Western Technologies
An RMA Company

GEOTECHNICAL EVALUATION REPORT

PAYSON CAMPUS TELESCOPE
APN: 304-01-369C
201 North Mud Springs Road
Payson, Arizona
WT Job No. 25-224193-0

PREPARED FOR:
Gila Community College
8274 South Six Shooter Canyon Road
Globe, Arizona 85501
Attn: Ms. Mary Springer

August 28, 2024

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO. 79669
GREGORY BURR
DATE SIGNED 8/28/24
ARIZONA, U.S.A.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 11860
CRAIG P. WIEDEMAN
ARIZONA U.S.A
8/28/24

Gregory L. E. Burr, P.E., R.G.
Geotechnical Department Manager

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

August 28, 2024

Gila Community College
8274 South Six Shooter Canyon Road
Globe, Arizona 85501

Attn: Ms. Mary Springer

Re: Geotechnical Evaluation — Job No. 25-224193-0
Payson Campus Telescope
APN: 304-01-369C
201 North Mud Springs Road
Payson, Arizona

Western Technologies Inc. has completed the geotechnical evaluation for the proposed telescope to be located in Payson, Arizona. This study was performed in general accordance with our proposal number 25-224193-P dated June 10, 2024. The results of our study, including the test pit location diagram, laboratory test results, test pit 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 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, P.E., R.G.
Geotechnical Department Manager

Copies to: Addressee (emailed)

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

GEOTECHNICAL EVALUATION
PAYSON CAMPUS TELESCOPE
APN # 304-01-369C
201 NORTH MUD SPRINGS ROAD
PAYSON, ARIZONA
JOB NO. 25-224193-0

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the proposed telescope to be located at 201 North Mud Springs Road in Payson, 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

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 Ms. Mary Springer, the proposed project will consist of a new dome/telescope with a total plan area of approximately 300 square feet to be constructed on the Gila Community College Campus. The structure is assumed to use metal frame and/or masonry construction with slab-on-grade floors. Maximum wall and column loads for the structure are assumed to be 2.5 kips per linear foot and 30 kips, respectively. We anticipate no extraordinary slab-on-grade criteria and that the finished floor level will be within 2 to 3 feet of the existing site grades. 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

Two test pits were each excavated to a depth of about 3 feet below existing site grades at the approximate locations shown on the attached Test Pit Location Diagram. Logs of the test pits are presented in Appendix A. Subsoils encountered during excavating were examined visually and sampled at selected depth intervals. A field log was prepared for each test pit. In addition, two samples of on-site rock were collected for laboratory testing. These logs contain visual classifications of the materials encountered during excavating 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 test pit 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/rock samples to aid in material classification and to estimate pertinent engineering properties of the on-site soils/rock 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.

- Remolded expansion
- Maximum density/optimum moisture
- Sieve analysis
- Plasticity
- Soluble salt/sulfate/chloride content
- Unit weight (rock)
- Unconfined compressive strength (rock)

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 a developed community college. Previous development on the site consisted of a masonry constructed school building, solar canopies, and asphalt paved parking and drive areas that all appeared to be in good to fair condition. The site was bordered on the north by East Canyon Drive, on the south by East State Highway 260, on the east by undeveloped land, and on the west by North Mud Springs Road. The ground surface on the site contained embedded granite gravel, cobbles and boulders, and exhibited a moderate slope down to the east. Site surface drainage appeared to be good to fair by means of sheet flow to the east. Vegetation on the site consisted of a moderate to heavy growth of native juniper trees, bushes, cacti, weeds and grasses.

4.2 Subsurface

As presented on the test pit logs, surface and subsoils extending to the full depth of exploration in the test pits were found to be low plasticity Poorly Graded SANDS with variable amounts of silt and gravel. Refusal to excavator penetration occurs in both test pits at a depth of about 3 feet on dense GRANITE. Groundwater was not encountered in either test pit at the time of exploration. The logs in Appendix A show details of the subsurface conditions encountered during the field exploration.

The test pit 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 test pits may become evident during construction. If variations appear, we should be contacted to re-evaluate our recommendations.

