Huddleston-Berry
Engineering & Testing, LLC

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Grand Junction, Colorado 81501
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August 9, 2024
Project#01754-0010

JUB Engineers, Inc.
305 S. Main Street
Palisade, Colorado 81526

Attention: Mr. Matt Filla

Subject: Geotechnical Investigation
Palisade Sewer Transfer
Clifton/Palisade, Colorado

Dear Mr. Filla,

This letter presents the results of a geotechnical investigation conducted by Huddleston-Berry Engineering & Testing, LLC (HBET) for the Palisade Sewer Transfer project in Clifton and Palisade, Colorado. The scope of our investigation included evaluating the subsurface conditions at the site with regard to the proposed construction.

Subsurface Investigation

The subsurface investigation consisted of nine geotechnical borings drilled between February and April, 2024. The borings were drilled to depths of between approximately 10.0 and 26.5 feet below the existing ground surface. The locations of the borings are shown on Figure 2 – Site Plan. Typed boring logs are included in Appendix A. Samples of the native soils were collected during Standard Penetration Testing (SPT) and using bulk sampling methods at the locations shown on the logs.

As shown on the logs, the subsurface conditions were slightly variable. However, the borings generally encountered 0.5 to 1.5 feet of topsoil or pavement section materials above brown, moist to wet, very soft to stiff lean clay soils. The clay soils extended to the bottoms of B-1, B-2, B-3, and B-F&34. In B-5, the clay soils extended to a depth of 8.0 feet and were underlain by brown, wet, very loose sandy silt soils to the bottom of the boring. In the remaining borings, the clay soils extended to depths of between 7.0 and 23.0 feet and were underlain by brown, wet, dense to very dense sandy gravel and cobbles soils to the bottoms of the borings. Groundwater was not encountered in B-1 or B-3 but was encountered in the remaining borings at depths of between 5.0 and 20.0 feet at the time of the investigation.

Laboratory Testing

Selected representative samples of the site soils were collected from the borings and tested in the Huddleston-Berry Engineering and Testing LLC geotechnical laboratory for natural moisture content determination, grain size analysis, maximum dry density and optimum moisture content (Proctor) determination, and Atterberg limits. The laboratory testing results are included in Appendix B.

The laboratory results indicate that the native clay soils range from slightly to moderately plastic. Based upon the Atterberg limits of the materials and upon our experience with similar soils in the vicinity of the subject site, the native clay soils are anticipated to range from slightly collapsible to slightly expansive.

The native silt soils were indicated to be non-plastic. These soils are below the water table and are generally anticipated to consolidate under loading.

Open Trench Construction

As discussed previously, shallow groundwater was encountered at the site. As a result, dewatering may be required. In addition, soft/loose soils may exist in the bottom of the trench. It may be necessary to utilize geotextile and/or geogrid in conjunction with granular fill materials to stabilize the subgrade soils prior to pipe bedding and pipe placement in some areas. Typically, stabilization can be achieved using crushed stone, pit-run or other granular material in conjunction with geotextile and/or geogrid. However, HBET should be contacted to provide specific recommendations for subgrade stabilization based upon the actual conditions in the trench.

Trenchless Construction

Figure 3 is a fence diagram generated from the geotechnical data based upon profiles provided by bore log data. Although the ground surface elevations of the borings were estimated, the diagram suggests that the sewer line will run through clay soils for most of the alignment. However, shallow groundwater was encountered in most of the borings may impact the proposed construction. As a result, horizontal directional drilling trenchless construction methods are suitable at this site. However, it is recommended that the actual method used be selected by a contractor with extensive experience.

Foundation Recommendations

Lift Station

Based upon information provided to HBET, the bottom of the lift station will be at an elevation of approximately 4652 feet. Based upon the geotechnical boring conducted at this location, the bottom of the lift station will bear on the dense gravel and cobble soils. Based upon recent groundwater monitoring data, the seasonal high groundwater is located at an elevation of approximately 4,667.8 feet.

In order to limit the potential for point stresses to develop on the bottom of the lift station foundation, a minimum of 6-inches of base course is recommended between the bottom of the lift station and native gravel and cobble soils.

Prior to placement of base course, it is recommended that the bottom of the foundation excavation be proofrolled to HBET's satisfaction. Base course should be compacted to a minimum of 95% of the modified Proctor maximum dry density, within ±2% of the optimum moisture content as determined in accordance with ASTM D1557C. For foundations resting on properly compacted gravel and cobble subgrade soils and base course, a net allowable bearing capacity of 3,000 psf may be used. Total settlements of 1.0-inch and differential settlements of ½-inch or less are anticipated for properly constructed foundations at this location.

Generator Building

For the generator building, spread footings and monolithic structural slabs are both appropriate alternatives. However, in order to provide a uniform bearing stratum and reduce the risk of excessive differential movements, it is recommended that the foundations be constructed above a minimum of 24-inches of structural fill.

Due to their plasticity, the native clay soils are not suitable for reuse as structural fill. Imported structural fill should consist of a granular, non-expansive, ***non-free draining*** material with greater than 10% passing the #200 sieve and Liquid Limit of less than 30. However, all proposed imported structural fill materials should be approved by HBET.

