

GEOTECHNICAL ENGINEERING SERVICES REPORT JOB NO. 1-10302

SOUTHERN SANDOVAL COUNTY ARROYO & FLOOD CONTROL AUTHORITY

HARLEY POND PROJECT

RIO RANCHO, NEW MEXICO

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RESPEC

DEO-IEST

April 16, 2021 Job No. 1-10302

RESPEC 5971 Jefferson St. NE, Suite 101 Albuquerque, NM 87109

ATTN: E. Christian Naidu, PE

RE: Geotechnical Engineering Services Report SSCAFCA Harley Pond Project Rio Rancho, New Mexico

Dear Mr. Naidu:

Submitted herein is the Geotechnical Engineering Services Report for the above referenced project. The report contains the results of our field investigation and laboratory testing as well as embankment foundation and construction, slope stability, excavation and site grading recommendations.

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.

Patrick R. Whorton, PE

EN 2634 PROFESSIONAL

Reviewad By:

Robert D. Booth, PE

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INTRODUCTION

This report presents the results of geotechnical engineering services performed by this firm for the proposed new Harley Pond Project to be constructed in Rio Rancho, New Mexico.

The objectives of this investigation were to:

- 1) Evaluate the nature and engineering properties of the soils underlying the dam and pond site.
- 2) Provide recommendations for the design and construction of the detention pond including embankment foundation preparation and construction, considering slope stability, settlement, and seepage.

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

PROPOSED CONSTRUCTION

It is understood that the project consists of the construction of a flood control pond located south of the intersection of Vargas Rd. and Vicenza Dr. in Rio Rancho. The pond will be constructed by excavating the native soils on the west side of the site to a depth of approximately 10 feet below existing surface grades at a 3:1 slope. The excavated soils will be used to construct an embankment dam located on the east side of the site. The embankment dam will be 8 feet high with a 3:1 slope on the upstream side of the dam and sloped on the downstream side at a 4:1 slope to native grade approximately 18 feet below the crest of the dam which is 15 feet wide.

The primary outlet for the pond will be a drop inlet structure located on the southern side of the pond within the cut area. The drop inlet will feed into reinforced concrete pipes connected to the city storm sewer system. An emergency spillway weir will be constructed on the northern portion of the pond with an associated concrete lined channel. The inlet to the pond will be a concrete lined channel at the approximate location of an existing arroyo located at the northern portion of the pond. A conceptual site plan is included as Figure 1 in a later section of this report.

FIELD EXPLORATION

A total of ten (10) exploratory borings were drilled at the site. Five (5) borings were drilled to a depth of 25 feet below existing grades along the alignment of the proposed dam embankment while five (5) borings were drilled to a depth of 15 feet below existing grades within the detention pond area. The locations of the borings are shown on the attached Boring Location Maps, Figure 2. During the test drilling, the soils encountered in the borings were continuously examined, visually classified, and logged. The boring logs are presented in a following section of this report. Drilling was accomplished with a truck mounted

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drill rig using 5.5-inch 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. Bulk samples of auger cuttings were also collected.

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 presented on the boring logs.

Sieve analysis and Atterberg limits tests were performed on selected samples to aid in soil classification. In addition, moisture-density relationship tests were performed on composite bulk samples to determine the optimum moisture content and maximum dry density of blended onsite soils. Re-molded permeability testing was also performed on selected samples to determine hydraulic conductivity of the compacted soils. 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.

SITE CONDITIONS

The Harley Pond site is located approximately 1,800 feet north of the intersection of Westside Blvd. and 10th St. SE in Rio Rancho. The area is generally undeveloped; 10th St. is rough cut through the site and a city water line was recently installed through the southern portion of this site, beyond these improvements, the site is in a native state. There are two arroyos which enter the site from the west (Viccenza Dr.) and currently exit the site along the east side (11th St.). The arroyos are in a general native state with no engineered improvements. Some garbage has been dumped on the site, particularly at the intersections of 10th St. and the arroyos. This garage appears to be household debris which appears to be recently deposited and limited to the surface.

The overall site slopes downward from southwest to northeast with a total grade change on the order of 25 feet. There are also localized elevation changes throughout. The site is populated with native shrubs and grasses.

SUBSURFACE SOIL CONDITIONS

As indicated by the exploratory borings, the subsurface profile underlying the Harley Pond site consists primarily of non-plastic silty and poorly graded sands which were encountered at the surface and extended to the full depths explored. Based on standard penetration testing, the relative density of these soils was found to be loose to medium dense near the surface becoming dense to very dense with depth. In half of the exploratory borings, a layer of cemented sand, commonly referred to as caliche, was encountered at depths ranging from 2.5 feet to 12.5 feet below surface grade. The degree of

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cementation and thickness of the caliche varied from each location tested. See boring logs included in a later section of this report for specific soil profiles.

