



RFP 24MCO634

In response refer to RFP No. 24MCO634 Addendum 2 and Response to Questions August 8, 2024

Ladies/Gentlemen,

The following changes are made in the subsequent pages of this addendum:

1. Changed design as reflected in C101 to tie directly to the existing City manhole. Carl was concerned that it was a concrete manhole initially but it is fiberglass. This way we can stay slightly above the groundwater at the connection area. Reduced time for Dewatering based on this adjustment.
2. G002 was changed to show the Staging sites for the contractor.
3. Changes to the bid form:
 - a. Reduced dewatering days
 - b. Reduced manholes as we eliminated one at the connection point.
 - c. Added note to Gravel Pavement replacement item. There is a lot of gravel replacement associated with the County areas I think they should be able to remove the existing gravel topping and reuse to reduce the cost of this item.
 - d. Removed the \$ figure shown on 'completion time' item.

This document contains questions submitted by prospective bidders and responses to those questions.

1. Is there a pre-bid conference scheduled for this project?

ANSWER. No, there is not a pre-bid conference scheduled at this time.

2. Is Geotechnical Report available for this project?

ANSWER. A geotechnical report is available and will be issued in Addendum 2

3. Are TxDOT permits for bore and utility installation on hand? If they are, can you provide a copy?

ANSWER. TxDOT bore and utility installation permits are pending and not available at this time.

ADDENDUM NO: 002

TO: ALL PLANHOLDERS

FROM: PARKHILL

PROJECT NAME: Midland County Sheriff's Office Utilities

PROJECT NO.: 41563.23

DATE: 08/08/2024

Attention of all Prospective Proposers/Plan Holders is directed to the following modifications to the referenced Drawings and Project Manual. This Addendum becomes a part of the Contract Documents and modifies the original Contract Documents dated July 12, 2024 as noted below:

This Addendum consists of 2 pages, the attached section no. 00 41 00, the attached drawings nos. G-002, C-101, and the attached Response to Questions sheet, Geotechnical Engineering Report.

I. CHANGES TO ADVERTISEMENT

1. NONE

II. CHANGES TO DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS:

1. SECTION 00 41 00 – BID FORM
 - a. REMOVE and REPLACE section in its entirety as attached to this Addendum.

III. CHANGES TO DIVISION 01 – GENERAL REQUIREMENTS:

1. NONE

IV. CHANGES TO DIVISIONS 02 THROUGH 40 (TECHNICAL SPECIFICATIONS):

1. NONE

V. CHANGES TO DRAWINGS:

1. SHEET G-002 – PROJECT LOCATION AND CONTROLS
 - a. REMOVE and REPLACE Sheet G-002 in its entirety as attached to this Addendum.
2. SHEET C-101 – SEWER LINE A PLAN AND PROFILE STA 0+00 TO STA 6+00
 - a. REMOVE and REPLACE Sheet C-101 in its entirety as attached to this Addendum.

VI. QUESTION AND ANSWERS

1. See attached sheet.

END OF ADDENDUM NO. 002



Respectfully submitted,

PARKHILL

By 

Receipt of this addendum shall be acknowledged by the Bidder, below and on the bid Proposal. This entire addendum, or a copy thereof, shall be attached to the bid Proposal submitted.

ACKNOWLEDGED:

By: _____

SECTION 00 41 00 - BID FORM

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:
Midland County Purchasing Department
Midland County Courthouse
Attention: Kristy Engeldahl, Purchasing Agent
500 N. Loraine Street
Suite 1101
Midland, Texas 79701

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents. 08/08/2024

ARTICLE 2—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:
- A. Required Bid Security;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;
 - E. Contractor’s license number as evidence of Bidder’s State Contractor’s License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;
 - F. Required Bidder Qualification Statement with supporting data.

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 *Unit Price Bids*

A. Bidder will perform the following Work at the indicated unit prices:

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization/Demobilization (Max 5% of Total Bid Amount)	LS	1	\$	\$
2	Subsurface Utility Investigation (SUI) Lvl 'A'	LS	1	\$	\$
3	Stormwater Pollution Prevention Plan and Erosion Control	LS	1	\$	\$
4	Traffic Control	LS	1	\$	\$

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
5	Trench Safety (Water & Wastewater)	LF	15,050	\$	\$
6	Warning Tape & Tracer Wire (Water & Wastewater)	LF	15,050	\$	\$
7	Dewatering (Calendar Days)	DAYS	30	\$	\$
8	Asphalt Paving – Saw Cut Pavement Edges, Remove & Replace	SY	1,571	\$	\$
9	Concrete Paving – Saw Cut Concrete Pavement Edge, Remove & Replace	SY	333	\$	\$
10	Gravel Paving – Remove & Replace (On County property, Contractor may double cut / remove gravel paving prior to excavation and reuse if maintained in good satisfactory condition.)	SY	2,518	\$	\$
11	Rip Rap – Remove & Replace	SY	69	\$	\$
12	Mailbox – Remove, Reinstall, or Replace	EA	4	\$	\$
13	Roadway Sign – Remove & Replace	EA	10	\$	\$
14	Driveway Culvert Pipe – Remove & Replace	LF	157	\$	\$
15	Chain Link Fence – Remove & Replace	LF	240	\$	\$
16	Parking Lot – Re-Stripe Damaged Striping	LS	1	\$	\$
WASTEWATER					
17	Gravity Wastewater Pipe - 8" PVC DR26 ASTM D3034	LF	6,614	\$	\$
18	Gravity Wastewater Pipe - 6" DR 26 ASTM D3034	LF	625	\$	\$
19	Manhole (0-6' Depth) w/ Water Tight Cover	EA	12	\$	\$
20	Manhole (0-6' Depth) w/ Standard Cover	EA	7	\$	\$
21	Manhole Over Standard Depth (Vf > 6')	VF	48	\$	\$
22	16" Steel Casing Bore (T=0.375")	LF	151	\$	\$
23	Casing - Wastewater Line Crossing Water Line	EA	4	\$	\$
24	Casing - Wastewater Line Crossing Petroleum Line	EA	7	\$	\$