For spread footing foundations, the footing areas may be trenched. However, for monolithic slab foundations, the structural fill should extend across the entire building pad area to a depth of 24-inches below the turndown edges. Structural fill should extend laterally beyond the edges of the foundations a distance equal to the thickness of structural fill for both foundation types.

Prior to placement of structural fill, it is recommended that the bottoms of the foundation excavations be scarified to a depth of 6 to 8-inches, moisture conditioned, and re-compacted to a minimum of 95% of the standard Proctor maximum dry density, within ±2% of the optimum moisture content as determined in accordance with ASTM D698. However, soft soils were encountered in the subsurface and this may make compaction of the subgrade difficult. It may be necessary to utilize geotextile and/or geogrid in conjunction with additional granular fill to stabilize the subgrade. HBET should be contacted to provide recommendations for stabilization based upon the actual conditions encountered during construction.

Structural fill should be moisture conditioned, placed in maximum 8-inch loose lifts, and compacted to a minimum of 95% of the standard Proctor maximum dry density for fine grained soils or modified Proctor maximum dry density for coarse grained soils, within ±2% of the optimum moisture content as determined in accordance with ASTM D698 or D1557C, respectively. Structural fill should be extended to within 0.1-feet of the bottom of the foundation. No more than 0.1-feet of gravel should be placed below the footings or turndown edge as a leveling course.

For structural fill consisting of imported granular materials, and foundation building pad preparation as recommended, a maximum allowable net bearing capacity of 1,500 psf may be used. In addition, a modulus of subgrade reaction of 200 pci may be used for suitable imported structural fill. Foundations subject to frost should be at least 24 inches below the finished grade.

In general, for properly constructed shallow foundations, HBET anticipates total settlement are anticipated to be 1.0-inch or less and differential settlements are anticipated to be ½-inch or less. However, if excess moisture is permitted to infiltrate into the shallow subsurface, total differential movements could exceed 1.0-inch.

Lateral Resistance

Lateral resistance can be developed from sliding friction between the foundations and the ground. A sliding friction angle of 18° is recommended. This corresponds to a friction factor of 0.32.

Corrosion of Concrete and Steel

Water soluble sulfates are common to the soils in Western Colorado. Therefore, at a minimum, cement adequate for Sulfate Exposure Class S1 is recommended for construction at this site.

Based upon our experience in the vicinity of the subject site, the native clay soils are anticipated to have a resistivity of less than 1,000 ohm-cm. In addition, groundwater fluctuations will tend to facilitate corrosion. Therefore, corrosion should be considered for any steel foundation elements, utility lines, etc.

Lateral Earth Pressures

Any stemwalls or retaining walls should be designed to resist lateral earth pressures. For backfill consisting of the native soils or imported granular, non-free draining, non-expansive material, we recommend that the walls be designed for a moist equivalent active fluid unit weight of 45 pcf and a saturated equivalent fluid unit weight of 80 pcf. In general, HBET recommends against using passive earth pressures due to the magnitude of movement required to mobilize it. However, if passive pressures are used, an equivalent passive fluid unit weight of not more than 150 pcf may be used for both moist and saturated conditions.

Where surcharge loads are present, HBET recommends that a coefficient of 0.39 be applied to the surcharge to compute lateral loading associated with the surcharge. A moist unit weight of 105 pcf may be used for the in-situ native soils.

Seismic Design Criteria

In general, based upon the results of the subsurface investigation and upon our experience at the VA Hospital, Site Class D is appropriate for this site.

Non-Structural Floor Slab and Exterior Flatwork Recommendations

In order to limit the potential for excessive differential movements of slabs-on-grade it is recommended that non-structural floating floor slabs be constructed above a minimum of 18-inches of structural fill with subgrade preparation and fill placement in accordance with the *Foundation Recommendations* section of this report. It is recommended that exterior flatwork be constructed above a minimum of 12-inches of structural fill.

Drainage Recommendations

Grading and drainage are critical to the long-term performance of the structure. Grading around the structure should be designed to carry precipitation and runoff away from the structure. It is recommended that the finished ground surface drop at least twelve inches within the first ten feet away from the structure. It is also recommended that landscaping within five feet of the structure include primarily desert plants with low water requirements. In addition, it is recommended that automatic irrigation, including drip lines, within ten feet of foundations be minimized.

HBET recommends that surface downspout extensions be used which discharge a minimum of 15 feet from the structure or beyond the backfill zone, whichever is greater. However, if subsurface downspout drains are utilized, they should be carefully constructed of solid-wall PVC and should daylight a minimum of 15 feet from the structure. In addition, an impermeable membrane is recommended below subsurface downspout drains. Dry wells should not be used.

General Recommendations

Bearing Capacity
In general, for well compacted native clay soils, where no structural fill is utilized, HBET recommends a maximum net allowable bearing capacity of 1,000 psf.

Subgrade Strength
In general, based upon our experience with the native sand soils in the vicinity of the subject site, HBET recommends that a Resilient Modulus of 3,000 psi be utilized for these materials. This corresponds to a CBR of 2.0 or R-value of less than 5.