5.0 GEOTECHNICAL PROPERTIES AND ANALYSIS

Near-surface soils contain low plasticity to non-plastic fines. Slabs-on-grade supported on recompacted on-site soils have a low potential for heaving if the water content of the soil increases. On-site soils were too granular to obtain samples for compression testing. Samples of the on-site rock were obtained for unit weight and unconfined compressive strength testing and the results are presented in Appendix B.

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 from similar projects in the area indicate that the site soils become weaker and more compressible with an increase in moisture content under typical foundation loadings. These soils are not considered suitable for support of foundations in their present state and should be over-excavated 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 some boulders were observed on the site. These oversized materials, greater than 3 inches, could present construction difficulties for foundation, utility trenches and other excavations. In cut areas and excavations, exposed oversized materials should be removed.

6.3 Conventional Spread Foundations

In order to minimize differential movement and obtain maximum foundation support conditions, we recommend that the proposed structure be supported by conventional shallow spread footings bearing on dense granite and/or lean mix (2-sack) concrete backfill extending to dense granite. 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 granite or on lean mix concrete backfill extending to dense granite 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 ....35 psf/ft
  Compacted granular backfill ....30 psf/ft
  Compacted site soils ....35 psf/ft

- Passive:
  Shallow wall footings ....220 psf/ft
  Shallow column footings..350 psf/ft
  Dense rock ....500 psf/ft

- Coefficient of base friction:
  Soil.. 0.35*
  Rock.. 0.55

  * 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 ....65 psf/ft
  Compacted granular backfill ....56 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 any retaining walls. 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 clayey 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)	0.272g
Mapped Spectral Response Acceleration at 1.0 sec period (S_1)	0.086g
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})	0.236g
Design Spectral Response Acceleration at 1.0 sec period (S_{D1})	0.086g

The soil site class is based upon conditions identified in shallow exploratory test pits and local knowledge of the geotechnical conditions in the vicinity of the site. Conditions extending beyond the depth of our test pits 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 considered to be a significant concern on this site.

6.6 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 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 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/or gutters 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.

- A minimum of 5 feet should be maintained between building foundations and the shallow rooted plants. In like manner, for deeper-rooted plants, a minimum of 10 feet should be maintained. These deeper-rooted plants should still have a low moisture requirement.

- 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 soils at the site classify as Class S0 in accordance with Table 19.3.1.1 of ACI 318-19. 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.

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 area. 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. On site soils will 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. Any excavations penetrating the underlying granite may require the use of heavy-duty, specialized equipment, possibly together with drilling and blasting, to facilitate rock break up and removal.

7.4 Spread Foundation Preparation

Specialized treatment of dense granite 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 Slab-on-Grade 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. In areas were dense granite is encountered, scarification and recompaction is not required.

7.6 Materials

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

- Slab-on-grade areas
- Backfill
- Landscape areas

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

c. 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

d. Base course should conform to current City of Payson specifications.

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 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.

d. Materials should be compacted to the following:

Material	Minimum Percent Compaction (ASTM D698)
• On-site or imported soils, reworked and fill:	
Below slabs-on-grade	95
Landscape areas	85
• Aggregate base:	95
• Backfill:	
Structural	95
Nonstructural	90

e. 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.

7.8 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.