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
25	Connection - Existing 36" Wastewater Trunk	EA	1	\$	\$
26	Connection - Existing 4" Service Line	EA	6	\$	\$
27	Wastewater Cap & Plug - 8"	EA	2	\$	\$
28	Cleanout - 6"	EA	2	\$	\$
29	Decommissioning - OSSF #1, OSSF#2, & OSSF#3	LS	1	\$	\$
WATER LINE					
30	Water Line - 12" PVC C900 DR18	LF	7,650	\$	\$
31	Water Line - 6" PVC C900 DR18	LF	120	\$	\$
32	Water Line - 2" PVC Sch. 40 ASTM D1784	LF	39	\$	\$
33	Ductile Iron Fittings	TON	4	\$	\$
34	20" Steel Casing Bore (T=0.375")	LF	65	\$	\$
35	Casing - Water Line Crossing Wastewater Line	EA	2	\$	\$
36	Casing - Water Line Crossing Petroleum Line	EA	7	\$	\$
37	Precast Concrete Vault And 6" Water Meter Assembly	LS	1	\$	\$
38	Fire Hydrant Assembly w/ 6" Gate Valve and Box	EA	4	\$	\$
39	12" Bollards	EA	8	\$	\$
40	Gate Valve with Box - 12"	EA	12	\$	\$
41	Gate Valve with Box - 4"	EA	3	\$	\$
42	Combination Air / Vac Valve & Vault	EA	4	\$	\$
43	12" Plug	EA	2	\$	\$
44	4" Cut & Plug	EA	2	\$	\$
45	2" Cut & Plug	EA	1	\$	\$
46	Connection To Existing 12" Water Main	EA	1	\$	\$
47	Connection To 4" Water Line	EA	2	\$	\$
48	Connection To 2" Service Line	EA	1	\$	\$
49	Completion Time (Calendar Days)	DAYS			
Total of All Unit Price Bid Items					\$

- B. Bidder acknowledges that:
 1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor’s overhead and profit for each separately identified item, and
 2. estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

3.02 *Total Bid Price (Lump Sum and Unit Prices)*

Total Bid Price (Total of all Lump Sum and Unit Price Bids)	\$
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ARTICLE 4—TIME OF COMPLETION

- 4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 4.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5—BIDDER’S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

- 5.01 *Bid Acceptance Period*
 - A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.
- 5.02 *Instructions to Bidders*
 - A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid Security.
- 5.03 *Receipt of Addenda*
 - A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 6—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

- 6.01 *Bidder’s Representations*
 - A. In submitting this Bid, Bidder represents the following:
 1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
 2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions, or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
 - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
 - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at

artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.

- c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
- d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

BIDDER hereby submits this Bid as set forth above:

Bidder:

_____ *[typed or printed name of organization]*

By: _____ *[individual's signature]*

Name: _____ *[typed or printed]*

Title: _____ *[typed or printed]*

Date: _____ *[typed or printed]*

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____ *[individual's signature]*

Name: _____ *[typed or printed]*

Title: _____ *[typed or printed]*

Date: _____ *[typed or printed]*

Address for giving notices:

Bidder's Contact:

Name: _____ *[typed or printed]*

Title: _____ *[typed or printed]*

Phone: _____

Email: _____

Address:

Bidder's Contractor License No.: (if applicable) _____



Midland County Sheriff Office Utilities



CLIENT

Midland County
5000 N Loraine St
Midland, Texas
79701-4725
(432) 742-7777

PROJECT NO.
41563.23

5	08-07-2024	Addendum #2
4	07-10-2024	Sealed Set
3	06-20-2024	100% Review
2	05-08-2024	80% Review
1	04-01-2024	60% City Review

DATE DESCRIPTION

Project Location And Controls

G-002



SURVEY CONTROL

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	10682777.10	1767516.20	2758.19	SET #4 BAR W/ PSC CONTROL CAP
2	10686188.48	1768379.78	2743.98	SET #4 BAR W/ PSC CONTROL CAP
3	10687792.64	1767168.45	2745.95	SET #4 BAR W/ PSC CONTROL CAP
4	10682200.55	1766699.78	2762.68	SET MAG NAIL W/ WASHER PARKHILL CONTROL
5	10682376.86	1766599.21	2761.70	SET MAG NAIL W/ WASHER PARKHILL CONTROL
6	10682548.86	1766591.44	2762.17	SET MAG NAIL W/ WASHER PARKHILL CONTROL
7	10682788.41	1766563.27	2759.65	SET MAG NAIL W/ WASHER PARKHILL CONTROL
8	10682874.62	1766832.43	2758.00	SET MAG NAIL W/ WASHER PARKHILL CONTROL
9	10682620.01	1766903.60	2762.39	SET MAG NAIL W/ WASHER PARKHILL CONTROL
10	10682516.55	1767070.87	2760.19	SET MAG NAIL W/ WASHER PARKHILL CONTROL
11	10682309.81	1767131.16	2761.13	SET MAG NAIL W/ WASHER PARKHILL CONTROL
12	10682253.93	1766901.90	2761.98	SET MAG NAIL W/ WASHER PARKHILL CONTROL
13	10682434.61	1766852.87	2762.18	SET #4 BAR W/ PSC CONTROL CAP
14	10682587.70	1766739.05	2763.64	SET #4 BAR W/ PSC CONTROL CAP
15	10682757.05	1766699.78	2762.79	SET #4 BAR W/ PSC CONTROL CAP
16	10682968.86	1767992.23	2754.85	SET #4 BAR W/ PSC CONTROL CAP
17	10683295.83	1767951.65	2754.64	SET #4 BAR W/ PSC CONTROL CAP

HORIZONTAL DATUM IS NAD83 TEXAS STATE PLANE COORDINATES CENTRAL ZONE 4203

VERTICAL DATUM IS NAVD88



**Midland County
Sheriff Office Utilities**



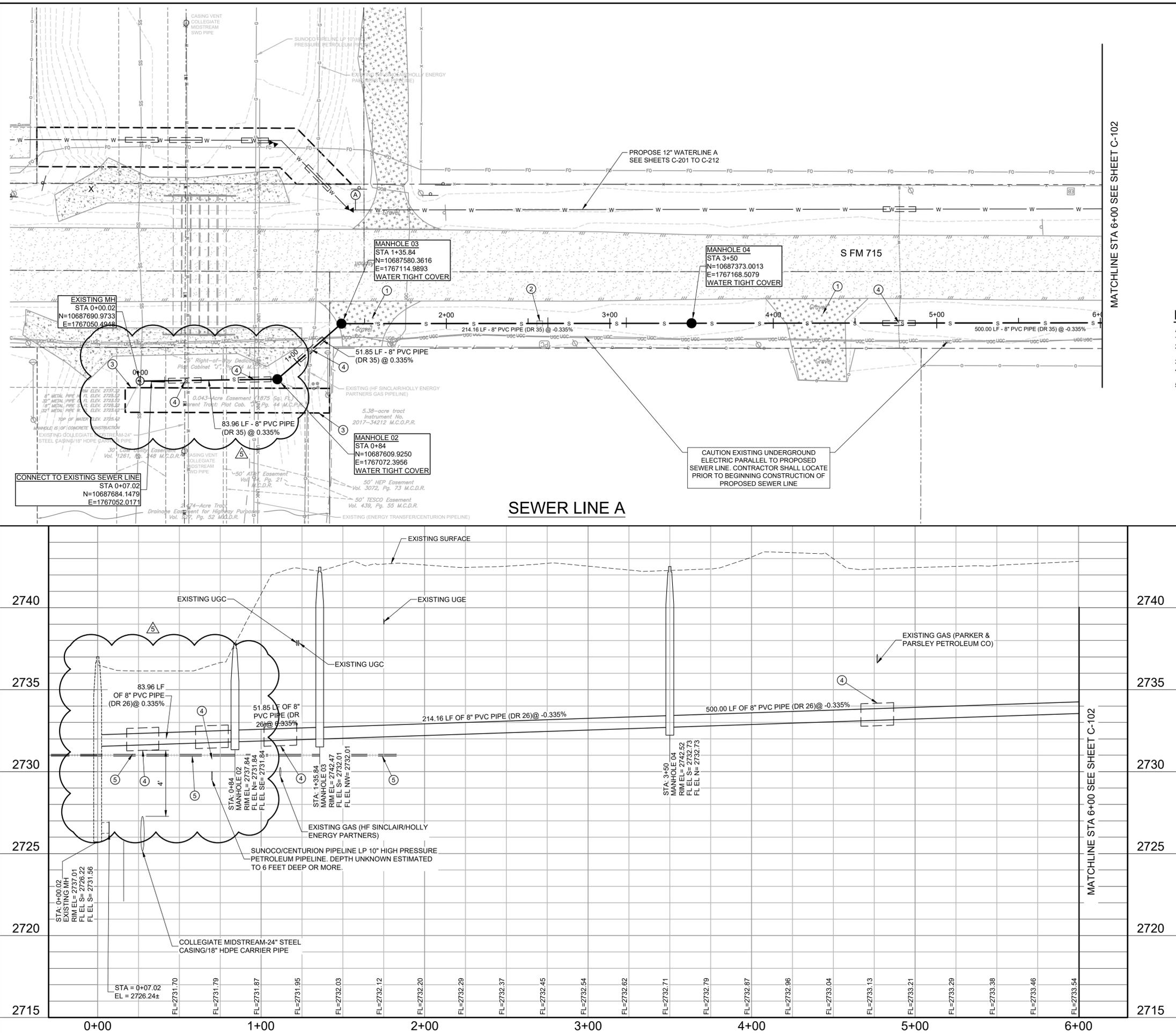
CLIENT
Midland County
5000 N Loraine St
Midland, Texas
79701-4725
(432) 742-7777

