GEO-TEST

GEOTECHNICAL ENGINEERING SERVICES REPORT
JOB NO. 1-21107

CHIMAYO FIRE STATION ADDITION

226 JUAN MEDINA ROAD
CHIMAYO, NEW MEXICO

PREPARED FOR:

MOLZEN CORBIN & ASSOCIATES

GEO-TEST, INC.
3204 RICHARDS LANE
SANTA FE,
NEW MEXICO
87507
(505) 471-1101
FAX (505) 471-2245

8528 CALLE ALAMEDA NE
ALBUQUERQUE,
NEW MEXICO
87113
(505) 857-0933
FAX (505) 857-0803

2805-A LAS VEGAS CT.
LAS CRUCES,
NEW MEXICO
88007
(575) 526-6260
FAX (575) 523-1660

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February 6, 2023
Job No. 1-21107

Molzen Corbin & Associates
2701 Miles Road SE
Albuquerque, Nm 87106

ATTN: Jeremy Alford

RE: Geotechnical Engineering Services Report
Chimayo Fire Station Addition
226 Juan Medina Road
Chimayo, New Mexico

Dear Mr. Alford:

Submitted herein is the Geotechnical Engineering Services Report for the above referenced project. The report contains the results of our field investigation, laboratory testing, and recommendations for foundation, floor slab and retaining structure design as well as criteria for site grading.

It has been a pleasure to serve you on this project. If you should have any questions, please contact this office.

Respectfully submitted:
GEO-TEST, INC.

Timothy Matson, Staff Engineer

Reviewed By:

PATRICK R. WHORTON NEW MEXICO 26342 PROFESSIONAL ENGINEER

Patrick R. Whorton, PE

GEO-TEST, INC.
3204 RICHARDS LANE
SANTA FE,
NEW MEXICO
87507
(505) 471-1101
FAX (505) 471-2245

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2805-A LAS VEGAS CT.
LAS CRUCES,
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(575) 526-6260
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GEO-TEST, INC.
3204 RICHARDS LANE
SANTA FE,
NEW MEXICO
87507
(505) 471-1101
FAX (505) 471-2245

8528 CALLE ALAMEDA NE
ALBUQUERQUE,
NEW MEXICO
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INTRODUCTION

This report presents the results of our geotechnical engineering services investigation performed by this firm for the proposed Chimayo Fire Station Addition project to be constructed at the fire station located at 226 Juan Medina Road in Chimayo, New Mexico.

The objectives of this investigation were to:

1) Evaluate the nature and engineering properties of the subsurface soils underlying the site.

2) Provide recommendations for foundation design, slab support and retaining structure design as well as criteria for site grading.

The investigation includes subsurface exploration, selected soil sampling, laboratory testing of the samples, performing an engineering analysis and preparation of this report.

PROPOSED CONSTRUCTION

It is understood that the project will include the construction of a new approximately 3,000 square foot addition to the existing fire station. The addition will be single story with no basement. Foundation loads are unknown but are anticipated not to exceed 30 kips on columns and 1.5 kips per lineal foot on walls. A Conceptual Site Plan is included as Figure 1 in a later section of this report.

Should structural loads or other project details vary significantly from those outlined above, this firm should be notified for review and possible revision of the recommendations contained herein.

FIELD EXPLORATION

A total of two (2) exploratory borings were drilled within the proposed addition footprint to a depth of 15 feet below existing site grades. The locations of the borings are shown on the Boring Location Map, Figure 2. The soils encountered in the borings were continuously examined, visually classified and logged during the drilling operation. The boring logs are presented in a following section of this report. Drilling was accomplished using a truck mounted drill rig equipped with 2.25-inch inside diameter continuous flight hollow stem auger. Subsurface materials were sampled at five-foot intervals or less utilizing an open tube split barrel sampler driven by a standard penetration test hammer. Auger cuttings were also collected from the borings.

GEO-TEST, INC.
3204 RICHARDS LANE
SANTA FE,
NEW MEXICO
87507
(505) 471-1101
FAX (505) 471-2245

8528 CALLE ALAMEDA NE
ALBUQUERQUE,
NEW MEXICO
87113
(505) 857-0933
FAX (505) 857-0803

2805-A LAS VEGAS CT.
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NEW MEXICO
88007
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FAX (575) 523-1660

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LABORATORY TESTING

Selected samples were tested in the laboratory to determine certain engineering properties of the soils. Moisture contents were determined to evaluate the various soil deposits with depth. The results of these tests are shown on the boring logs.

Sieve analysis and Atterberg limits tests were performed to aid in soil classification. The results of these tests are presented in the Summary of Laboratory Results and on the individual test reports presented in a following section of this report.

SURFACE CONDITIONS

A brief site reconnaissance was performed during our site exploration. The site for the addition is located on the south and southeast side of the existing structure. The site is relatively flat and had a thin layer of base course over the surface.

SUBSURFACE SOIL CONDITIONS

As indicated by the exploratory borings, the soils underlying the site generally consist of interbedded layers of silty sand, sand with silt and gravel and gravels with various amounts of silt and sand to full depth explored. These soils were non-plastic and ranged from medium dense near the surface becoming denser with depth. Detailed lithologic descriptions are shown on the attached boring logs.

