Western Technologies Inc.

GEOTECHNICAL EVALUATION REPORT

COMMERCIAL LUBE CENTER
80 Posse Ground Road
Sedona, Arizona
WT Reference No. 2521JW085

PREPARED FOR:
Sedona Take Five, LLC
106 Foster Avenue
Charlotte, North Carolina 28203

May 28, 2021

Registered Geologist Certificate No. 67873 Gregory Burr, Date Signed 5/28/21, Arizona U.S.A.

Gregory L. E. Burr, R.G., E.I.T.
Geotechnical Project Manager

Registered Professional Engineer (Civil) Certificate No. 11860 Craig P. Wiedeman, Date Signed 5/28/21, Arizona U.S.A.

Craig P. Wiedeman, P.E.
Senior Geotechnical Engineer

Western Technologies Inc.
The Quality People
Since 1955

2400 East Huntington Drive
Flagstaff, Arizona 86004-8934
(928) 774-8700 • fax 774-6469

May 28, 2021

Sedona Take Five, LLC
106 Foster Avenue
Charlotte, North Carolina 28203

Attn: Mr. Bill Burwood

Re: Geotechnical Evaluation
Commercial Lube Center
80 Posse Ground Road
Sedona, Arizona

Job No. 2521JW085

Western Technologies Inc. has completed the geotechnical evaluation for the proposed commercial lube center to be located in Sedona, Arizona. This study was performed in general accordance with our proposal number 2521PW022 dated January 25, 2021. The results of our study, including the boring location diagram, laboratory test results, boring logs, and the geotechnical recommendations are attached.

We have appreciated being of service to you in the geotechnical engineering phase of this project and are prepared to assist you during the construction phases as well. If design conditions change, or if you have any questions concerning this report or any of our testing, inspection, design and consulting services, please do not hesitate to contact us. We look forward to working with you on future projects.

Sincerely,
WESTERN TECHNOLOGIES, INC.
Geotechnical Engineering Services

Gregory L. E. Burr, R.G., E.I.T.
Geotechnical Project Manager

Copies to: Addressee (emailed)

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GEOTECHNICAL EVALUATION
COMMERCIAL LUBE CENTER
80 POSSE GROUND ROAD
SEDONA, ARIZONA
JOB NO. 2521JW085

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the proposed commercial lube center to be located at 80 Posse Ground Road in Sedona, Arizona. The purpose of these services is to provide information and recommendations regarding:

- foundation design parameters
- floor slab support
- lateral earth pressures
- earthwork
- drainage
- corrosivity to concrete
- on-site pavements

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

2.0 PROJECT DESCRIPTION

Based on information provided by Bill Burdwood with Durban Development, the proposed project will consist of a single-story commercial building with a plan area of approximately 1,500 square feet to be constructed on a 0.43-acre lot. It is assumed the structure will use wood frame and/or masonry construction with a slab-on-grade floor. Maximum wall and column loads for the structure are assumed to be 2.5 kips per linear foot and 35 kips, respectively. We anticipate no extraordinary slab-on-grade criteria and that the finished floor level will be within about 2 feet of the existing site grade. On-site pavement will be included as part of the development. Should any of our information or assumptions not be correct, we request that the Client notify Western Technologies (WT) immediately.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Six borings were drilled to depths of about 2 to 5 feet below existing site grades at the approximate locations shown on the attached boring location diagram. Logs of the borings are presented in Appendix A. Subsoils encountered during drilling were examined visually and sampled at selected depth intervals. 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 include modifications based on laboratory observations and tests of the field samples. The final logs describe the materials encountered, their thicknesses, 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 liquefaction potential.

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
- Dry density
- Compression
- Remolded expansion potential
- Gradation
- Plasticity
- Water-soluble salt/sulfate/chloride content

Test results were utilized in the development of the recommendations contained in this report.

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 the 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

At the time of our field exploration, the site was an undeveloped commercial lot. The site is bordered on the north and east by developed commercial lots, on the west by Posse Ground Road, and on the south by Arizona Route 89A. The ground surface was smooth and exhibited a gentle, near-flat slope down to the south. Site surface drainage appeared to be fair to poor by means of sheet flow to the south. Evidence of previous surface water ponding was observed on the site at the time of our field exploration. Vegetation on the site consisted of a sparse to moderate growth of native juniper trees, cacti, grasses and weeds.