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 native soils encountered throughout the site are considered suitable for use as structural fill and may be used for the construction of the dam embankment. The density of near surface soils beneath the dam site are generally loose to medium dense and most soils were found to have a low moisture content and would be likely to experience settlement upon significant moisture increase. Therefore, in order to provide a stable and uniform surface for the construction of the dam, it is recommended that the subsurface soils beneath the dam, which will comprise the dam foundation, be overexcavated to such an extent as to provide for a minimum of 3 feet of properly compacted structural fill beneath the embankment. The limits of the overexcavation should also and extend a minimum distance of 3 feet beyond the perimeter of the dam. Detailed recommendations for dam embankment design and the required site grading are presented in the following sections of this report.

The native soils encountered at the pond area may be readily excavated using normal earthmoving equipment and may be reused as structural fill for the construction of the dam embankment, although some blending may be required to meet the specifications for structural fill. Cut slopes may be excavated at a maximum temporary slope of 1.5:1 (H:V) and permanent slopes should be graded or created at slopes as described in the Dam Embankment Construction section of this report.

DAM EMBANKMENT FOUNDATION

Clearing, grubbing and stripping will be required over the entire embankment foundation areas extending a distance of at least 3 feet horizontally beyond the limits of the embankment. The resulting foundation areas should then be overexcavated to such an extent as to provide for a minimum 3 feet of structural fill beneath the embankment. The overexcavation should also extend a minimum of 3 feet laterally from the embankment perimeter. Once the overexcavation has been completed, the native cut surface should be densified, and the embankment constructed in accordance with the Site Grading section of this report.

Total settlement of the embankment is a function of internal embankment settlement and foundation settlement. Maximum foundation settlements are estimated to be on the order of $1\frac{1}{2}$ inches, and internal embankment settlements are estimated to be on the order of 1 inch or less. However, since the vast majority of both foundation and embankment settlements will be elastic and occur during construction, only minor settlement, less than $\frac{3}{4}$ inch is anticipated upon completion of construction.

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DAM EMBANKMENT CONSTRUCTION

Embankments should meet the specifications and be constructed according to the method outlined within the Site Grading section of this report. Based on the results of this investigation; it is anticipated that the majority of native soils encountered throughout the site will be suitable for use as dam embankment fill, although some blending will be required to provide for a homogenous fill meeting the specifications outlined within the Site Grading section of this report.

The stability of constructed dam embankment slopes was analyzed using the two-dimensional limit equilibrium stability program STABLPRO by Ensoft. Bishop's Method of Slices was used to develop factors of safety against slip on a circular failure plane for both static and pseudo-static loading conditions for three anticipated slopes to be used in pond construction are presented below in terms of factors of safety with a factor of 1 being stable, less than 1 unstable, 2 recommended for static conditions and 1.3 recommended for pseudo-static conditions.

Slope (H:V)	Height (ft)	Static FS	Pseudo-Static FS
3:1	8	3.181	1.989
3:1 Cut	12	2.607	1.524
4:1	18	3.696	1.928

Embankments with a lesser height, wider crest and flatter slope will have factors of safety higher than those listed above such that they would also be deemed acceptable.

It is assumed that the native sands encountered will be the primary material utilized for the construction of the embankment slopes. The slope stability analysis was conducted using the soil characteristics of the sampled onsite material such that the calculated slope stability applies only to these materials. Should import material be required for embankment construction, the soils should conform to the structural fill requirements presented in the Site Grading section of this report and be approved by the geotechnical engineer.

For the purposes of this analysis, a horizontal pseudo-static coefficient of 0.20g was utilized in the analyses based on 100% of the predicted peak ground acceleration within 50 years with a 2 percent probability of exceedance.

Should alternative embankment configurations be considered which do not conform to the embankment configurations and dimensions discussed above, this firm should be notified, and additional slope stability analysis can be performed for the embankment design chosen.

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INLET AND OUTLET STRUCTURES

The principal outlet for Harley Pond will consist of a drop inlet structure connected to a 24-inch diameter reinforced concrete pipe that will discharge into a storm sewer system. The drop inlet structure and RCP will be placed within a cut area of the pond. As these structures will not be supported by the embankment foundation, it is recommended overexcavation be conducted to provide for a minimum of 3 feet of structural fill beneath the drop inlet structure. In addition, the excavation for the pipe should be overexcavated to provide a minimum of 3 feet of properly compacted structural fill surrounding the entire pipe. The pipe should then be backfilled with structural fill meeting the requirements presented in the Site Grading section of this report.

The inlet channel to the pond as well as the emergency spillway weir and rundown channel will be constructed with concrete or shotcrete slabs on grade. Prior to the placement of the concrete or shotcrete, the subgrade should be scarified to a depth of 12 inches, moisture conditioned to optimum moisture or above and compacted to 95 percent or greater of maximum density as determined by ASTM D-1557. Riprap to be used in energy dissipation areas should also be placed on a minimum of 12 inches of compacted subgrade as prepared for the concrete.