No free groundwater was encountered in the borings and soil moisture contents were relatively low throughout the extent of the borings.

CONCLUSIONS AND RECOMMENDATIONS

The surficial soils encountered in the borings are medium dense at shallow depths and are considered suitable to provide reliable support of the proposed addition. Accordingly, provided the site is prepared as recommended in the Site Grading section of this report, it is recommended that the proposed structure be supported on shallow spread-type footings and slab on-grade bearing directly on densified native soils or on properly compacted structural fill, if required for grading purposes. Detailed recommendations concerning the required site preparation and for foundation design are presented in the following sections of this report.

Significant post-construction moisture increases in the supporting soils could create additional movements, and thus, the moisture protection provisions as recommended in a following section of this report are considered critical for the satisfactory performance of the proposed structure.

GEO-TEST, INC.
3204 RICHARDS LANE
SANTA FE,
NEW MEXICO
87507
(505) 471-1101
FAX (505) 471-2245

8528 CALLE ALAMEDA NE
ALBUQUERQUE,
NEW MEXICO
87113
(505) 857-0933
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LAS CRUCES,
NEW MEXICO
88007
(575) 526-6260
FAX (575) 523-1660

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FOUNDATIONS

Shallow spread-type footings bearing directly on densified native soils, or on properly compacted structural fill, are recommended for the support of the structures. An allowable soil bearing pressure of 2,000 pounds per square foot is recommended for footing design. The bearing pressure applies to full dead load plus realistic live loads and can be safely increased by one-third for totals loads including wind and seismic forces.

Exterior footings should be established a minimum of 2.0 feet below lowest adjacent grade while interior footings should extend at least 12 inches below finished floor elevation. The minimum recommended width of continuous footings is 16 inches while the minimum recommended width of isolated spot footings is 2.0 feet.

All bearing surfaces should be cleaned of all loose, disturbed material prior to placement of structural fill or concrete. All foundation systems should be adequately reinforced to aid in redistributing loads and to minimize the effects of differential settlement.

Resistance to lateral forces will be provided by soil friction between the base of floor slabs and foundation elements and the soil and by passive earth resistance against the sides of the footings and stem walls. A coefficient of friction of 0.40 should be used for computing the lateral resistance between bases of footings and slabs and the soil. With backfill placed as recommended in the site grading section of this report, a passive soil resistance equivalent to a fluid weighing 375 pounds per cubic foot should be used for analysis.

Maximum settlements of foundations designed and constructed as recommended herein are estimated not to exceed ¾ inch for the in-situ soil moisture contents or compaction moistures introduced during construction. Differential settlements are not expected to exceed ½ inch. Significant moisture post-construction increases could create additional settlements and, thus, the moisture protection provisions presented in a following section of this report are considered important.

SLABS ON GRADE

Concrete slabs on grade should be founded on densified native soils and constructed in conformance with the methods outlined in the current edition of ACI 302.1R.

Adequate support for lightly loaded slab-on-grade floors will be provided by the structural fill when compacted as recommended in the Site Grading section of this report. Thus, the use of granular base for structural support of lightly loaded slabs is not considered necessary. However, should it be desired as a working surface, or to increase the modulus of subgrade reaction, a course of granular base can be placed beneath concrete floor slabs.

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87113
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2805-A LAS VEGAS CT.
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Where granular base is used beneath the slabs, it should have a plasticity index of no greater than 3 and meet the following grading requirements:

Sieve Size Square Openings	Percent Passing by Dry Weight
1 Inch	100
¾ Inch	70-100
No. 4	35-85
No. 200	0-10

The granular base should be compacted to at least 95 percent of maximum dry density as determined in accordance with ASTM D1557.

Any heavily loaded slabs on the project bearing on structural fill should be designed using a modulus of subgrade reaction of 200 pounds per square inch per inch of deflection. If a 6-inch thickness of granular base is placed and compacted beneath the slabs, the modulus of subgrade reaction can be increased to 300 pounds per square inch per inch of deflection.

The granular base may act as a capillary barrier but will not totally eliminate the rise of moisture to the slabs. If floor coverings are proposed which are highly sensitive to moisture or highly moisture sensitive equipment will be installed within the buildings, a synthetic vapor barrier should be installed to prevent moisture intrusion through the slab. A minimum of 4 inches of granular base as recommended above should be placed between the vapor barrier and the slab. Barriers should be overlapped a minimum of 6 inches at joints, should be carefully fitted around service openings and should conform with ACI 302.1R specifications.

RETAINING WALLS

Retaining walls should be founded on foundations as recommended for the building.

Lateral pressure against retaining walls will depend upon the degree of restraint. Walls which are restrained so as to limit movement at the top of the wall to less than 0.001 times the height of the wall should be designed for an 'at rest' earth pressure of 55 pounds per square foot of depth. Walls free to move at the top should be designed using an 'active' earth pressure equal to 35 pounds per square foot per foot of depth. These recommended lateral pressures are applicable to a condition of horizontal backfill without surcharge loads. Analysis of earth pressures produced by sloping backfill or surcharge loads can be provided by this firm upon request.