4.2 Subsurface

As presented on the boring logs, shallow surface soils extending to the full depth of exploration were found to be very dense, non-plastic Silty SANDS and hard, medium plasticity CLAYS, both with variable amounts of gravel, cobbles and boulders. Refusal to auger penetration occurred in all borings at depths of about 2 to 5 feet on SANDSTONE. Groundwater was not encountered in any boring at the time of exploration. The logs in Appendix A show details of the subsurface conditions encountered during the field exploration.

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.

5.0 GEOTECHNICAL PROPERTIES AND ANALYSIS

5.1 Laboratory Tests

Laboratory test results (see Appendix B) indicate that native subsoils exhibit moderate compressibility at existing water contents. Moderately high additional compression occurs when the water content is increased.

Near-surface native soils are of nil to medium plasticity. These soils exhibit low to no expansion potential when recompacted, confined by loads approximating floor loads and saturated in accordance with standard Arizona test methods. Slabs-on-grade supported on recompacted native soils have a low potential for heaving if the water content of the soil increases. Densification of the soil by the passage of construction equipment will increase the expansion potential of the native soil.

5.2 Field Tests

Native subsoils exhibited high resistance to penetration using test method ASTM D3550.

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.

6.2 Design Considerations

Laboratory test results indicate that the site soils become weaker and more compressible with an increase in moisture content. These soils are not considered suitable for support of foundations and concrete slabs in their present state and should be over-excavated and/or recompacted as recommended in the **EARTHWORK** section of this report. Proper drainage should be provided to help prevent infiltration of moisture below the foundations and concrete slabs.

Cobbles and boulders were encountered in the borings. These oversized materials, greater than 6 inches, could present construction difficulties for foundation, utility trench, and other excavations. In cut areas and excavations, exposed oversized materials should be removed.

6.3 Foundations

The proposed structure can be supported by conventional shallow spread footings bearing on dense sandstone and/or lean mix (2-sack) concrete backfill extending to dense sandstone. Footings should bear at least 2 feet below the lowest adjacent finished grade. Footings may be designed to impose a maximum dead plus live-load pressure of up to 3500 pounds per square foot.

Total and differential settlement of foundation elements bearing on dense sandstone or on lean mix concrete backfill extending to dense sandstone should be nominal. Finished grade is the lowest adjacent grade for perimeter footings and floor slab level for interior footings. The design bearing capacity applies to dead loads plus design live load conditions. Recommended minimum widths of column and wall footings are 24 inches and 16 inches, respectively. The bearing value given is a net bearing value and the weight of the concrete in the footings may be ignored. All footings, stem walls and masonry walls should be reinforced to reduce the potential for distress caused by differential foundation movements. The use of joints at openings or other discontinuities in masonry walls is recommended.

We recommend that the geotechnical engineer or his representative observe the footing excavations before reinforcing steel and concrete are placed. It should be determined whether the rock materials exposed are similar to those anticipated for support of the footings. Any soft, loose or unacceptable materials should be undercut to suitable materials and backfilled with either lean mix or structural concrete.

6.4 Lateral Design Criteria

For retaining walls located above any free water surface with no surcharge loads, recommended equivalent fluid pressures and coefficients of base friction for unrestrained elements are:

- Active:
  Undisturbed subsoil .... 36 psf/ft
  Compacted granular backfill .... 30 psf/ft
  Compacted site soils .... 36 psf/ft

- Passive:
  Shallow wall footings .... 225 psf/ft
  Shallow column footings .... 325 psf/ft

- Coefficient of base friction 0.35*

  * The coefficient of base friction should be reduced to 0.25 when used in conjunction with passive pressure.

Where the design includes restrained elements, the following equivalent fluid pressures are recommended:

- At-rest:
  Undisturbed subsoil .... 62 psf/ft
  Compacted granular backfill .... 55 psf/ft

These lateral earth pressures are not applicable for submerged soils. We should be consulted for additional recommendations if such conditions are to be included in the design. Any surcharge from adjacent loadings must also be considered. Walls below grade should be waterproofed.

