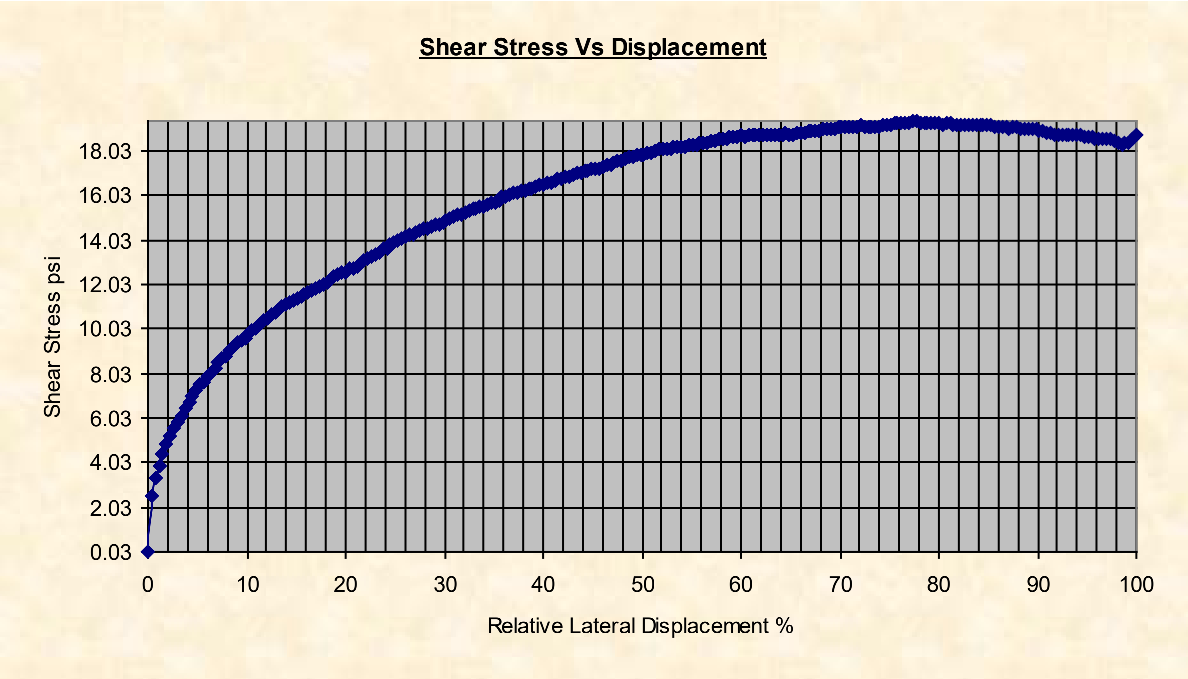
* Calculated from initial and dry weights of whole specimen

