Western Technologies
An RMA Company

GEOTECHNICAL EVALUATION REPORT

BATHTUB ROW RECONSTRUCTION
Along Bathtub Row
Los Alamos, New Mexico
WT Job No. 32-223627 - 0

PREPARED FOR:
Los Alamos County Public Works Department
2300 Trinity Drive
Los Alamos, New Mexico 87544

Attn: Jeremy Lujan

April 4, 2024

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GEOTECHNICAL ENVIRONMENTAL INSPECTIONS NDT MATERIALS

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*Building **Confidence** from the Ground Up*

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GEOTECHNICAL EVALUATION
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BATHTUB ROW
LOS ALAMOS, NEW MEXICO
JOB NO. 32-223627-0

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for a proposed roadway reconstruction in Los Alamos, New Mexico. The purpose of these services is to provide information and recommendations regarding:

- Subsurface conditions
- Drainage
- Earthwork guidelines
- Groundwater
- Excavation conditions
- Pavement sections

Results of the field exploration, field tests, and laboratory testing program are presented in the Appendices.

2.0 PROJECT DESCRIPTION

Based on the information provided in the RFP, the proposed project will consist of roadway reconstruction in Los Alamos, New Mexico. The proposed reconstruction is approximately 1,500 linear feet of Bathtub Row. Final grading plans were not available at the time of this report. Should any of our information or assumptions not be correct, we should be notified.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Four (4) test borings were drilled to depths of 5 to 10 feet below existing site grade in the proposed roadway. The borings were at the approximate locations shown on the attached Boring Location Diagram. A field log was prepared for each boring. These logs contain visual classifications of the materials encountered during drilling as well as interpolation of the subsurface conditions between samples. Final logs, included in Appendix A, represent our interpretation of the field logs and may include modifications based on laboratory observations and tests of the field samples. The final logs describe the materials encountered, their thickness, and the locations where samples were obtained.

The Unified Soil Classification System was used to classify soils. The soil classification symbols appear on the boring logs and are briefly described in Appendix A. Local and regional geologic characteristics were used to estimate the seismic design criteria <and evaluate subsidence zones.

3.2 Laboratory Analyses

Laboratory analyses were performed on representative soil samples to aid in material classification and to estimate pertinent engineering properties of the on-site soils for preparation of this report. Testing was performed in general accordance with applicable standard test methods. The following tests were performed and the results are presented in Appendix B.

- Water content
- Plasticity
- R-Value
- Gradation

3.3 Analyses and Report

This geotechnical engineering report includes a description of the project, a discussion of the field and laboratory testing programs, a discussion of the subsurface conditions, and design recommendations as appropriate to its purpose. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site, discovery of underground storage tanks or other underground structures, or identification of contaminated or hazardous materials or conditions. If there is concern about the potential for such contamination, other studies should be undertaken. We are available to discuss the scope of such studies with you.

4.0 SITE CONDITIONS

4.1 Surface

Existing site development consisted of paved roadways in commercial and residential areas. Existing pavement sections along the alignment are about 3½ to 4 inches of asphalt concrete overlying 3½ to 4 inches of aggregate base course. Generally, the pavements along the project site were in fair condition with longitudinal and transverse cracking observed along with alligator cracked areas, rutting, dips, and bumps. Photos of the site at the time of our fieldwork are shown below.

4.2 Subsurface

As presented on the Boring Logs, surface soils to the full depth of exploration consisted of medium dense Silty SAND and stiff Lean CLAY and SILT. Near surface soils are of nil to medium plasticity. Groundwater was not encountered in any of our borings. A detailed description of the soils encountered can be found on the boring logs in Appendix A.

5.0 GEOTECHNICAL PROPERTIES & ANALYSIS

5.1 Laboratory Tests

Near-surface soils are of nil to medium plasticity. These materials are considered as poor to good-quality materials for support of pavements.

5.2 Field Tests

The boring logs included in this report are indicators of subsurface conditions only at the specific location and date noted. Variations from the field conditions represented by the borings may become evident during construction. If variations appear, we should be contacted to re-evaluate our recommendations.

6.0 RECOMMENDATIONS

6.1 General

Recommendations contained in this report are based on our understanding of the project criteria described in Section 2.0 and the assumption that the soil and subsurface conditions are those disclosed by the explorations. Others may change the plans, final elevations, number and type of structures, foundation loads, and floor levels during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to our attention in writing. This report does not encompass the effects, if any, of underlying geologic hazards or regional groundwater withdrawal and expresses no opinion regarding their effects on surface movements at the project site.