We recommend a free-draining soil layer or manufactured geocomposite material, be constructed adjacent to the back of the retaining wall. A filter may be required between the soil backfill and drainage layer. This drainage zone should help prevent hydrostatic pressure buildup. This vertical drain should be tied into a gravity drainage system at the base of the retaining wall. It is important that all backfill be properly placed and compacted. Backfill should be mechanically compacted in layers. Flooding or jetting should not be permitted. Care should be taken not to damage the walls when placing the backfill. Backfills should be inspected and tested during placement.

Fill against footings, stem walls and retaining walls should be compacted to densities specified in **EARTHWORK**. Medium to high plasticity clay soils should not be used as backfill against retaining walls. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Overcompaction may cause excessive lateral earth pressures which could result in wall movements.

6.5 Seismic Considerations

Structures should be designed in accordance with applicable building codes. The seismic design parameters presented in the following table, in accordance with the 2018 International Building Code and ASCE 7-16, are applicable to the project site:

Seismic Design Parameters International Building Code 2018, ASCE 7-16	
Soil Site Class	C
Mapped Spectral Response Acceleration at 0.2 sec period (S_s)	0.295g
Mapped Spectral Response Acceleration at 1.0 sec period (S_1)	0.093g
Site Coefficient for 0.2 sec period (F_a)	1.3
Site Coefficient for 1.0 sec period (F_v)	1.5
Design Spectral Response Acceleration at 0.2 sec period (S_{DS})	0.255g
Design Spectral Response Acceleration at 1.0 sec period (S_{D1})	0.093g

The soil site class is based upon conditions identified in shallow exploratory borings and local knowledge of the geotechnical conditions in the vicinity of the site. Conditions extending beyond the depth of our borings to a depth of 100 feet were assumed for the purposes of providing the information presented in the table. Based upon the density of the on-site soils, the shallow rock conditions and lack of groundwater, the potential settlement and lateral spread due to liquefaction is not a considered to be a significant concern on this site.

6.6 Conventional Slab-on-Grade Support

Floor slabs can be supported on properly placed and compacted fill or approved, properly recompacted, low expansive potential native soils. For design of interior slabs-on-grade, we recommend using a modulus of subgrade reaction (k) of 225 pounds per cubic inch (pci) for the on-site soils or imported fill material, based on a 30-inch diameter plate. The slab subgrade should be prepared by the procedures outlined in this report. A minimum 4-inch thick layer of base course should be provided beneath all slabs to help prevent capillary rise and a damp slab. The use of vapor retarders is desirable for any slab-on-grade where the floor will be covered by products using water based adhesives, wood, vinyl backed carpet, impermeable floor coatings (urethane, epoxy, acrylic terrazzo, etc.) or where the floor will be in contact with moisture sensitive equipment or product. When used, the design and installation should be in accordance with the guidance provided in ACI 302.1R and 302.2R. Final determination on the use of a vapor retarder should be left to the slab designer.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (water-cement ratio) could cause excessive shrinkage, cracking or curling. The plastic properties of the concrete should be documented at the time of placement and specimens should also be prepared for strength testing to verify compliance with project specifications. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor covering.

6.7 Drainage

The major cause of soil-related foundation and slab-on-ground problems is moisture increase in soils below structures. Properly functioning conventional foundations and floor slabs-on-ground require appropriately constructed and maintained site drainage conditions. Therefore, it is extremely important that positive drainage be provided during construction and maintained throughout the life of the structure. It is also important that proper planning and control of landscape and irrigation practices be performed.

Infiltration of water into utility or foundation excavations must be prevented during construction. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to minimize the possibility of moisture infiltration. If utility line trenches are backfilled with a granular material, then a clay or concrete plug should be placed in the trench adjacent to the structure to prevent water from following the trench back under the structure.

In areas where sidewalks, patios or driveways do not immediately adjoin the structure, protective slopes should be provided with an outfall of about 5 percent for at least 10 feet from perimeter walls. Scuppers and drain pipes should be designed to provide drainage away from the structure for a minimum distance of 10 feet. Planters or other surface features that could retain water adjacent to the structure should be avoided if at all possible. If planters and/or landscaping are adjacent to or near the structure, there will be a greater potential for moisture infiltration, soil movement and structure distress. As a minimum, we recommend the following:

- Grades should slope away from the structure.

- Planters should slope away from the structure and should not pond water. Drains should be installed in enclosed planters to facilitate flow out of the planters.