SEEPAGE AND INTERNAL DRAINAGE

The project consists of a flood control structure to be constructed on normally dry watercourse. Maximum storm water detention time is anticipated to be 24 hours or less. Based upon the results of the laboratory tests, this is not nearly enough time to develop steady state seepage. Accordingly, seepage analysis and internal drainage design is not considered necessary. In addition, filter/drain material around the principal spillway or within the embankment itself to control seepage is not considered necessary provided the embankment fill is carefully placed around the pipe as recommended in the Site Grading section of this report.

EROSION

The onsite soils anticipated to be used as dam embankment fill and which will comprise cut slopes throughout the project are low cohesive granular soils. As such, slopes constructed with these soils will be subject to both sheet and rill erosion. As a general rule the amount of erosion to be expected is directly related to how steep the slope in question is with steeper slopes experiencing more erosion that flatter slopes.

As stated in previous sections, permanent project slopes may be as steep as 3:1. Although stable, these steeper slopes will likely experience greater erosion than flatter slopes which may compromise the stability and integrity of the slopes. Therefore, the stability of all slopes recommended herein should be considered contingent upon the implementation of proper erosion protection.

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The area immediately surrounding the drop inlet structure of the primary outlet will be particularly susceptible to erosion which may compromise the adjacent cut slope. As such, it is recommended that riprap or other erosion protection be installed around the drop inlet and placed to protect the adjacent cut slope.

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) Clearing, grubbing and stripping will be required over the entire dam embankment foundation areas. Stumps, matted roots, or rocks larger than 2 inches in diameter should be removed from within 18 inches of the foundation areas. Stripping and preparation of dam embankment foundation areas should extend a minimum of 3 feet horizontally beyond embankment limits. Stripping should be achieved only by cutting, i.e., ground depressions or narrow sections of tributary arroyos should not be inadvertently filled during the foundation preparation.
- 2) After clearing, grubbing and required excavations, the existing site soils throughout the foundation areas should be overexcavated to such an extent as to provide for at least 3 feet of properly compacted structural fill beneath the dam embankments and outlet pipe. The overexcavation limits should extend laterally a minimum of 3 feet beyond the embankment and pipe perimeters. The soils exposed at the base of the overexcavation should be densified before placement of structural fill.
- 3) Densification of native cut surfaces shall consist of moisture conditioning to the optimum moisture content or above. The upper 12 inches should then be compacted to a minimum of 95 percent of the maximum dry density at or above the optimum moisture content as determined in accordance with ASTM D-1557.
- 4) The results of this investigation indicate that most of the native soils will be suitable for use as structural fill; however, some blending may be required to meet the specifications below. Should imported fill be required, it should also meet the specifications for structural fill.
- 5) All structural fill and backfill should be free of vegetation and debris and contain no rocks larger than 3 inches. Gradation of the backfill material, as determined in accordance with ASTM D-422, should be as follows:

Size	Percent Passing
3 inch	100
No. 4	60 - 100
No. 200	10 - 35

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- 6) Fill or backfill, consisting of soil approved by the geotechnical engineer, should be placed in controlled compacted layers not exceeding 8 inches (compacted) with approved compaction equipment. All structural fill material should be blended as necessary to produce a homogeneous embankment. No lifts of high permeability material or material differing substantially from the lift below should be permitted. Sheepsfoot or vibratory sheepsfoot or segmented steel wheel type compactors should be used. If the compactors "walk out" during compaction, or if it is desired to use flat wheel compactors, the upper 1 to 2 inches of the lift should be scarified prior to placing a subsequent lift. The embankment should be raised uniformly. All compaction should be accomplished to a minimum of 95 percent of maximum dry density as determined in accordance with ASTM D-1557. The moisture content of the structural fill during compaction should be at or 3 percent above the optimum moisture content. With any vibratory compactor, vibrations should be controlled or eliminated to avoid damage to adjacent structures or infrastructure.
- 7) Fill below and above the principal spillway pipe should be placed and compacted as outlined above. In the zone within 3 feet of the pipe, fill should be placed in maximum 6 inch lifts, moisture conditioned and compacted as outlined above, using manually controlled walk behind rolling compactors, vibratory plate compactors or jumping jacks capable of compacting the soil immediately adjacent to and beneath the haunches of the pipe. Continuous observation and testing should be performed by a representative of the geotechnical engineer during the backfilling process to verify proper placement and compaction around the pipes.
- 8) Tests for degree of compaction should be determined in accordance with ASTM D-1556 or ASTM D-6938. Continuous, full time observation and field tests should be conducted during fill and backfill placement by a representative of the geotechnical engineer to assist the contractor in evaluating the required degree of compaction. If less than the required compaction is required, additional compaction effort should be made with adjustment of the moisture content as necessary until 95 percent compaction is obtained.