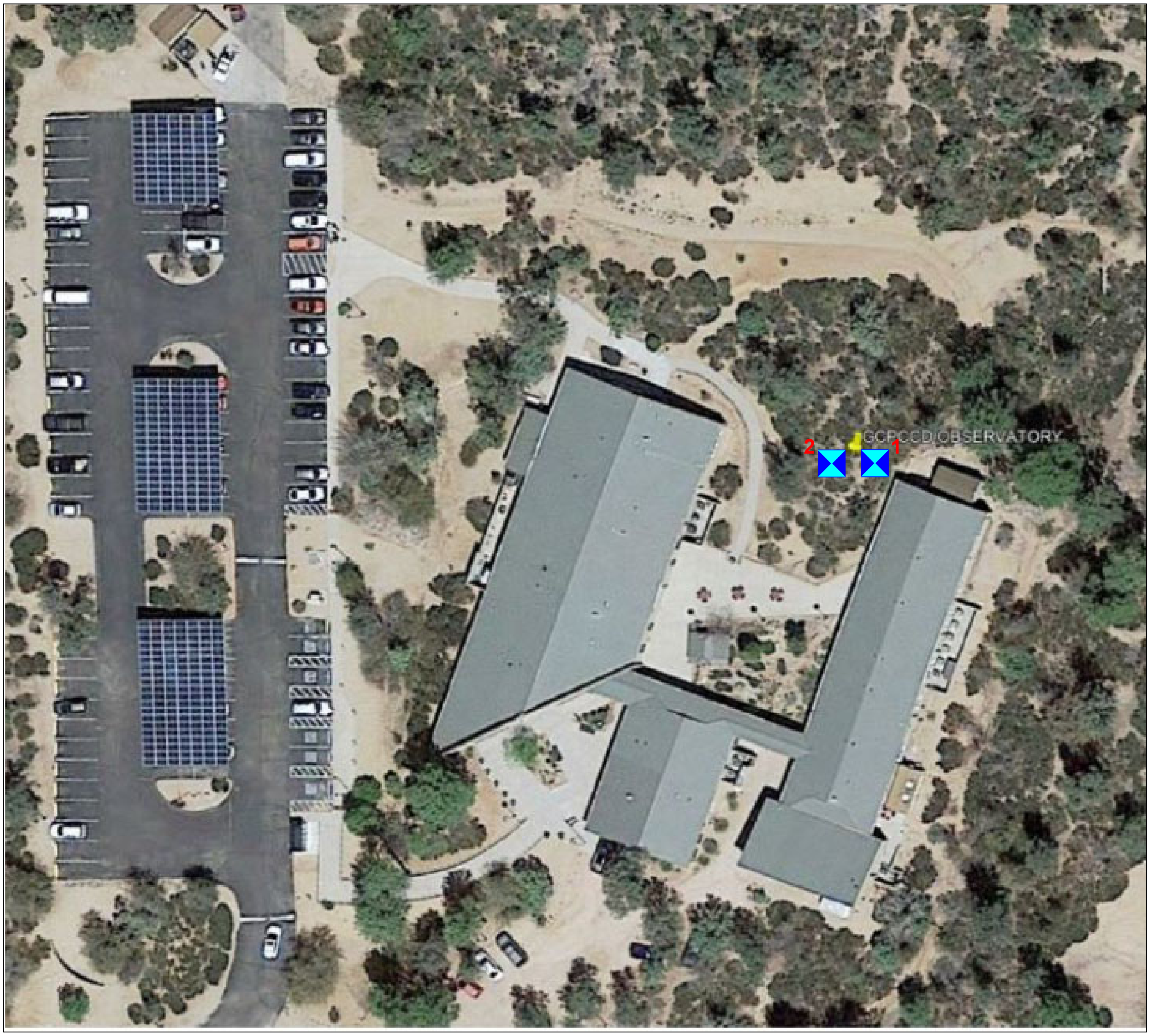
The recommendations presented are based entirely upon data derived from a limited number of samples obtained from two widely spaced explorations. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. This report assumes the uniformity of the geology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

PAYSON CAMPUS TELESCOPE	
Test Pit Location Diagram	
Western Technologies Inc.	
Job No.: 25-224193-0	Plate: 1

Western Technologies
An RMA Company

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

Western Technologies
An RMA Company

METHOD OF CLASSIFICATION

PLATE

A-2

The number shown in **"TEST PIT"** refers to the approximate location of the same number indicated on the "Test Pit Location Diagram" as positioned in the field by pacing or measurement from property lines and/or existing features.

"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.

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

"DRY DENSITY (LBS/CU FT)" refers to the laboratory-determined dry density in pounds per cubic foot. A double vertical line within the symbol indicates no sample recovery. A circle within the symbol indicates sample disturbance.

"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 test pit logs are intended for use in conjunction with the purposes of our services defined in the text. Test pit log data should not be construed as part of the construction plans nor as defining construction conditions.

The test pit 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 test pits. Groundwater levels may fluctuate due to seasonal variations and other factors.