- Only shallow rooted landscaping should be used.

- Watering should be kept to a minimum. Irrigation systems should be situated on the far side of any planting and away from the structure to minimize infiltration beneath foundations from possible leaks.

- Trees should be planted no closer than a distance equal to three-quarters of their mature height or 15 feet, whichever is greater.

It should be understood that these recommendations will help minimize the potential for soil movement and resulting distress, but will not eliminate this potential.

6.8 Corrosivity to Concrete

The chemical test results indicate that the site soils are negligibly corrosive to concrete. However, in order to be consistent with standard local practice and for reasons of material availability, we recommend that Type II portland cement be used for all concrete on and below grade.

6.9 Pavements

Based on existing subgrade conditions, the following pavement sections are recommended for the areas indicated:

Traffic Area	Asphalt Concrete (in.)	Base Course (in.)
Passenger car parking/drives (low traffic frequency)	3	4
Major access drives (medium traffic frequency)	4	5

Bituminous surfacing should be constructed of dense-graded, central plant-mix, asphalt concrete. Base course and asphalt concrete should conform with City of Sedona or Yavapai County specifications.

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 native subgrade soils will soften and lose stability if subjected to conditions which result in an increase in water content.

Due to the high static loads imposed by parked trucks in loading and unloading areas and at dumpster locations, we recommend that a rigid pavement section be considered for these areas. A minimum 6-inch thick concrete pavement over 4 inches of aggregate base course material is recommended.

6.9.1 Pavement Analyses

The recommended pavement sections are based on the following conditions. This firm should be contacted if any of these conditions change so that revised recommendations can be provided, if necessary.

a. A correlated R-value of 30 for the on-site soils which corresponds to a resilient modulus of approximately 10,500 pounds per square inch. Any required fills should be constructed using on-site or imported materials with subgrade support characteristics equal to or greater than the subgrade soils in the area being filled.

b. Structural coefficients of 0.40 for asphalt concrete and 0.12 for aggregate base course material.

c. A present serviceability index of 4.5, a terminal serviceability index of 2.5, an overall standard deviation of 0.35, a reliability factor of 85 percent, a drainage coefficient of 0.85, a seasonal variation factor of 2.4, and a design life of 20 years.

d. An assumed total 18-kip equivalent single axle load (ESAL) of 25,000 for the passenger car parking areas and 50,000 for the major access drives areas.

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.

7.2 Site Clearing

Strip and remove all vegetation, debris, and any other deleterious materials from the building and pavement areas. The building area is defined as that area within the building 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 into the site soils for the proposed construction can be accomplished with conventional equipment. Excavations penetrating the underlying sandstone will require the use of heavy-duty, specialized equipment to facilitate rock break up and removal.

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

7.4 Foundation Preparation

Specialized treatment of dense sandstone within foundation areas is not required. Remove all loose or disturbed materials from the bottoms and sides of the excavations prior to the placement of foundation concrete. If desired, lean mix (2-sack) concrete backfill may be used between the design bottom of footing elevation and the top of the dense rock.

7.5 Conventional Interior Slab Preparation

Scarify, moisten or dry as required, and compact all subgrade soils to a minimum depth of 8 inches. The subgrade preparation should be accomplished in a manner that will result in uniform water contents and densities after compaction. All subgrade preparation in the building area should extend a minimum of 5 feet beyond perimeter footings.

7.6 Pavement Preparation

Prior to placement of fill and/or pavement materials, the exposed subgrade soils should be proof-rolled and observed by the geotechnical engineer or his qualified representative to verify that stable subgrade conditions exist. Any loose, soft, disturbed, or otherwise unsuitable materials should be over-excavated and replaced with engineered fill. The subgrade should then be scarified, moisture conditioned as required, and recompacted for a minimum depth of 8 inches.

7.7 Materials

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

- Interior slab areas
- Backfill
- Pavement areas

b. Frozen soils should not be used as fill or backfill.

c. Lean mix (2-sack) concrete backfill should consist of aggregate base course type material combined with 2 sacks of cement per cubic yard. A coarse rock mix should not be used.

d. 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 ....40 (max)

- Maximum expansive potential (%)[1] 1.5

- Maximum soluble sulfates (%) 0.10

e. Base course should conform to current City of Sedona or Yavapai County specifications.