EXCAVATIONS

The results of this investigation indicate that the surficial soils can be readily excavated using normal earth moving and excavation equipment. Temporary construction excavations should be maintained at slopes of 1.5:1 (H:V) or flatter. Surcharge loads including construction traffic and excavated spoil materials should be maintained at least 10 feet from the crest of any excavation slope. Surface water should be routed such that it does not flow down the face of the excavation slopes. Where insufficient space exists for open cut excavations, a shoring system will be required. All excavations should comply with all applicable safety regulations.

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Experience dictates shrinkage factors greater than calculated values. Stripping, subgrade preparation, hauling and wind losses, and ground compaction, both in the borrow (reservoir) areas and within the embankment foundation areas are all factors in shrinkage. We recommend using a shrinkage factor on the order of 25 percent.

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 and embankment soils are placed upon competent materials.

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 RESPEC, specifically to aid in the design of the proposed Harley Pond Project in Rio Rancho, 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

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Harley F	Pond Project
Job No.	1-10302

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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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Figure 1

EXHIBIT A HARLEY'S POND CONCEPTUAL DESIGN

APRIL 16, 2021

POND STORAGE VOLUME = 39.9 AC-FT



STORM DRAIN

EMERGENCY SPILLWAY

PROPERTY ACCESS ROAD

POND MAINTENANCE ACCESS ROAD

SHOTCRETE

RIPRAP

 SEWER CONSTRUCTION NOTES

 I.D.#
 DESCRIPTION

 1
 5 STRAND BARBLESS WIRE FENCE

 2
 RE-SEEDING WITH 1" ROCK MULCH, 2" DEEP

 3
 RE-SEEDING WITH NATIVE SEEDING

 4
 48" MANHOLE WITH BEEHIVE GRATE INLET



Routing Summary TableDesign Pond Storage
volume from Grading
PlanPeak Stored
Volume for
Design
StormPeak Water
Surface
ElevationFreeboard to
Emergency
SpillwayFreeboard to
Top of Pond
Embankmentac-ftac-ftft.ftft39.924.95454.72.33.339.936.05457.3-0.30.7

BORING LOCATION MAP





Project: Harley Pond Project 04/02/2021 Date: Elevation: Type:

Project No: 1-10302 5.5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 1

During Drilling: none

After 24 Hours:

				SA	MPLE			SUBSURFACE PROFILE	
DEPTH (Ft)	DOL	SAMPLE INTERVAL	ТҮРЕ	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft 20 40 60 80
-		\times	SS SS	1-5-8 13 6-8-7	5				
5			SS	15 7-6-5 11	3		SM	SILTY SAND, non-plastic, medium dense, dry, light brown	
- - 10 — -			SS	5-6-8 14	3		SM	Slightly Cemented SILTY SAND (Caliche), non-plastic, medium dense, dry, light brown/white	- . </td
- - 15 -			SS	6-9-10 19	2				
		\times	SS	15-19-24 43	1		SP	POORLY GRADED SAND, non-plastic, medium dense to dense, dry, gray	
		\times	SS	15-19-23 42	1			Stopped Auger @ 24 feet Stopped Sampler @ 25.5 feet	
	-								

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve

AMSL - Above Mean Sea Level CS - Continuous Sampler

UD - Undisturbed



Project:Harley Pond ProjectDate:04/02/2021Project No:1-10302Elevation:Type:5.5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 2

During Drilling: none

After 24 Hours:

				SAI	MPLE			SUBSURFACE PROFILE	
DEPTH (Ft)	DOG	SAMPLE INTERVAL	ТҮРЕ	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft 20 40 60 80
-		\ge	SS	3-3-6	3				- ¶9. <u> -</u> . <u> </u> <u> </u> <u> </u> <u> </u> <u> </u>
-		\ge	SS	7-7-6 13	2		SP-SM	POORLY GRADED SAND with SILT,	
5		\geq	SS	5-6-7 13	2			light brown	- 13 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
-									
10		\ge	SS	9-12-17 29	2				
- - - 15 —		\ge	SS	13-12-22 34	3				
							SP	POORLY GRADED SAND, non-plastic, medium to very dense, dry, gray	
- 20 – Esilen		\ge	SS	11-17-23 40	3				
			SS	12-22-31	4				
				53	4			Stopped Auger @ 24 feet Stopped Sampler @ 25.5 feet	
21 - 	-								

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve

AMSL - Above Mean Sea Level

CS - Continuous Sampler

UD - Undisturbed

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.