6.2 Pavements

At the time of this report, traffic information was not available. We assumed that expected traffic would consist primarily of automobile traffic including passenger vehicles, small to medium size trucks, and occasional emergency and dump trucks. On this basis, a daily traffic value of 5 Equivalent 18-kip Single Axle Loads (ESAL) was estimated for the roadway. A resilient modulus (M_r) of 5,167 pounds per square inch was estimated for the roadway based on an R-value of 25. A reliability value of 80 percent was assigned to the facility which corresponds to occasional interruption of traffic for pavement repairs. Based upon these parameters, the resulting pavement sections according to the AASHTO procedure for a 20-year design life are:

Options	Asphalt Concrete Pavement (inches)	Base Course (inches)	Structural Number, SN
1	3.5	8	2.27
2	4.0	6	2.28

Base course and asphalt concrete should conform to the New Mexico Department of Transportation (NMDOT) Standard Specifications for Road and Bridge Construction. Bituminous surfacing should be constructed of dense-graded, central plant-mix, asphalt concrete of an SP-IV or SP-III mix design.

Material and compaction requirements should conform to recommendations presented under **EARTHWORK.** The gradient of paved surfaces should ensure positive drainage. Water should not pond in areas directly adjoining paved sections. The on-site subgrade soils may soften and lose stability if subjected to conditions that result in an increase in water content.

The "design life" (20 years) of a pavement is defined as the expected life at the end of which reconstruction of the pavement will need to occur. Normal maintenance, including crack sealing, slurry sealing, and/or chip sealing, should be performed during the life of the pavement.

6.2.1 Pavements on Expansive Soils

Pavement design methods are intended to provide an adequate thickness of structural materials over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink and swell movements of an expansive clayey subgrade such as the soils encountered on this project. Consequently, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell movement of the subgrade. It is therefore important to minimize moisture changes in the subgrade in or to reduce shrink/swell movements. The pavement surface, subbase surface, and adjacent areas should be well drained. Excessive watering of landscaped areas adjacent to pavement should be avoided. Proper maintenance should be performed on cracks in the pavement surface to prevent water from penetrating through to the base or subbase material. Even with these precautions, some movement and related cracking may still occur, requiring periodic maintenance.

7.0 EARTHWORK

7.1 General

The conclusions contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section. Any excavating, trenching, or disturbance that occurs after completion of the earthwork must be backfilled, compacted and tested in accordance with the recommendations contained herein. It is not reasonable to rely upon our conclusions and recommendations if any future unobserved and untested trenching, earthwork activities or backfilling occurs.

If any unobserved and untested earthwork, trenching or backfilling occurs, then the conclusions and recommendations in this report may not be relied on. We recommend that Western Technologies Inc. be retained to provide services during these phases of the project. Observation and testing of all foundation excavations should be performed prior to placement of reinforcing steel and concrete to confirm that foundations are constructed on satisfactory bearing materials.

7.2 Site Clearing

Strip and remove any existing vegetation, debris, and any other deleterious materials from the pavement areas. The pavement area is defined as that area within the pavement footprint plus 5 feet beyond the perimeter of that footprint. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

7.3 Excavation

We anticipate that excavations for shallow foundations and utility trenches for the proposed construction can be accomplished with conventional equipment. The speed and ease of excavation is dependent on the nature of the deposit, the type of equipment used, and the skill and experience of the equipment operator.

On-site soils may become unworkable at high water content. Workability may be improved by scarifying and drying. Over-excavation of wet zones and replacement with granular materials may be necessary. The use of lightweight excavation and compaction equipment may be required to minimize subgrade movement.

The soils to be penetrated by the proposed excavations may vary significantly across the site. Our soil classifications are based solely on the materials encountered in widely spaced exploratory test boring. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are found at the time of construction, we should be contacted immediately to evaluate the conditions encountered.

7.3.1 Temporary Excavations and Slopes

Temporary, non-surcharged construction excavations should be sloped or shored. The individual contractor should be made responsible for designing and constructing stable, temporary excavations as required to maintain the stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards. OSHA recommends a maximum slope inclination of ¾:1 (horizontal:vertical) for Type A soils, 1:1 for Type B soils, and 1½:1 for Type C soils.

As a safety measure, it is recommended that all vehicles and soil piles should be kept a minimum lateral distance back from the crest of the slope at least equal to the slope height. The exposed slope face should be protected against the elements.

If any excavation, including a utility trench, is extended to a depth of more than 20 feet, it will be necessary to have the side slopes designed by a professional engineer.

We recommend that the contractor retain a geotechnical engineer to observe the soils exposed in all excavations and provide engineering design for the slopes. This will provide an opportunity to classify the soil types encountered, and to modify the excavation slopes as necessary. This also allows the opportunity to analyze the stability of the excavation slopes during construction.

7.4 Pavement Preparations

The subgrade should be scarified, moistened as required, and recompacted for a minimum depth of 12 inches prior to placement of fill and pavement materials.

