ADDENDUM NO. 1

PALESTINE-HOLLANSBURG JOINT SEWER DISTRICT
Centralized Wastewater System
Contract 'B' - Wastewater Treatment Facility

To: Planholders

From: Mote & Associates, Inc.
214 West Fourth Street
Greenville, Ohio 45331

Phone: (937) 548-7511
Fax: (937) 548-7484
E-mail: info@moteassociates.com

Re: Palestine-Hollansburg Joint Sewer District
Centralized Wastewater System – Contract 'B' - Wastewater Treatment Facility

This Addendum forms a part of the Contract Documents and modifies the original Contract Documents dated August, 2021. Acknowledge receipt of this Addendum in the space provided on the Bid Proposal Form. Failure to do so may subject the Bidder to disqualification.

CHANGES/CLARIFICATIONS TO THE CONTRACTING DOCUMENTS

1. Section 00 41 43, BID FORM

   The Bid Form to be submitted for this project includes two (2) Alternate Bids. It is the Contractor's choice in providing pricing for the Alternates which consist of construction of an effluent building to house equipment and the addition of a tertiary filter to the treatment process. The Alternate Bids are optional and not required for a responsive Bid.

CHANGES/CLARIFICATIONS TO THE CONSTRUCTION PLANS

2. Sheet #8 of 17, HEADWORKS SCREENING & GRIT–WASTEWATER TREATMENT FACILITY

   A Screening & Grit Structure Reinforcement Detail is attached to this Addendum to provide additional information to the work contained on this Sheet #8.

3. Sheet #12 of 17, SAGR PIPING LAYOUT-WASTEWATER TREATMENT FACILITY

   A. Sheet #12 shall be revised to include two (2) 6" SDR 35 pipes installed from the level control box to the SAGR splitter box (one to each SAGR splitter cell) to correspond with the Plan View Detail shown on Sheet #13 of 17.

   B. Pipe plugs are required on all four inverts in the lagoon level control box and SAGR cell flow control box as shown on this Sheet #12.

   C. Influent and effluent primary and secondary SAGR piping ("contractor supplied") shall be HDPE and welded to the SAGR liner at any termination with the outer SAGR wall.

   D. The effluent pipe from the SAGR Effluent Collection Box to the UV Structure shall be constructed of C900 or ductile iron pipe.

E. The 90 degree bends in the SAGR Cell Splitter Box were omitted from this Sheet #12, but are required as shown on Sheet #14 of 17.

4. Sheet #13 of 17, SAGR LAGOON LEVEL CONTROL-WASTEWATER TREATMENT FACILITY

   A. Sheet #13 shall be revised to show the Telescopic Valve Riser on Detail "AC" to be constructed of P401 lined ductile iron pipe and not SDR-26 as shown.

   B. Technical Specification 40 92 13.13 issued with Addendum #1 contains the actuator that is to be used for the dilution water flow control valve. There is only one of these valves required on the project.

5. Sheet #15 of 17, SAGR SECTIONS-WASTEWATER TREATMENT FACILITY

   The note on Detail AF on this sheet that states "Supplied by Nexom or approved equal" and "Contractor Supplied" also applies to Details AG, AD, and AF. The intent of the note "Supplied by Nexom or approved equal" is to state that the internal SAGR piping shall be supplied by Nexom or approved equal through the Contract 'B' Contractor.

GENERAL CLARIFICATIONS:

6. The Owner is releasing the attached Geotechnical Engineering Investigation for informational purposes only. This Inspection Report is not part of the Contract Documents. See Contract Documents General Conditions, Section 00 72 00, Section 5.03 "Subsurface and Physical Conditions" (Page 13 of 64).

7. Suitable Clean Fill for Backfill and Embankment Material for WWTP Construction shall be defined as follows:

   The material shall be of maximum size that can be readily placed in loose, 8" lifts and compacted per the specifications for this project. All clean fill material shall be free of contaminating materials, organic matter, rocks (as specified in the specifications), asphalt, trash, rubble, metal, glass, muck, foreign materials or refuse. Each soil type shall have a proctor compaction test performed on it to determine the optimal water content for maximum dry density prior to placement to ensure optimal compaction during placement. Soil shall not be placed or compacted when frozen, too dry or too wet.

   The use of the Wastewater Treatment Plant site for placement of stockpiled fill material shall be discussed and coordinated at the preconstruction meeting between the Contractors of Contract 'A' & 'B' as well as the Owner and Engineer.

8. Wastewater Treatment Plant driveway responsibility limits have been defined on the attached "WWTP Access Drive – Addendum #2" drawing. Contract 'A' shall construct the access driveway, including the two RCP drive pipes into the wastewater treatment plant site. They shall maintain the drive during its use to haul and stockpile fill material until this portion of the work is completed and the drive is no longer being used by Contract 'A'. The driveway shall be built to the "Typical Roadway Detail" contained on Sheet #6 of 6 of the General Details Plans to the satisfaction of the Engineer when it is released by Contract 'A' to the Contractor of Contract 'B'. At this point, Contract 'B' will assume maintenance of the driveway to complete their work until final completion of the work at which time the driveway shall also reflect the Typical Roadway Detail to the satisfaction of the Engineer.

9. All sanitary ductile iron pipe and fittings, including buried fittings shall be required to have Protecto 401 interior pipe coating. All air piping, including ductile iron and fittings (buried or above grade), shall be unlined. All air piping and appurtenances shall have restrained joints.

10. All pipe testing shall be in accordance with the Construction Drawings and Technical Specifications as well as all industry standards.

11. For clarification of the "Typical Valve Box Detail" located on Sheet #5 of 6 of the General Details Plans, valve box shall be cast iron with lid embossed with "Sewer" like Sigma Series VB630, Tyler Union Series 6850, or approved equal.

12. The flange coupling adapters shown on the Lift Stations shall be Romac Industries Style FCA501 or approved equal.

13. The cam and groove connections on the draft pipes on the Lift Stations shall be male adaptor with male NPT (type F) connection to the draft pipe comprised of 316 stainless steel material with a cap on each connection.

14. All flanged bolts (sanitary and air piping) shall be constructed of 304 stainless steel. High temperature gaskets shall be utilized on all air piping.

15. The lagoon crossover pipe shown on Sheets #9 and #10 of 17 of the Wastewater Treatment Plant Plans shall be 8" HDPE.

16. All variable frequency drives shall be the same brand/type/model for ease in replacement parts and service.

17. The high temperature gaskets shown on Sheet #11 of 17, SAGR Details of the Wastewater Treatment Plant Plans, are required on all air piping. The highest temperature is not expected to exceed 350 degrees Fahrenheit, however, this temperature shall be verified with the selected blower manufacturer.

18. The pipe from the UV Disinfection Structure to the Non-Potable Wet-Well shown in Section View AN on Sheet #17 of 17, Effluent Details, Plans & Sections of the Wastewater Treatment Plant Plans shall be constructed of 8" SDR 35.

END OF ADDENDUM

Attachments: Geotechnical Report
Screening & Grit Structure Reinforcement Detail
WWTP Access Drive – Addendum #1

Soil Study for Proposed Wastewater Treatment Lagoons
Hollansburg-Arcanum Road,
Hollansburg, Ohio

Submitted For:

Palestine-Hollansburg Joint Sewer District
Attn: Mr. Matthew Harrison
P.O. Box 117
Palestine, Ohio 45342

Report No. 183404-0718-134
July 30, 2018

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July 30, 2018

Palestine-Hollansburg Joint Sewer District
P.O. Box 117
Palestine, Ohio 45352

Attention: Mr. Matthew Harrison

Re: Report No. 183404-0718-134; Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

Dear Mr. Harrison:

Bowser-Morner, Inc. is pleased to submit our report of the soil study for the above-referenced project. The purpose of this study is to determine the physical characteristics of the soil strata and recommendations for the construction of proposed lagoon system. Also noted are other conditions that could affect the design and/or construction of the lagoons and the installation of the sanitary sewer.

The samples collected that were not used to perform the laboratory tests will be kept in our laboratory for 30 days unless you advise us otherwise. If you have any questions or if we can help you in any way on this project or future work, please call us.

Sincerely,
BOWSER-MORNER, INC.

"This document was originally issued by Richard J.Y. Tseng, Ph.D., P.E. and Chris R. Ryan, M.S.C.E., P.E. on July 30,2018. This document is not considered a sealed document."

Chris R. Ryan, M.S.C.E., P.E.
Geotechnical Engineer

Richard J.Y. Tseng, Ph.D., P.E.
Chief Geotechnical Engineer

CRR/RJYT/ccs
2-Client
2- Mote and Associates
Attn: Mr. Dave Mathews
2-File

TABLE OF CONTENTS

Section I

Text

1.0 INTRODUCTION

A lagoon system will be constructed near Hollansburg, Ohio, on the southwest side, and a section of sewer in Hollansburg, Ohio to handle the wastewater. A vicinity map (Figure 1) is included in Section III of this report. Our findings on the subgrade soil conditions and groundwater levels with respect to the potential lagoon construction problems, and recommendations for the excavation of the lagoons and for the installation of the sanitary sewer are given in this report.

The initial authorization to proceed with this soil study was given by Palestine-Hollansburg Joint Sewer District in a signed Proposal Acceptance Sheet dated January 16, 2018. The work was to proceed in accordance with our proposal and agreement, Quotation No. 18-2771-002 dated January 2, 2018 for a total of 9 borings to extend to depths between 10 and 15 feet. Three additional borings were requested by Mote and Associates to be performed along the sanitary sewer route.

After our preliminary report was issued, the constructability of the lagoon system at the original proposed site was vetted. As a result, five additional, borings were requested by Mote and Associates for the determination of the subgrade soils to the north and east of the original site. The authorization to proceed with five additional borings was given by Mote and Associates in an email dated May 8, 2018. This report discusses a total of 17 borings made for this project

The draft soil boring logs and preliminary foundation recommendations were distributed to Mr. Matthew Harrison of Palestine-Hollansburg Joint Sewer District and Mr. Dave Mathews of Mote and Associates on March 21, 2018.