Excavations
Excavations in the soils at the site may stand for short periods of time but should not be considered to be stable. In general, the site soils classify as Type C soil with regard to OSHA's *Construction Standards for Excavations*. For Type C soils, the maximum allowable slope in temporary cuts is 1.5H:1V. However, due to the presence of soft soils, shoring or trench boxes will likely be required.

General Notes

The recommendations included above are based upon the results of the subsurface investigation and on our local experience. These conclusions and recommendations are valid only for the proposed construction.

As discussed previously, the subsurface conditions at the site were slightly variable. However, the precise nature and extent of subsurface variability may not become evident until construction. As a result, it is recommended that a representative of HBET be retained to provide engineering oversight, construction materials testing, and special inspections during the construction. This is to verify compliance with the recommendations included in this report or permit identification of significant variations in the subsurface conditions which may require modification of the recommendations.

We are pleased to be of service to your project. Please contact us if you have any questions or comments regarding the contents of this report.

Respectfully Submitted:
Huddleston-Berry Engineering and Testing, LLC

Michael A. Berry, P.E.
Vice President of Engineering

FIGURES

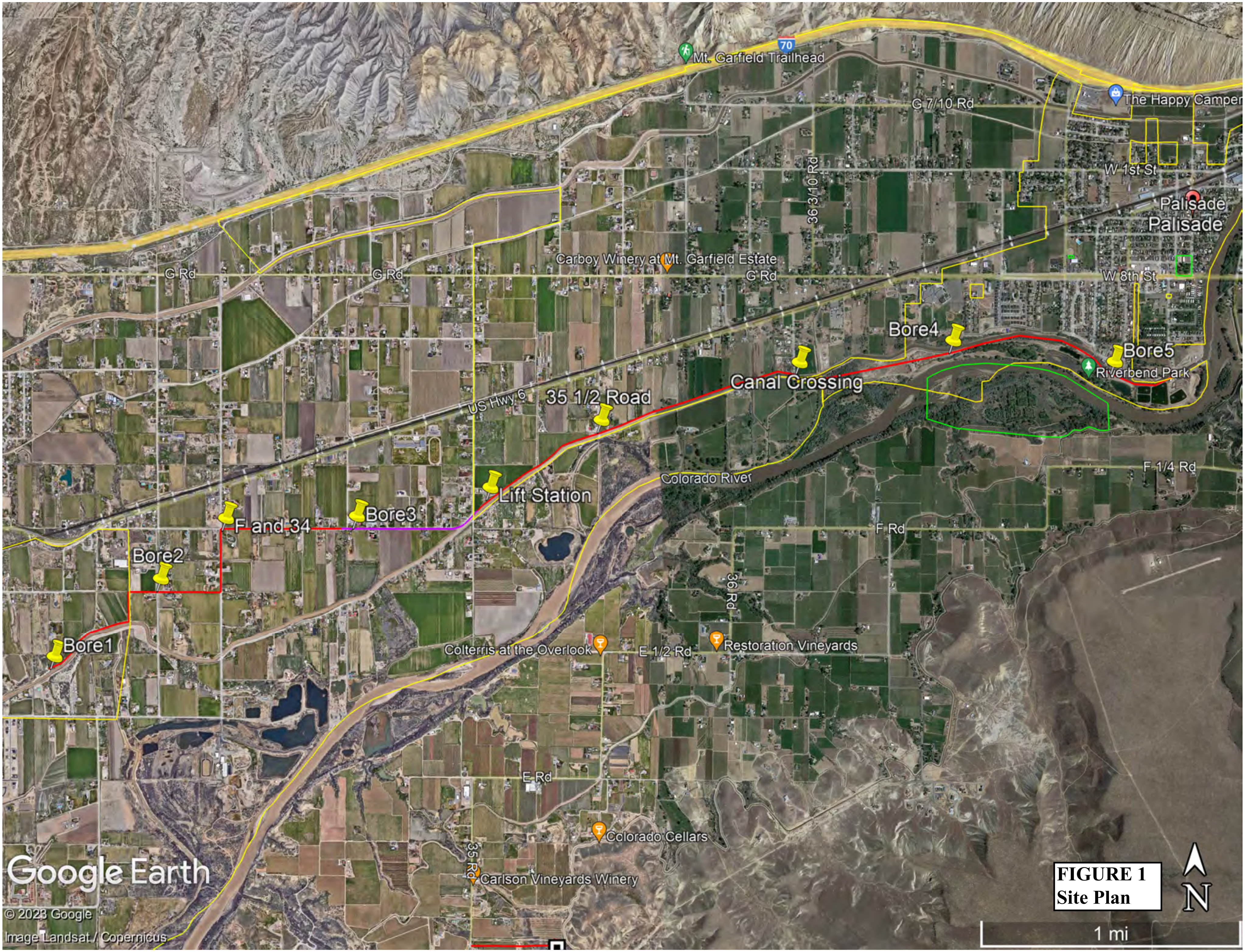

FIGURE 1
Site Plan

Huddleston-Berry Engineering & Testing, LLC
2789 Riverside Parkway
Grand Junction, CO 81501
970-255-8005