7.5 Unstable Subgrade Soils

If site soils become excessively wet, pumping and instability should be anticipated. If wet, unstable subgrade soils are encountered during construction, there are several alternatives to mitigate them. The alternatives vary in cost and time to implement, so the alternatives should be evaluated and compared in order to decide which one is most beneficial for the project.

1. The wet, unstable subgrade may be scarified and/or partially removed in order to allow the excess moisture to evaporate. The soils should be periodically blended to allow uniform drying to occur. When the soils are near optimum moisture content, they should be compacted in accordance with project requirements.

2. The wet, unstable subgrade may be removed and replaced with drier, granular soil and/or aggregate base course. The depth of removal necessary will vary depending on the conditions in each unstable area. It may be best to remove a uniform thickness of 2 feet in each area. Although the wet, unstable soils may extend to a depth greater than 2 feet, the granular material should bridge over these deeper wet soils. Removal should be performed with an excavator or similar piece of equipment so that underlying wet soils will not be adversely affected by wheel loads and thereby become more unstable. The first foot of granular backfill should be placed at near-optimum moisture content and compacted using static (non-vibrating) equipment to at least 90 percent of the maximum dry density. The second foot of granular material may then be placed and compacted in accordance with project requirements.

3. Geogrid and aggregate base course may be used to bridge over wet subgrade soils. Wet, unstable subgrade should be removed to a depth of at least 1 foot and to a distance at least 2 feet beyond the edge of the unstable area. Removal should be performed with an excavator or similar piece of equipment so that underlying wet soils will not be adversely affected by wheel loads and thereby become unstable. Geogrid should consist of Tensar InterAx or equivalent and should be installed in accordance with the manufacturer's installation instructions. The geogrid should extend at least 2 feet beyond the edge of the unstable area. Aggregate base course (not just granular soil) should be placed over the geogrid and compacted in accordance with project requirements.

4. Wet, unstable subgrade soils at the site may be mixed with dry portland cement or hydrated lime. For cost-estimating purposes, it may be assumed that 5 percent by dry weight of the soil will be required to stabilize the site soils and that treatment to a depth of 1 foot will be required to bridge over the unstable areas. The depth of treatment and quantity of cement or lime may be modified during construction depending on the results achieved. It should be noted that the portland cement will not chemically react with the clay component of the soil; however, the cement will dry the soil and will provide cementation of the coarse-grained particles in the soil. Since the dry cement will react with the excess moisture in the subgrade soils, additional water will need to be added to achieve moisture contents near optimum prior to compaction of the soils. The blended soil should be compacted and tested in accordance with project requirements.

The extent of the unstable areas to be treated may be identified by proof rolling the exposed materials with a 20-ton, tandem-axle, dual-wheel water truck or dump truck loaded to the legal limit with tires inflated to 100 psi. Areas where soil movement is observed more than 6 inches away from the truck's rear tires should be considered unstable.

7.6 Materials

Clean imported or on-site soils with low expansive potentials and a maximum dimension of 6 inches or imported materials may be used as fill material for the following:

- Pavements
- Backfill/Embankment

Frozen soils should not be used as fill or backfill.

Imported soils should conform to the following:

- Gradation (ASTM C136): percent finer by weight

  6" 100
  4" 85-100
  ¾" 70-100
  No. 4 Sieve 50-100
  No. 200 Sieve .... 30 (max)

- Maximum Plasticity Index 5
- Maximum soluble sulfates (%) 0.10

On-site clay soils should not be used as fill or backfill.

Base course should conform to the New Mexico Department of Transportation (NMDOT) Standard Specifications for Road and Bridge Construction.

7.7 Placement and Compaction

a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.

b. Uncompacted lift thickness should not exceed 10 inches.

c. Materials should be compacted to the following:

Material	Minimum Percent Compaction (ASTM D1557)
• On-site or imported soil, reworked and fill below pavement	95
• Aggregate base below pavement	95
• Nonstructural backfill	90

Imported and on-site low expansive soils should be compacted within a water content range of 3 percent below to 3 percent above optimum. On-site clayey soils should be compacted to within a water content range of 1 percent below to 3 percent above optimum.

7.8 Compliance

Recommendations for foundations and slabs-on-grades supported on compacted fills or prepared subgrade depend upon compliance with the **EARTHWORK** recommendations. To assess compliance, observation and testing should be performed under the direction of a WT geotechnical engineer. Please contact us to provide these observations and testing services.

8.0 PLAN REVIEW

Foundation and grading plans were not available at the time of this report. WT should be retained to review the final plans to determine if they are consistent with the recommendations presented in this report. If the Client does not retain WT to review the plans and specifications, WT shall have no responsibility for the suitability of the plans for project application.