7.8 <u>Placement and Compaction</u>

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 8 inches.

c. No fill should be placed over frozen ground.

[1] Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about 3 percent below optimum water content. The sample is confined under a 100 psf surcharge and submerged.

c. Materials should be compacted to the following:

Material	Minimum Percent Compaction (ASTM D698)
• On-site or imported soil, reworked and fill:	
Below slabs-on-grade	90
Pavement areas	95
• Aggregate base:	
Below slabs-on-grade	95
Pavement areas	100
• Structural backfill	95
• Nonstructural backfill	90

d. On-site and imported soils with low expansive potential and aggregate base course materials should be compacted with a moisture content in the range of 3 percent below to 3 percent above optimum.

7.9 Compliance

Recommendations for foundations and slabs-on-grade 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 observation and testing services.

8.0 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.

9.0 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.

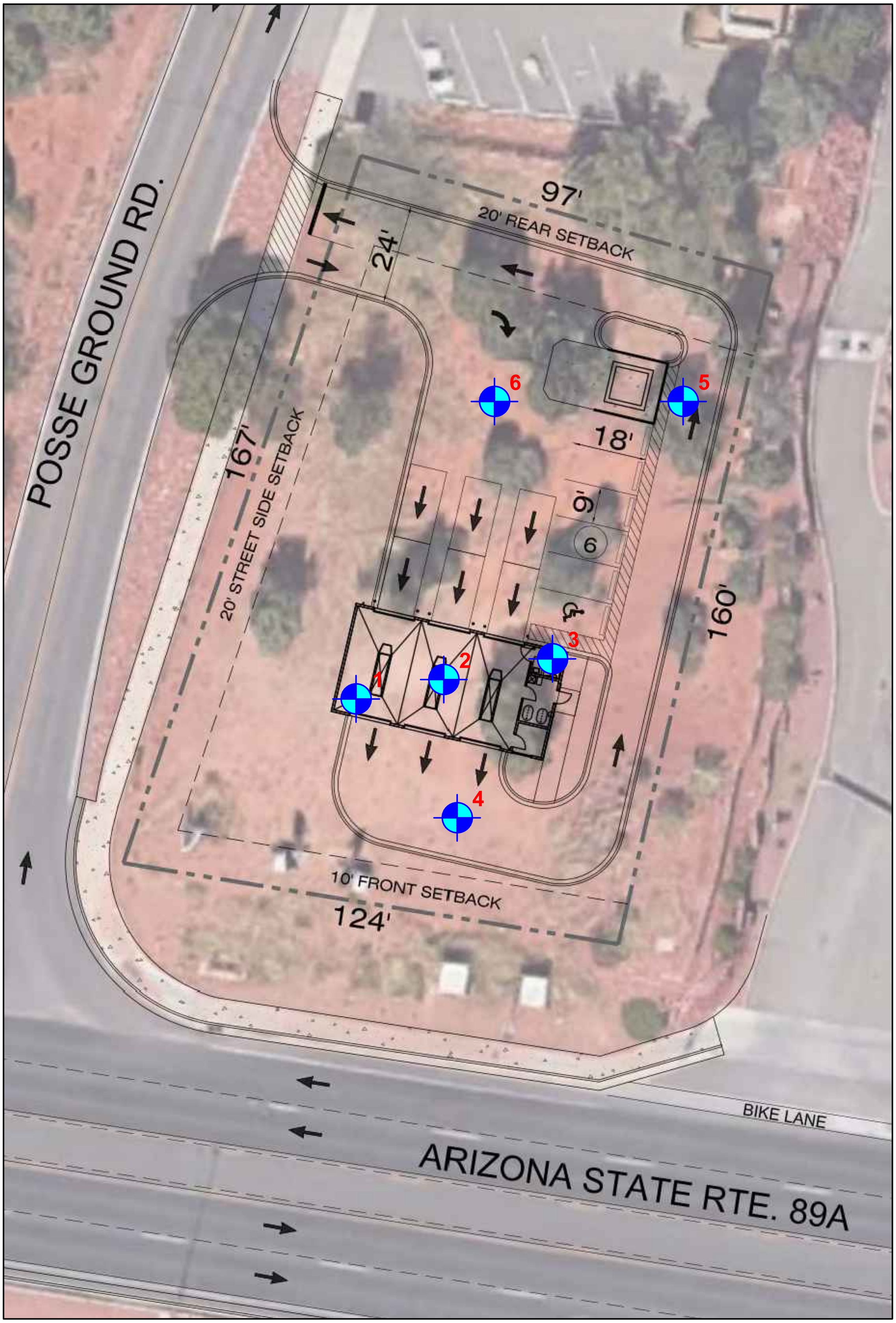
The recommendations presented are based entirely upon data derived from a limited number of samples obtained from widely spaced explorations. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. This report assumes the uniformity of the geology and 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.