Project:Harley Pond ProjectDate:04/02/2021Project No:1-10302Elevation:Type:5.5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 3

During Drilling: none

After 24 Hours:

				SAI	MPLE			SUBSURFACE PROFILE	
DEPTH (Ft)	DOJ	SAMPLE INTERVAL	ТҮРЕ	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft 20 40 60 80
-		\ge	SS	1-4-4 8	4				-¶8·└└
-		\ge	SS	6-10-10 20	2		SP-SM	non-plastic, loose to medium dense, dry, light brown	
5 —		\ge	SS	6-6-6 12	1				
-									
-			22	17-16-13	_				
10 -			00	29	2				
-	-								
15 —		\ge	SS	11-13-13 26	1		SP	POORLY GRADED SAND, non-plastic, medium dense to dense, dry, gray	
- 14/21	-								
			SS	13-18-22					
20 — 	-		00	40	2				$\begin{array}{c} - \cdot + - \cdot + 40 \cdot + - \cdot + - \cdot - \\ \cdot + - \cdot + - \cdot + - \cdot + - \cdot - \\ \cdot + - \cdot + - \cdot + - \cdot - + - \cdot - \\ \cdot + - \cdot + - \cdot + - \cdot - + - \cdot - \\ \cdot + \cdot + - \cdot + - \cdot - + - \cdot - \\ \cdot + \cdot + - \cdot + - \cdot - + - \cdot \\ \cdot + \cdot + - \cdot + - \cdot - + - \cdot \\ \cdot + \cdot + \cdot + - \cdot - + - \cdot \\ \cdot + + + +$
25 – 25 –		\ge	SS	11-22-22 44	2				┝ - · ┝ - · ₦ - · + - · + - · + - · - · └ - · └ • 44 ↓ - · ↓ - · - - · · └ · · · · · · · · · · · · · · · ·
	-							Stopped Auger @ 24 feet Stopped Sampler @ 25.5 feet	$\begin{vmatrix} - & \cdot & \vdots \\ - & \cdot & \vdots \\ 1 & \cdot & \vdots \\ 0 & \cdot & 0 \\ 0 $
- - -	-								
ğ <u>30</u> —	1								

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve

AMSL - Above Mean Sea Level

CS - Continuous Sampler

UD - Undisturbed

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.



Project:Harley Pond ProjectDate:04/02/2021Project No:1-10302Elevation:Type:5.5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 4

During Drilling: none

After 24 Hours:

					SA	MPLE			SUBSURFACE PROFILE	
DEPTH (Ft)		FOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	usc	DESCRIPTION	N blows/ft 20 40 60 80
			\leq	SS	2-3-4 7	4		SM	SILTY SAND, non-plastic, loose, dry, light brown	
	-		\ge	SS	5-7-9 16	3				
5			\times	SS	5-8-7 15	3		SM	Slightly Cemented SILTY SAND (Caliche), non-plastic, medium dense, dry, light brown/white	
	-									
10	-		\times	SS	5-6-7	1				
	_				15					
	-									
15	-		\times	SS	12-14-18	2				$- \cdot + + \cdot + - \cdot + - \cdot + - \cdot + - \cdot - +$
5	_				32			SP	POORLY GRADED SAND, non-plastic,	
4/14/2									medium to very dense, dry, gray	
20	_		\times	SS	16-23-29	1				
	_				52					
2.GPJ 6	-									
25	-		\times	SS	18-24-23	1				
	-				47				Stopped Auger @ 24 feet	
	-								Stopped Sampler (# 23.3 leet	
- 10 - 10 - 10 - 10 - 10 - 10 - 10 - 10	_									

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve

AMSL - Above Mean Sea Level

CS - Continuous Sampler

UD - Undisturbed



Project: Harley Pond Project 04/02/2021 Date: Elevation: Type:

Project No: 1-10302 5.5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 5

During Drilling: none

After 24 Hours:

				SA	MPLE			SUBSURFACE PROFILE	
DEPTH (Ft)	POG	SAMPLE INTERVAL	ТҮРЕ	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft 20 40 60 80
	-	\ge	SS	3-6-8 14	3				
		\ge	SS	6-7-6 13	5		SM	SILTY SAND, non-plastic, medium dense to	
5 -		\ge	SS	5-4-4 8	3			loose, dry, light brown	
	-								
10 -		\ge	SS	20-34-34 68	3		SP-SM	Moderaltely Cemented POORLY GRADED SAND with SILT (Caliche), non-plastic, very dense, dry, light brown/white	
	-								
45			SS	9-16-14	4				
-				30	I				
4/14/2							SP	POORLY GRADED SAND, non-plastic,	·+-·+-·+-·+-·+
20 -		\ge	SS	12-19-21 40	2			medium to very dense, dry, gray	
	-								$ \begin{array}{c} \begin{array}{c} \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} $
1302.050	-								$\begin{array}{c} - & \cdot \\ + & - & - \\ + & - & - \\ + & - & - \\ + & - & - \\ + & - & - \\ + & - & - \\ + & - & - \\ + & - & - \\ + & - & - \\ + & - & - \\ + & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - \\ + & - & - & - & - \\ + & - & - & - & - \\ + & - & - & - & - \\ + & - & - & - & - \\ + & - & - & - & - \\ + & - &$
25 -		\mid	SS	13-18-33 51	2				
								Stopped Auger @ 24 teet Stopped Sampler @ 25.5 feet	
3	-								┝╼╵╆╼╵╈╼╵╅╾╵┥
30 -	_								