SUBSURFACE DIAGRAM

CLIENT JUB Engineers

PROJECT NUMBER 01754-0010

PROJECT NAME Palisade Sewer Transfer

PROJECT LOCATION Clifton/Palisade

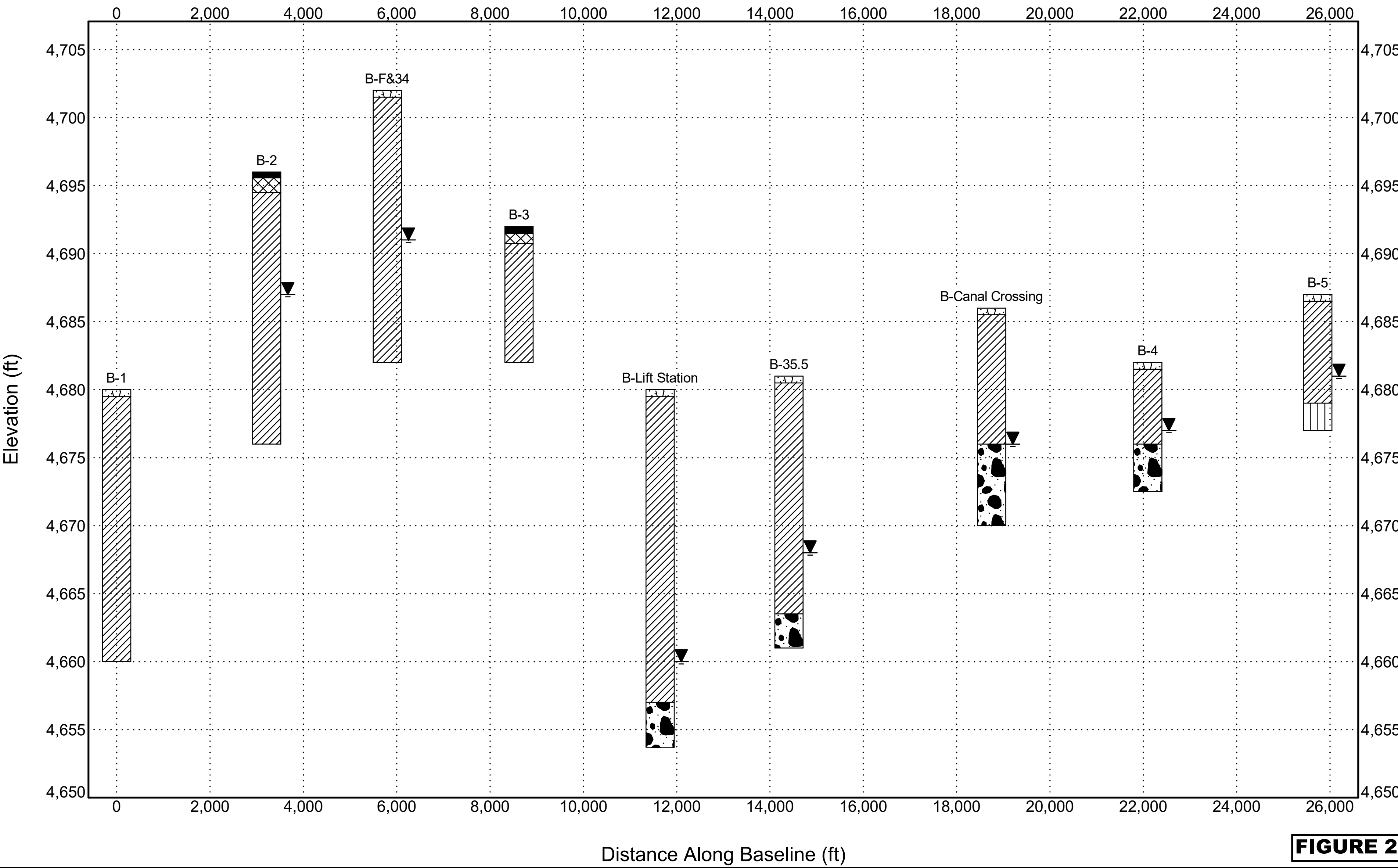

FIGURE 2

STRATIGRAPHY & GW - A SIZE 01754-0010 PALISADE SEWER TRANSFER.GPJ GINT US LAB.GDT 5/6/24

APPENDIX A
Typed Boring Log

BORING NUMBER B-1

Huddleston-Berry Engineering & Testing, LLC
2789 Riverside Parkway
Grand Junction, CO 81501
970-255-8005

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade
DATE STARTED 2/27/24 **COMPLETED** 2/27/24
GROUND ELEVATION 4680 ft **HOLE SIZE** 4-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig
AT TIME OF DRILLING dry
LOGGED BY TC **CHECKED BY** MAB
AT END OF DRILLING dry
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY with Organics (TOPSOIL)										
		Lean CLAY (CL), brown, moist, soft to medium stiff										
			SS 1	96	4-2-3-4 (5)							
5		**Lab Classified: GB1	GB 1					4	27	16	11	86
			SS 2	63	1-1-1-1 (2)							
10												
			SS 3	83	0-2-1-2 (3)							
15												
			SS 4	38	1-1-2-3 (3)							
20		Bottom of hole at 20.0 feet.										