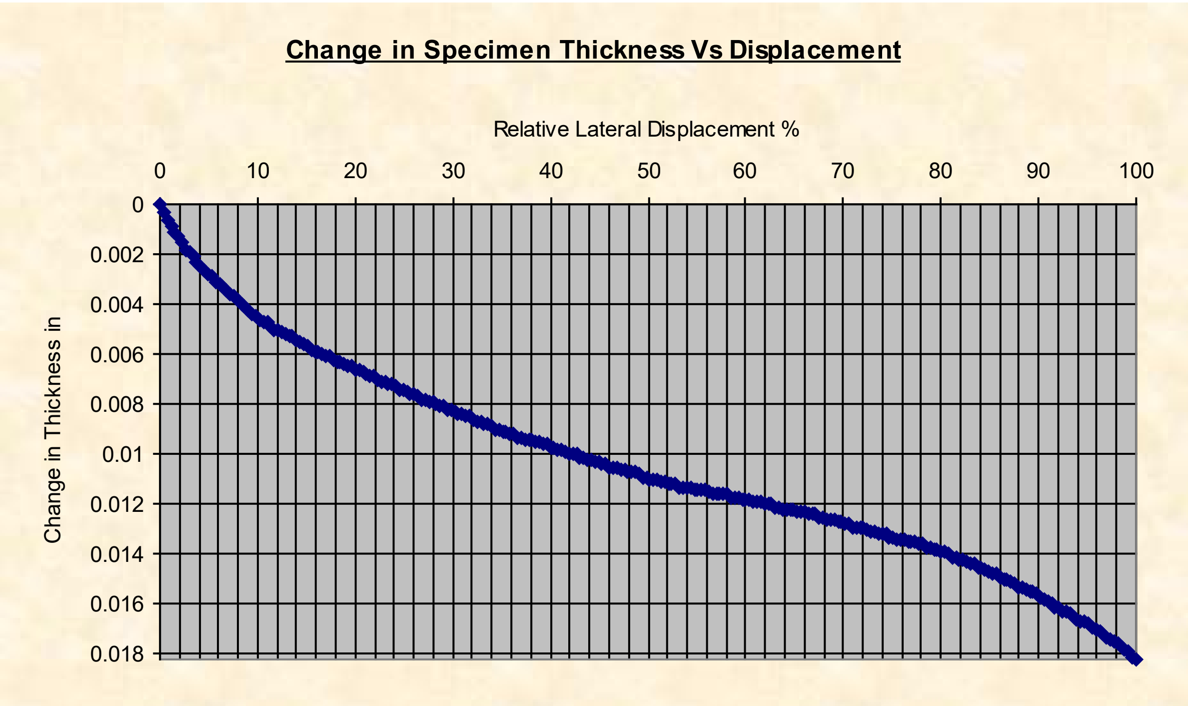


YeDoma Consultants, LLC
523 Louisiana Blvd SE, ABQ, NM, 87108

Shear Strength by Direct Shear
(Small Shear Box)

Client	William J Miller Engineers	Lab Ref	
Project	Acequia de las Trampas	Job	621222
Borehole	GR-1	Sample	222-04





Rate of Horizontal Displacement	Stage 1: 0.011800in/min

Shear Strength by Direct Shear
(Small Shear Box)

Client	William J Miller Engineers	**Lab Ref**	
Project	Acequia de las Trampas	**Job**	621222
Borehole	GR-1	**Sample**	222-04

Conditions at Failure	
Normal Stress	29.63 psi
Peak Strength	19.39 psi
Horizontal Deformation	0.1844 in
Residual Stress	0.00 psi
Vertical Deformation	0.0167 in

Tested By and Date:	12/23/2023

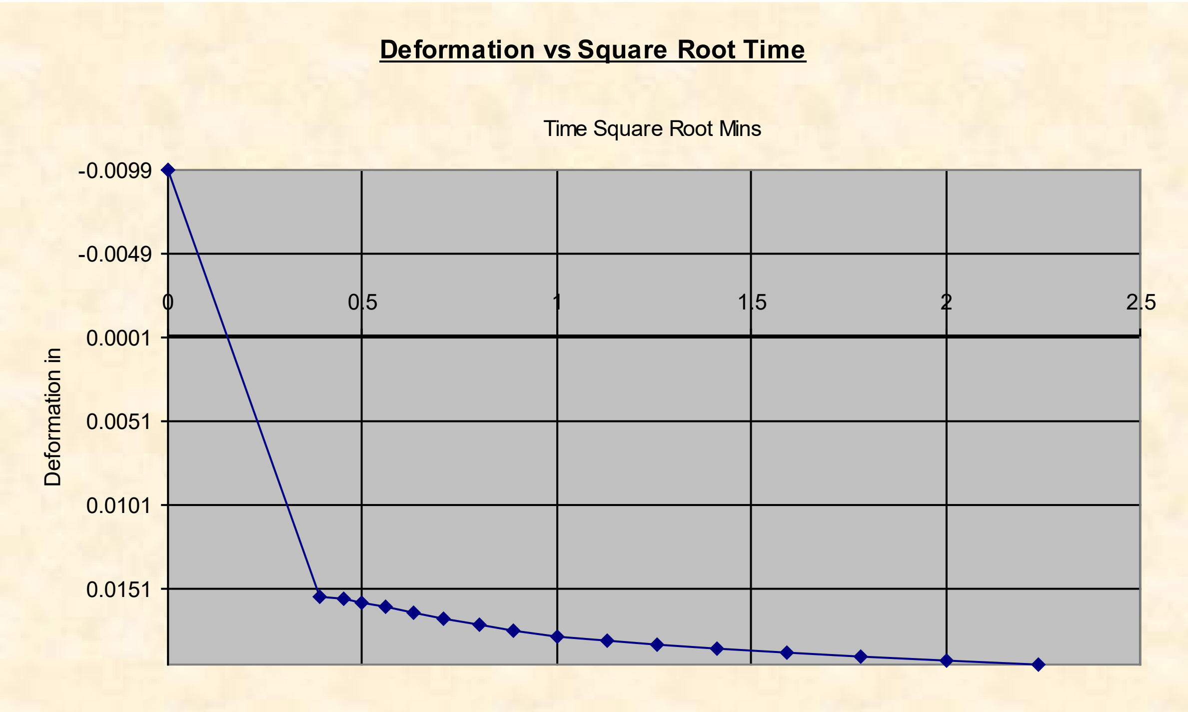
Shear Strength by Direct Shear (Small Shear Box)