2.0 WORK PERFORMED

2.1 Field Work

A total of 17 soil borings were made at the locations shown on the boring location plan, Figure 2 in Section III. Fourteen borings were performed in the proposed lagoon sites and three borings were performed along the proposed sanitary sewer route. The boring logs and boring location plan are included in Section III. The borings were made with a boring rig mounted on an all-terrain vehicle (ATV) using hollow-stem augers and standard penetration resistance methods. The standard penetration tests were performed in accordance with ASTM D1586, which includes a 140-pound hammer, 30-inch drops, and two-inch-O.D. split-spoon samplers driven at maximum depth intervals of five feet or at major changes in stratum, whichever occurred first. The disturbed split-spoon samples were visually classified, logged, sealed in moisture-proof jars, and taken to the Bowser-Morner, Inc. laboratory for study. The depths where these "A"-type split-spoon samples were collected are noted on the corresponding boring logs.

2.2 Laboratory Work

Three Unified Soil Classification soil classification tests were performed in accordance with ASTM D422, D2216, D2487, and D4318. The purpose of this type of test is to determine parameters that aid in the evaluation of the general behavior of the soils.

Three Atterberg limits tests were performed in accordance with ASTM D4318 to determine the liquid and plastic limits on the most visibly plastic cohesive soil or as needed for soil classification. In addition, 56 moisture content determinations were made in accordance with ASTM D2216. The moisture contents ranged from 11.6% to 28.5% for the brown lean clay with sand, from 9.6% to 14.0% for the brown, sandy lean clay, from 10.4% to 15.4% for the gray, sandy lean clay, from 12.0% to 25.0% for the brown clayey sand with gravel, from 16.0% to 16.6% for the brown silty sand with varying amounts of gravel, and from 17.1% to 21.8% for the brown sand with varying amounts of gravel. The moisture content for the undocumented fill was 10.5%. The moisture content for the gray lean clay with sand was 29.0%. The results of the laboratory tests are summarized in Table 2-1 and included in Section III of this report.

Table 2-1. Summary of Laboratory Test Results

Boring No.	Depth (ft.)	Moisture Content (%)	% Gravel	% Sand	% Fines	Atterberg Limits LL	PL	PI
1	1.0 – 2.5	28.5						
	6.0 – 7.5	9.6						
2	3.5 – 5.0	13.9						
	6.0 – 7.5	12.0	31.8	39.5	28.7	22	17	5
	8.5 – 10.0	14.3						
3	1.0 – 2.5	20.2						
	6.0 – 7.5	10.9						
	8.5 – 10.0	12.9						
4	3.5 – 5.0	22.0						
	6.0 – 7.5	14.0				31	17	14
	8.5 – 10.0	13.1						
5	1.0 – 2.5	24.3						
	6.0 – 7.5	11.4						
	13.5 – 15.0	12.8						
6	1.0 – 2.5	25.2						
	3.5 – 5.0	26.3						
	8.5 – 10.0	11.5						
7	1.0 – 2.5	16.4						
	6.0 – 7.5	16.0	7.8	76.3	15.9		Non-Plastic	
	8.5 – 10.0	13.8						
	13.5 – 15.0	14.0						
8	3.5 – 5.0	22.8						
	8.5 – 10.0	15.4						

Table 2-1. Summary of Laboratory Test Results

Boring No.	Depth (ft.)	Moisture Content (%)	% Gravel	% Sand	% Fines	Atterberg Limits LL	PL	PI
9	1.0 – 2.5	25.1						
	6.0 – 7.5	11.4				20	13	7
10	3.5 – 5.0	13.7						
	8.5 – 10.0	14.3						
	18.5 – 20.0	11.1						
	28.5 – 30.0	12.3						
11	1.0 – 2.5	10.5						
	6.0 – 7.5	10.7						
	13.5 – 15.0	10.6						
	23.5 – 25.0	10.4						
12	3.5 – 5.0	12.4						
	8.5 – 10.0	12.5						
	18.5 – 20.0	17.1						
	28.5 – 30.0	11.3						
13	1.0 – 2.5	15.7						
	6.0 – 7.5	14.9						
	8.5 – 10.0	21.8	4.1	80.3	15.6		Non-Plastic	
	18.5 – 20.0	14.0						
14	1.0 – 2.5	21.3						
	6.0 – 7.5 (A)	11.6						
	6.0 – 7.5 (B)	25.0						
	8.5 – 10.0	12.9						
	18.5 – 20.0	15.4						
15	1.0 – 2.5	29.0						
	6.0 – 7.5	15.8						
	13.5 – 15.0	12.1						
16	3.5 – 5.0	19.1						
	6.0 – 7.5 (A)	16.6						
	6.0 – 7.5 (B)	10.4						
	18.5 – 20.0	12.9						
17	1.0 – 2.5	16.4				33	18	15
	6.0 – 7.5	12.1						
	13.5 – 15.0	10.9						

3.0 SOIL AND GROUNDWATER CONDITIONS

3.1 Lagoon Site

Borings 1 through 9 and 13 through 17 were performed in the proposed lagoon areas. Based on the information from these fourteen borings, the subgrade soil conditions are described in descending order below:

- Six to fourteen inches of topsoil.
- Below the topsoil, 0.5 to eight feet of very-soft-to-stiff, brown or gray lean clay with sand.
- In Borings 2, 3, 6, 14, and 15 and below the lean clay with sand layer, 0.5 to six feet of very-loose-to-medium-dense, brown clayey sand with gravel.
- In Borings 7, 8, and 16 and below the lean clay with sand layer, one to seven feet of very-loose-to-medium-dense, brown silty sand with varying amounts of gravel.
- In Borings 1, 4, and 5 and below the lean clay with sand layer, in Boring 3 and below the clayey sand with gravel layer, and in Boring 16 and below the silty sand with gravel layer, two to 6.5 feet of very stiff, brown, sandy lean clay.
- In Borings 5 and 16 and below the sandy, lean clay layer, and in Boring 13 and below the lean clay with sand layer, 1.5 to 3.5 feet of medium dense brown sand with varying amounts of gravel.
- In Boring 17 and below the lean clay with sand layer, five feet of hard, brown and gray, sandy lean clay.
- In Borings 1, 3, and 4 and below the brown, sandy lean clay layer, in Borings 2, 6, 14, and 15 and below the brown clayey sand with gravel layer, in Borings 5, 13, and 16 and below the brown sand with gravel layer, in Borings 7 and 8 and below the brown silty sand layer, in Boring 9 and below the brown lean clay with sand layer, and in Boring 17 and below the brown and gray, sandy lean clay layer, medium-stiff-to-hard, gray, sandy lean clay extending to the bottoms of these borings at depths of 10 to 20 feet.

3.2 Sanitary Sewer Route

Borings 10, 11, and 12 were performed along the proposed sanitary sewer route. Based on the information from these three borings, the subgrade soil conditions are described in descending order below:

- 1.5 to 3.5 feet of undocumented and uncontrolled fill consisting of asphalt pavement, granular base, and gray lean clay with sand.

- Below the fill layer, ten to twelve feet of medium-stiff-to-hard, brown, sandy lean clay.

- In Borings 10 and 12 and below the brown, sandy lean clay layer, three to five feet of very-loose-to-medium-dense, brown silty sand.

- In Boring 12 and below the brown silty sand layer, 3.5 feet of medium dense brown sand with gravel.

- In Boring 10 and below the brown silty sand layer, in Boring 11 and below the brown, sandy lean clay layer, and in Boring 12 and below the brown sand with gravel layer, more than eight to 15 feet of stiff-to-hard, gray, sandy lean clay. The gray, sandy lean clay extended to the bottoms of Borings 10 and 12 at a depth of 30 feet.

- In Boring 11 and below the gray, sandy lean clay layer, very dense, gray clayey sand with gravel extending to the bottom of this boring at a depth of 30 feet.

Free groundwater was encountered during the advancement of the borings at the depths and elevations summarized in Table 3-1.

Table 3-1. Summary of Groundwater Observations

Boring No.	Depth Groundwater First Observed (ft)		Groundwater Observation at Completion of Boring (ft)		Groundwater Observation After Time Interval (ft, hrs)		
	Depth	Elevation	Depth	Elevation	Depth	Elevation	Time
1	No Water		No Water			Not Applicable	
2	4.5	1127.9	5.0	1127.4		Not Applicable	
3	3.5	1128.2	2.6	1129.1	0.5	1131.2	24
4	6.0	1128.3	10.8	1123.5	1.3	1133.0	24
5	6.8	1127.8	2.9	1131.7	0.8	1133.8	24
6	3.5	1130.1	2.2	1131.4	1.2	1132.4	24
7	6.0	1129.6	2.8	1132.8	1.7	1133.9	24
8	6.0	1128.7	3.5	1131.2	1.8	1132.9	2.5
9	6.0	1128.1	7.5	1126.6	2.6	1131.5	1.5
10	14.2	79.0*	23.0	70.2*		Not Applicable	
11	28.5	71.6*	28.0	72.1*		Not Applicable	
12	13.5	88.1*	13.0	88.6*		Not Applicable	
13	6.0	1132.0	7.0	1131.0	3.8	1134.2	7
14	6.7	1133.3	7.0	1133.0	6.5	1133.5	5
15	6.0	1130.5	5.2	1131.3	2.3	1134.2	3
16	6.0	1131.9	7.5	1130.4	4.3	1133.6	2
17	No Water		No Water			Not Applicable	

*Refers to an assumed elevation of 100.0 feet for the benchmark shown on the boring location plan.

Free groundwater is defined as water that seeps into an open borehole before it is backfilled. Groundwater observations were made during the boring operations by noting the depth of water on the boring tools and in the open boreholes following withdrawal of the boring augers. However, it should be noted that short-term water level readings are not necessarily a reliable indication of the groundwater level and that significant fluctuations may occur due to variations in rainfall and other factors. For specific questions on the soil conditions, please refer to the individual boring logs in Section III.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Project Description

The Palestine-Hollansburg Joint Sewer District proposes to construct a lagoon system near Hollansburg, Ohio, on the southwest side, and a section of sewer in Hollansburg, Ohio to handle the wastewater.