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

Western Technologies An RMA Company	TEST PIT LOG NOTES	PLATE A-3

Project: Payson Campus Telescope **Project Number: 25-224193-0**	**TEST PIT NO. 1**	Western Technologies An RMA Company

Date(s) Excavated **8/8/24**	Logged By **L. Sulzen**	Checked By **J. Quinlan**
Excavation Type **Test Pit**	Bucket Size **24" Bucket**	Approximate Surface Elevation **Not Determined**
Equipment Type **CASE 580N**	Excavation Contractor **Western Technologies**	
Groundwater Level and Date Measured **Not Encountered**	Location **See Location Diagram**	

MOISTURE CONTENT	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOW COUNTS	DEPTH (FEET)	Soil Type	GRAPHIC	SOIL DESCRIPTION
			G		0	SP-SM		Poorly-Graded SAND; with silt and gravel, red/tan, slightly damp
			R	Push				
								Excavator Refusal at 3 Feet on Granite
					5			
					10			
					15			

PLATE NO. A-4

Project: Payson Campus Telescope Project Number: 25-224193-0	# TEST PIT NO. 2	Western Technologies An RMA Company

Date(s) Excavated **8/8/24**	Logged By **L. Sulzen**	Checked By **J. Quinlan**
Excavation Type **Test Pit**	Bucket Size **24" Bucket**	Approximate Surface Elevation **Not Determined**
Equipment Type **CASE 580N**	Excavation Contractor **Western Technologies**	
Groundwater Level and Date Measured **Not Encountered**	Location **See Location Diagram**	

MOISTURE CONTENT	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOW COUNTS	DEPTH (FEET)	Soil Type	GRAPHIC	SOIL DESCRIPTION
			G		0	SP-SM		Poorly-Graded SAND; with silt and gravel, red/tan, slightly damp
			R	Push				
					3			Excavator Refusal at 3 Feet on Granite
					5			
					10			
					15			

Test Pit 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	SP-SM	100	99	65	38	18	9.2		26	3				2
2	0-3	SP-SM	100	99	55	31	14	7.2		28	5				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

Western Technologies
An RMA Company

PROJECT: PAYSON CAMPUS TELESCOPE

JOB NO.: 25-224193-0

PLATE

B-1

SOIL PROPERTIES

Test Pit No.	Depth (ft.)	USCS Class.	Initial Dry Density (pcf)	Initial Water Content (%)	Laboratory Compaction Characteristics			Expansion Properties		Plasticity		Soluble		Remarks
					Dry Density(pcf)	Optimum Moisture(%)	Method	Surcharge (ksf)	Expansion (%)	LL	PI	Salts (ppm)	Sulfate (ppm)	
1	0-3	SP-SM	113.6	7.5	119.3	10.9	A	0.1	0					1,2,3

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.
3. Test Method ASTM D698/AASHTO T99
4. Test Method ASTM D1557/AASHTO T180
5. From the ADOT Family of Curves

Western Technolo

PROJECT:	PAYSON CAMPUS TELESCOPE
JOB NO.:	25-224193-0

SOIL PROPERTIES

PLATE

B-2

Test No.	Depth (ft)	Rock Classification	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Remarks
1	Surface	Granite	161.3	13,490	1,2
2	Surface	Granite	161.1	15,200	1,2

REMARKS:

1. ASTM D7012 – Unit Weight of Rock Cores
2. ASTM C39 – Unconfined Compressive Strength of Rock Cores

Western Technologies
An RMA Company

PROJECT: PAYSON CAMPUS TELESCOPE

JOB NO.: 25-224193-0

PLATE

B-3

ROCK PROPERTIES

Nortest Analytical
An RMA Company

Reported: 8/13/2024
Received: 8/9/2024

LABORATORY ANALYSIS REPORT

Project: 25-224193-0

Lab Number: 24S0167

Sample ID: 1(0-3)

Test Parameter

Test	*Method*	*Result*	*Units*
Soluble Salts	ARIZ 237b	151	ppm
Sulfate	ARIZ 733b	39	ppm
Chloride	ARIZ 736b	21	ppm