10.0 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.



Not to Scale

Approximate Test Boring Location

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
The Quality People
Since 1955

COMMERCIAL LUBE CENTER	
Boring Location Diagram	
Western Technologies Inc.	
Job No.: 2521JW085	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

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METHOD OF CLASSIFICATION

PLATE
A-2

The number shown in **"BORING NO."** refers to the approximate location of the same number indicated on the "Boring Location Diagram" as positioned in the field by pacing or measurement from property lines and/or existing features.

"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.

"R" in "BLOW COUNTS" refers to a 3-inch outside diameter ring-lined split barrel sampler driven into the ground with a 140 pound 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 per foot. A double vertical line within the symbol indicates no sample recovery. A circle within the symbol indicates sample disturbance.

"SAMPLE TYPE" refers to the form of sample recovery, in which **R** = Ring-lined sample and **G** = Grab sample.

"DRY DENSITY (LBS/CU FT)" refers to the laboratory-determined dry density in pounds per cubic foot.

"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.

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DATE DRILLED: **5-4-21**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. 1

EQUIPMENT TYPE: **CME-75**
DRILLING TYPE: **7"HSA**
FIELD ENGINEER: **C. Senior**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				SM		Silty SAND; with gravel, cobbles and boulders, red, very dense, damp
15.6	98	R		50/4"				
								Auger Refusal at 3 Feet on SANDSTONE
					5			

N- STANDARD PENETRATION TEST
R- RING SAMPLE
CA- CALIFORNIA MODIFIED SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

WESTERN TECHNOLOGIES INC.
2400 Huntington Drive
Flagstaff, AZ 86004-8934

PROJECT: **COMMERCIAL LUBE CENTER**
PROJECT NO.: **2521JW085**

BORING LOG

PLATE **A-4**

DATE DRILLED: **5-4-21**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. 2

EQUIPMENT TYPE: **CME-75**
DRILLING TYPE: **7"HSA**
FIELD ENGINEER: **C. Senior**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				SM		Silty SAND; some gravel, cobbles and boulders, red, very dense, slightly damp
		R		50/2"				
								Auger Refusal at 3 Feet on SANDSTONE
					5			

N- STANDARD PENETRATION TEST
R- RING SAMPLE
CA- CALIFORNIA MODIFIED SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

WESTERN TECHNOLOGIES INC.
2400 Huntington Drive
Flagstaff, AZ 86004-8934

PROJECT: **COMMERCIAL LUBE CENTER**
PROJECT NO.: **2521JW085**

BORING LOG

PLATE **A-5**

DATE DRILLED: **5-4-21**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. 3

EQUIPMENT TYPE: **CME-75**
DRILLING TYPE: **7"HSA**
FIELD ENGINEER: **C. Senior**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				SM		Silty SAND; some gravel, cobbles and boulders, red, very dense, slightly damp
		R		50/2"				
								Auger Refusal at 3 Feet on SANDSTONE
					5			

N- STANDARD PENETRATION TEST
R- RING SAMPLE
CA- CALIFORNIA MODIFIED SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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PROJECT: **COMMERCIAL LUBE CENTER**
PROJECT NO.: **2521JW085**

BORING LOG

PLATE **A-6**

DATE DRILLED: **5-4-21**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. 4

EQUIPMENT TYPE: **CME-75**
DRILLING TYPE: **7"HSA**
FIELD ENGINEER: **C. Senior**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				SM		Silty SAND; some gravel, cobbles and boulders, red, very dense, slightly damp
		N		50/1"				
								Auger Refusal at 2 Feet on SANDSTONE
					5			

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

N- STANDARD PENETRATION TEST
R- RING SAMPLE
CA- CALIFORNIA MODIFIED SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