Client	William J Miller Engineers	**Lab Ref**	
Project	Acequia de las Trampas	**Job**	621222
Borehole	GR-1	**Sample**	222-04

Test Details			
Standard	ASTM D3080-03 / AASHTO T236-92	**Particle Specific Gravity**	2.65
Sample Type	Small disturbed sample	**Single or Multi Stage**	Single Stage
Lab. Temperature	70.0 deg.F	**Location**	Trampas Taos County
Sample Description	Silty Sand		
Variations from procedure	None		

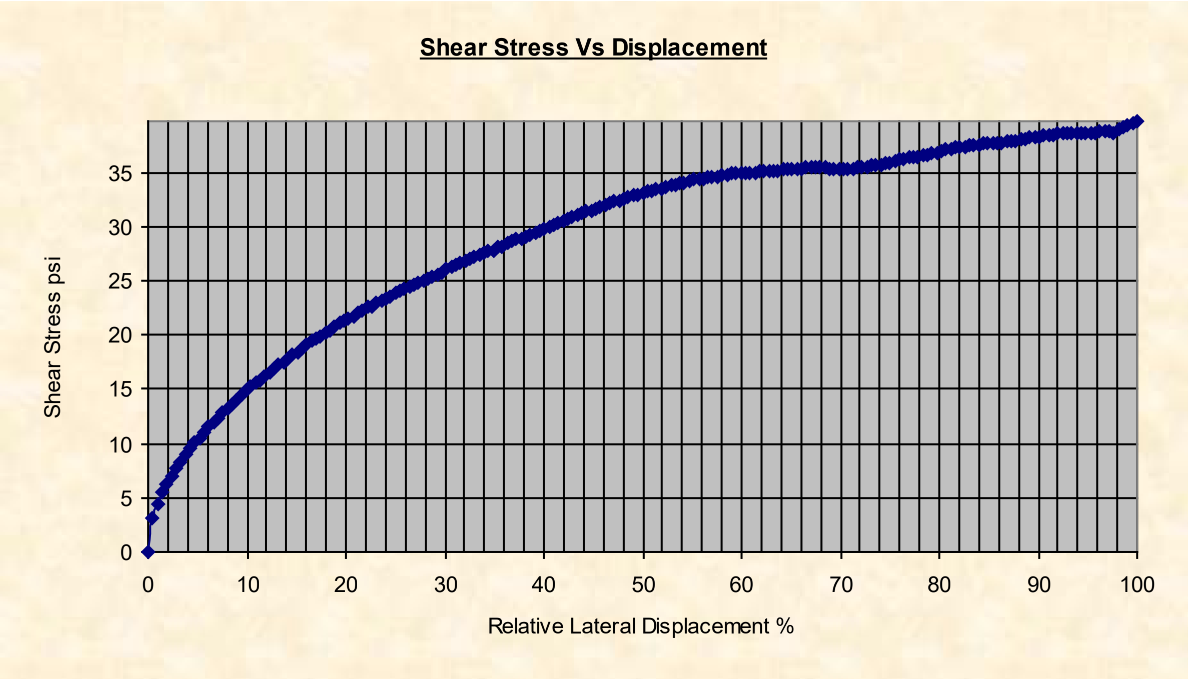
Specimen Details			
Specimen Reference	C	**Description**	
Depth within Sample	0.0000in	**Orientation within Sample**	
Initial Height	1.0000 in	**Area**	4.60820 in2
Structure / Preparation		**Initial Water Content***	9.01 % (trimmings: 9.00 %)
Initial Wet Unit Weight	128.93 lbf/ft3	**Degree of Saturation**	59.79 %
Initial Dry Unit Weight	118.28 lbf/ft3	**Initial Voids Ratio**	0.399
Final Wet Unit Weight	143.48 lbf/ft3	**Final Water Content**	13.29%
Final Dry Unit Weight	126.65 lbf/ft3	**Dry Mass**	0.3153 lb
Tested Dry or Submerged	Dry		
Comments			