The lateral pressures presented above assume no buildup of hydrostatic pressures behind the walls. To prevent the buildup of hydrostatic pressures, adequate weep holes should be provided or composite drainage systems such as Miradrain or equivalent can be installed on the backside of the walls prior to backfilling. The drainage layer should be connected to a collector pipe at

GEO-TEST, INC.
3204 RICHARDS LANE
SANTA FE,
NEW MEXICO
87507
(505) 471-1101
FAX (505) 471-2245

8528 CALLE ALAMEDA NE
ALBUQUERQUE,
NEW MEXICO
87113
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FAX (505) 857-0803

2805-A LAS VEGAS CT.
LAS CRUCES,
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88007
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the base of the walls and routed to a sump or to a positive gravity drain.

Retaining wall backfill should meet the structural fill specifications outlined in the Site Grading section of this report. During backfilling, the contractor should be limited to the use of hand operated compaction equipment within a zone of about 3 feet horizontally from the back of the walls. The use of heavier equipment could apply lateral pressures well in excess of the recommended design earth pressure, particularly over the upper portions of the walls.

EXCAVATIONS

Excavation of the surficial soils can be readily accomplished using normal earthmoving equipment. Excavated slopes for foundation and utility construction should be designed and constructed in accordance with 29 CFR 1926, Subpart P, and any applicable state or local regulations. Excavated temporary and permanent slopes should not exceed 1.5 to 1 (horizontal to vertical). The contractor should be responsible for all temporary excavation slopes excavated for the purpose of structural fill placement as well as the design of any required temporary shoring, as applicable. Shoring, bracing, and benching should be performed by the contractor in accordance with applicable safety standards. Spoil piles and heavy equipment should not be allowed within 5 feet of the top of the slopes.

SITE GRADING

The following general guidelines should be included in the project construction specifications to provide a basis for quality control during site grading. It is recommended that all structural fill and backfill be placed and compacted under engineering observation and in accordance with the following:

1) After site clearing and grubbing and making any required excavations, the exposed soils throughout the entire building area should be densified prior to construction or placement of structural fill.

2) Densification of the exposed native soils should consist of scarifying, moisture conditioning, and compacting the area to a minimum of 95 percent of maximum dry density as determined in accordance with ASTM D-1557. The moisture content of the native soils during compaction should be within 2 percent of the optimum moisture content.

3) The results of this investigation indicate that most of the existing and overexcavated soils will be suitable for use as structural fill, however, some blending may be required. Any imported material should also meet the specification for structural fill presented below. All structural fill or backfill material should be free of vegetation and debris and contain no rocks larger than 3 inches. Gradation of the structural fill or backfill material, as determined in accordance with ASTM D-422, should be as follows:

GEO-TEST, INC.
3204 RICHARDS LANE
SANTA FE,
NEW MEXICO
87507
(505) 471-1101
FAX (505) 471-2245

8528 CALLE ALAMEDA NE
ALBUQUERQUE,
NEW MEXICO
87113
(505) 857-0933
FAX (505) 857-0803

2805-A LAS VEGAS CT.
LAS CRUCES,
NEW MEXICO
88007
(575) 526-6260
FAX (575) 523-1660

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Size	Percent Passing
3-inch	100
No. 4	60 - 100
No. 200	15 - 45

4) The plasticity index should be less than 15 when tested in accordance with ASTM D-4318.

5) Fill or backfill, shall be placed in 8-inch loose lifts and compacted with approved compaction equipment. Loose lifts should be reduced to 4 inches if hand-held compaction equipment is used. Each lift should be firm and non-yielding. All compaction of fill or backfill shall be accomplished to a minimum of 95 percent of the maximum dry density as determined in accordance with ASTM D-1557. The moisture content of the structural fill during compaction should be within 2 percent above the optimum moisture content.

6) Tests for degree of compaction should be determined by the ASTM D-1556 method or ASTM D-6938. Observation and field tests should be carried on during fill and backfill placement by the geotechnical engineer to assist the contractor in obtaining the required degree of compaction. If less than 95 percent is indicated, additional compaction effort should be made with adjustment of the moisture content as necessary until 95 percent compaction is obtained.

MOISTURE PROTECTION

Precautions should be taken during and after construction to minimize moisture increase of foundation soils. Accumulations of excessive moisture could be harmful to some types of interior flooring, to HVAC ductwork beneath the slabs, and can weaken or cause other changes in the soils supporting the foundations and slabs. This can cause differential movement of the foundations and can result in cosmetic or structural damage to the structure.

Positive drainage should be established away from the exterior walls of the structure. A typical adequate slope is 6 inches in the first 5 feet with positive drainage being provided from those points to streets, pavement or natural water courses. If necessary to provide positive drainage, the building area should be raised above adjacent grades with structural fill.