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PROJECT: **COMMERCIAL LUBE CENTER**
PROJECT NO.: **2521JW085**

BORING LOG

PLATE **A-7**

DATE DRILLED: **5-4-21**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. 5

EQUIPMENT TYPE: **CME-75**
DRILLING TYPE: **7"HSA**
FIELD ENGINEER: **C. Senior**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				CL		Gravelly Lean CLAY; some sand, cobbles and boulders, red, hard, slightly damp
2.9	124	R		50/10"				
3.4	107	R		50/5"				
					5			**Boring Stopped at 5 Feet**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

N- STANDARD PENETRATION TEST
R- RING SAMPLE
CA- CALIFORNIA MODIFIED SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

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PROJECT: **COMMERCIAL LUBE CENTER**
PROJECT NO.: **2521JW085**

PLATE **A-8**

BORING LOG

DATE DRILLED: **5-4-21**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. 6

EQUIPMENT TYPE: **CME-75**
DRILLING TYPE: **7"HSA**
FIELD ENGINEER: **C. Senior**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				SM		Silty SAND; some gravel, cobbles and boulders, red, very dense, slightly damp
		N		50/3"				
								Auger Refusal at 3 Feet on SANDSTONE
					5			

N- STANDARD PENETRATION TEST
R- RING SAMPLE
CA- CALIFORNIA MODIFIED SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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PROJECT: **COMMERCIAL LUBE CENTER**
PROJECT NO.: **2521JW085**

PLATE **A-9**

BORING LOG

Boring No.	Depth (ft)	USCS Class.	Particle Size Distribution (%) Passing by Weight							Atterberg Limits		Laboratory Compaction Characteristics			Remarks
			3"	¾"	#4	#10	#40	#200	2µ	LL	PI	Dry Density (pcf)	Optimum Moisture (%)	Method	
1	0-3	SM	100	88	74	64	53	41.2		21	3				2
3	0-3	SM	100	98	89	82	65	45.3			NP				2
5	0-5	CL	100	92	79	72	68	58.3		26	9				2

NOTE: NP = Non-plastic
µ = microns (2µ = 0.002mm)

REMARKS

Classification / Particle Size / Moisture-Density Relationship
1. Visual
2. Laboratory Tested
3. Minus #200 Only
4. Test Method ASTM D698/AASHTO T99
5. Test Method ASTM D1557/AASHTO T180
6. From the ADOT Family of Curves

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PLATE
B-1

SOIL PROPERTIES

Boring No.	Depth (ft.)	USCS Class.	Initial Dry Density (pcf)	Initial Water Content (%)	Compression Properties			Expansion Properties		Plasticity		Percent Passing #200	Soluble		Remarks
					Surcharge (ksf)	Total Compression (%) In-Situ	Total Compression (%) After Saturation	Surcharge (ksf)	Expansion (%)	LL	PI		Salts (ppm)	Sulfate (ppm)	
1	0-3	SM	122.8	9.7				0.1	0.1						1,2
3	0-3	SM	125.4	9.0				0.1	0.3						1,2
5	0-5	CL	122.8	9.7				0.1	1.9						1,2

Notes: Initial Dry Density and Initial Water Content are remolded.

Remarks

1. Compacted density (approx. 95% of ASTM D698 max. density at moisture content slightly below optimum.)
2. Submerged to approximate saturation.

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JOB NO.: 2521JW085

SOIL PROPERTIES

PLATE
B-2

MOTZZ LABORATORY, INC.

Laboratory Analysis Report

Western Technologies - Flagstaff
Gregory L. E. Burr
2400 East Huntington
Flagstaff, AZ 86004-8934