PROJECT NO.
41563.23

#	DATE	DESCRIPTION
5	08-07-2024	Addendum #2
4	07-10-2024	Sealed Set
3	06-20-2024	100% Review
2	05-08-2024	80% Review
1	04-01-2024	60% City Review

**Sewer Line A
Plan and Profile
Sta 0+00 To
Sta 6+00**

C-101



A:\2023\41563.23\03_DSGN\01_CIVIL\C-101-141563.DWG, 7/10/2024 8:43:45 AM, jvasquez



RFP 24MCO634

In response refer to RFP No. 24MCO634 Response to Questions August 2, 2024

Ladies/Gentlemen,

This document contains questions submitted by prospective bidders and responses to those questions.

1. Is there a pre-bid conference scheduled for this project?

ANSWER. No, there is not a pre-bid conference scheduled at this time.

2. Is Geotechnical Report available for this project?

ANSWER. Yes, a Geotechnical Report will be provided in Addenda #2.

3. Are TxDOT permits for bore and utility installation on hand? If they are, can you provide a copy?

ANSWER. TxDOT permits are pending and not on hand.

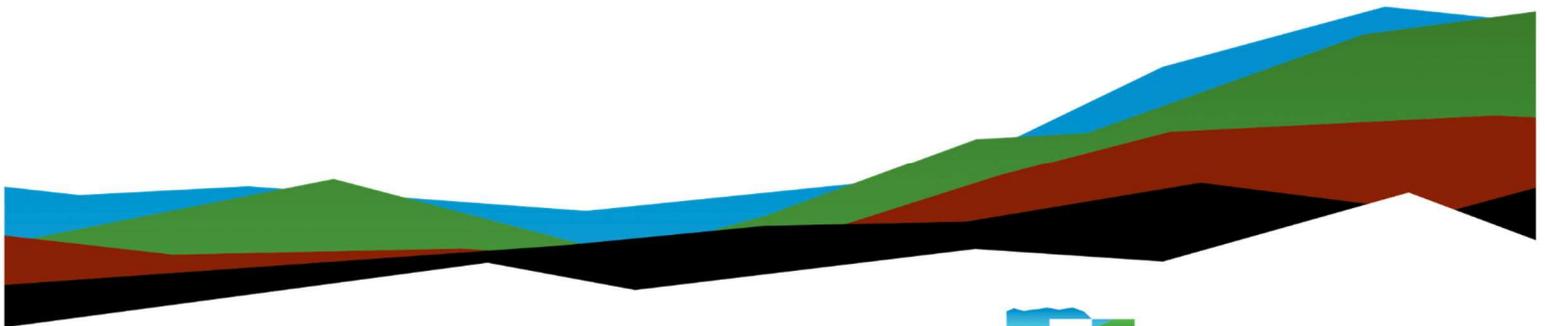
Midland County Water and Sewer Line Extension

Geotechnical Engineering Report

November 6, 2023 | Terracon Project No. A4235139

Prepared for:

Parkhill
1700 W. Wall Street, Suite 100
Midland, TX 79701



Nationwide

[Terracon.com](https://www.terracon.com)

- Facilities
- Environmental
- Geotechnical
- Materials



10400 State Highway 191
Midland, TX 79707
P (432) 684-9600
Terracon.com

November 6, 2023

Parkhill
1700 W. Wall Street, Suite 100
Midland, TX 79701

Attn: Ms. Diana Welch Palmieri – Project Manager
P: 432.681.6117
E: DPalmieri@parkhill.com

Re: Geotechnical Engineering Report
Midland County Water and Sewer Line Extension
From E County Road 120 to I-20 Frontage Road
Midland County, TX
Terracon Project No. A4235139

Dear Ms. Palmieri:

We have completed Geotechnical Engineering services for the above referenced project in general accordance with Consulting Services Agreement between Parkhill and Terracon dated October 3, 2023, and Terracon Proposal No. PA4235139 dated July 20, 2023. This report presents the findings of the subsurface exploration and provides geotechnical engineering recommendations for pipeline installation for this project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

Texas Firm Registration No. F-327

Kiran P. Acharya, Ph.D., P.E.
Project Engineer



Jon Sheng, P.E.
Sr. Principal/Office Manager

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Exploration and Testing Procedures

Photography Log

Site Location and Exploration Plans

Exploration and Laboratory Results

Supporting Information

Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the  logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

Refer to each individual Attachment for a listing of contents.