Roof runoff from the structure should be collected by gutters and downspouts or roof canales and discharged to splash blocks which carry water rapidly away from the structure's foundation. Should lot size or other factors impede positive drainage away from the structure to less than 5 feet from foundations, a non-perforated drain system should be installed to carry water to a minimum of five feet away from foundations or to streets or natural water courses.

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3204 RICHARDS LANE
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NEW MEXICO
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ALBUQUERQUE,
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87113
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2805-A LAS VEGAS CT.
LAS CRUCES,
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Utility backfill should be well compacted and should meet the specifications outlined in the Site Grading section of this report. Special care should be taken during installation of the subfloor sewer and water lines to reduce the possibility of future subsurface saturation.

Irrigation within 10 feet of foundations is discouraged or at the very least should be carefully controlled. Proper landscaping and drainage maintenance are required to preclude accumulation of excessive moisture in the soils below the structures and throughout the site. This should include but is not limited to routine maintenance checks of irrigation system to ensure no leakage and proper functionality and that irrigation is adjusted and maintained seasonally so that over watering does not occur. Native drought resistant plants are recommended for use in landscaping. Landscape features should not impede positive drainage away from foundations as recommended above.

Drainage control ponds or any other drainage/landscaping feature which allow for surface waters to infiltrate the subsurface soils should not be placed within 20 feet of building foundations.

Increases in the subgrade moisture content can weaken the subgrade soils, thereby shortening pavement life and causing localized failure. Therefore, all paved areas should be graded to drain and not allow any ponding on the surface of the paved areas. Positive drainage should be provided away from the perimeter of all paved areas for a distance of at least 10 feet. It is recommended that the pavement be graded with a 2 percent crown or slope to facilitate drainage.

The foregoing recommendations should only be considered minimum requirements for overall site development. It is recommended that a civil/drainage engineer be consulted for more detailed grading and drainage recommendations.

FOUNDATION REVIEW AND INSPECTION

This report has been prepared to aid in the evaluation of this site and to assist in the design of this project. It is recommended that the geotechnical engineer be provided the opportunity to review the final design drawings and specifications in order to determine whether the recommendations in this report are applicable to the final design. Review of the final design drawings and specifications should be noted in writing by the geotechnical engineer.

In order to permit correlation between the conditions encountered during construction and to confirm recommendations presented herein, it is recommended that the geotechnical engineer be retained to perform continuous observations and testing during the earthwork portion of this project. Observation and testing should be performed during construction to confirm that suitable fill soils are placed upon competent materials and properly compacted and foundation elements penetrate the recommended soils.

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3204 RICHARDS LANE
SANTA FE,
NEW MEXICO
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FAX (505) 471-2245

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ALBUQUERQUE,
NEW MEXICO
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(505) 857-0933
FAX (505) 857-0803

2805-A LAS VEGAS CT.
LAS CRUCES,
NEW MEXICO
88007
(575) 526-6260
FAX (575) 523-1660

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CLOSURE

Our conclusions, recommendations and opinions presented herein are:

1) Based upon our evaluation and interpretation of the findings of the field and laboratory program.

2) Based upon an interpolation of soil conditions between and beyond the explorations.

3) Subject to confirmation of the conditions encountered during construction.

4) Based upon the assumption that sufficient observation will be provided during construction.

5) Prepared in accordance with generally accepted professional geotechnical engineering principles and practice.

This report has been prepared for the sole use of the Molzen Corbin & Associates, specifically to aid in the design of the proposed new Chimayo Fire Station project to be located at 226 Juan Medina Road in Chimayo, New Mexico, and not for use by any third parties without consent.

We make no other warranty, either expressed or implied. Any person using this report for bidding or construction purposes should perform such independent investigation as they deem necessary to satisfy themselves as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project. If conditions encountered during construction appear to be different than indicated by this report, this office should be notified.

All soil samples will be discarded 60 days after the date of this report unless we receive a specific request to retain the samples for a longer period of time.

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3204 RICHARDS LANE
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NEW MEXICO
87507
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FAX (505) 471-2245