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BORING NUMBER B-2

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade
DATE STARTED 2/27/24 **COMPLETED** 2/27/24
GROUND ELEVATION 4696 ft **HOLE SIZE** 4-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig
AT TIME OF DRILLING 9.0 ft / Elev 4687.0 ft
LOGGED BY TC **CHECKED BY** MAB
AT END OF DRILLING 9.0 ft / Elev 4687.0 ft
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		ASPHALT Pavement										
		Granular BASE COURSE										
		Lean CLAY (cl), brown, moist to wet, very soft to medium stiff										
			SS 1	58	14-8-5-5 (13)							
5												
			SS 2	88	0-0-1-1 (1)							
10												
			SS 3	100	0-1-1-1 (2)							
15												
			SS 4	100	0-1-0-1 (1)							
20		Bottom of hole at 20.0 feet.										

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BORING NUMBER B-3

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade
DATE STARTED 4/10/24 **COMPLETED** 4/10/24
GROUND ELEVATION 4692 ft **HOLE SIZE** 4
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig
AT TIME OF DRILLING Dry
LOGGED BY TC **CHECKED BY** MAB
AT END OF DRILLING Dry
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		ASPHALT Pavement										
		Granular BASE COURSE										
		Lean CLAY (cl), brown, moist, medium stiff to stiff										
2.5			SS 1	46	4-6-4-4 (10)							
5.0												
7.5												
			SS 2	100	3-3-4-5 (7)							
10.0		Bottom of hole at 10.0 feet.										

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BORING NUMBER B-35.5

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade
DATE STARTED 3/6/24 **COMPLETED** 3/6/24
GROUND ELEVATION 4681 ft **HOLE SIZE** 4-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig
AT TIME OF DRILLING 13.0 ft / Elev 4668.0 ft
LOGGED BY TC **CHECKED BY** MAB
AT END OF DRILLING 13.0 ft / Elev 4668.0 ft
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY with Organics (TOPSOIL)										
		Lean CLAY (cl), brown, moist to wet, soft to medium stiff										
			SS 1	92	3-3-2-2 (5)							
5												
			SS 2	67	2-1-2-3 (3)							
10												
			SS 3	83	0-1-2-2 (3)							
15												
		Sandy GRAVEL and COBBLES (gw), brown, wet, dense to very dense										
			SS 4	50	20-28-25-25 (53)							
20		Bottom of hole at 20.0 feet.										

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BORING NUMBER B-4

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade
DATE STARTED 2/28/24 **COMPLETED** 2/28/24
GROUND ELEVATION 4682 ft **HOLE SIZE** 4-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig
AT TIME OF DRILLING 5.0 ft / Elev 4677.0 ft
LOGGED BY TC **CHECKED BY** MAB
AT END OF DRILLING 5.0 ft / Elev 4677.0 ft
NOTES
AFTER DRILLING ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
0.0	Lean CLAY with Organics (TOPSOIL)										
	Lean CLAY (cl), brown, moist, soft to medium stiff										
2.5		SS 1	71	3-3-2-3 (5)							
5.0											
	Sandy GRAVEL and COBBLES (gw), brown, wet, dense to very dense										
7.5		SS 2	33	28-30-30 (60)							
	Bottom of hole at 9.5 feet.										

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BORING NUMBER B-5

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade
DATE STARTED 2/28/24 **COMPLETED** 2/28/24
GROUND ELEVATION 4687 ft **HOLE SIZE** 4-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig
AT TIME OF DRILLING 6.0 ft / Elev 4681.0 ft
LOGGED BY TC **CHECKED BY** MAB
AT END OF DRILLING 6.0 ft / Elev 4681.0 ft
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Lean CLAY with Organics (TOPSOIL)										
		Lean CLAY (cl), brown, moist, very soft to medium stiff										
2.5			SS 1	71	2-1-2-2 (3)							
5.0												
7.5												
		Sandy SILT (ML), brown, wet, very loose **Lab Classified: SS2	SS 2	75	2-0-0-0 (0)			32	NP	NP	NP	61
10.0		Bottom of hole at 10.0 feet.										

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BORING NUMBER B-Canal Crossing

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade
DATE STARTED 3/7/24 **COMPLETED** 3/7/24
GROUND ELEVATION 4686 ft **HOLE SIZE** 4-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig
AT TIME OF DRILLING 10.0 ft / Elev 4676.0 ft
LOGGED BY TC **CHECKED BY** MAB
AT END OF DRILLING 10.0 ft / Elev 4676.0 ft
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY with Organics (TOPSOIL)										
		Lean CLAY (CL), brown, moist, soft to medium stiff **Lab Classified: SS1										
			SS 1	63	4-4-6-7 (10)			19	31	16	15	94
5												
			SS 2	67	3-2-1-2 (3)							
10		Sandy GRAVEL and COBBLES (gw), brown, wet, dense to very dense										
15			SS 3	83	17-18-23-35 (41)							
		Bottom of hole at 16.0 feet.										