Report Summary

Topic ¹	Overview Statement ²
Project Description	<p>This project consists of extension of water and wastewater lines between E County Road 120 and I-20 Frontage Road, and along FM-715 in Midland, TX. The pipeline will be installed using open trench excavation technique. The depth of water-line excavation will be about 3 feet below ground surface (bgs). The depth of sewer-line excavation will be about 10 feet bgs near I-20 Frontage Road and 12 feet bgs along FM-715.</p>
Geotechnical Characterization	<p>Silty sand, clayey sand with gravel, and sandy lean clay were encountered on the site. We note that relatively loose soils were encountered from a depth of about 2 to 3.5 feet bgs in boring BH-1 and within the upper 4 feet of existing grades in boring BH-2. Groundwater was not encountered in any of the borings during our field exploration.</p>
Earthwork	<p>On-site soils are generally suitable use as backfill above water and sewer pipes. Sand, fine gravel or crushed stones can be used as pipe bedding materials.</p> <p>The on-site subsurface materials to full depth of exploration in the area of boring BH-1 are generally suitable for use as structural fill. The on-site subsurface materials within the upper 6 to 8 feet of existing grades in the areas of borings BH-2 and BH-3 are suitable for use as structural fill.</p> <p>Based on the conditions encountered, we believe conventional earth moving equipment, such as a loader or an excavator will generally be suitable for excavations.</p>
Pipeline Construction Feasibility	<p>The project site appears suitable for the pipeline installation based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.</p>
General Comments	<p>This section contains important information about the limitations of this geotechnical engineering report.</p>

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed Midland County Water and Sewer Line Extension project located From E County Road 120 to I-20 Frontage Road in Midland County, TX. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic site classification per IBC
- Pipeline installation

The geotechnical engineering Scope of Services for this project included the advancement of three test borings, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the [Site Location and Exploration Plan](#), respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and separate graphs in the [Exploration and Laboratory Results](#) section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Pipeline alignment was received from Mrs. Diana Welch Palmieri of Parkhill via an email on July 17, 2023. Terracon communicated with client and selected three boring locations along the alignment.
Project Description (Provided)	Water and sewer pipeline will be installed along the proposed alignment using open trench excavation technique. Water pipe diameter will be about 8 to 12 inches, and wastewater pipe diameter will be about 8 to 10 inches. The maximum depth of water line will be about 3 feet bgs. The maximum depth of sewer line will be about 10 feet bgs near to I-20 Frontage Road and 12 feet bgs along FM 715.

Item	Description
Below Grade Structures	Pipeline
Cut and Fill Slopes (assumed)	We recommend temporary slopes of 1.5(H): 1(V) in the upper 5 feet of existing grades. Anything over 5 feet deep should be braced. Permanent slopes no steeper than 3H:1V (Horizontal to Vertical).

Terracon should be notified if any of the above information is inconsistent with the planned construction, as modifications to our recommendations may be necessary.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	This project alignment starts From E County Road 120 to I-20 Frontage Road and runs along FM-715. See Site Location and Exploration Plan
Existing Improvements	FM-715
Current Ground Cover	The areas of proposed boring locations were covered with loose soils, gravels, and native grasses.
Existing Topography	The area slopes downward towards the south from the north with an overall topographic relief of about 17 to 20 feet.

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual log. The individual log can be found in the [Exploration and Laboratory Results](#) and the GeoModel can be found in the [Figures](#) attachment of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Sand	Silty sand, clayey sand with gravel; loose to dense
2	Upper Clay	Sandy lean clay; stiff to hard
3	Lower Clay	Sandy lean clay; stiff to hard

The borings were advanced in the dry using air rotary drilling technique that allows short term groundwater observations to be made while drilling. Groundwater seepage was not encountered in any of the borings within the maximum drilling depths of about 15 feet bgs at the time of our field exploration.

Groundwater conditions may be different at the time of construction. Groundwater conditions may change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project. Long-term groundwater monitoring was outside the scope of services for this project.

Seismic Site Class

The seismic design requirements for structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties observed at the site and as described on the exploration logs and results, our professional opinion is for that a **Seismic Site Classification of D** be considered for the project. Subsurface explorations at this site were extended to a maximum depth of about 15 feet bgs. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

Geotechnical Overview

Although no construction debris, organics or deleterious materials were encountered during our field exploration or observed in the collected samples, we caution that potential undocumented

fill that contains deleterious materials could exist in areas away from our borings at the predeveloped site such as this one. If existing fill that contains deleterious materials is detected during construction, Terracon should be notified immediately to provide consultation. In general, deleterious materials should be removed and replaced with structural fill.

The project site appears suitable for the pipeline installation based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

The subsurface materials generally consisted of loose to dense sandy soils and stiff to hard clayey soils. Groundwater was not encountered in the borings during our field exploration. We make a note that clayey sand with gravel with standard penetration resistance (N-value) of 6 blows per foot (bpf) was encountered from a depth of about 2 to 3.5 feet bgs in boring BH-1. Silty sand with N-values of 4 bpf to 9 bpf were encountered within the upper 4 feet of existing grade in boring BH-2.

On-site soils are generally suitable for use as backfill above the sewer pipes. Sand, fine gravel or crushed stones can be used as pipe bedding materials. The on-site subsurface materials to full depth of exploration in the area of boring BH-1 are generally suitable for use as structural fill. The subsurface materials within the upper 6 to 8 feet of existing grades in the areas of borings BH-2 and BH-3 are also suitable for use as structural fill.

Based on the conditions encountered, we believe conventional earth moving equipment such as loader or excavator will likely be suitable for earthwork. Occupational Safety and Health Administration (OSHA) requirements for excavation should be followed during trench excavation to install pipeline. Excavations deeper than 4 feet will need to have appropriate temporary construction slopes. We note that the soil types (silty sand) encountered in the areas of borings BH-2 and BH-3 are susceptible to erosion. Erosion control should be provided to prevent backfill materials from washing away by storm water.

According to the 2021 International Structures Code (Section 1613.3.2), IBC seismic site classification for this site is determined to be D. The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the [Exploration and Laboratory Results](#)), engineering analyses, and our current understanding of the proposed project. The [General Comments](#) section provides an understanding of the report limitations. Geotechnical engineering recommendations for pipeline installation and design are presented in the following report sections.

Earthwork

Earthwork will include clearing and grubbing, excavations, and fill placement. The following sections provide recommendations for use in the preparation of specifications

for the work. Recommendations include critical quality criteria as necessary to render the site in the state considered in our geotechnical engineering evaluation for pipeline installation and design.

Site Preparation

Prior to placing fill, striping of existing topsoil, vegetations, and root mats should be performed in the proposed pipeline installation area. The soil materials which contain less than 5 percent organics can be reused as structural fill provided the material is moisture conditioned and properly compacted.

Subgrade Preparation

All exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, and compacted per the compaction requirements in this report.

Erosion Control

Subsurface materials are expected to exhibit erosion potential and may be transported by running water. Erosion control contractor should be contact to provide efficient erosion control for pipeline backfill materials. Erosion can be controlled by several different methods such as vegetation, placement of riprap, etc.

Pipe Bedding Materials

Care should be taken so that the soils at the base of excavations are not disturbed during construction. Disturbed or unstable materials should be removed before placing any granular bedding material, where groundwater, lower strength soils, and unstable conditions are encountered, a greater thickness of bedding materials should be provided. The thickness of the required materials should satisfy the requirements of the pipe manufacturer.

Excavation

Based on the conditions encountered, we believe conventional earth-moving equipment, such as a loader or an excavator will generally be suitable for excavations. The bottom of excavations should thoroughly be cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 10 feet of structures, pavements, or constructed slopes. General fill is material used to achieve grade outside of these areas.