Based on the initial boring location plan provided by Mr. Dave Mathews of Mote and Associates, three ponds will be constructed on the east bank of Middle Fork East Whitewater River on the southeast side of Hollansburg-Arcanum Road near Hollansburg, Ohio. The proposed Ponds 1 and 2 will be on the east side of the complex and the storage pond will be on the west side of the complex and east of the river.

The proposed lagoon site is a cultivated field with the existing ground surface at elevations between 1131 and 1140 feet as shown on the topographic map provided by Mr. Dave Mathews of Mote and Associates.

Mr. Mathews stated in his letter dated December 21, 2017, Ponds 1 and 2 will have a designed water depth of 10 feet. The bottoms of these ponds will be at an elevation of 1129 feet. The tops of the berms will be at an elevation of 1142 feet, which is about 6 feet higher than the existing ground surface at an approximate elevation of 1136 feet.

The storage pond will be a large, triangle-shaped pond. As stated in the letter, the designed water depth will be 12 feet. The bottom elevation will be at an elevation of 1127 feet. The top of the berm will be at an elevation of 1142 feet, which is about 7 feet higher than the existing ground surface at an approximate elevation of 1135 feet.

Again, after our preliminary report was issued, the constructability of the lagoon system at the original proposed site was vetted. As a result, five additional, borings were requested by Mote and Associates for the determination of the subgrade soils to the north and east of the original site.

Additionally, an “L”-shaped section of sanitary sewer will be installed along Union and Main Streets in Hollansburg, Ohio. The invert of the proposed sewer was not provided.

The following recommendations are based on this information. If the above statements are incorrect or changes are made, Bowser-Morner, Inc. should be notified so that the new data can be reviewed and additional recommendations and services can be given if required to meet the needs of your project.

4.2 Lagoon Subgrade Conditions and Recommendations

Borings 1 through 9 and 13 through 17 were performed in three proposed lagoon sites. Based on the information from these fourteen borings, the proposed lagoon sites are covered by a layer of topsoil that extends to the approximate depths and elevations outlined in Table 4-1.

Table 4-1. Depths to Bottoms of Topsoil

Boring No.	Depth to Bottom of Topsoil (ft)	Elevation at Bottom of Topsoil (ft)
1	0.8	1132.9
2	1.2	1131.2
3	0.8	1130.9
4	1.1	1133.2
5	0.6	1134.0
6	0.7	1132.9
7	1.0	1134.6
8	0.5	1134.2
9	0.7	1133.4
13	0.7	1137.3
14	0.6	1139.4
15	0.9	1135.6
16	0.7	1137.2
17	0.7	1138.8

Based on the initial design, the bottom elevation of Ponds 1 and 2 (Borings 6 through 9) will be at 1129 feet and the bottom elevation of the triangle-shaped pond (Borings 1 through 5) will be at an elevation of 1127 feet. Based on the soil conditions indicated in nine borings made for the initial study, the bottoms of the lagoons will be on brown or gray sandy, lean clay layer, with the exception of Borings 2, 5, 6, and 7. Based on our experience, the sandy, lean clay type of soil will have a relatively low permeability and will detain the water.

The bottoms of the Lagoon 2 and the storage pond, in the vicinity of Borings 2, 5, 6, and 7 will be in the sand and gravel layers. Sand layers were also encountered in Borings 13 through 16 at depths of 6 to 8.5 feet below the existing grade. Any sand with gravel or the pockets of sand with gravel encountered at the bottoms of the excavation will have a higher permeability. The sides or the bottoms of the lagoon excavations over the sand with gravel layer will leak. We recommend that the excavation of the lagoons or pond in any sand with gravel layer should be extended at least two feet below the proposed final grade. The removed brown or gray lean clay or sandy lean clay can be used as backfill for the construction of clay liner over any sand with gravel layer. A minimum of two feet of compacted clay liner should be constructed over the sand with gravel layer.

4.2.1 SUBGRADE SOIL CLASSIFICATION FOR LAGOON EXCAVATIONS

Based on Occupational Safety and Health Administration (OSHA) Subpart P-Excavations (29 CFR PART 1926), cohesive soil with an unconfined compressive strength of 3,000 pounds per square foot (psf) or greater can be classified as Type "A" soil. Cohesive soil with an unconfined compressive strength greater than 1,000 psf but less than 3,000 psf can be classified as Type "B" soil, and cohesive soil with an unconfined compressive strength of 1,000 psf or less can be classified as Type "C" soil. Dense or very dense granular soil with no water can be classified as Type "B" soil; the other granular soils should be classified as Type "C" soil. Previously disturbed soil (fill) should not be classified as Type "A" soil. Soil that is fissured shall not be classified as Type "A" soil.

Based on the standard penetration test (SPT) results from this study, the subgrade soils at this site are classified in accordance with OSHA trench excavation regulations as shown in Table 4-2.

Table 4-2. Lagoon Subgrade Soil Classification (OSHA)

Boring No.	Depth (ft.)	OSHA Soil Type
1	0.0 – 3.5	B
	3.5 – 10.0	A
2	0.0 – 4.0	B
	4.0 – 9.0	C
	9.0 – 10.0	A
3	0.0 – 3.5	B
	3.5 – 4.0	C
	4.0 – 10.0	A
4	0.0 – 6.0	B
	6.0 – 15.0	A
5	0.0 – 3.5	B
	3.5 – 7.0	A
	7.0 – 9.5	C
	9.5 – 15.0	A
6	0.0 – 4.0	B
	4.0 – 6.0	C
	6.0 – 10.0	A
7	0.0 – 1.5	B
	1.5 – 8.5	C
	8.5 – 15.0	A
8	0.0 – 6.0	B
	6.0 – 9.5	C
	9.5 – 10.0	A
9	0.0 – 5.0	B
	5.0 – 10.0	A

Table 4-2. Lagoon Subgrade Soil Classification (OSHA)

Boring No.	Depth (ft.)	OSHA Soil Type
13	0.0 – 8.5	B
	8.5 – 10.0	C
	10.0 – 20.0	A
14	0.0 – 3.5	B
	3.5 – 6.5	A
	6.5 – 12.5	C
	12.5 – 18.5	B
	18.5 – 20.0	A
15	0.0 – 6.0	B
	6.0 – 12.0	C
	12.0 – 20.0	A
16	0.0 – 6.0	B
	6.0 – 7.0	C
	7.0 – 13.5	A
	13.5 – 17.0	C
	17.0 – 20.0	A
17	0.0 – 3.5	B
	3.5 – 20.0	A

If weaker soil is encountered below stronger soil, the classifications of all of the stronger soil above the weaker soil layer will have to be lowered to the weaker soil classification.

Based on OSHA excavation regulations, for any excavation that will extend more than a depth of 20 feet below the grade, the stability of the excavations should be evaluated by a geotechnical engineer. The pond or lagoon excavations will be less than 10 feet deep below the existing grade, between 3 and 7 feet below the existing grade for those lagoons and the storage pond. However, for any excavations to be more than 20 feet deep and the sloping-benching methods for excavations are selected as the construction method, a registered professional engineer should analyze the slope stability of each of trench excavations. While the engagement of a geotechnical engineer during the construction is beyond the scope of this study, we will be glad to provide assistance during the construction as a separate study at your request.

For excavations less than 20 feet deep, the maximum allowable slopes for excavations should be maintained in accordance with OSHA excavation regulations for stability and for safety of the worker. For Type “A” soil, a side slope of 3/4 (horizontal) to 1 (vertical) should be provided; for Type “B” soil, a side slope of 1 (horizontal) to 1 (vertical) should be provided; and for Type “C” soil, a side slope of 1-1/2 (horizontal) to 1 (vertical) should be provided.

Based on our experiences, a maximum side slope of 3 (horizontal) to 1 (vertical) should be provided for stability, since the lagoon will be filled with wastewater and the pond embankment will be saturated. The water level will fluctuate during the filling and emptying of the lagoon. The side slopes will be in a "rapid draw-down" condition of the saturated, cut soil-slopes. Additionally, the top of the pond embankment should be protected with riprap against the wave action. Otherwise, the pond embankments will be eroded by water in the pond.

The slope stability study is beyond the scope of this soil study. We will be glad to analyze the stability of the slope as a separate study, at your request.

At the time of our study, free groundwater was encountered in Borings 2 through 9 and 13 through 16 at depths of 0.5 to 10.8 feet below the existing ground surface. Free groundwater was not encountered in Borings 1 and 17 during the boring operations. The groundwater should be lowered to at least three feet below the bottom of the maximum excavation in sand and gravel layers and to the bottom of the maximum excavation in lean, clay soil layers using sumps and pumps. Otherwise, the bottoms of the excavation will be very soft due to the groundwater seepage. All submerged soil or soil from which water is freely seeping should be classified as Type "C" soil.

Due to the spacing of the borings, the type of subgrade soil may vary between the soil borings made for this study. During the excavations, the subsurface conditions should be verified. A "competent person" as defined by OSHA should be present throughout the excavations to verify the soil types and soil conditions. The sloping and benching design should be adjusted with changes in the subgrade soil in accordance with OSHA regulations.

4.2.2 LAGOON COMPACTION REQUIREMENTS

Any structural fill to be placed for the construction of the embankment and as the clay liner over the sand layers should be compacted to at least 90% of the maximum dry-unit weight with moisture contents between the optimum and/or less than 2% above the optimum moisture content as determined by the standard Proctor test (ASTM D-698). The compaction should be accomplished by placing the fill in successive, horizontal, approximately six- to eight-inch-thick loose lifts and mechanically compacting each lift to at least the specified minimum dry density. Field-density tests should be performed at a minimum rate of one per 2,500 square feet of fill area and for each lift to verify that adequate compaction is achieved. After the backfill is placed and compacted over the sand layer, the cut slopes can be graded with earth-moving equipment for the construction of the lagoons.