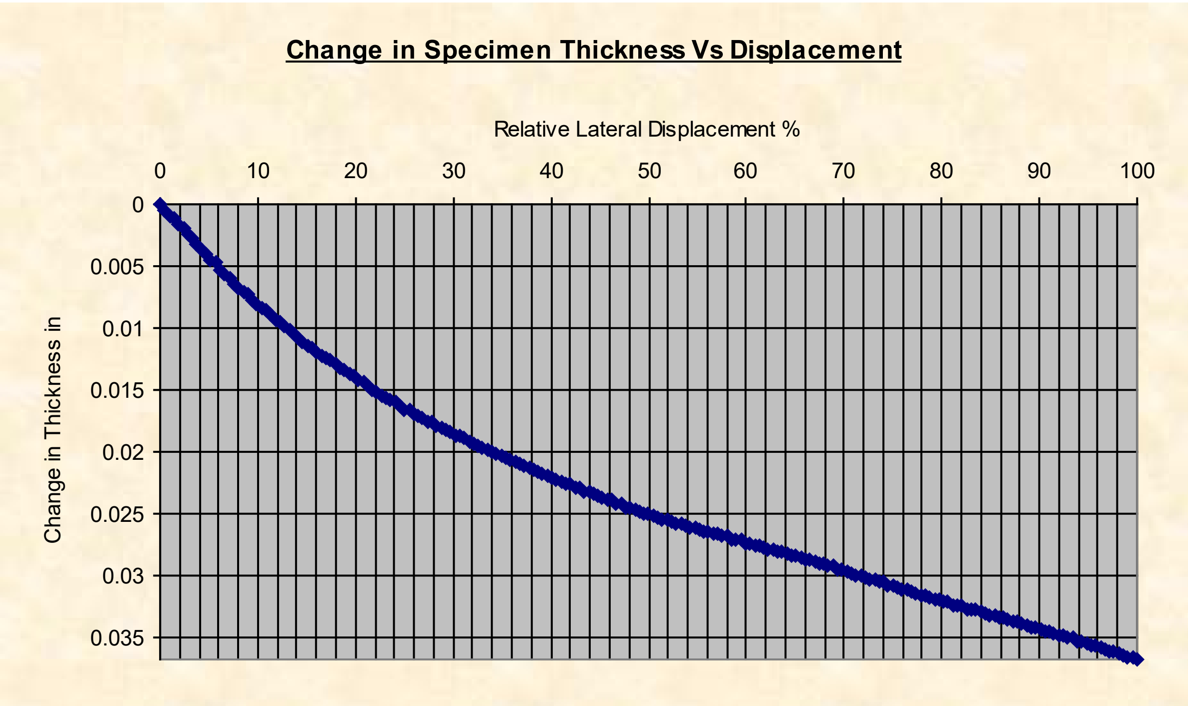
* Calculated from initial and dry weights of whole specimen



Shear Strength by Direct Shear
(Small Shear Box)

Client	William J Miller Engineers	**Lab Ref**	
Project	Acequia de las Trampas	**Job**	621222
Borehole	GR-1	**Sample**	222-04