8528 CALLE ALAMEDA NE
ALBUQUERQUE,
NEW MEXICO
87113
(505) 857-0933
FAX (505) 857-0803

2805-A LAS VEGAS CT.
LAS CRUCES,
NEW MEXICO
88007
(575) 526-6260
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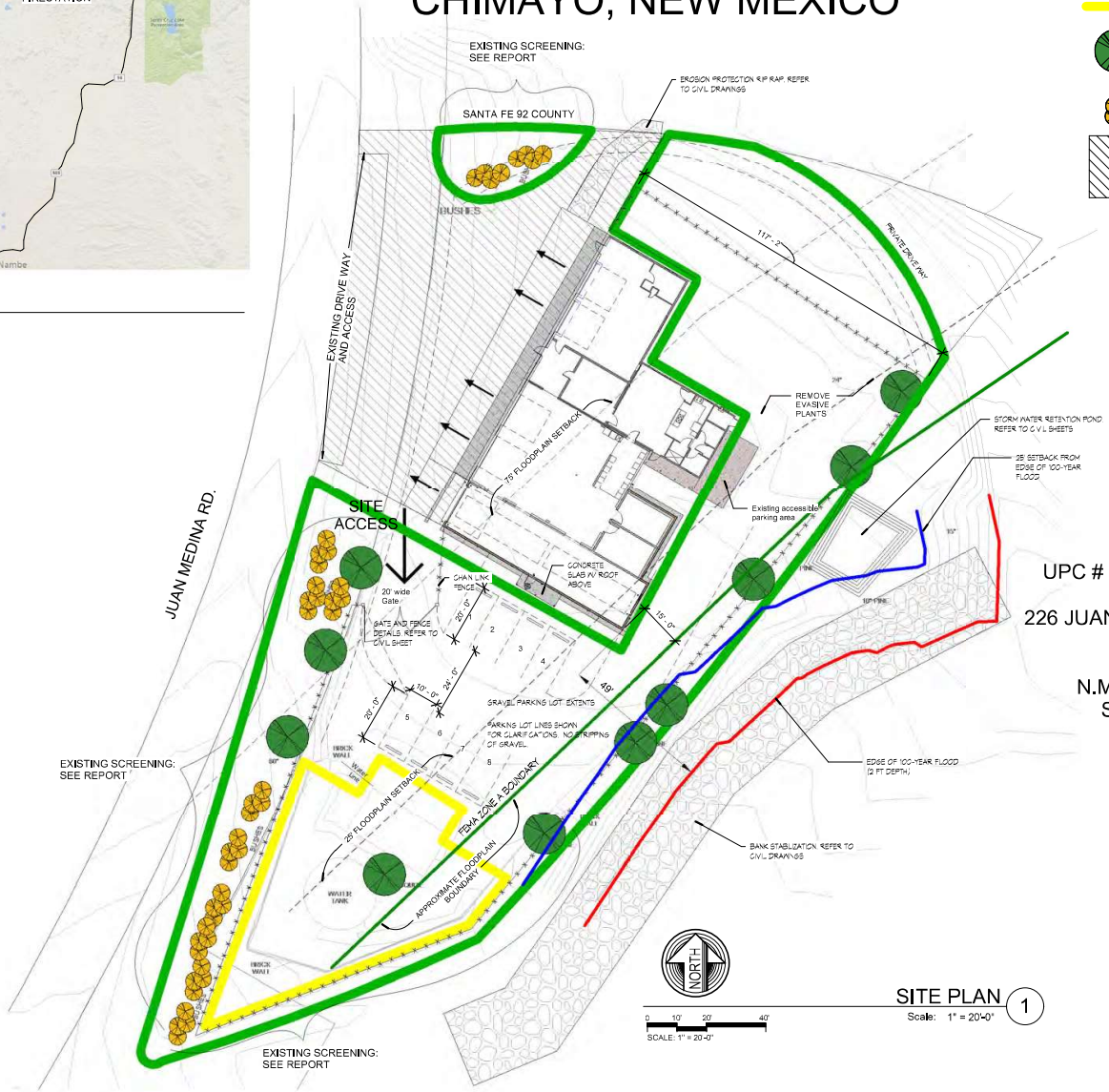
SITE DEVELOPMENT PLAN FOR CHIMAYO FIRE STATION ADDITION CHIMAYO, NEW MEXICO

VICINITY PLAN



SITE PLAN 1
Scale: 1" = 20'-0"

LEGEND

- MAINTAIN EXISTING LANDSCAPE
- GREATER CHIMAYO MDWCA
- EXISTING TREES
- EXISTING SHRUBS
- EXISTING ASPHALT DRIVEWAY

UPC # : 1-054-119-455-462 / 000-000

226 JUAN MEDINA ROAD, CHIMAYO, NM
T20N R9E S12
37.34 AC
N.M.P.M. SANTA FE COUNTY,
STATE OF NEW MEXICO
LOT 4

GENERAL NOTES FOR SITE DEVELOPMENT PERMIT

1. LANDSCAPE AND BUFFERING - SEE SCREENING REPORT.
2. LIGHTING PER CODE AND NIGHT SKY PROTECTION ACT.
3. WATER, SEWER AND GAS UTILITIES PER CODE.
4. LETTER FROM GREATER CHIMAYO (MDWCA). "READY, WILLING, AND BE ABLE TO PROVIDE SERVICE."
5. TERRAIN MANAGEMENT PER CODE.
6. SOLID WASTE: USERS WILL CONTINUE TO HAUL REFUSE TO TRANFER STATION.
7. THE SITE IS WITHIN THE CHIMAYO DESIGN OVERLAY DISTRICT DESIGN WILL COMPLY.
8. NO SIGNAGE MODIFICATION.