It must be emphasized that the excavation and compaction of soil fill are highly influenced by weather conditions. Performing the earthwork under wet and frozen conditions is generally very difficult, if not impossible. The preparation of the pond embankment should avoid by using wet silty and clayey soil as backfill and during wet and frozen conditions because the wet soil cannot be compacted to the required unit weight without drying or other soil stabilization methods. Consequently, the construction of the lagoons and the storage pond should be

performed in favorable weather. The construction should not be performed in the winter and wet weather conditions. The soil removed from the site to be reused as backfill should be covered or the top of the soil stockpile should be graded to drain and should be compacted to provide a seal layer to prevent the soil from being saturated by rain. Water should not be allowed to pond next to the soil stockpile to increase the moisture contents in the stockpiled soil backfill material.

Puddling or jetting of the backfill material, including the utility trenches, should not be allowed as a compaction method.

4.2.3 LAGOON EXCAVATIONS

During the excavations, the subsurface conditions should be verified. If it is necessary, any major changes in subsurface conditions other than what are shown on the boring logs warrant additional subsurface investigation.

The excavations should be observed to ensure that the loose, soft, or otherwise undesirable materials are removed and that the bottoms of the excavations are directly on an acceptable surface. At the time of this observation, it may be verified with a hand penetration device in the base of the excavation to ensure that the soils immediately below the bottom of the excavation are satisfactorily prepared to support any additional soil fill, if needed. Please note that such shallow observations do not replace an adequate deep-boring program and structural fill compaction QA/QC records. The overall performance of the lagoon is governed by the soils on the sides of the excavation and below the bottom of the excavation.

If pockets of soft, loose, or otherwise unsuitable materials are encountered at the bottom of the excavation, the proposed bottom of the lagoon elevations may be reestablished by backfilling after the undesirable materials have been removed. The excavation should extend to suitable soils. The unsuitable materials can be removed and replaced with well-compacted, engineered fill. Special care should be taken to remove the sloughed, loose, or soft materials near the base of the excavation slopes. Extra care should also be taken to tie-in the compacted fill with the excavation slopes, with benches as necessary, to ensure that no pockets of loose or soft materials are left along the excavation slopes below the bottoms of the lagoon excavation level. The contractor should maintain temporary cut slopes in accordance with the current OSHA regulations governing trenching and slope stability.

Soils exposed at the bases of satisfactory excavations should be protected against any detrimental change in condition such as from construction disturbances, rain, and freezing. Surface runoff should be drained away from the excavation and not allowed to pond in the excavations. It must be emphasized that all excavations must conform to all state, federal, and local regulations relative to slope geometry.

4.2.4 LAGOON CONSTRUCTION DEWATERING

At the time of our study, free groundwater was encountered in Borings 2 through 9 and 13 through 16 at depths of 0.5 to 10.8 feet below the existing ground surface. Free groundwater was not encountered in Borings 1 and 17 during the boring operations. As a result, groundwater will be encountered during the lagoon excavation. The bottoms of the excavations should be sloped to one corner in each of the pond excavations. The slump can be located at the lowest corner of the excavations. The groundwater should be lowered to at least three feet below the bottom of the maximum excavation in sand and gravel layers and to the bottom of the maximum excavation in lean, clay soil layers using sumps and pumps.

Sumps can consist of perforated pipes or drums installed vertically in the relatively permeable granular soils and surrounded with free-draining sand and gravel. The perforations of the pipe should be covered with a layer of filter fabric to keep silt and fine sand from pumping through the sumps. Care must be exercised when pumping from sumps that extend into silts or other granular soils since general deterioration of the bearing soils and a localized "quick" condition could result. The groundwater should be kept at a level below the fill operation during the placement and compaction of the backfill materials during the construction of any foundations.

The amount and type of dewatering required during construction will depend on the weather and groundwater levels at the time of construction, and the effectiveness of the contractor's techniques in preventing surface runoff from entering open excavations. Typically, groundwater levels are highest during winter and spring, and lower in summer and early fall.

4.3 Sanitary Sewer Subgrade Conditions and Recommendations

Borings 10 through 12 were performed over the street pavement along the proposed sanitary sewer route on Union and Main Streets. Based on the information from these three borings, the proposed sewer alignment is covered by a layer of undocumented fill that extends to the approximate depths and elevations outlined in Table 4-3.

Table 4-3. Depths to Bottoms of Fill Layer

Boring No.	Depth to Bottom of Topsoil (ft)	Elevation* at Bottom of Topsoil (ft)
10	3.5	89.7
11	3.5	96.6
12	1.5	100.1

*Refers to an assumed elevation of 100.0 feet for the benchmark shown on the boring location plan.

The streets are covered with 3 to 7 inches of asphalt pavement, 3.5-to-13-inch-thick of granular base, and gray lean clay. We assume that the invert of the sewer will be more

than 4 feet below the top of street pavement. The bottoms of the sewer trench excavations will have to be extended below the existing fill layer.

4.3.1 SUBGRADE SOIL CLASSIFICATION FOR TRENCH EXCAVATION

Again, based on Occupational Safety and Health Administration (OSHA) Subpart P-Excavations (29 CFR PART 1926), cohesive soil with an unconfined compressive strength of 3,000 pounds per square foot (psf) or greater can be classified as Type "A" soil. Cohesive soil with an unconfined compressive strength greater than 1,000 psf but less than 3,000 psf can be classified as Type "B" soil, and cohesive soil with an unconfined compressive strength of 1,000 psf or less can be classified as Type "C" soil. Dense or very dense granular soil with no water can be classified as Type "B" soil; the other granular soils should be classified as Type "C" soil. Previously disturbed soil (fill) should not be classified as Type "A" soil. Soil that is fissured shall not be classified as Type "A" soil.

Based on the standard penetration test (SPT) results from this study, the subgrade soils along the proposed sewer line route can be classified as shown in Table 4-4.

Table 4-4. Sewer Subgrade Soil Classification (OSHA)

Boring No.	Depth (ft.)	OSHA Soil Type
10	0.0 – 3.5	C
	3.5 – 14.0	A
	14.0 – 17.0	C
	17.0 – 30.0	A
11	0.0 – 3.5	B
	3.5 – 28.5	A
	28.5 - 30.0	C
12	0.0 – 3.5	B
	3.5 – 13.5	A
	13.5 – 22.0	C
	22.0 – 30.0	A

If weaker soil is encountered below stronger soil, the classifications of all of the stronger soil above the weaker soil layer will have to be lowered to the weaker soil classification. Any groundwater encountered should be lowered to at least three feet below the bottom of the maximum excavation during the installation of the sewer line. Otherwise, the bottoms of the trench excavation will be very soft due to the groundwater seepage. All submerged soil or soil from which water is freely seeping should be classified as Type "C" soil.

The side slopes of the trench excavations should be maintained in accordance with OSHA trench excavation regulations for stability and for safety of the worker. The sloping and benching method can be used during the installation of the utility line. For type "A" soil, a side slope of 3/4 (horizontal) to 1 (vertical) should be provided; For type "B" soil, a side slope of 1 (horizontal) to 1 (vertical) should be

provided; and For type “C” soil, a side slope of 1-1/2 (horizontal) to 1 (vertical) should be provided.

The maximum allowable slopes outlined above, apply only to excavations less than 20 feet deep. For excavations greater than 20 feet deep, sloping or benching for excavations should be designed, and the slope stability of each trench excavation should be analyzed and designed by a registered professional engineer.

Alternatively, a trench box can be used to keep the sidewalls from caving in and for the safety of the workers. The trench box should be rated in accordance with OSHA regulations. Tabulated data for the trench box that identify the registered professional engineer who approved the data should be kept on the job site. For more detailed information on the OSHA regulations, please refer to OSHA Subpart P-Excavations (29 CFR PART 1926).

During the trench excavations, the subsurface conditions should be verified. A “competent person” as defined by OSHA should be present throughout the sewer line trench excavations to verify the soil types and soil conditions. The sloping and benching or trench box design should be adjusted with changes in the subgrade soil in accordance with OSHA regulations.

4.3.2 COMPACTION REQUIREMENTS

Structural fill placed below any manhole foundations or any other structure foundation bearing elevation should be compacted to at least 95% of the maximum dry unit weight with a moisture content within 2% of the optimum moisture content as determined by the modified Proctor test (ASTM D1557). Fill placed above the bottoms of the sewer pipes as the subgrade soil for the pavement should be compacted to at least 90% of the maximum dry unit weight with a moisture content within 2% of the optimum moisture content as determined by the modified Proctor test (ASTM D1557). To minimize the settlement potential of the backfill, the backfill in unpaved areas should be compacted to at least 85% of the maximum dry-unit weight as determined by the modified Proctor test (ASTM D-1557). Otherwise, the backfill will settle with time, and the ground surface along the trench will be lower than the adjacent area. The compaction should be accomplished by placing the fill in successive, horizontal, approximately six- to eight-inch-thick loose lifts and mechanically compacting each lift to at least the specified minimum dry density. Field density tests should be performed at a minimum rate of one per 2,500 square feet of fill area or at a minimum rate of one per 300 linear feet of trench excavation and for each lift to verify that adequate compaction is achieved. Backfill for utility trenches, foundation excavations, etc., within structures or paved areas, is considered structural fill and should be placed in accordance with these recommendations.

It must be emphasized that the excavation and compaction of soil fill are highly influenced by weather conditions. Performing the earthwork under wet and frozen conditions is generally very difficult. As a result, compaction of wet silty and clayey soil should be avoided during wet and frozen conditions because the

wet soil cannot be compacted to the required unit weight without drying or other soil stabilization methods. Alternatively, granular soil can be used as backfill to facilitate the backfilling and compaction work during winter and wet weather. The construction cost during the winter and wet weather conditions will be higher due to the need to purchase the granular soil.