Project: 2521JW085
Date Received: 5/10/2021
Date Reported: 5/12/2021

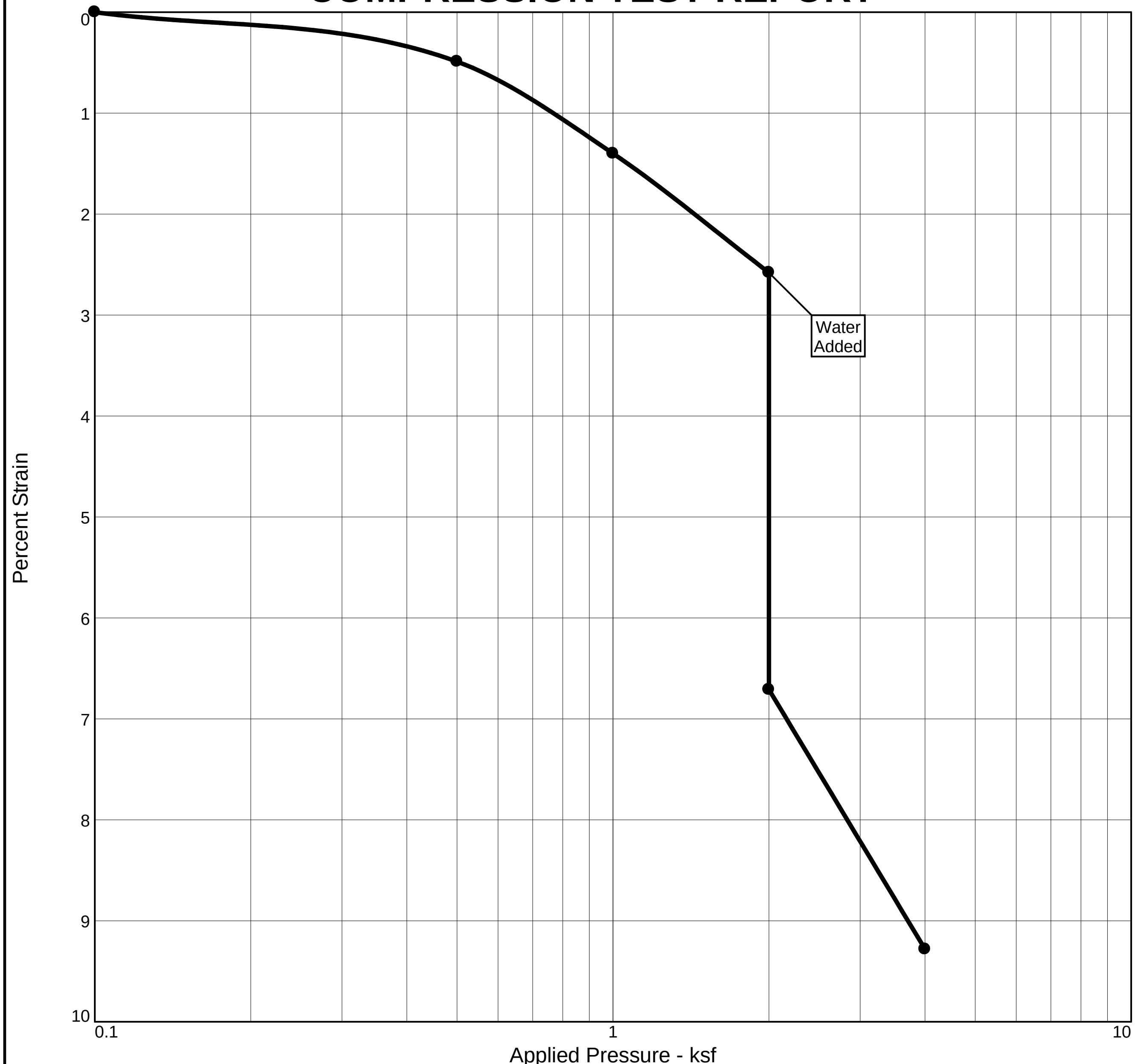
PO Number: 2521P015

Lab Number: 936757-1 **1 (0-3)**

Test Parameter	Method	Result	Units	Levels
Soluble Salts	ARIZ 237b	217	ppm	
Sulfate	ARIZ 733b	< 3	ppm	
Chloride	ARIZ 736b	3	ppm	

Plate B-3

COMPRESSION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	e_o	Swell Press. (ksf)	Clpse. %	C_r
Sat.	Moist.									
59.7 %	15.6 %	97.8			2.65		0.691		4.1	

MATERIAL DESCRIPTION	USCS	AASHTO
SILTY SAND WITH GRAVEL	SM	

Project No. 2521JW085 **Client:** SEDONA TAKE 5, LLC

Project: COMMERCIAL LUBE CENTER

Source: RING SAMPLE **Depth:** 2-3 FEET **Sample No.:** BORING 1

Western Technologies, Inc.

Flagstaff, AZ

Remarks:

Figure B-4