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1-21107
Figure 1

MOLZENCORBIN
2701 Miles Road SE
Albuquerque, New Mexico 87106
505 242 5700 office
505 242 0673 fax
MolzenCorbin.com

NOTICE OF EXTENDED PAYMENT PROVISION:
THIS CONTRACT ALLOWS THE OWNER TO MAKE PAYMENT WITHIN 45 DAYS AFTER SUBMISSION OF AN UNDISPUTED REQUEST FOR PAYMENT

NUMERIC SCALE CONFIRMATION
DRAWINGS ARE DEPICTED AT INTENDED NUMERIC SCALES IF THIS BAR EQUALS ONE INCH

PRELIMINARY NOT FOR CONSTRUCTION

REV NO	REV DATE	DESCRIPTION
PROJECT NUMBER		SFC18S-11
DESIGNED BY:		JA
DRAWN BY:		IWS
CHECKED BY:		JA
PRNE DESIGN PROFESSIONAL: JOHN CORBIN		
PROJECT DATE		APRIL, 2021

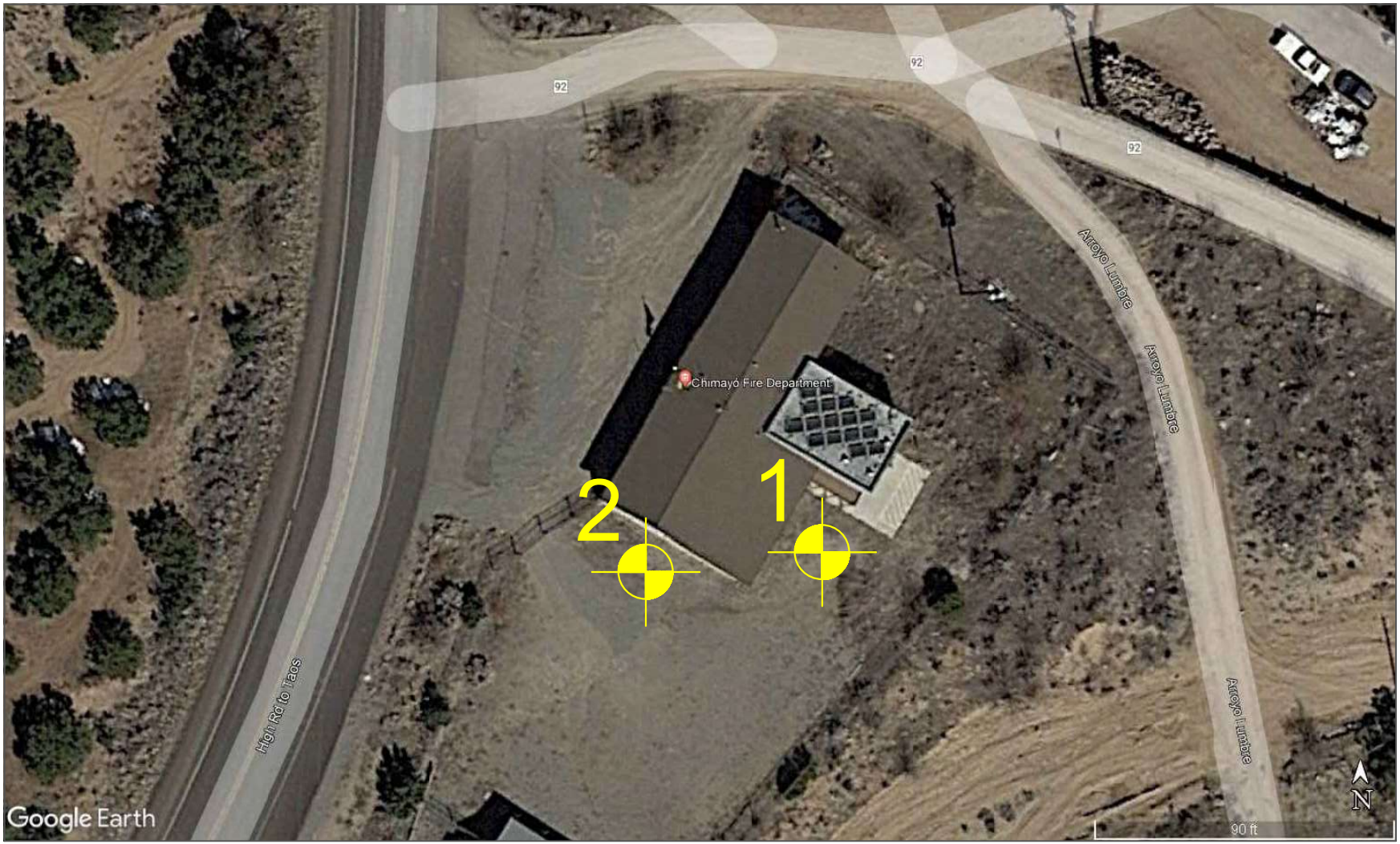
SITE DEVELOPMENT PLAN

CHIMAYO FIRE STATION ADDITION
SANTA FE COUNTY
CHIMAYO, NEW MEXICO

A-001
SHEET

I:\SANTA FE COUNTY\SFC18S-11 Chimayo Fire\DWGS\ACH\ach2sprx.rvt
5/3/2021 9:31:40 AM