9.0 ADDITIONAL SERVICES

The recommendations provided in this report are based on the assumption that a sufficient schedule of tests and observations will be performed during construction to verify compliance. At a minimum, these tests and observations should be comprised of the following:

- Observations and testing during site preparation and earthwork,
- Observation of foundation excavations, and
- Consultation as may be required during construction.

Retaining the geotechnical engineer who developed your report to provide construction observation is the best way to verify compliance and to help you manage the risks associated with unanticipated conditions.

10.0 LIMITATIONS

This report has been prepared assuming the project criteria described in **2.0 PROJECT DESCRIPTION**. If changes in the project criteria occur, or if different subsurface conditions are encountered or become known, the conclusions and recommendations presented herein shall become invalid. In any such event, WT should be contacted in order to assess the effect that such variations may have on our conclusions and recommendations. If WT is not retained for the construction observation and testing services to determine compliance with this report, our professional responsibility is accordingly limited.

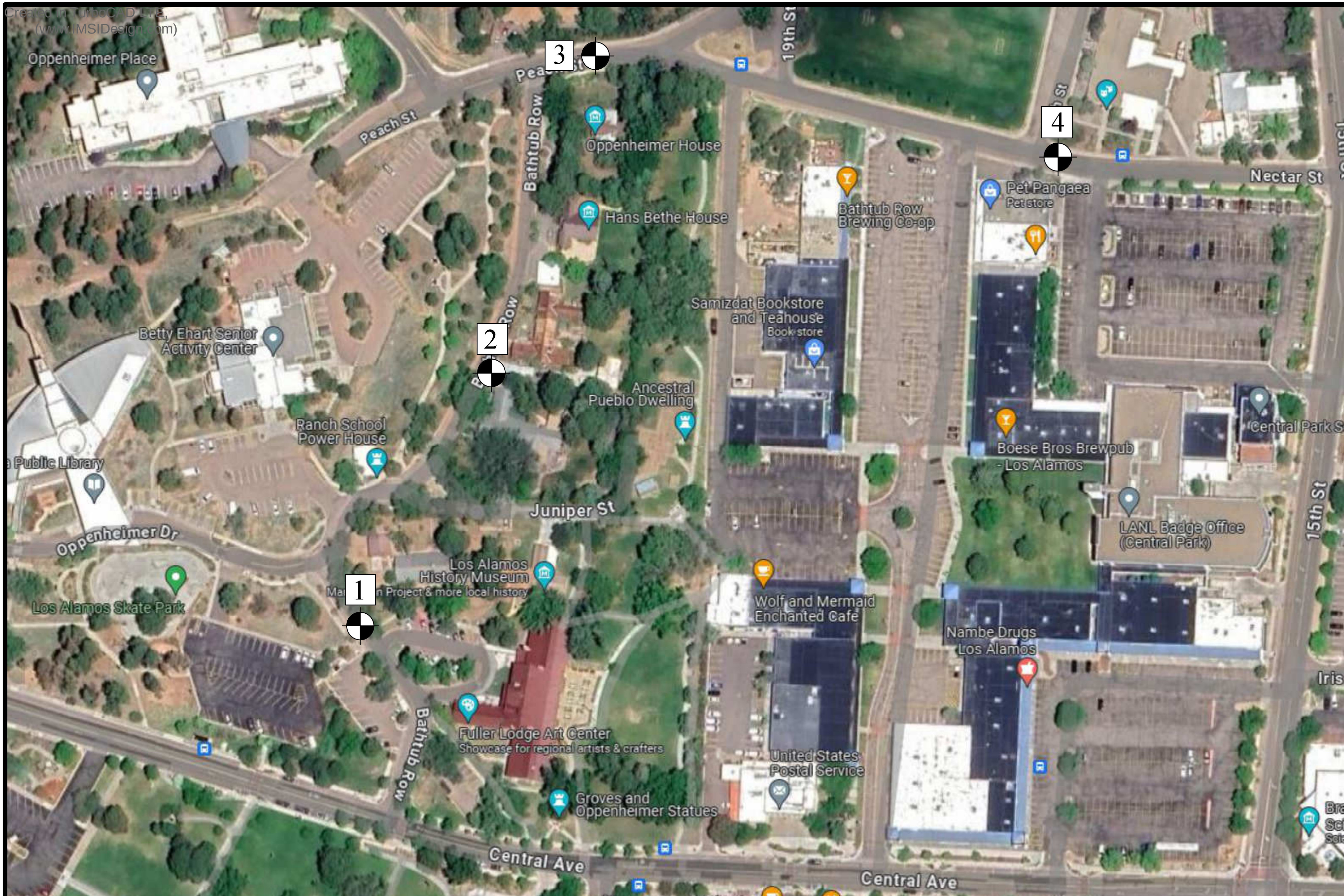
The recommendations presented are based entirely upon data derived from a limited number of samples obtained from widely spaced explorations. The attached logs are indicators of subsurface conditions only at the specific location and time noted. This report assumes the uniformity of the geology and soil structure between explorations, however variations can and often do exist. Whenever any deviation, difference, or change is encountered or becomes known, WT should be contacted.