Reuse of On-Site Soil: Excavated on-site soil (to full depth of exploration) in the area of boring BH-1, and to depths of about 6 to 8 feet bgs in the areas of borings BH-2 and BH-3) can generally reused as structural fill. Material property requirements for on-site soil for use as general fill and structural fill are noted in the table below:

Property	General Fill	Structural Fill
Composition	Free of deleterious material	Free of deleterious material
Maximum particle size	6 inches	4 inches
Plasticity	Not limited	Maximum liquid limit 40 and maximum plasticity index of 20
GeoModel Layer Expected to be Suitable ¹	1, 2, 3	1, 2

1. Based on subsurface exploration. Actual material suitability should be determined in the field at time of construction.

Imported Fill Materials: Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade.

Soil Type ¹	USCS Classification	Acceptable Parameters (for Structural Fill)
Low Plasticity Cohesive	CL, CLML	Liquid Limit less than 40 Plasticity index less than 20 Greater than 25% retained on No. 200 sieve
Granular	GW, GP, GM, GC, SW, SP, SM, SC	10% to 50% passing No. 200 sieve

1. To the Geotechnical Engineer for evaluation prior to use on this site. Structural and general fill should consist of approved materials free of organic matter and debris. A sample of each material type should be submitted.

Fill Placement and Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. 4 inches in loose thickness when hand-guided equipment (i.e., jumping jack or plate compactor) is used.	Same as structural fill
Minimum Compaction Requirements ^{1,2}	At least 95% of the material’s maximum dry density in all fill areas	Same as structural fill
Water Content Range ¹	-2% to +2% of optimum moisture content	As required to achieve min. compaction requirements

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).
2. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254).

Earthwork Construction Considerations

Excavations for pipeline placement on this project are anticipated to be accomplished with conventional earth moving equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction foundations. Construction equipment or traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to foundation construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, “Excavations” and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines should be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Recommendations for Pipeline Construction

Modulus of Soil Reaction for Pipeline Installation

The modulus of soil reaction, E_b or sometimes referred to as E' , of the backfill material planned to support the sides of the pipe is typically used in the design of the flexible piping. This value is a function of several variables that include:

- Soil type that comprises the backfill material supporting the pipe sides.
- Degree of compaction of the backfill material supporting the pipe sides.
- Lift thickness of the backfill material supporting the pipe sides.

Fine-grained soils consisting of primarily silt or clay should not be used for bedding materials and backfill around the pipe. The bedding materials should be selected and placed to provide as much of a uniform contact between the pipe and the material as possible. Bedding material selection should meet the applicable utility and locality guidelines. Sand, fine gravel or crushed stones can be used as pipe bedding materials. The following table presents typical modulus of soil reaction values, E_b , for various backfill materials at different compaction ranges.

Type of Material	Modulus of Soil Reaction, E_b^1 , psi, For Degrees of Compaction			
	Dumped (no compaction)	Slight <85%	Moderate 85% to 95%	High >95%
Fine Grained Soil (LL<50): CL, ML	NR ²	NR ²	NR ²	NR ²
Fine Grained Soil (LL<50) with >25% Coarse-Grained Material: CL or Coarse-Grained Soil with fines: GM, GC, SM, SC	NR ²	NR ²	1000	2000
Coarse-Grained Soil with <12% fines: GW, GP, SW, SP	NR ²	1000	2000	3000
Crushed Rock	1000	3000	3000	3000

1. These values do not include a factor of safety. A factor of safety may be needed for design purposes. These values are for use in predicting the initial deflections only. If a high degree of compaction is not achieved in the backfill adjacent to the sides of the pipe, an approximate deflection lag factor should be applied for long-term deflection estimates. NR means that the use of these materials is not recommended by ASTM D2321 for the backfill envelope.

2. Not recommended

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or

identification or prevention of pollutants, hazardous materials, or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

Geotechnical Engineering Report

Midland County Water and Sewer Line Extension | Midland County, TX

November 6, 2023 | Terracon Project No. A4235139

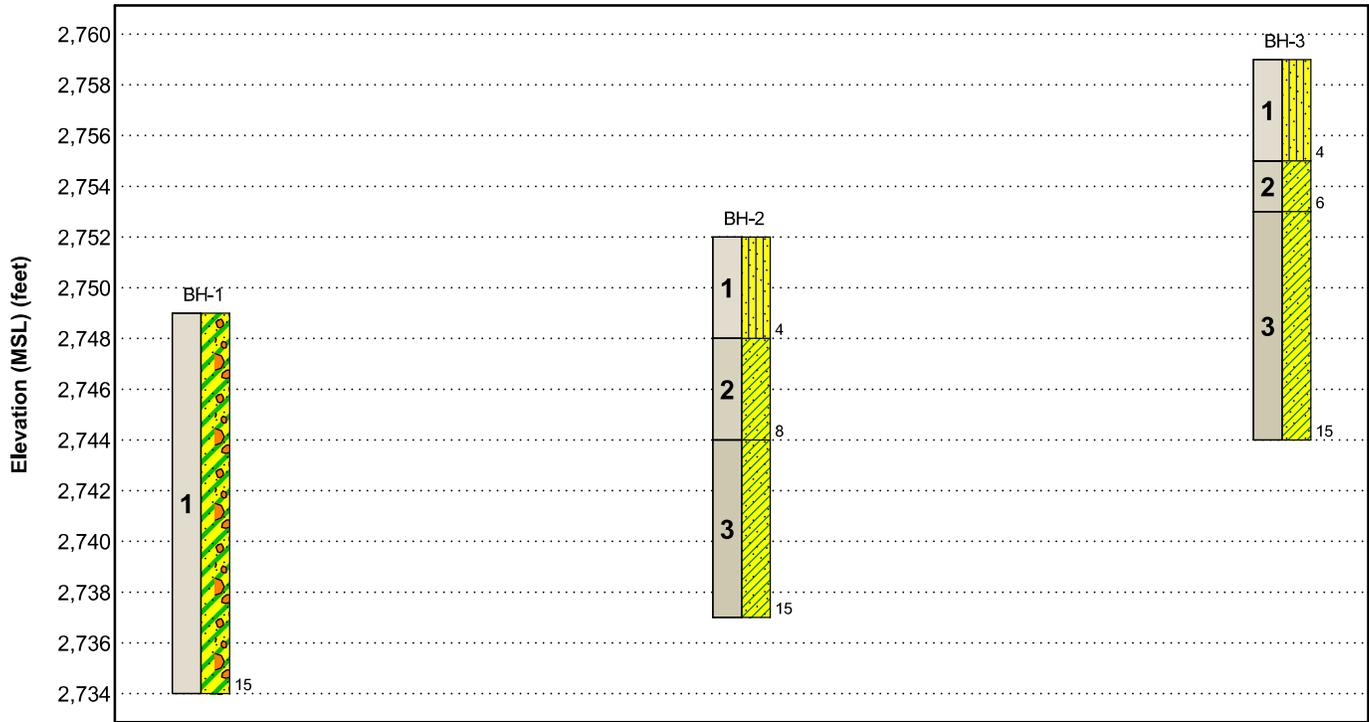


Figures

Contents:

GeoModel

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Sand	Silty sand, Clayey sand with gravel; loose to dense
2	Upper Clay	Sandy lean clay; stiff to hard
3	Lower Clay	Sandy lean clay; stiff to hard

LEGEND

- Clayey Sand with Gravel
- Silty Sand
- Sandy Lean Clay

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Geotechnical Engineering Report

Midland County Water and Sewer Line Extension | Midland County, TX

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Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Boring Depth (feet) ^{1,2}	Location
BH-1 to BH-3	15	Pipeline Alignment

1. Below ground surface

Boring Layout and Elevations: Parkhill and Terracon personnel communicated with each other and selected boring locations along the pipeline route. Elevations were estimated at the boring locations using provided topographic map. We used handheld GPS equipment to locate borings with an estimated horizontal accuracy of +/-20 feet. using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. Approximate ground surface elevations were obtained from Google Earth. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted rotary drill rig using air rotary drilling technique. Five samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. For safety purposes, all borings were backfilled with auger cuttings after their completion.

We also observed the boreholes while drilling and at the completion of drilling for the presence of groundwater. Groundwater was not observed at the time of boreholes.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Particle-Size Analysis
- Atterberg Limits

The laboratory testing program included examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Photography Log



Boring BH-1



Boring BH-2



Boring BH-3

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Site Location and Exploration Plans

Contents:

Site Location Plan

Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

Midland County Water and Sewer Line Extension ■ Midland, TX
November 6, 2023 ■ Terracon Project No. A4235139

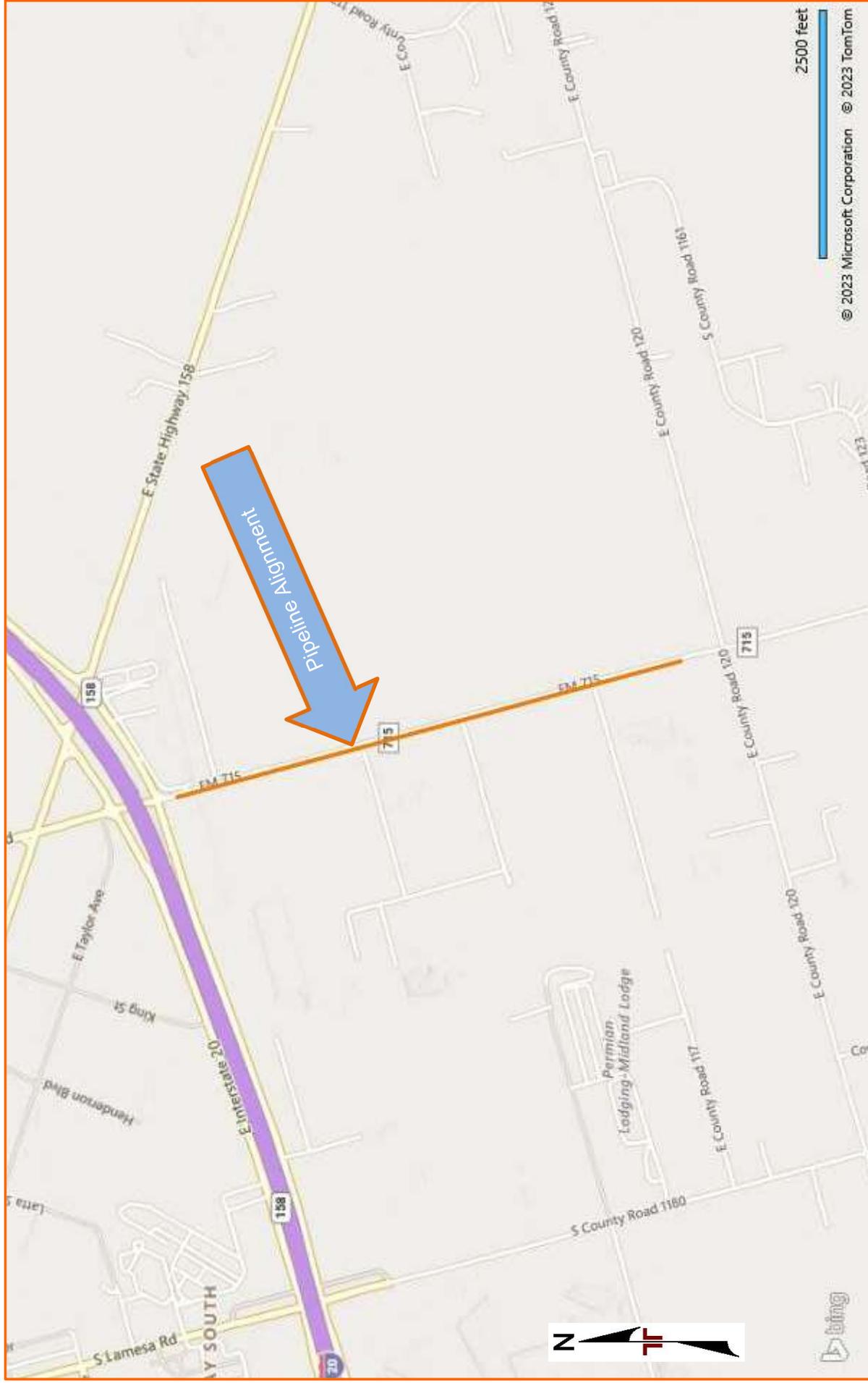


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT
INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY
MICROSOFT BING MAPS

EXPLORATION PLAN

Midland County Water and Sewer Line Extension ■ Midland, TX

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DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (7 pages)

Atterberg Limits

Grain Size Distribution (2 pages)

Note: All attachments are one page unless noted above.

Boring Log No. BH-1

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 31.9797° Longitude: -102.0408°	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits			
								LL-PL-PI	Percent Fines		
1		Depth (Ft.)	Elevation: 2749 (Ft.) +/-								
		CLAYEY SAND WITH GRAVEL (SC) , brown to light reddish brown, medium dense									
			- loose at 2 feet				10-6-5 N=11				
					5		4-3-3 N=6	7.3	29-14-15	33	
							6-8-13 N=21				
			- dense at 8 feet				8-9-8 N=17				
			10		3-11-28 N=39						
					4-12-12 N=24	12.2	27-13-14	29			
		15.0	2734	15							
Boring Terminated at 15 Feet											

<p>See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.</p>	<p>Water Level Observations No groundwater encountered while drilling Dry at completion of drilling</p>
<p>Notes Elevation Reference: Elevations obtained from google earth</p>	<p>Advancement Method Air rotary</p> <p>Abandonment Method Boring backfilled with auger cuttings upon completion.</p>
	<p>Drill Rig CME-75</p> <p>Hammer Type Automatic</p> <p>Driller Bobby(blue hole drilling)</p> <p>Logged by Varshini</p> <p>Boring Started 10-16-2023</p> <p>Boring Completed 10-16-2023</p>