BORING LOCATION MAP



Fire Station Addition
Chimayo, New Mexico
Job No. 1-21107

Figure 2

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GEOTECHNICAL ENGINEERING
AND MATERIAL TESTING

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Project: Fire Station Addition
Date: 01/26/2023 Project No: 1-21107
Elevation: Type: 2.25" I.D. HSA

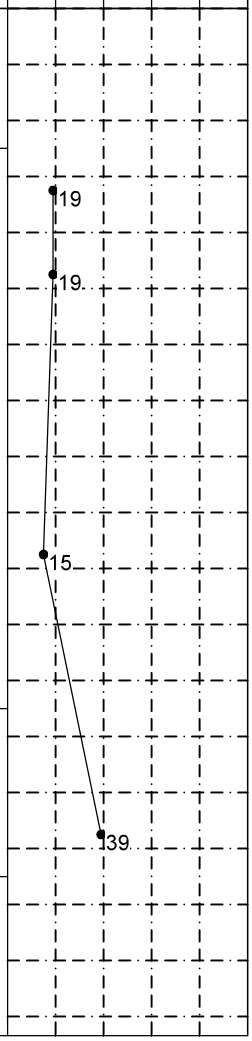
LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 1

During Drilling: NONE After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION
			AC		12		SM	SILTY SAND, fine grained, some gravel, non-plastic, moist, brown
			SS	8-8-11 19	3		SP-SM	SAND with SILT and GRAVEL, fine to coarse grained, non-plastic, medium dense, slightly mosit to dry, brown/light brown
5			SS	10-10-9 19	2			
10			SS	10-8-7 15	2			
			SS	10-18-21 39	3		GP-GM	GRAVEL with SILT, fine to coarse grained, non-plastic, dense, slightly moist to dry, tan/light brown
15								STOPPED AUGER AT 14' STOPPED SAMPLER AT 15.5'



LOG OF TEST BORING 1-21107-CHIMAYO FIRE STATION ADDITION.GPJ GEO TEST.GDT 2/4/23

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
UD - Undisturbed
ST - Shelby Tube

Stratification lines represent approximate boundaries between soil types. Transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurments were made.

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Project: Fire Station Addition
Date: 01/26/2023 Project No: 1-21107
Elevation: Type: 2.25" I.D. HSA

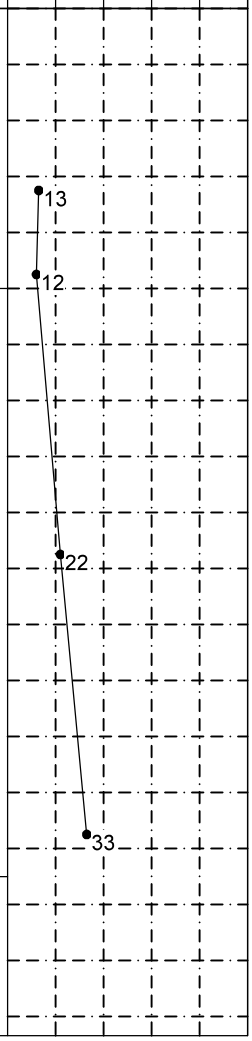
LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 2

During Drilling: NONE After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION
			SS	4-5-8 13	4		SW-SM	SAND with SILT, fine to medium grained, some gravel, non-plastic, medium dense, slightly moist to dry, tan/light brown
			SS	10-6-6 12	3			
5			AC		2			
			SS	14-14-8 22	1		SW-SM	SAND with SILT and GRAVEL, fine to coarse grained, non-plastic, medium dense to dense, dry, tan/light brown
10								
			SS	9-14-19 33	1			
15								STOPPED AUGER AT 14' STOPPED SAMPLER AT 15.5'



LOG OF TEST BORING 1-21107-CHIMAYO FIRE STATION ADDITION.GPJ GEO TEST.GDT 2/4/23

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
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Stratification lines represent approximate boundaries between soil types. Transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurments were made.