Puddling or jetting of the backfill material, including the utility trenches, should not be allowed as a compaction method. Silty or clayey soils encountered above foundation depth will often soften, and the bearing capacity may be reduced if water ponds in the excavation.

4.3.3 TRENCH EXCAVATIONS

During the trench excavations, the subsurface conditions should be verified. Changes in subsurface conditions other than what are shown on the boring logs warrant additional subsurface investigation before the manhole foundation and pipe foundation are constructed.

The trench excavations should be observed to ensure that the loose, soft, or otherwise undesirable materials are removed and that any foundations will be supported directly on an acceptable surface. At the time of this observation, it may be necessary to use a hand penetration device in the base of the trench excavation to ensure that the soils immediately below the foundation base are satisfactorily prepared to support the foundations. Please note that such shallow observations do not replace an adequate deep-boring program and structural fill compaction QA/QC records. The overall performance of the foundations is governed by the soils below the bottom of the foundation.

If pockets of soft, loose, or otherwise unsuitable materials are encountered at the bottom of the trench excavation, the proposed sewer line elevations may be reestablished by backfilling after the undesirable materials have been removed. The excavation should extend to suitable soils, and the base of the excavation should extend one lateral foot for every foot of excavation below the bottom of the foundation. The entire excavation should then be refilled with well-compacted, engineered fill. Special care should be taken to remove the sloughed, loose, or soft materials near the base of the excavation slopes. Extra care should also be taken to tie-in the compacted fill with the excavation slopes, with benches as necessary, to ensure that no pockets of loose or soft materials are left along the excavation slopes below the foundation bearing level. The contractor should maintain temporary cut slopes in accordance with the current OSHA regulations governing trenching and slope stability.

Soils exposed at the bases of satisfactory foundation excavations should be protected against any detrimental change in condition such as from construction disturbances, rain, and freezing. Surface runoff should be drained away from the excavation and not allowed to pond. It must be emphasized that all excavations must conform to all state, federal, and local regulations relative to slope geometry.

4.3.4 TRENCH DEWATERING

Based on the information from the three borings made along the proposed sewer route, groundwater was encountered at depths of 13 to 28.5 below the existing grade during the time of this study. If groundwater is encountered, the sewer line pipes, fittings, and manhole structures should be designed with watertight connections to reduce the amount of groundwater seeping into the sewer line pipe or manhole. The manhole structures in this area should also be designed against floatation by the groundwater.

Any groundwater encountered should be lowered to at least three feet below the bottom of the maximum excavation in sand and gravel layers or to the bottom of the maximum excavation in silt and clay layers using sumps and pumps. Sumps can consist of perforated pipes installed vertically in the relatively permeable granular soils and surrounded with free-draining sand and gravel. The perforations of the pipe should be covered with a layer of filter fabric to prevent silt and fine sand from pumping through the sumps. Care must be exercised when pumping from sumps that extend into silts or other granular soils since general deterioration of the bearing soils and a localized "quick" condition could result. The groundwater should be kept at a level below the fill operation during the placement and compaction of the backfill materials during the construction of the foundations.

The amount and type of dewatering required during construction will depend on the weather and groundwater levels at the time of construction, and the effectiveness of the contractor's techniques in preventing surface runoff from entering open excavations. Typically, groundwater levels are highest during winter and spring, and lower in summer and early fall.

5.0 CLOSURE

5.1 Basis Of Recommendations

The evaluations, conclusions, and recommendations in this report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project and our experience with similar sites and subsurface conditions. Data used during this exploration included, but were not necessarily limited to:

- A total of 17 exploratory borings performed during this study.
- Observations of the project site by our staff.
- The results of the laboratory soil tests.
- The site plan provided by Mote and Associates.
- Limited interaction with Mr. Matthew Harrison of Palestine-Hollansburg Joint

Sewer District, and Mr. Dave Mathews, Mr. Mike Bruns, Ms. Susan Laux, and Mr. Corey Bremigan of Mote and Associates.

- Published soil or geologic data of this area.

In the event that changes in the project characteristics are planned, or if additional information or differences from the conditions anticipated in this report become apparent, Bowser-Morner, Inc. should be notified so that the conclusions and recommendations contained in this report can be reviewed and, if necessary, modified or verified in writing.

5.2 Limitations And Additional Services

The subsurface conditions discussed in this report and those shown on the boring logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by designers, or that the construction process has altered the soil conditions. As variations in the soil profile are encountered, additional subsurface sampling and testing may be necessary to provide data required to reevaluate the recommendations of this report. Consequently, after submission of this report, it is recommended that Bowser-Morner, Inc. be authorized to perform additional services to work with the designer(s) to minimize errors and omissions regarding the interpretation and implementation of this report.

Before construction begins, we recommend that Bowser-Morner, Inc.:

- Work with the designers to implement the recommended geotechnical design parameters into plans and specifications.
- Consult with the design team regarding interpretation of this report.
- Establish criteria for the construction observation and testing for the soil conditions encountered at this site.
- Review final plans and specifications pertaining to geotechnical aspects of design.

During construction, we recommend that Bowser-Morner, Inc.:

- Observe the construction, particularly the site preparation, fill placement, and any foundation or trench excavation.
- Perform in-place density testing of all compacted fill.
- Perform materials testing of soil and other materials as required.

- Consult with the design team to make design changes in the event that differing subsurface conditions are encountered.

If Bowser-Morner, Inc. is not retained for these services, we shall assume no responsibility for construction compliance with the design concepts, specifications or recommendations.

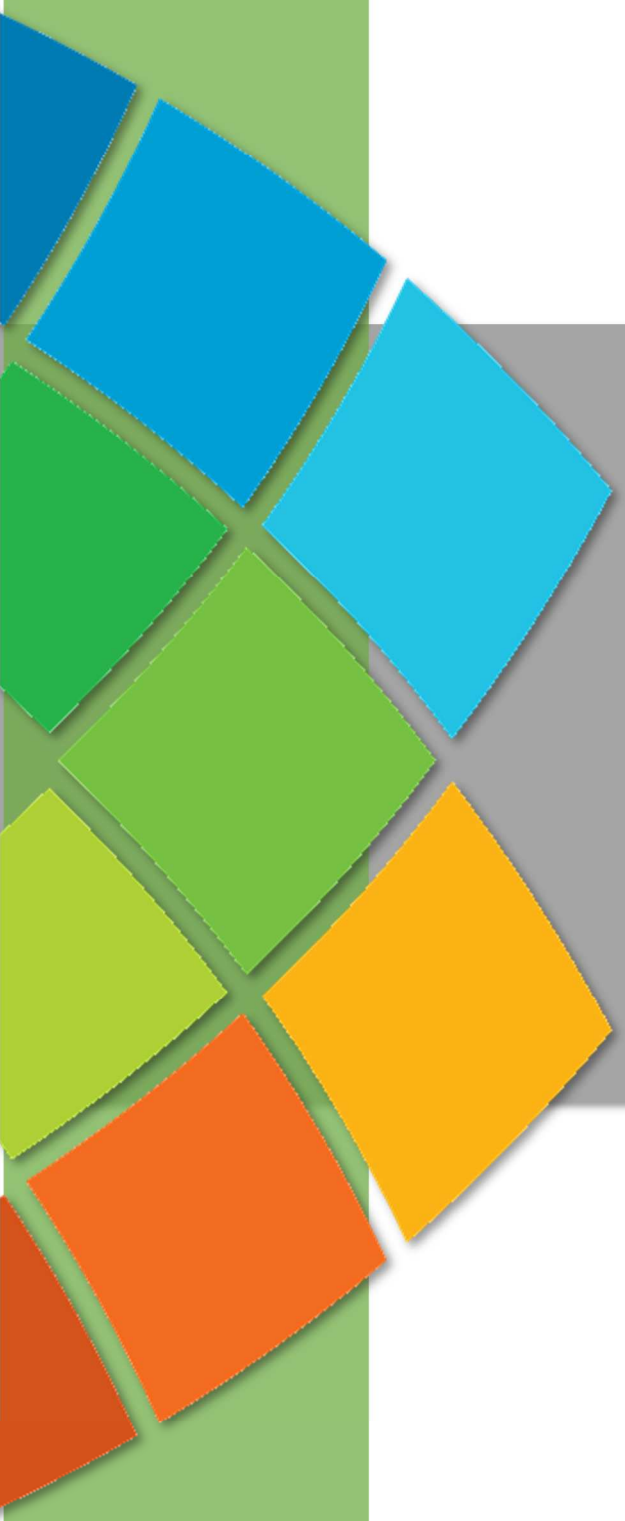
5.3 Warranty

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, express or implied, is made.

The scope of this study did not include an environmental assessment for the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater or air, on, within or beyond the site studied. Any statements in the report or on the boring logs regarding odors, staining of soils or other unusual items or conditions observed are strictly for the information of our client.

To evaluate the site for possible environmental liabilities, we recommend an environmental assessment, consisting of a detailed site reconnaissance, a record review, and report of findings. Additional subsurface drilling and sampling, including groundwater sampling, may be required. Bowser-Morner, Inc. can provide this service and would be pleased to provide a cost proposal to perform such a study, if requested.

This report has been prepared for the exclusive use of Palestine-Hollansburg Joint Sewer District for specific application to the lagoons on Hollansburg-Arcanum Road in Hollansburg, Ohio (see Figure 1 in Section III of this report). Specific design and construction recommendations have been provided in the various sections of the report. The report shall therefore, be used in its entirety. This report is not a bidding document and shall not be used for that purpose. Anyone reviewing this report must interpret and draw their own conclusions regarding specific construction techniques and methods chosen. Bowser-Morner, Inc. is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.



Section II

Specifications

CLEARING AND GRADING SPECIFICATIONS

I. GENERAL CONDITIONS

The contractor shall furnish all labor, materials, and equipment, and perform all work and services necessary to complete in a satisfactory manner the site preparation, excavation, filling, compaction and grading as shown on the plans and as described therein.