Boring Log No. BH-2

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 31.9720° Longitude: -102.0393° Depth (Ft.)	Elevation: 2752 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1		SILTY SAND (SM) , brown, loose		4.0	2748	X	6-6-3 N=9			
2		SANDY LEAN CLAY (CL) , brown, stiff		8.0	2744	X	2-2-2 N=4	12.6	30-12-18	54
3		SANDY LEAN CLAY (CL) , brown to tannish brown, hard		15.0	2737	X	3-5-8 N=13			
		- hard below 12 feet				X	3-5-7 N=12			
		Boring Terminated at 15 Feet		15		X	5-4-5 N=9	12.5	38-12-26	64
						X	6-18-22 N=40			

<p>See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.</p> <p>Notes Elevation Reference: Elevations obtained from google earth</p>	<p>Water Level Observations No groundwater encountered while drilling Dry at completion of drrilling</p> <p>Advancement Method Air rotary</p> <p>Abandonment Method Boring backfilled with auger cuttings upon completion.</p>	<p>Drill Rig CME-75</p> <p>Hammer Type Automatic</p> <p>Driller Bobby(blue hole drilling)</p> <p>Logged by Varshini</p> <p>Boring Started 10-16-2023</p> <p>Boring Completed 10-16-2023</p>
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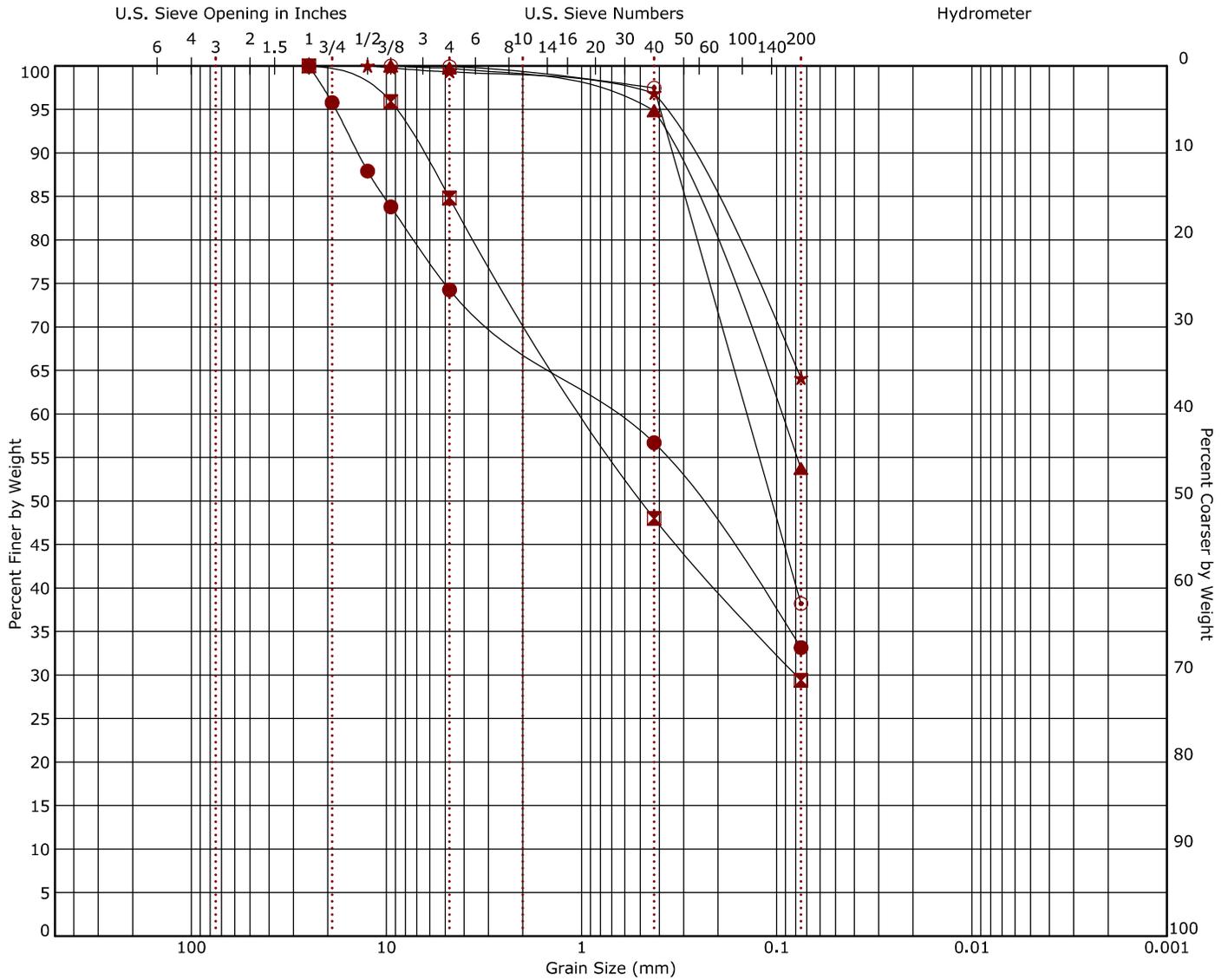
Boring Log No. BH-3

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 31.9662° Longitude: -102.0371°	Depth (Ft.)	Elevation: 2759 (Ft.) +/-	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1		SILTY SAND (SM) , brown, medium dense	4.0	2755	X	X	8-6-5 N=11	4.2	NP	38
							5-7-11 N=18			
2		SANDY LEAN CLAY (CL) , tannish brown to tannish white, hard	6.0	2753	X	X	5-18-14 N=32	9.2	39-15-24	60
3			SANDY LEAN CLAY (CL) , tannish white, very stiff - hard below 8 feet	15.0	2744	X	X			
	3-18-18 N=36									
	9-20-24 N=44									
Boring Terminated at 15 Feet			15							

<p>See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.</p>	<p>Water Level Observations No groundwater encountered while drilling Dry at completion of drilling</p>	<p>Drill Rig CME-75</p> <p>Hammer Type Automatic</p> <p>Driller Bobby(blue hole drilling)</p>
<p>Notes Elevation Reference: Elevations obtained from google earth NP: Non Plastic</p>	<p>Advancement Method Air rotary</p> <p>Abandonment Method Boring backfilled with auger cuttings upon completion.</p>	<p>Logged by Varshini</p> <p>Boring Started 10-16-2023</p> <p>Boring Completed 10-16-2023</p>