SUMMARY OF LABORATORY RESULTS

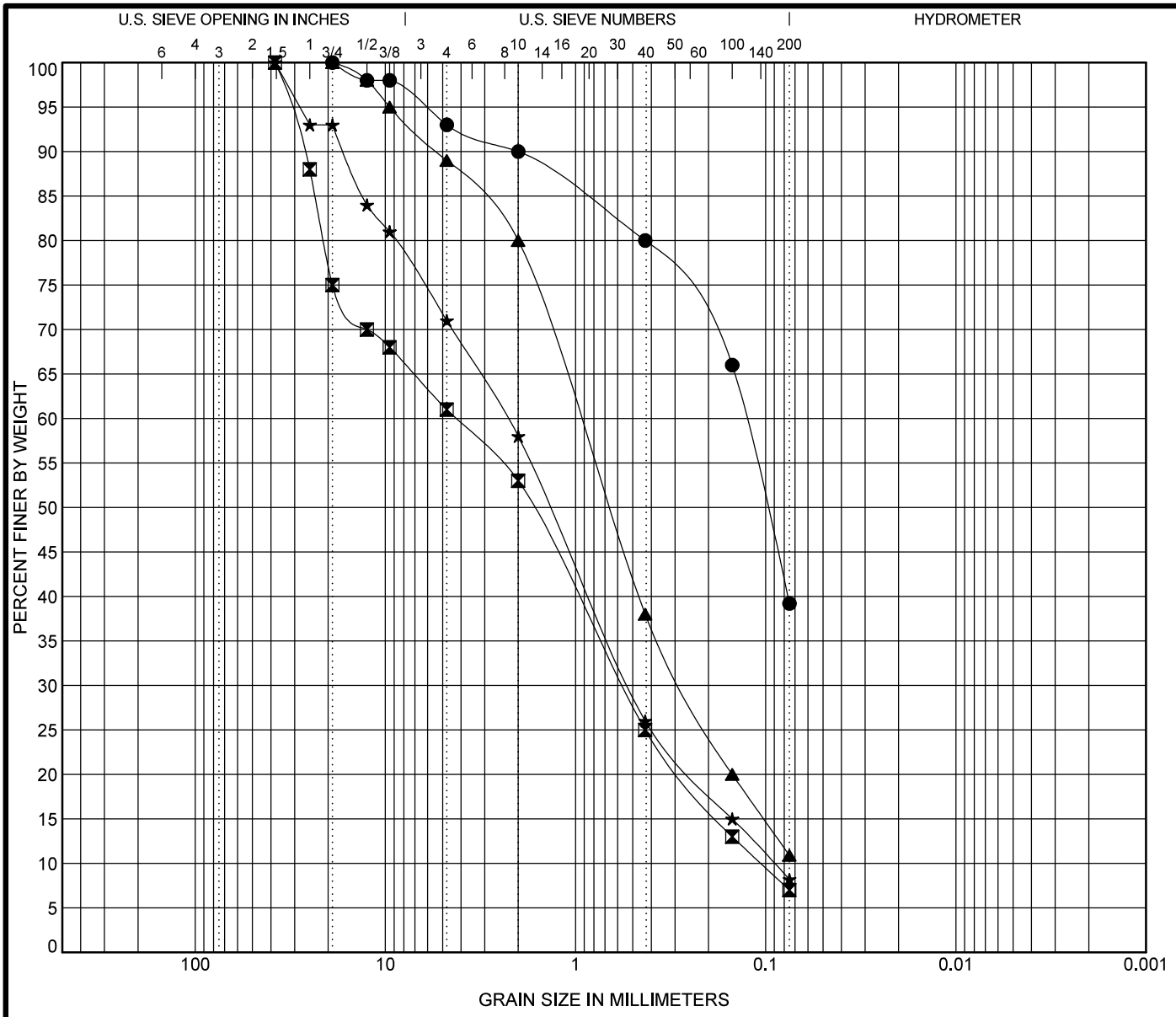
						SIEVE ANALYSIS PERCENT PASSING											
TEST HOLE	DEPTH (FEET)	UNIFIED CLASS	(%) MOIST	LL	PI	NO 200	NO 100	NO 40	NO 10	NO 4	3/8"	1/2"	3/4"	1"	1 1/2"	2"	4"
1	0.0 - 2.5	SM	11.9	NP	NP	39	66	80	90	93	98	98	100				
1	3.0		2.7														
1	5.0	SP-SM	2.3	NP	NP	7	13	25	53	61	68	70	75	88	100		
1	10.0		2.4														
1	15.0		3.1														
2	3.0	SW-SM	3.9	NP	NP	11	20	38	80	89	95	98	100				
2	5.0		2.8														
2	5.0 - 10.0	SW-SM	2.3	NP	NP	8	15	26	58	71	81	84	93	93	100		
2	10.0		1.4														
2	15.0		1.0														

GEO-TEST

LL = LIQUID LIMIT
PI = PLASTICITY INDEX
NP = NON PLASTIC or NO VALUE

Project: Fire Station Addition
Location: Chimayo, New Mexico
Number: 1-21107

SUMMARY OF LABORATORY RESULTS 1-21107-CHIMAYO FIRE STATION ADDITION.GPJ GEO TEST.GDT 2/4/23



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	1	0.0 - 2.5	SILTY SAND(SM)	NP	NP	NP		
⊠	1	5.0	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)	NP	NP	NP	0.71	40.19
▲	2	3.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP	1.08	13.74
★	2	5.0 - 10.0	WELL-GRADED SAND with SILT and GRAVEL(SW-SM)	NP	NP	NP	1.32	25.36

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	1	0.0 - 2.5	19	0.128			7.0	53.8	39.2	
⊠	1	5.0	38	4.263	0.566	0.106	39.0	54.0	7.0	
▲	2	3.0	19	0.962	0.269		11.0	78.1	10.9	
★	2	5.0 - 10.0	38	2.285	0.521	0.09	29.0	62.8	8.2	

GEO-TEST

GRAIN SIZE DISTRIBUTION

Project: Fire Station Addition

Location: Chimayo, New Mexico

Number: 1-21107

US GRAIN SIZE 1-21107-CHIMAYO FIRE STATION ADDITION.GPJ GEO TEST.GDT 2/4/23