Rate of Horizontal Displacement	Stage 1: 0.011800in/min

Shear Strength by Direct Shear
(Small Shear Box)

Client	William J Miller Engineers	**Lab Ref**	
Project	Acequia de las Trampas	**Job**	621222
Borehole	GR-1	**Sample**	222-04

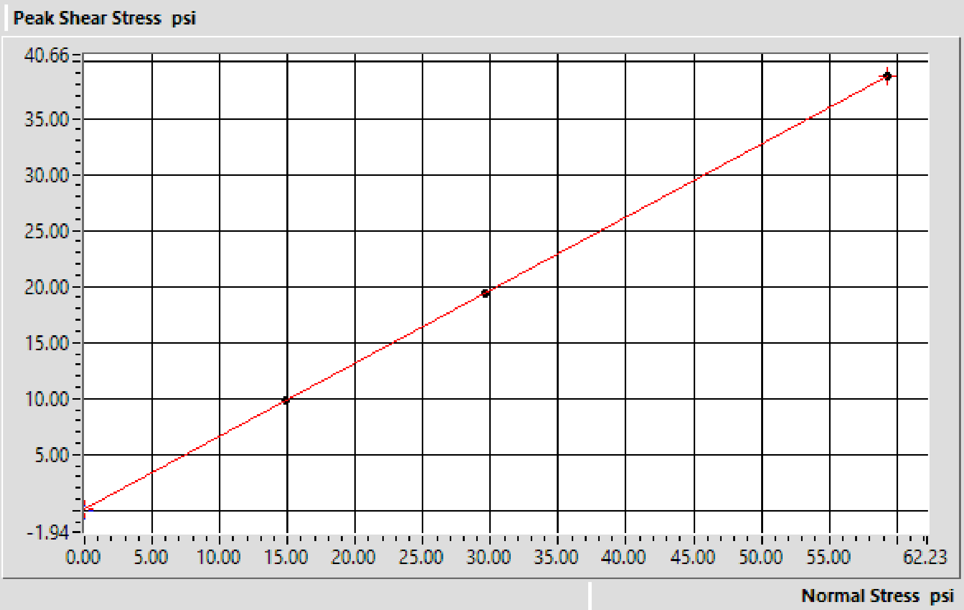
Conditions at Failure	
Normal Stress	59.26 psi
Peak Strength	38.72 psi
Horizontal Deformation	0.1853 in
Residual Stress	0.00 psi
Vertical Deformation	0.0566 in

Tested By and Date:	12/23/2023

Shear Strength by Direct Shear (Small Shear Box)

Test Summary				
Reference	A	B	C	
Normal Stress	14.80 psi	29.63 psi	59.26 psi	
Peak Strength	9.78 psi	19.39 psi	38.72 psi	
Corresponding Horizontal Displacement	0.2462 in	0.1844 in	0.1853 in	
Residual Stress	N/A	N/A	N/A	
Rate of Shear Displacement	Stage 1: 0.015750in/min	Stage 1: 0.011800in/min	Stage 1: 0.011800in/min	
Final Height	0.9695 in	0.9713 in	0.9339 in	
Sample Area	4.60820 in2	4.60820 in2	4.60820 in2	
Initial Wet Unit Weight	126.94 lbf/ft3	129.23 lbf/ft3	128.93 lbf/ft3	
Initial Dry Unit Weight	116.44 lbf/ft3	118.54 lbf/ft3	118.28 lbf/ft3	
Final Wet Unit Weight	137.25 lbf/ft3	138.02 lbf/ft3	143.48 lbf/ft3	
Final Dry Unit Weight	120.11 lbf/ft3	122.04 lbf/ft3	126.65 lbf/ft3	
Final Moisture Content	14.27 %	13.10 %	13.29 %	
Particle Specific Gravity	2.65	2.65	2.65	
Final Void Ratio	0.3779	0.3561	0.3067	
Final Saturation	100.08%	97.50%	114.83%	

Maximum Shear Stress vs Normal Stress



Peak ●

Angle of Shear Resistance

33.07 Degrees

Cohesion

0.12 psi