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve

AMSL - Above Mean Sea Level

CS - Continuous Sampler

UD - Undisturbed



Project: Harley Pond Project 04/12/2021 Project No: 1-10302 Date: 5.5" OD HSA Elevation: Type:

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 6

During Drilling: none

After 24 Hours:

				SA	MPLE			SUBSURFACE PROFILE	
DEPTH (Ft)	DOJ	SAMPLE INTERVAL	ТҮРЕ	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft 20 40 60 80
-		\ge	SS	4-4-3 7	3		SM	SILTY SAND, non-plastic, loose, dry, light brown	$- \begin{array}{c} \bullet \\ 7 \cdot \begin{array}{c} \bullet \\ i \end{array} $
-		\ge	SS	4-3-4 7	1				-••7·•++++
5 -		\ge	SS	4-3-6 9	2				
-									
-			SS	4-10-10	1		SP	POORLY GRADED SAND, non-plastic, loose to medium dense, dry, gray	
- 10				20	I				
-									
15 —		\boxtimes	SS	6-12-17 29	1				
								Stopped Auger @ 14 feet Stopped Sampler @ 15.5 feet	
	-								
5 20 – 5 -	-								
25 –									
30 -	-								

LEGEND

SS - Split Spoon
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UD/SL - Undisturbed Sleeve

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UD - Undisturbed



Project: Harley Pond Project 04/02/2021 Project No: 1-10302 Date: 5.5" OD HSA Elevation: Type:

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 7

During Drilling: none

After 24 Hours:

Γ					SAI	MPLE		1	SUBSURFACE PROFILE	
	DEPTH (Ft)	POG	SAMPLE INTERVAL	ТҮРЕ	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft 20 40 60 80
	- - - 5 -			SS SS SS	5-7-5 12 5-9-10 19 9-12-16 28	3 1 2		SP-SM	POORLY GRADED SAND with SILT, non-plastic, medium dense, dry, light brown	
	- 10 — - - - 15 —			SS	5-7-9 16 11-18-24	1		SP	POORLY GRADED SAND, non-plastic, medium densse to dense, dry, gray	
D TEST.GDT 4/14/21					42	I			Stopped Auger @ 14 feet Stopped Sampler @ 15.5 feet	
TEST BORING 1-10302.GPJ GE	- - 25 — - -									
OG OF	- 30 —	-								

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve

AMSL - Above Mean Sea Level

CS - Continuous Sampler

UD - Undisturbed



Project: Harley Pond Project 04/12/2021 Date: Elevation: Type:

Project No: 1-10302 5.5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 8

During Drilling: none

After 24 Hours:

				SA	MPLE		1	SUBSURFACE PROFILE	
DEPTH (Ft)	DOJ	SAMPLE INTERVAL	ТҮРЕ	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft 20 40 60 80
- - - 5 -			SS SS SS	3-3-4 7 6-7-5 12 2-3-3 6	3 4 3		SP-SM	POORLY GRADED SAND with SILT, non-plastic, loose to medium dense, dry, light brown	
- 			SS	4-9-10 19	2		SP	POORLY GRADED SAND, non-plastic, medium dense, dry, gray	
15 -		\times	SS	6-9-14 23	2			Stopped Auger @ 14 feet Stopped Sampler @ 15.5 feet	
20	-								
25 -	-								

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve

AMSL - Above Mean Sea Level

CS - Continuous Sampler

UD - Undisturbed



Project: Harley Pond Project 04/12/2021 Project No: 1-10302 Date: 5.5" OD HSA Elevation: Type:

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 9

During Drilling: none

After 24 Hours:

Γ					SAM	MPLE			SUBSURFACE PROFILE	
	DEPTH (Ft)	DOJ	SAMPLE INTERVAL	ТҮРЕ	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft 20 40 60 80
	-		XX	SS SS	8-10-15 25 9-12-16 28	5 4		SP-SM	SILTY SAND, non-plastic, medium dense, dry, light brown	
	- 5 — -		\ge	SS	14-13-36 49	9		SP-SM	Slightly Cemented POORLY GRADED SAND with SILT, non-plastic, dense, dry, brown/white	
	- 10 - -		\times	SS	15-17-25 42	3		SP	POORLY GRADED SAND, non-plastic, dense to very dense, dry, gray	
4/21	- 15 — -		\times	SS	14-21-31 52	4			Stopped Auger @ 14 feet Stopped Sampler @ 15.5 feet	
O TEST.GDT 4/1	- - 20 — -	-								
IG 1-10302.GPJ GE	- - 25 —									
OG OF TEST BORIN	- - - 30 —									

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve

AMSL - Above Mean Sea Level

CS - Continuous Sampler

UD - Undisturbed



Project: Harley Pond Project 04/12/2021 Date: Elevation: Type:

Project No: 1-10302 5.5" ODHSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 10

During Drilling: none

After 24 Hours:

					SA	MPLE			SUBSURFACE PROFILE	
	DEPTH (Ft)	907	SAMPLE INTERVAL	ТҮРЕ	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft 20 40 60 80
	-		\times	SS SS	5-6-5 11 4-3-5 8	4 3		SM	SILTY SAND, non-plastic, medium dense to loose, dry, light brown	• • 11 - · · · · · · · · · · · · · · · · ·
	5 — - -		\ge	SS	3-8-33 41	4			Moderately Cemented SILTY SAND.	
	- 10 — -		\ge	SS	16-25-36 61	5		SM	non-plastic, very dense, dry, light brown/white	
	- - 15 —		\ge	SS	11-14-16 30	3		SP	POORLY GRADED SAND, non-plastic, medium dense, dry, gray	
L.GDT 4/14/21	-	-							Stopped Auger @ 14 feet Stopped Sampler @ 15.5 feet	
2.GPJ GEO TES'	20 — - -									
BORING 1-1030	- 25 — -									
-OG OF TEST	- - 30 —									

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve

AMSL - Above Mean Sea Level

CS - Continuous Sampler

UD - Undisturbed

						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	1.0	SM	5.2	NP	NP	33	74	97	100								
1	3.0		4.7														
1	5.0		3.2														
1	10.0	SM	3.1	NP	NP	24	47	79	95	98	100						
1	15.0		1.7														
1	20.0		1.5														
1	25.0		1.2														
2	1.0		2.5														
2	3.0		2.2														
2	5.0	SP-SM	2.3	NP	NP	6	20	47	78	90	98	98	100				
2	10.0		2.1														
2	15.0		3.3														
4/14/21	20.0		2.8														
2 2	25.0	SP	3.8	NP	NP	4	30	84	98	99	100						
3 0 1 0 1 0 1 0	1.0		3.8														
6 GB 3	3.0	SP-SM	1.9	NP	NP	11	39	67	88	94	98	100					
-1-10302	5.0		1.1														
SULTS 3	10.0		1.5														
a ∠ 3	15.0	SP	1.5	NP	NP	3	12	51	89	96	99	100					
SUMMARY OF LABORA IC	OEO-IEST					LL = LIQUID LIMIT PI = PLASTICITY INDEX NP = NON PLASTIC or NO VALUE							Project: Harley Pond Project Location: Rio Rancho, NM Number: 1-10302				

Sheet 1 of 4

						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"
3	20.0		2.0														
3	25.0		1.9														
4	1.0		3.8														
4	3.0		2.8														
4	5.0	SM	3.2	NP	NP	15	38	73	93	97	100						
4	10.0		1.5														
4	15.0		1.7														
4	20.0	SP	1.4	NP	NP	3	12	49	86	91	93	95	98	100			
4	25.0		1.2														
5	1.0	SM	3.4	NP	NP	18	62	95	100								
5	3.0		4.7														
5	5.0		2.7														
5/14/2	10.0	SP-SM	3.2	NP	NP	11	29	62	91	97	99	99	100				
2 5	15.0		1.2														
10 5	20.0		1.9														
0 Pag 5	25.0		1.9														
9 1-1030	1.0	SM	3.3	NP	NP	13	35	66	88	94	98	99	100				
6 6	3.0		1.4														
0RY RE	5.0	SP	1.7	NP	NP	3	12	46	80	87	93	99	100				
SUMMARY OF LABORAT	Geo-lest					LL = LIQUID LIMIT PI = PLASTICITY INDEX NP = NON PLASTIC or NO VALUE							Project: Harley Pond Project Location: Rio Rancho, NM Number: 1-10302				

Sheet 2 of 4

						SIEVE ANALYS PERCENT PASS								YSIS SSING					
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"		
6	10.0		1.4																
6	15.0		1.5																
7	1.0		2.9																
7	3.0		1.4																
7	5.0	SP-SM	1.6	NP	NP	6	17	38	66	81	89	92	94	100					
7	10.0		1.4																
7	15.0		1.5																
8	1.0		3.1																
8	3.0		3.6																
8	5.0	SP-SM	2.6	NP	NP	9	34	65	88	94	98	98	100						
8	10.0		2.1																
8	15.0		1.6																
6 4/14/2	1.0		4.6																
6 60T	3.0	SM	4.0	NP	NP	15	54	92	99	100									
9	5.0		8.5																
9 9	10.0	SP-SM	3.2	NP	NP	9	43	88	97	98	99	99	100						
9	15.0		4.0																
10	1.0	SM	3.9	NP	NP	20	58	93	99	100									
[₩] /200	3.0		3.0																
SUMMARY OF LABORAT	Geo-lest					LL = LIQUID LIMIT PI = PLASTICITY INDEX NP = NON PLASTIC or NO VALUE						Pro Loo Nu	Project: Harley Pond Project Location: Rio Rancho, NM Number: 1-10302						