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BORING NUMBER B-F&34

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade
DATE STARTED 3/6/24 **COMPLETED** 3/6/24
GROUND ELEVATION 4702 ft **HOLE SIZE** 4-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig
AT TIME OF DRILLING 11.0 ft / Elev 4691.0 ft
LOGGED BY TC **CHECKED BY** MAB
AT END OF DRILLING 11.0 ft / Elev 4691.0 ft
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY with Organics (TOPSOIL)										
		Lean CLAY (cl), brown, moist to wet, very soft to medium stiff										
			SS 1	42	5-3-3-2 (6)							
5												
			SS 2	46	1-1-1-1 (2)							
10												
			SS 3	88	0-1-1-1 (2)							
15												
			SS 4	79	1-1-1-1 (2)							
20		Bottom of hole at 20.0 feet.										

Huddleston-Berry Engineering & Testing, LLC
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Grand Junction, CO 81501
970-255-8005

BORING NUMBER B-Lift Station

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade
DATE STARTED 3/7/24 **COMPLETED** 3/7/24
GROUND ELEVATION 4680 ft **HOLE SIZE** 4-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig
AT TIME OF DRILLING 20.0 ft / Elev 4660.0 ft
LOGGED BY TC **CHECKED BY** MAB
AT END OF DRILLING 20.0 ft / Elev 4660.0 ft
NOTES
AFTER DRILLING ---

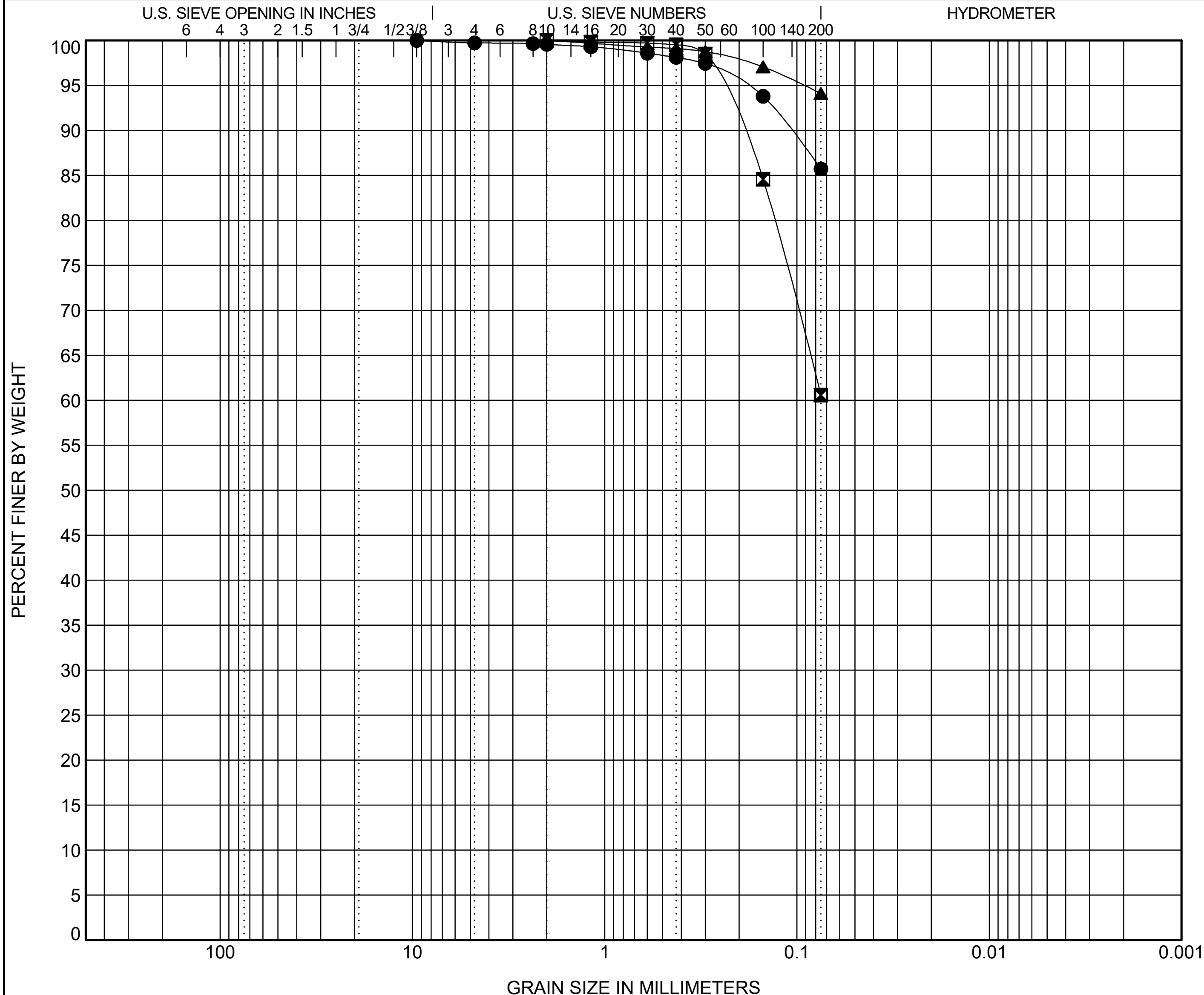
DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
0	Lean CLAY with Organics (TOPSOIL)										
	Lean CLAY (cl), brown, moist, soft to medium stiff										
		SS 1	38	2-2-2-3 (4)							
5											
		SS 2	42	2-2-2-2 (4)							
10											
		SS 3	75	0-1-0-1 (1)							
15											
		SS 4	79	0-1-2-2 (3)							
20											
	Sandy GRAVEL and COBBLES (gw), brown, wet, dense to very dense										
25											
	Bottom of hole at 26.3 feet.	SS 5	17	50							