This report is for the exclusive benefit of our client alone. There are no intended third-party beneficiaries of our contract with the client or this report, and nothing contained in the contract, or this report shall create any express or implied contractual or any other relationship with, or claim or cause of action for, any third party against WT.

This report is valid for the earlier of one year from the date of issuance, a change in circumstances, or discovered variations. After expiration, no person or entity shall rely on this report without the express written authorization of WT.

11.0 CLOSURE

We prepared this report as an aid to the designers of the proposed project. The comments, statements, recommendations, and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon data obtained at the location of the explorations, and from laboratory tests. Work on your project was performed in accordance with generally accepted standards and practices utilized by professionals providing similar services in this locality. No other warranty, express or implied, is made.



Approximate Boring Location

N

NOT TO SCALE

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PROJECT:	BATHTUB ROW RECONSTRUCTION
JOB NO.:	32-223627-0

BORING LOCATION DIAGRAM

PLATE

1

Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Backfill	A specified material placed and compacted in a confined area.
Base Course	A layer of specified aggregate material placed on a subgrade or subbase.
Base Course Grade	Top of base course.
Bench	A horizontal surface in a sloped deposit.
Caisson/Drilled Shaft	A concrete foundation element cast in a circular excavation which may have an enlarged base (or belled caisson).
Concrete Slabs-On-Grade	A concrete surface layer cast directly upon base course, subbase or subgrade.
Crushed Rock Base Course	A base course composed of crushed rock of a specified gradation.
Differential Settlement	Unequal settlement between or within foundation elements of a structure.
Engineered Fill	Specified soil or aggregate material placed and compacted to specified density and/or moisture conditions under observations of a representative of a soil engineer.
Existing Fill	Materials deposited through the action of man prior to exploration of the site.
Existing Grade	The ground surface at the time of field exploration.
Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Fill	Materials deposited by the actions of man.
Finished Grade	The final grade created as a part of the project.
Gravel Base Course	A base course composed of naturally occurring gravel with a specified gradation.
Heave	Upward movement.
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil.
Rock	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
Sand and Gravel Base Course	A base course of sand and gravel of a specified gradation.
Sand Base Course	A base course composed primarily of sand of a specified gradation.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Soil	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
Strip	To remove from present location.
Subbase	A layer of specified material placed to form a layer between the subgrade and base course.
Subbase Grade	Top of subbase.
Subgrade	Prepared native soil surface.

COARSE-GRAINED SOILS

LESS THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVEL OR WELL-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE
GP	POORLY-GRADED GRAVEL OR POORLY-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	
GM	SILTY GRAVEL OR SILTY GRAVEL WITH SAND, MORE THAN 12% FINES	
GC	CLAYEY GRAVEL OR CLAYEY GRAVEL WITH SAND, MORE THAN 12% FINES	
SW	WELL-GRADED SAND OR WELL-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE
SP	POORLY-GRADED SAND OR POORLY-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	
SM	SILTY SAND OR SILTY SAND WITH GRAVEL, MORE THAN 12% FINES	
SC	CLAYEY SAND OR CLAYEY SAND WITH GRAVEL, MORE THAN 12% FINES	

NOTE: Coarse-grained soils receive dual symbols if they contain 5% to 12% fines (e.g., SW-SM, GP-GC).

FINE-GRAINED SOILS

MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	SILT, SILT WITH SAND OR GRAVEL, SANDY SILT, OR GRAVELLY SILT	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50
CL	LEAN CLAY OF LOW TO MEDIUM PLASTICITY, SANDY CLAY, OR GRAVELLY CLAY	
OL	ORGANIC SILT OR ORGANIC CLAY OF LOW TO MEDIUM PLASTICITY	
MH	ELASTIC SILT, SANDY ELASTIC SILT, OR GRAVELLY ELASTIC SILT	SILTS AND CLAYS LIQUID LIMIT MORE THAN 50
CH	FAT CLAY OF HIGH PLASTICITY, SANDY FAT CLAY, OR GRAVELLY FAT CLAY	
OH	ORGANIC SILT OR ORGANIC CLAY OF HIGH PLASTICITY	
PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE: Fine-grained soils may receive dual classification based upon plasticity characteristics (e.g. CL-ML).