Grain Size Distribution

ASTM D422 / ASTM C136

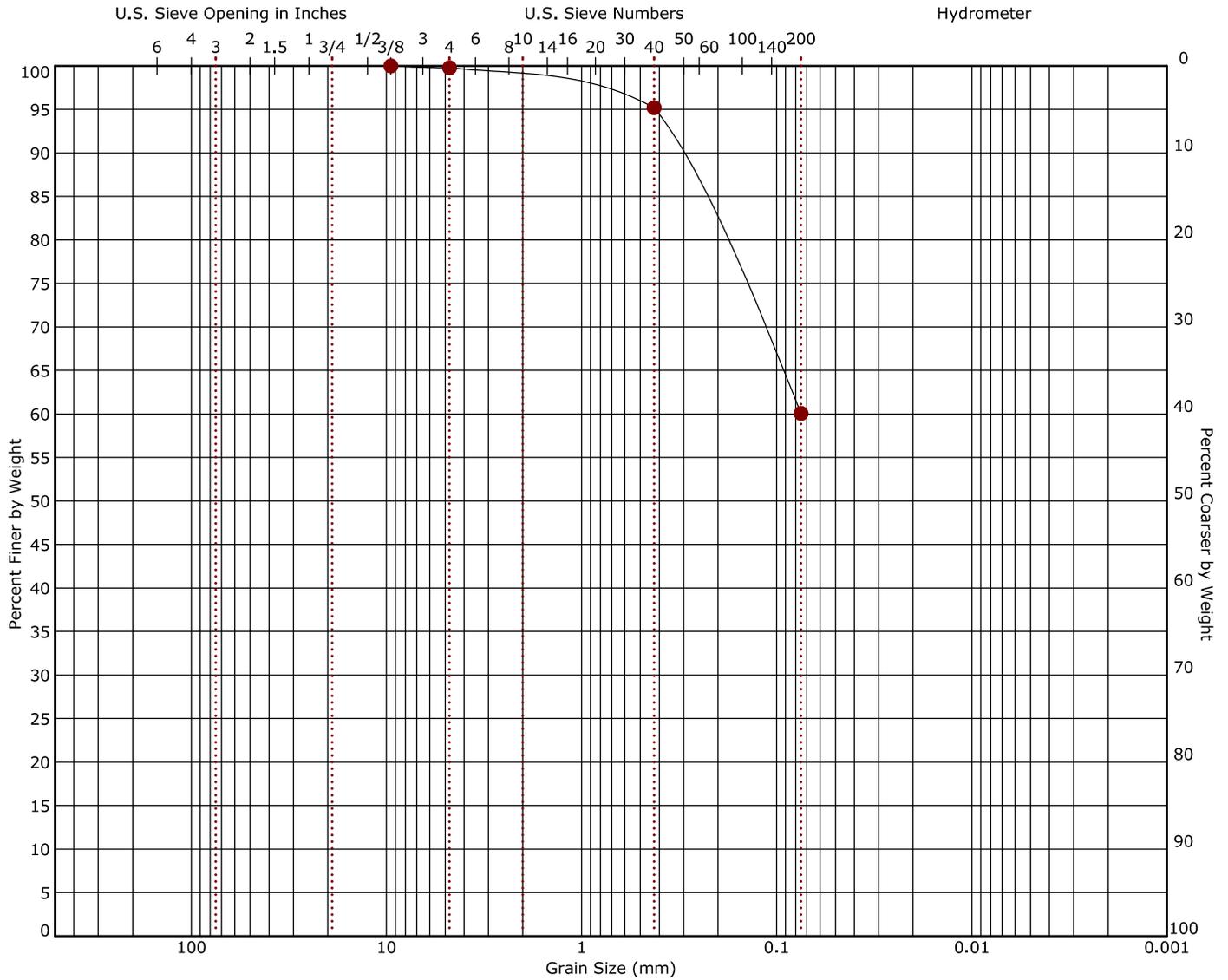


Boring ID	Depth (Ft)	Description	LL	PL	PI	Cc	Cu
● BH-1	2 - 3.5	CLAYEY SAND with GRAVEL	29	14	15		
⊠ BH-1	13.5 - 15	CLAYEY SAND with GRAVEL	27	13	14		
▲ BH-2	4 - 5.5	SANDY LEAN CLAY	30	12	18		
★ BH-2	8.5 - 10	SANDY LEAN CLAY	38	12	26		
⊙ BH-3	0 - 1.5	SILTY SAND	NP	NP	NP		

Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
● BH-1	2 - 3.5	25	0.669			0.0	25.7	41.1	33.1		
⊠ BH-1	13.5 - 15	25	0.933	0.079		0.0	15.2	55.4	29.4		
▲ BH-2	4 - 5.5	9.5	0.098			0.0	0.2	46.0	53.7		
★ BH-2	8.5 - 10	12.5				0.0	0.6	35.2	64.1		
⊙ BH-3	0 - 1.5	9.5	0.142			0.0	0.1	61.7	38.2		

Grain Size Distribution

ASTM D422 / ASTM C136



Boring ID	Depth (Ft)	Description	LL	PL	PI	Cc	Cu
● BH-3	6 - 7.5	SANDY LEAN CLAY	39	15	24		

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Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
● BH-3	6 - 7.5	9.5				0.0	0.2	39.7	60.1		

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Geotechnical Engineering Report

Midland County Water and Sewer Line Extension | Midland County, TX

November 6, 2023 | Terracon Project No. A4235139



Supporting Information

Contents:

General Notes

Unified Soil Classification System

Note: All attachments are one page unless noted above.

General Notes

Sampling	Water Level	Field Tests
 Standard Penetration Test	<ul style="list-style-type: none">  Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Cave In Encountered <p>Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.</p>	<ul style="list-style-type: none"> N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Consistency	Unconfined Compressive Strength Qu (tsf)	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification	
				Group Symbol	Group Name ^B
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	Cu ≥ 4 and 1 ≤ Cc ≤ 3 ^E	GW	Well-graded gravel ^F
		Gravels with Fines: More than 12% fines ^C	Cu < 4 and/or [Cc < 1 or Cc > 3.0] ^E	GP	Poorly graded gravel ^F
			Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}
		Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	Fines classify as CL or CH	GC
	Cu ≥ 6 and 1 ≤ Cc ≤ 3 ^E			SW	Well-graded sand ^I
	Sands with Fines: More than 12% fines ^D		Cu < 6 and/or [Cc < 1 or Cc > 3.0] ^E	SP	Poorly graded sand ^I
			Fines classify as ML or MH	SM	Silty sand ^{G, H, I}
	Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots above "A" line ^J	CL
PI < 4 or plots below "A" line ^J				ML	Silt ^{K, L, M}
Organic:			$\frac{LL \text{ oven dried}}{LL \text{ not dried}} < 0.75$	OL	Organic clay ^{K, L, M, N}
					Organic silt ^{K, L, M, O}
Silts and Clays: Liquid limit 50 or more		Inorganic:	PI plots on or above "A" line	CH	Fat clay ^{K, L, M}
			PI plots below "A" line	MH	Elastic silt ^{K, L, M}
		Organic:	$\frac{LL \text{ oven dried}}{LL \text{ not dried}} < 0.75$	OH	Organic clay ^{K, L, M, P}
					Organic silt ^{K, L, M, Q}
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

^A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

^E $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

^F If soil contains ≥ 15% sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains ≥ 15% gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

^M If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

^N PI ≥ 4 and plots on or above "A" line.

^O PI < 4 or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.