APPENDIX B
Laboratory Testing Results

Huddleston-Berry Engineering & Testing, LLC
2789 Riverside Parkway
Grand Junction, CO 81501
970-255-8005

GRAIN SIZE DISTRIBUTION

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-1, GB-1**	**3/7**	**LEAN CLAY(CL)**	**27**	**16**	**11**		
⊠	**B-5, SS-2**	**3/7**	**SANDY SILT(ML)**	**NP**	**NP**	**NP**		
▲	**Canal Crossing**	**3/7**	**LEAN CLAY(CL)**	**31**	**16**	**15**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-1, GB-1**	**3/7**	**9.5**				**0.3**	**14.0**	**85.7**	
⊠	**B-5, SS-2**	**3/7**	**2**				**0.0**	**39.4**	**60.6**	
▲	**Canal Crossing**	**3/7**	**2**				**0.0**	**5.9**	**94.1**	

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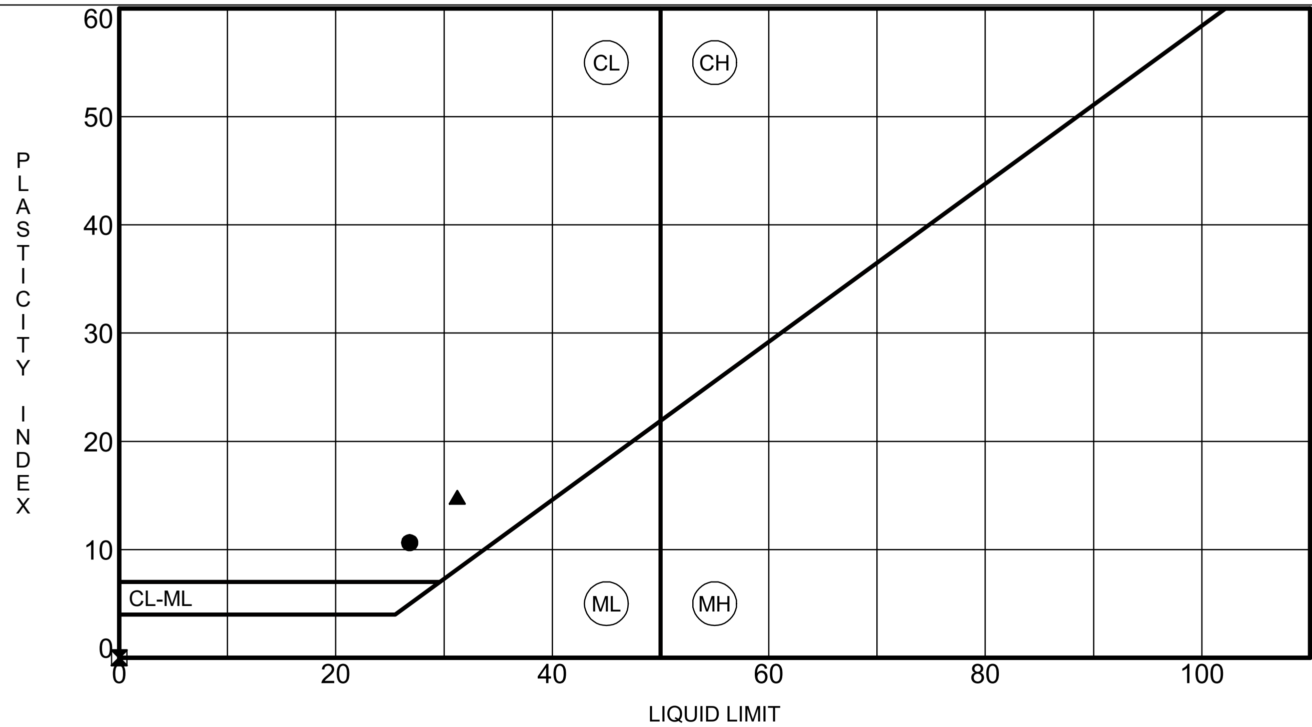
Grand Junction, CO 81501
970-255-8005