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	Above 12 in.
COBBLES	3 in. – 12 in.
GRAVEL	No. 4 – 3 in.
Coarse	¾ in. – 3 in.
Fine	No. 4 – ¾ in.
SAND	No. 200 – No. 4
Coarse	No. 10 – No. 4
Medium	No. 40 – No. 10
Fine	No. 200 – No. 40
Fines (Silt or Clay)	Below No. 200

NOTE: Only sizes smaller than three inches are used to classify soils

CONSISTENCY

CLAYS & SILTS	BLOWS PER FOOT
VERY SOFT	0 – 2
SOFT	3 – 4
FIRM	5 – 8
STIFF	9 – 15
VERY STIFF	16 – 30
HARD	OVER 30

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS PER FOOT
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

NOTE: Number of blows using 140-pound hammer falling 30 inches to drive a 2-inch-OD (1⅜-inch ID) split-barrel sampler (ASTM D1586).

PLASTICITY OF FINE GRAINED SOILS

PLASTICITY INDEX	TERM
0	NON-PLASTIC
1 – 7	LOW
8 – 20	MEDIUM
Over 20	HIGH

DEFINITION OF WATER CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

The number shown in **"BORING NO."** or "**TEST PIT NO.**" refers to the approximate location of the same number indicated on the "Boring and Test Pit Location Diagram" as positioned in the field by pacing or measurement from property lines and/or existing features, or through the use of Global Positioning System (GPS) devices. The accuracy of GPS devices is somewhat variable.

"DRILLING TYPE" refers to the exploratory equipment used in the boring wherein **HSA = hollow stem auger**, and the dimension presented is the outside diameter of the HSA used.

"EQUIPMENT TYPE" refers to the equipment used in the excavation of the test pit, and may include the width of the bucket on the excavator and the use of "rock" teeth or attachments.

"N" in "BLOW COUNTS" refers to a 2-in. outside diameter split-barrel sampler driven into the ground with a 140 lb. drop-hammer dropped 30 in. repeatedly until a penetration of 18 in. is achieved or until refusal. The number of blows, or "blow count", of the hammer is recorded for each of three 6-in. increments totaling 18 in. The number of blows required for advancing the sampler for the last 12 in. (2^{nd} and 3^{rd} increments) is defined as the Standard Penetration Test (SPT) "N"-Value. Refusal to penetration is considered more than 50 blows for a 6-inch increment. (Ref. ASTM D1586).
If,
N = a whole # e.g. "15", it represents the SPT blow counts for the last 12 inches.
N = stacked numbers e.g., 5/10/20, it represents the blow counts for each 6 inches increment.

"R" in "BLOW COUNTS" refers to a 3-in. outside diameter ring-lined split spoon sampler driven into the ground with a 140 lb. drop-hammer dropped 30 inches repeatedly until a penetration of 12 inches is achieved or until refusal. The number of blows required to advance the sampler 12 inches is defined as the "R" blow count. The "R" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows for a 6-inch increment. (Ref. ASTM D3550).
If,
R = a whole # e.g. "15", it represents the unconverted blow counts for 12 inches.
For refusal (penetration less than 12 inches), R=a whole #/X" e.g., 50/10"

"CS" in "BLOWS/FT." refers to a 2½-in. outside diameter California style split-barrel sampler, lined with brass sleeves, driven into the ground with a 140-pound hammer dropped 30 inches repeatedly until a penetration of 18 inches is achieved or until refusal. The number of blows of the hammer is recorded for each of the three 6-inch increments totaling 18 inches. The number of blows required for advancing the sampler for the last 12 inches (2^{nd} and 3^{rd} increments) is defined as the "CS" blow count. The "CS" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows for a 6-inch increment. (Ref. ASTM D3550)

"SAMPLE TYPE" refers to the form of sample recovery, in which **N** = Split-barrel sample, **R** = Ring-lined sample, **CS** = California style split-barrel sample, **G** = Grab sample, **B** = Bucket sample, **C** = Core sample (ex. diamond-bit rock coring), **S** = Shelby Tube.

"DRY DENSITY (LBS/CU FT)" refers to the laboratory-determined dry density in pounds per cubic foot. The symbol **"NR"** indicates that no sample was recovered.

"WATER (MOISTURE) CONTENT (% OF DRY WT.)" refers to the laboratory-determined water content in percent using the standard test method ASTM D2216.

"USCS" refers to the "Unified Soil Classification System" Group Symbol for the soil type as defined by ASTM D2487 and D2488. The soils were classified visually in the field, and where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the boring logs represent our interpretation of the approximate boundary between soil or rock types based upon visual field classification at the boring location. The transition between materials is approximate and may be more or less gradual than indicated.