This work shall consist of all clearing and grading, removal of existing structures unless otherwise stated, preparation of the land to be filled, filling of the land, spreading and compaction of the fill, and all subsidiary work necessary to complete the grading of the cut and fill areas to conform with the lines, grades, slopes, and specifications.

This work is to be accomplished under the constant and continuous supervision of the Owner or his designated representative.

In these specifications the terms "approved" and "as directed" shall refer to directions to the Contractor from the Owner or his designated representative.

II. SUBSURFACE CONDITIONS

Prior to bidding the work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site, including, without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as he may deem necessary for the planning and proper execution of the work. Borings and/or soil investigations shall have been made. Results of these borings and studies will be made available by the Owner to the Contractor upon his request, but the Owner is not responsible for any interpretations or conclusions with respect thereto made by the Contractor on the basis of such information, and the Owner further has no responsibility for the accuracy of the borings and the soil investigations.

If conditions other than those indicated are discovered by the Contractor, the Owner should be notified immediately. The material which the Contractor believes to be a changed condition should not be disturbed so that the Owner can investigate the condition.

III. SITE PREPARATION

Within the specified areas, all trees, brush, stumps, logs, tree roots, and structures scheduled for demolition shall be removed and disposed of.

All cut and fill areas shall be properly stripped. Topsoil will be removed to its full depth and stockpiled for use in finish grading. Any rubbish, organic and other objectionable soils, and other deleterious material, shall be disposed of off the site, or as directed by the Owner or his designated representative if on site disposal is provided. In no case shall such objectionable material be allowed in or under the fill unless specifically authorized in writing.

Prior to the addition of fill, the original ground shall be compacted to job specifications as outlined below. Special notice shall be given to the proposed fill area at this time. If wet spots, spongy conditions, or ground water seepage is found, corrective measures must be taken before the placement of fill.

IV. FORMATION OF FILL AREAS

Fills shall be formed of satisfactory materials placed in successive horizontal layers of not more than eight (8) inches in loose depth for the full width of the cross section. The depth of lift may be increased if the Contractor can demonstrate the ability to compact a larger lift. If compaction is accomplished using hand-tamping equipment, lifts will be limited to 4-inch lose lifts.

All material entering the fill shall be free of organic matter such as leaves, grass, roots, and other objectionable material.

The operations on earth work shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions. The Contractor shall keep the work areas graded to provide the drainage at all times.

The fill material shall be of the proper moisture content before compaction efforts are started. Wetting or drying of the material and manipulation to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content. The moisture content of the fill material should be no more than two (2) percentage points higher or lower than optimum unless otherwise authorized. Sprinkling shall be done with equipment that will satisfactorily distribute the water over the disced area.

Compaction operations shall be continued until the fill is compacted to not less than 90% above foundation elevation and 95% below foundation elevation, of the maximum density as determined in accordance with the latest ASTM D-1557 (Modified). Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer.

In the construction of filled areas, starting layers shall be placed in the deepest portion of the fill, and as placement progresses, additional layers shall be constructed in horizontal planes. If directed, original slopes shall be continuously, vertically benched to provide horizontal fill planes. The size of the benches shall be formed so that the base of the bench is horizontal and the back of the bench is vertical. As many benches as are necessary to bring the site to final grade shall be constructed. Filling operations shall begin on the lowest bench, with the fill being placed in horizontal eight (8) inch loose lifts unless otherwise authorized. The filling shall progress in this manner until the entire first bench has been filled, before any fill is placed on the succeeding benches. Proper

drainage shall be maintained at all times during benching and filling of the benches, to insure that all water is drained away from the fill area.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the areas. Stones or fragmentary rock larger than four (4) inches in their greatest dimensions will not be allowed in the fill unless specifically authorized in writing. Rock fill shall be brought up in layers as specified or as directed, and every effort shall be exerted to fill the voids with the finer material to form a dense, compact mass. Rock or boulders shall be disposed of as deleterious material per Item III.

Frozen material shall not be placed in the fill nor shall the fill be placed upon frozen material.

The Contractor shall be responsible for the stability of all fills made under the contract, and shall replace any portion, which in the opinion of the Owner or his designated representative, has become displaced due to carelessness or negligence on the part of the Contractor. Fill damaged by inclement weather shall be repaired at the Contractor's expense.

V. SLOPE RATIO AND STORM WATER RUN-OFF

Slopes shall not be greater than 2 (horizontal) to 1 (vertical) in both cut and fill, and storm water shall not be drained over the slopes.

VI. GRADING

The Contractor shall furnish, operate, and maintain such equipment as is necessary to construct uniform layers, and control smoothness of grade for maximum compaction and drainage.

VII. COMPACTING

The compaction equipment shall be approved equipment of such design, weight, and quantity to obtain the required density in accordance with these specifications.

VIII. TESTING AND INSPECTION SERVICES

Testing and inspection services will be provided by the Owner.

IX. SPECIAL CONDITIONS

Section III

Boring Log Terminology, Boring Logs, Laboratory Data, And Prints

BORING LOG TERMINOLOGY

Stratum Depth:

Distance in feet and/or inches below ground surface.

Stratum Elevation:

Elevation in feet below ground surface elevation.

Description of Materials:

Major types of soil material existing at boring location. Soil classification based on one of the following systems: Unified Soil Classification System., Ohio State Highway Classification System, Highway Research Board Classification System, Federal Aviation Authority Classification System, Visual Classification.

Sample No.:

Sample numbers are designated consecutively, increasing with depth for each boring.

Sample Type:

"A" Split spoon, 2" O.D., 1-3/8" I.D., 18" in length.

"B" Rock Core

"C" Shelby Tube 3" O.D. except where noted

"D" Soil Probe

"E" Auger Cuttings

"F" Sonic

Sample Depth:

Depth below top of ground at which appropriate sample was taken.

Blows per 6" on Sampler:

The number of blows required to drive a 2" O.D., 1-3/8" I.D., split spoon sampler, using a 140 pound hammer with a 30-inch free fall, is recorded for 6" drive increments. (Example: 3/8/9).

"N" Blows/Ft.:

Standard penetration resistance. This value is based on the total number of blows required for the last 12" of penetration. (Example: 3/8/9: N = 8 + 9 = 17)

BOWSER MORNER

Water Observations:

Depth of water recorded in test boring is measured from top of ground to top of water level. Initial depth indicates water level during boring, completion depth indicates water level immediately after boring, and depth after "X" number hours indicates water level after letting water rise or fall over a time period. Water observations in pervious soil are considered reliable ground water levels for that date. Water observations in impervious soils can not be considered accurate ground water measurements for that date unless records are made over several days' time. Factors such as weather, soil porosity, etc., will cause the ground water level to fluctuate for both pervious and impervious soils.

SOIL DESCRIPTION

Color:

When the color of the soil is uniform throughout, the color recorded will be such as brown, gray, or black and may be modified by adjectives such as light and dark. If the soil's predominant color is shaded by a secondary color, the secondary color precedes the primary color, such as: gray-brown, yellow-brown. If two major and distinct colors are swirled throughout the soil, the colors will be modified by the term mottled, such as: mottled brown and gray.

Particle Size		Visual
Boulders		Larger than 8"
Cobbles		8" to 3"
Gravel	– Coarse	3" to 3/4"
	– Fine	2 mm. To 3/4"
Sand	– Coarse	2 mm. – 0.6 mm. (Pencil lead size)
	– Medium	0.6 mm. – 0.2mm. Table sugar and salt size)
	– Fine	0.2 mm. – 0.06 mm. (Powdered sugar and human hair size)
Silt		0.06 mm. – 0.002 mm.
Clay		0.002 and smaller (Particle size of both Silt and Clay not visible To naked eye

Soil Components

Major Component:	Minor Component Term
Gravel	Trace 1-10%
Sand	Some 11-35%
Silt	And 36-50%
Clay	

Moisture Content

Term	Relative Moisture
Dry	Powdery
Damp	Moisture content below plastic limit
Moist	Moisture content above plastic limit but below liquid limit
Wet	Moisture content Above liquid limit

Condition of Soil Relative to Compactness Granular Material

Very Loose	5 blows/ft. or less
Loose	6 to 10 blows/ft.
Medium Dense	11 to 30 blows/ft.
Dense	30 to 50 blows/ft.
Very Dense	51 blows/ft. or more

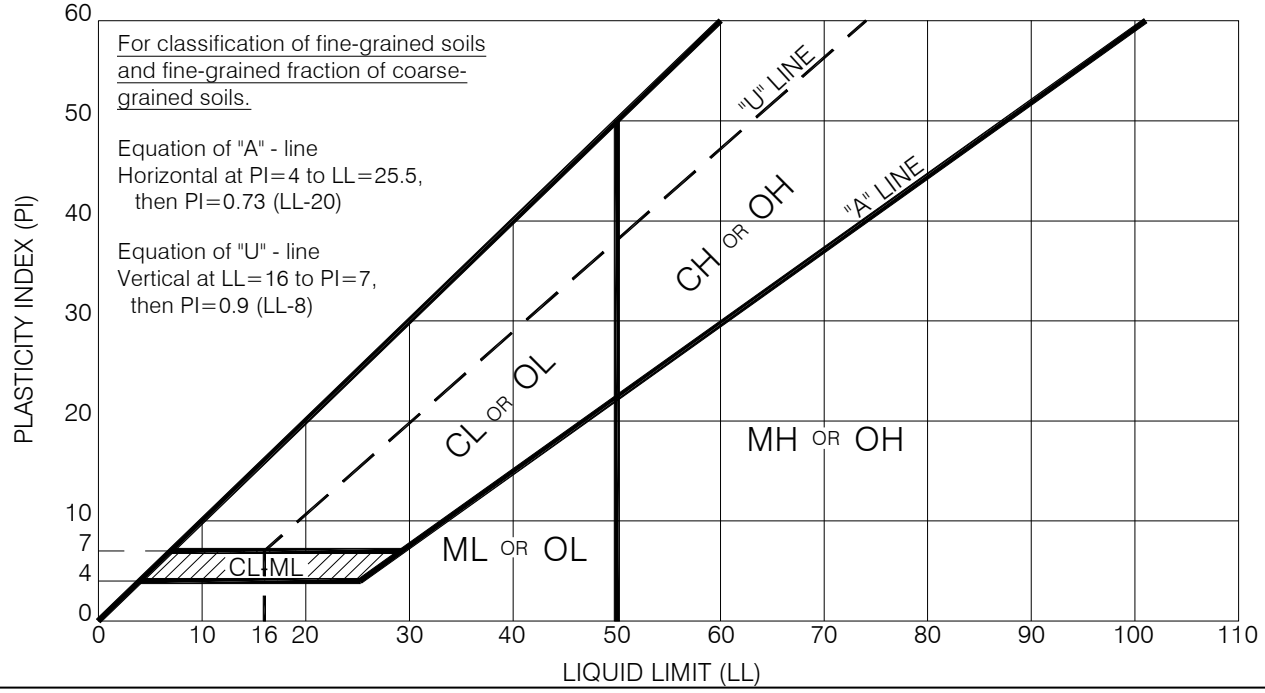
Condition of Soil Relative to Consistency Cohesive Material