ATTERBERG LIMITS' RESULTS

CLIENT JUB Engineers **PROJECT NAME** Palisade Sewer Transfer

PROJECT NUMBER 01754-0010 **PROJECT LOCATION** Clifton/Palisade



	Specimen Identification		LL	PL	PI	#200	Classification
●	**B-1, GB-1**	**3/7**	**27**	**16**	**11**	**86**	**LEAN CLAY(CL)**
⧗	**B-5, SS-2**	**3/7**	**NP**	**NP**	**NP**	**61**	**SANDY SILT(ML)**
▲	**Canal Crossing, SS-1**	**3/7**	**31**	**16**	**15**	**94**	**LEAN CLAY(CL)**

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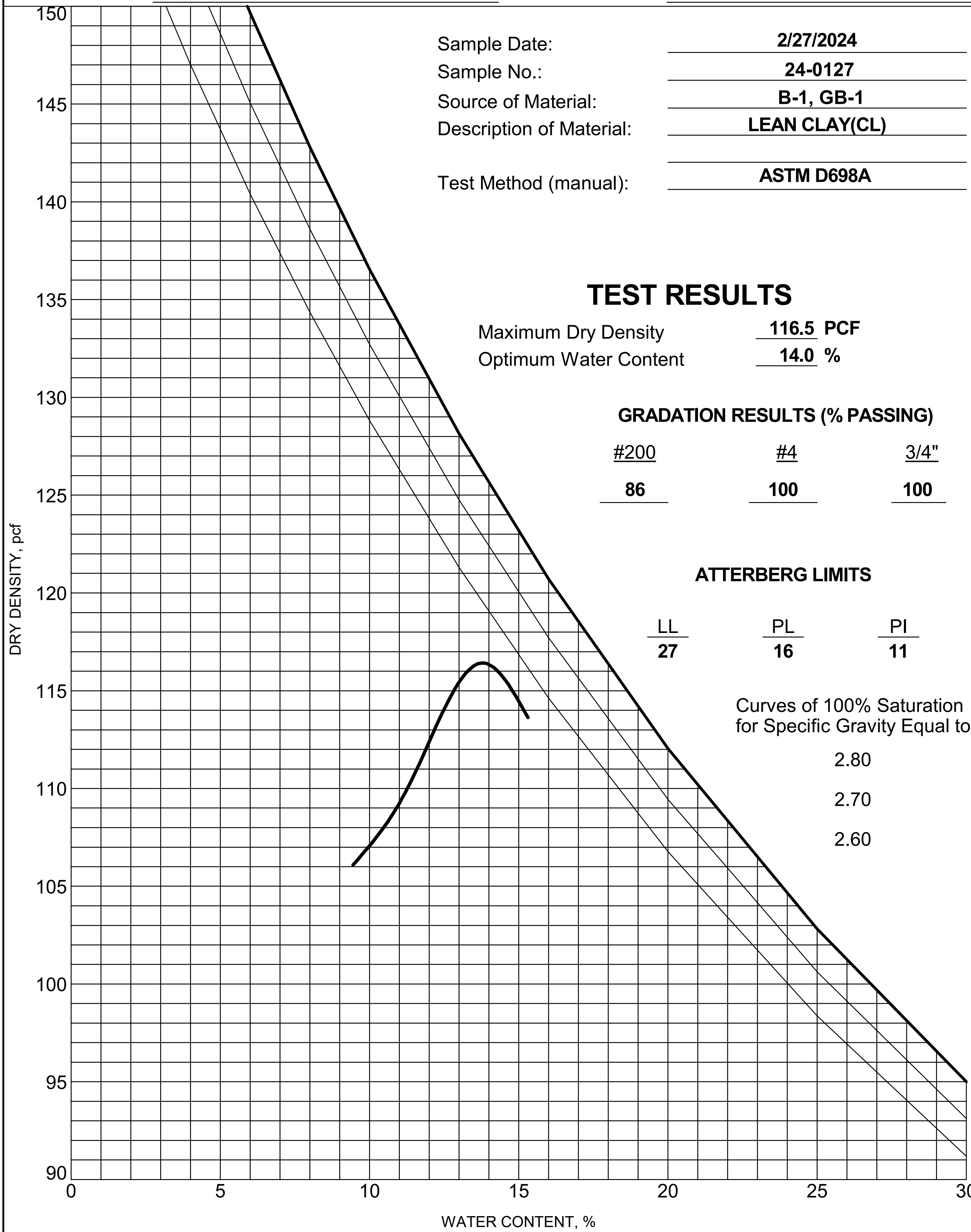
MOISTURE-DENSITY RELATIONSHIP

CLIENT JUB Engineers
PROJECT NAME Palisade Sewer Transfer
PROJECT NUMBER 01754-0010
PROJECT LOCATION Clifton/Palisade



Sample Date: **2/27/2024**
Sample No.: **24-0127**
Source of Material: **B-1, GB-1**
Description of Material: **LEAN CLAY(CL)**
Test Method (manual): **ASTM D698A**

TEST RESULTS

Maximum Dry Density **116.5 PCF**
Optimum Water Content **14.0 %**

GRADATION RESULTS (% PASSING)

#200	#4	3/4"
86	100	100

ATTERBERG LIMITS

LL	PL	PI
27	16	11

Curves of 100% Saturation
for Specific Gravity Equal to:
2.80
2.70
2.60