Project: BATHTUB ROW

Project Number: 32-223627-0

BORING NO. 1

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Date(s) Drilled **3/12/2024**	Logged By **S. O'HERRON-ALEX**	Checked By **A. KABA**
Drilling Method **HOLLOW STEM AUGER**	Drill Bit Size/Type **7"**	Total Depth of Borehole **5**
Drill Rig Type **CME 75**	Drilling Contractor **ENVIRO-DRILL**	Approximate Surface Elevation **NOT DETERMINED**
Groundwater Level and Date Measured **NO GROUNDWATER ENCOUNTERED**	Sampling Method(s) **GRAB, SPT**	Hammer Data **140-LB AUTOHAMMER**
Borehole Backfill **AUGER CUTTINGS**	Location **SEE LOCATION DIAGRAM**	

Depth (feet)	WATER CONTENT	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOW COUNTS	USCS	GRAPHIC LOG	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0						Asphalt		3.5" Asphalt, 4" Base Course	
						CL-ML		Silty CLAY with Sand; brown, moist	
	12.2			G					
5								BORING TERMINATED AT 5 FEET	
10									
15									

G:\2024\32-223627-0-COUNTY O-BATHTUB ROW REC\223627ELogs.bg4[Lynn.tpl]

PLATE A-4

Project: BATHTUB ROW Project Number: 32-223627-0	BORING NO. 2	Western Technologies An RMA Company

Date(s) Drilled **3/12/2024**	Logged By **S. O'HERRON-ALEX**	Checked By **A. KABA**
Drilling Method **HOLLOW STEM AUGER**	Drill Bit Size/Type **7"**	Total Depth of Borehole **10**
Drill Rig Type **CME 75**	Drilling Contractor **ENVIRO-DRILL**	Approximate Surface Elevation **NOT DETERMINED**
Groundwater Level and Date Measured **NO GROUNDWATER ENCOUNTERED**	Sampling Method(s) **GRAB, SPT**	Hammer Data **140-LB AUTOHAMMER**
Borehole Backfill **AUGER CUTTINGS**	Location **SEE LOCATION DIAGRAM**	

Depth (feet)	WATER CONTENT	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOW COUNTS	USCS	GRAPHIC LOG	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0						Asphalt		4" Asphalt, 3.5", Base Course	
	18.3			G		CL		Lean CLAY with Sand; dark brown, stiff, moist	
				N	4 5 7				
5									
				G					
				N	6 7 7				
10								BORING TERMINATED AT 10 FEET	
15									

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Project: BATHTUB ROW

Project Number: 32-223627-0

BORING NO. 3

Western Technologies
An RMA Company

Date(s) Drilled **3/12/2024**	Logged By **S. O'HERRON-ALEX**	Checked By **A. KABA**
Drilling Method **HOLLOW STEM AUGER**	Drill Bit Size/Type **7"**	Total Depth of Borehole **5**
Drill Rig Type **CME 75**	Drilling Contractor **ENVIRO-DRILL**	Approximate Surface Elevation **NOT DETERMINED**
Groundwater Level and Date Measured **NO GROUNDWATER ENCOUNTERED**	Sampling Method(s) **GRAB, SPT**	Hammer Data **140-LB AUTOHAMMER**
Borehole Backfill **AUGER CUTTINGS**	Location **SEE LOCATION DIAGRAM**	

Depth (feet)	WATER CONTENT	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOW COUNTS	USCS	GRAPHIC LOG	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0						Asphalt		3.5" Asphalt, 4" Base Course	
				G		CL		Lean CLAY; dark brown, moist	
5								BORING TERMINATED AT 5 FEET	
10									
15									

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Project: BATHTUB ROW Project Number: 32-223627-0	# BORING NO. 4	Western Technologies An RMA Company

Date(s) Drilled **3/12/2024**	Logged By **S. O'HERRON-ALEX**	Checked By **A. KABA**
Drilling Method **HOLLOW STEM AUGER**	Drill Bit Size/Type **7"**	Total Depth of Borehole **10**
Drill Rig Type **CME 75**	Drilling Contractor **ENVIRO-DRILL**	Approximate Surface Elevation **NOT DETERMINED**
Groundwater Level and Date Measured **NO GROUNDWATER ENCOUNTERED**	Sampling Method(s) **GRAB, SPT**	Hammer Data **140-LB AUTOHAMMER**
Borehole Backfill **AUGER CUTTINGS**	Location **SEE LOCATION DIAGRAM**	

Depth (feet)	WATER CONTENT	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOW COUNTS	USCS	GRAPHIC LOG	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0						Asphalt		4" Asphalt, 4" Base Course	
	5.0			G		SM		Silty SAND with Gravel; dark brown, medium dense, damp	
				N	6 8 13				
5						CL		Lean CLAY; brown, stiff, moist	
				G					
				N	4 5 6				
10								BORING TERMINATED AT 10 FEET	
15									

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PLATE A-7

SOIL PROPERTIES

Boring No.	Depth (ft.)	Soil Class	Particle Size Distribution - (%) Passing by Weight														Plasticity		Remarks
			1¼"	1"	¾"	½"	3/8"	#4	#8	#10	#16	#30	#40	#50	#100	#200	L L	P I	
1	0-5	CL-ML A-4 (3)	-	-	-	-	100	99	98	97	95	91	90	89	86	79	24	7	
2	0-5	CL A-4 (6)	-	-	-	-	100	99	98	98	96	92	91	89	87	79	27	10	
4	0-5	SM A-1-b (0)	-	-	100	98	95	85	70	68	56	43	36	30	23	21	NV	NP	

Note: NP = Non-Plastic
Samples obtained excluded cobbles and boulders.