Very Soft	3 blows/ft. or less
Soft	4 to 5 blows/ft.
Medium Stiff	6 to 10 blows/ft.
Stiff	11 to 15 blows/ft.
Very stiff	16 to 30 blows/ft.
Hard	31 blows/ft. or more

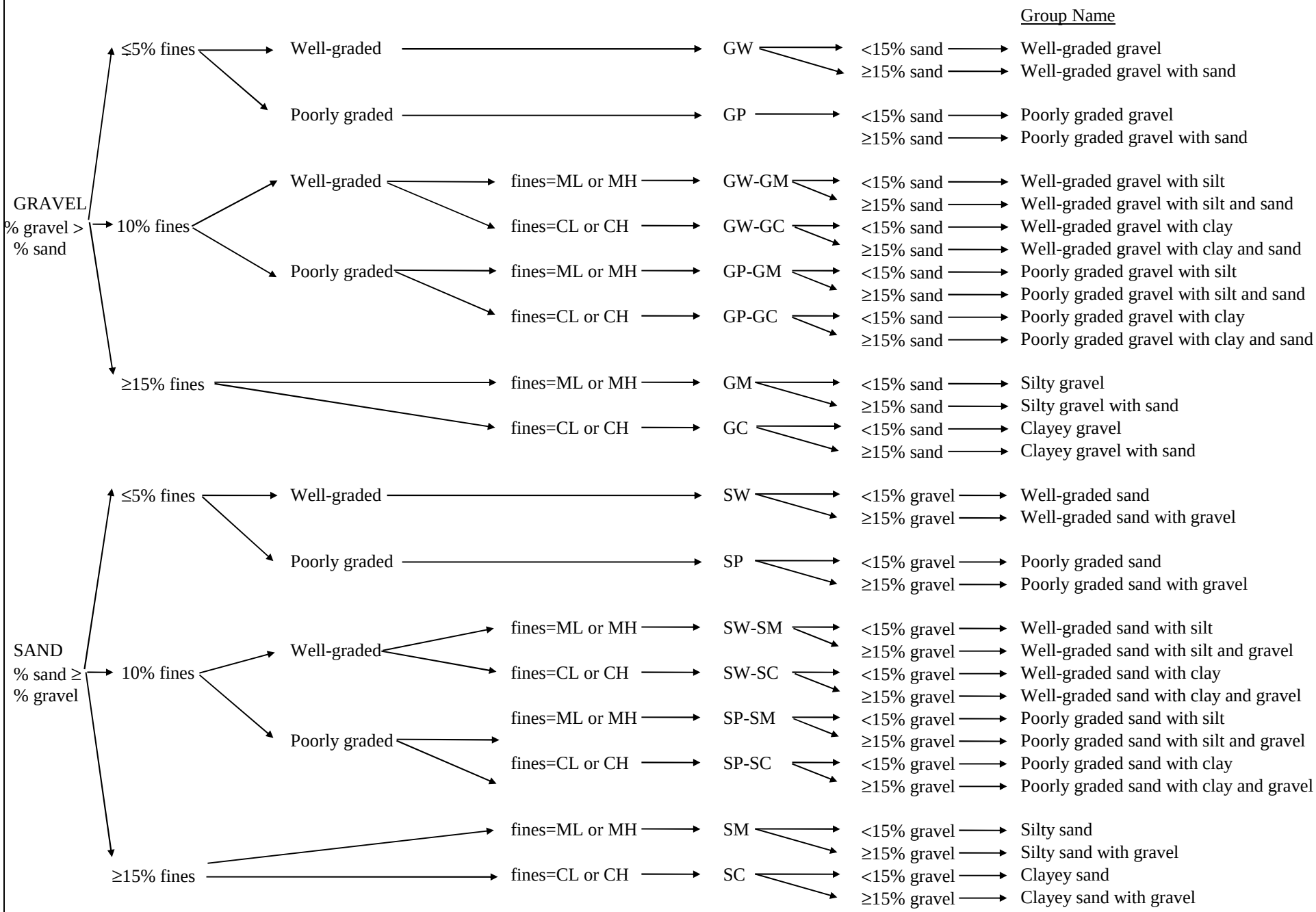
BOWSER MORNER

UNIFIED CLASSIFICATION SYSTEM

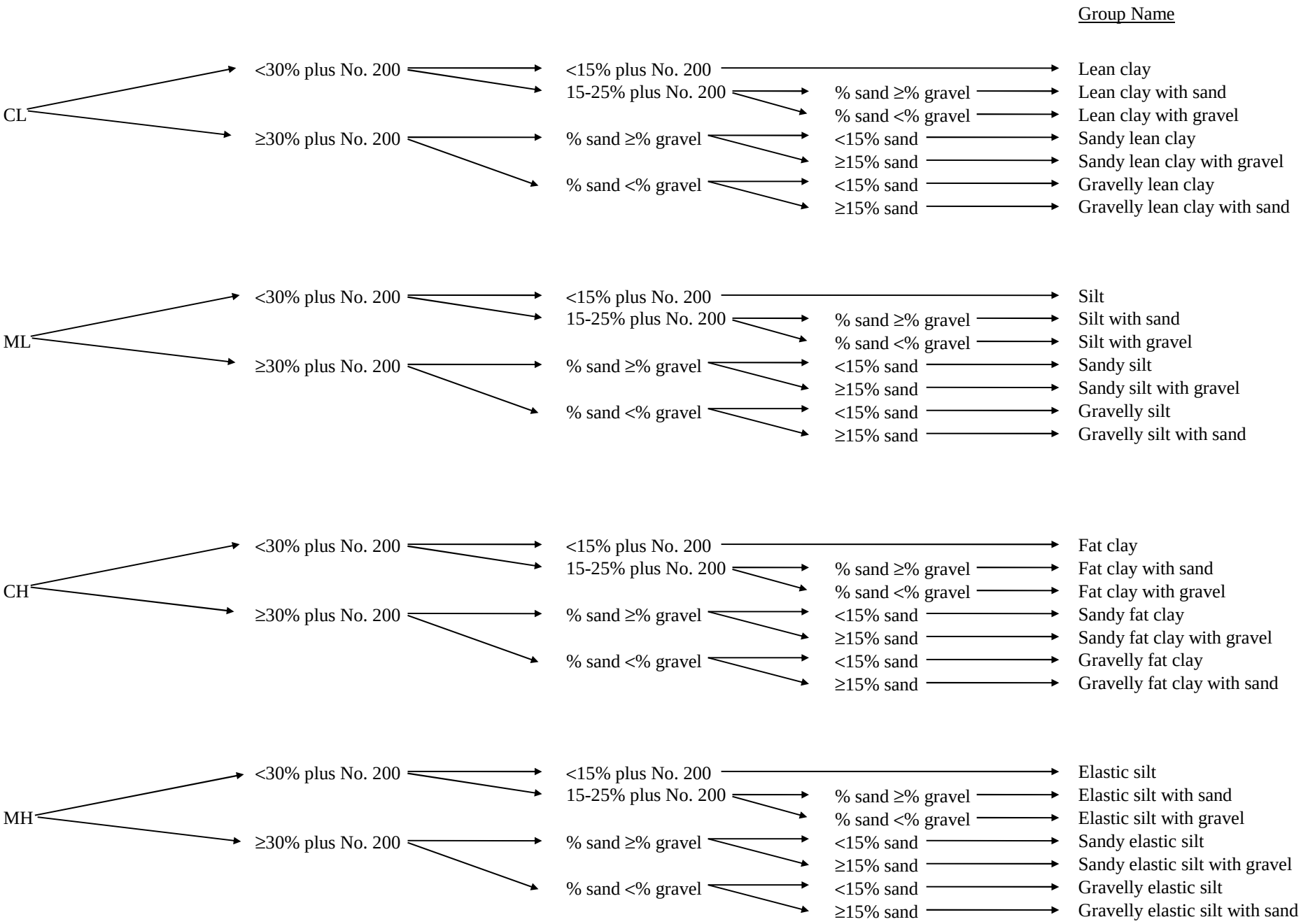
MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVEL WELL-GRADED GRAVEL WITH SAND
				GP	POORLY GRADED GRAVEL POORLY GRADED GRAVEL WITH SAND
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES APPRECIABLE AMT. OF FINES)		GM	SILTY GRAVEL SILTY GRAVEL WITH SAND
				GC	CLAYEY GRAVEL CLAYEY GRAVEL WITH SAND
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SAND WELL-GRADED SAND WITH GRAVEL
				SP	POORLY GRADED SAND POORLY GRADED SAND WITH GRAVEL
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMT. OF FINES)		SM	SILTY SAND SILTY SAND WITH GRAVEL
				SC	CLAYEY SAND CLAYEY SAND WITH GRAVEL
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILT AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	SILT, SILT WITH SAND, SANDY SILT GRAVELLY SILT, GRAVELLY SILT WITH SAND
				CL	LEAN CLAY WITH SAND, SANDY LEAN CLAY GRAVELLY LEAN CLAY WITH SAND
				OL	ORGANIC CLAY, SANDY ORGANIC CLAY ORGANIC SILT, SANDY ORGANIC SILT WITH GRAVEL
	SILT AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	ELASTIC SILT WITH SAND, SANDY ELASTIC SILT GRAVELLY ELASTIC SILT WITH SAND
				CH	FAT CLAY WITH SAND, SANDY FAT CLAY GRAVELLY FAT CLAY WITH SAND
				OH	ORGANIC CLAY WITH SAND, SANDY ORGANIC CLAY, ORGANIC SILT, SANDY ORGANIC SILT
	HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS



Flow Chart for Visually Identifying Soils Based on ASTM D-2488



Flow Chart for Visually Identifying Soils Based on ASTM D-2488



STANDARD PENETRATION RESISTANCE (ASTM D1586)

The purpose of this test is to determine the relative consistency of the soils in a boring, or from boring over the site. This method consists of making a hole in the ground and driving a 2-inch O.D. split spoon sampler into the soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven 18 inches and the number of blows recorded for each 6 inches of penetration. Values of standard penetration (N) are determined in blows per foot, summarizing the flows required for the last two 6-inche increments of penetration.