Sheet 3 of 4

SIEVE ANALYSIS PERCENT PASSING UNIFIED LL ΡI 1" 4" (%) MOIST 3/8" 1/2" 3/4" 1 1/2" 2" TEST DEPTH NO NO NO NO NO HOLE (FEET) CLASS 200 100 40 10 4 10 5.0 3.7 10 10.0 SM 5.1 NP NP 33 59 88 97 99 100 10 15.0 3.4 LL = LIQUID LIMIT Project: Harley Pond Project **DEO-IEST** PI = PLASTICITY INDEX NP = NON PLASTIC or NO VALUE Location: Rio Rancho, NM Number: 1-10302

1-10302.GPJ GEO TEST.GDT 4/14/21

SUMMARY OF LABORATORY RESULTS

Sheet 4 of 4





GEO T GPJ 1-10302 **GRAIN SIZE**











	Project:	Harley Pone	d Project					
	Job #:	1-10302						
Boring/	Location:	Composite						
Samp	le Depth:	0 - 15 feet						
Soil De	scription:	Silty Sand (SM)					
Rem	olded to:	Approx. 959	% of Maxim	um Density				
			055.4	I			400	
	Aparatus We	ight Empty:	255.1	grams	Weight of S	ample:	422	grams
	Aparartus w	eight + Soil:	6/7.1	grams	weight of S	ample:	0.930335	2
	Mole	d Diameter:	6.395	cm	Mole	d Area:	32.11966	cm
	Pipe	e Diameter:	1.27	cm	Pipe	e Area:	1.266769	cm ²
	Lengt	h of Sample	6.84	cm	Area	Factor:	0.039439	2
Pressure Head	Applied 1psi	= 70.34 cm:	0	cm	Volume of S	ample:	219.6985	cm³
		Can #:			Volume of S	ample:	0.007759	ft ³
	V	Vet Weight:	238.7	grams	Unit V	Veight:	119.9	lb/ft ³
	I	Dry Weight:	216.8	grams	Moisture Co	ontent:	10.1	%
					Dry Unit V	Veight:	108.9	lb/ft ³
Time		Trial 1		Trial 2	Tria	3		
Hour		0		0		0		
Minute		3		3		3		
Second		10		15		19		
Total (hr)		0.052778		0.054167	0.0)55278		
h _o		65	cm	65 cm		65	cm	
h ₁		10	cm	10 cm		10	cm	
1		= -						
$Head_0$		71.84	cm	71.84 cm		71.84	cm	
Head ₁		16.84	cm	16.84 cm		16.84	cm	
Ks (cm/hour)		7.41	cm/hr	7.22 cm,	/hr	7.08	cm/hr	
Ks (cm/sec)		2.06E-03	cm/s	2.01E-03 cm,	/s 1.	97E-03	cm/s	
Г	<u>د</u>	turated Uvd	raulic Cond		7 24 cm	/hr		
	56	питатей пуй	aune cono	uclivity, K _{s:}	7.24 UII	,		

Saturated Hydraulic Conductivity, K_s: **2.01E-03 cm/s**



Project: Job #: Boring/Location: Sample Depth: Soil Description: Romolded to:	Harley Pone 1-10302 Composite 0 - 15 feet Poorly Grad	d Project of Poorly G ded Sand (S	raded Sand - Eml P)	oankment Area	
Remolaed to:	Approx. 95	% of Maxim	ium Density		
Aparatus W Aparartus V	eight Empty: Veight + Soil:	248.6	grams grams	Weight of Sample: Weight of Sample:	439.9 grams 0.969797 lb
Mo	ld Diameter:	6.322	cm	Mold Area:	31.39055 cm ²
Pi	pe Diameter:	1.27	cm	Pipe Area:	1.266769 cm ²
Leng	th of Sample	6.87	cm	Area Factor:	0.040355
Pressure Head Applied 1ps	i = 70.34 cm:	0	cm	Volume of Sample:	215.653 cm ³
	Can #:			Volume of Sample:	0.007616 ft ³
	Wet Weight:	247.5	grams	Unit Weight:	127.3 lb/ft ³
	Dry Weight:	228.8	grams	Moisture Content:	8.2 %
				Dry Unit Weight:	117.7 lb/ft ³
Time Hour Minute Second Total (hr)	Trial 1 0 1 7 0.018611		Trial 2 0 1 9 0.019167	Trial 3 0 1 9 0.019167	
h	65	cm	65 cm	65	cm
h ₁	10	cm	10 cm	10	cm
Head ₀	71.87	cm	71.87 cm	71.87	cm
Head ₁	16.87	cm	16.87 cm	16.87	cm
Ks (cm/hour)	21.59	cm/hr	20.96 cm/ł	nr 20.96	cm/hr
Ks (cm/sec)	6.00E-03	cm/s	5.82E-03 cm/s	5.82E-03	cm/s
5	Saturated Hyd	Iraulic Cond	luctivity, K _{s:}	21.17 cm/hr	

Saturated Hydraulic Conductivity, K_s: **5.88E-03 cm/s**