Western Technologies
An RMA Company

PROJECT: **BATHTUB ROW**
JOB NO.: **32-223627-0**

SOIL PROPERTIES

PLATE
B-1

Western Technologies
An RMA Company

8305 Washington Place, N.E.
Albuquerque, New Mexico 87113
(505) 823-4488 • wt-us.com

Resistance R-Value and Expansion Pressure of Compacted Soils

Client **COUNTY OF LOS ALAMOS**
P.O. BOX 30
LOS ALAMOS, NM 87544

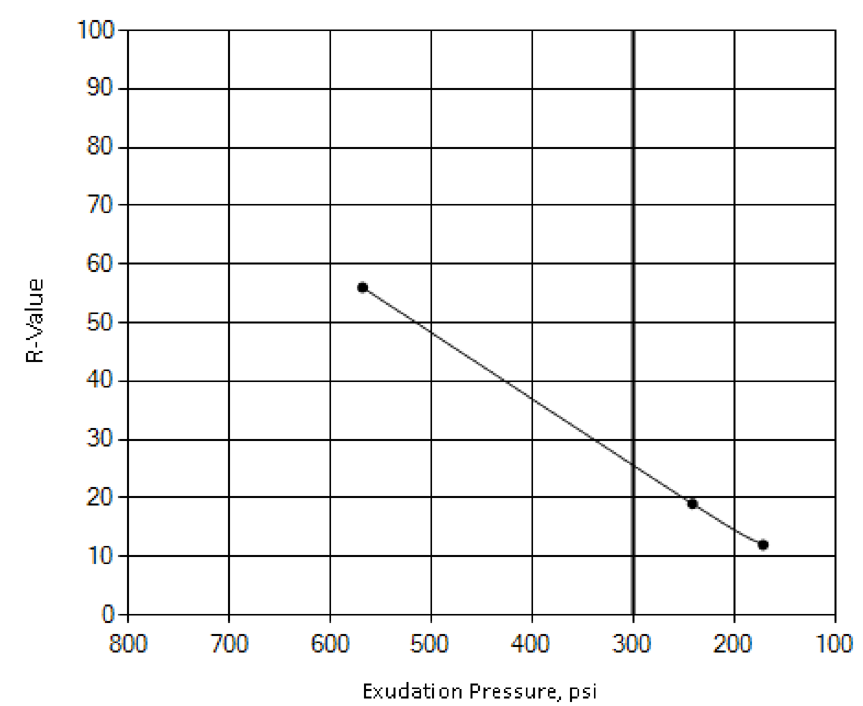
Date of Report **03/27/24**
Job No. **32-223627-0**
Event No.
Lab No. **51209**
Authorized By
Date
Sample Location Designated By
Date
Sampled By
Date **03/18/24**
Submitted By
Date **03/27/24**

Project **BATHTUB ROW RECONSTRUCTION**
Project Address **BATHTUB ROW AND PEACH STREET, LOS ALAMOS, NI**
Material Description
Material Use
Material Source **BORING 1 (0-5')**
Sample Location

Sieve Analysis
Finer than No. 200

Sieve Size	Accumulative Passing, %	Specification
6 in		
3 in		
2 in		
1-1/2 in.		
1 in.		
3/4 in.		
1/2 in.		
3/8 in.		
1/4 in.		
No. 4		
No. 8		
No. 10		
No. 16		
No. 30		
No. 40		
No. 50		
No. 100		
No. 200		

Reference	R-Value at 300 psi Exudation Pressure =	Specification	
ASTM D2844	**25**		



Liquid Limit, Plastic Limit & Plasticity Index	Result	Specification
Preparation Method		
Processing Method		
Liquid Limit		
Plastic Limit		
Plasticity Index		
Group Symbol		
Name		

Specimen	1	2	3
Moisture at Compaction, %	**13.5**	**12.1**	**10.7**
Dry Density, lbf/ft^3	**120.0**	**122.1**	**120.7**
Compactor Pressure, psi	**25**	**75**	**275**
Exudation Pressure, psi	**171**	**241**	**568**
Expansion Pressure, psf	**0**	**4**	**0**
Corrected R-Value	**12**	**19**	**56**

Comments:

Reviewed by: JAMES DACY, LAB SUPERVISOR