Example : 2-6-8; N = 14

THIN-WALLED SAMPLER (ASTM D1587)

The purpose of the thin-walled sampler is to recover a relatively undisturbed soil sample for laboratory tests. The sampler is a thin-walled seamless tube with a 3-inch outside diameter, which is hydraulically pressed into the ground, at a constant rate. The ends are then sealed to prevent soil moisture loss, and the tube is returned to the laboratory for tests.

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UNCONFINED COMPRESSION OR TRIAXIAL TESTS (ASTM D 2166)

The unconfined compression test and the triaxial tests are performed to determine the shearing strength of the soil, to use in establishing its safe bearing capacity. In order to perform the unconfined compression test, it is necessary that the soil exhibit sufficient cohesion to stand in an unsupported cylinder. These tests are normally performed on samples which are 6.0 inches in height and 2.85 inches in diameter. In the triaxial test, various lateral stresses can be applied to more closely simulate the actual field conditions. There are several different types of triaxial tests. These are, however, normally performed on constant strain apparatus with a deformation rate of 0.05 inches per minute.

CONSOLIDATION TEST (ASTM D 2435)

The purpose of this test is to determine the compressibility of the soil. This test is performed on a sample of soil which is 2.5 inches in diameter and 1.0 inch in height, and has been trimmed from relatively "undisturbed" samples. The test is performed with a lever system or an air activated piston for applying load. The loads are applied in increments and allowed to remain on the sample for a period of 24 hours. The consolidation of the sample under each individual load is measured and a curve of void ratio vs. Pressure is obtained. From the information obtained in this manner and the column loads of the structure, it is possible to calculate the settlement of each individual building column. This information, together with the shearing strength of the soil, is used to determine the safe bearing capacity for a particular structure.

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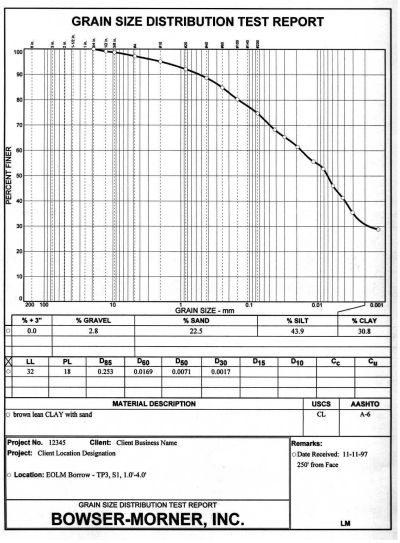
REVISED TO ASTM D4318

ATTERBERG LIMITS (ASTM D423 AND D424)

These tests determine the liquid and plastic limits of soils having a predominant percentage of fine particle (silt and clay) sizes. The liquid limit of a soil is the moisture content expressed as a percent at which the soil changes from a liquid to a plastic state, and the plastic limit is the moisture content at which the soil changes from a plastic to a semi-solid state. Their difference is defined as the plasticity index (P.I. = L.L. - P.L.), which is the change in moisture content required to change the soil from a "semi-solid" to a liquid. These tests furnish information about the soil properties which is important in determining their relative swelling potential and their classifications.

MECHANICAL ANALYSIS (ASTM D422)

This test determines the percent of each particle size of a soil. A sieve analysis is conducted on particle sizes greater than a No. 200 sieve (0.074 mm), and a hydrometer test on particles smaller than the No.200 sieve. The gradation curve is drawn through the points of cumulative percent of particle size, and plotted on semi-logarithmic paper for the combined sieve and hydrometer analysis. This test, together with the Atterberg Limits tests, is used to classify a soil.


GRAIN SIZE DISTRIBUTION TEST REPORT

PERCENT FINER

GRAIN SIZE - mm

% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.8	22.5	43.9	30.8

LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
32	18	0.253	0.0169	0.0071	0.0017				

MATERIAL DESCRIPTION	USCS	AASHTO
brown lean CLAY with sand	CL	A-6

Project No. 12345 Client: Client Business Name
Project: Client Location Designation
Location: EOLM Borrow - TP3, S1, 1.0'-4.0'

Remarks:
Date Received: 11-11-97
250' from Face

GRAIN SIZE DISTRIBUTION TEST REPORT
BOWSER-MORNER, INC.
LM

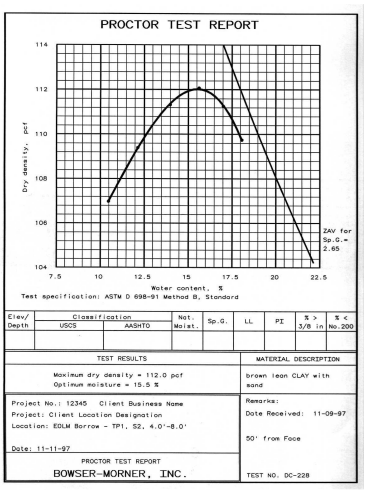
BOWSER MORNER

NATURAL MOISTURE CONTENT (ASTM D2216)

The purpose of this test is to indicate the range of moisture contents present in the soil. A wet sample is weighed, placed in the constant temperature oven at 105^{o} for 24 hours, and re-weighed. The moisture content is the change in weight divided by the dry weight.

PROCTOR TESTS

The purpose of these tests is to determine the maximum density and optimum moisture content of a soil. The Modified Proctor test is performed in accordance with ASTM D1557. The test is performed by dropping a 10-pound hammer 25 times from an 18-inch height on each of 5 equal layers of soil in a 1/30 cubic foot mold, which represents a compaction effort of 56,250 foot pounds per cubic foot. The moisture content is then raised, and this procedure is repeated. A moisture density curve is then plotted, with the density on the ordinate axis and the moisture on the abscissa axis. The moisture content at which the maximum density requirement can be achieved with a minimum compactive effort is designated as the optimum moisture content (O.M.C.). The Standard Proctor test is performed in accordance with ASTM D698. This test is similar to the Modified Proctor test and is performed by dropping a 5.5 pound hammer 25 times from a height of 12 inches on 3 equal layers of soil in a 1/30 cubic foot mold, which represents a compaction effort of 12,375 foot pounds per cubic foot. This test gives proportionately lower results than the Modified Proctor test.


PROCTOR TEST REPORT

Dry density, pcf: 114, 112, 110, 108, 106, 104

Water content, %: 7.5, 10, 12.5, 15, 17.5, 20, 22.5

ZAV for Sp.G.= 2.65

Test specification: ASTM D 698-91 Method B, Standard

Elev/ Depth	Classification USCS	Classification AASHTO	Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No. 200

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 112.0 pcf Optimum moisture = 15.5 %	brown lean CLAY with sand

Project No.: 12345 Client Business Name
Project: Client Location Designation
Location: EDLM Borrow - TP1, S2, 4.0'-8.0'
Date: 11-11-97

Remarks:
Date Received: 11-09-97
50' from Face

PROCTOR TEST REPORT
BOWSER-MORNER, INC.
TEST NO. DC-228

BOWSER MORNER

CLIENT
Palestine-Hollansburg Joint Sewer District

PROJECT
Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **2/28/18** | BORING COMPLETED **2/28/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

1 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1133.7'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				TOPSOIL (10")			
1.0 – 3.0	1A			Medium stiff brown lean CLAY with sand (trace gravel) - moist	2 3 3	6	
4.0 – 7.0	2A, 3A			Very stiff brown sandy lean CLAY (trace gravel) - moist	8 11 11 / 6 7 9	22 / 16	
9.0	4A			Very stiff gray sandy lean CLAY (trace gravel) - moist	5 7 9	16	
10.0				Bottom of boring at 10.0 feet			

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	NONE	2/28/2018
AT COMPLETION	NONE	2/28/2018
OTHER	N/A	0.5HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

Bowser-Morner, Inc.
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CLIENT
Palestine-Hollansburg Joint Sewer District

PROJECT
Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **2/27/18** | BORING COMPLETED **2/27/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

2 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1132.4'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
0.0				TOPSOIL (14")			
1.0	1A			Medium stiff brown lean CLAY with sand (trace gravel) - moist	3 4 4	◇8	
4.0	2A			Loose brown clayey SAND with gravel (trace cobble) - wet	4 4	◇8	▽ ▼
6.0	3A			(Becomes medium dense at 6.0')	5 7 10	◇17	
9.0	4A			Very stiff gray sandy lean CLAY (trace gravel) - moist	7 9 14	◇23	
10.0				Bottom of boring at 10.0 feet			

WATER LEVEL MEASUREMENTS

	DEPTH		DATE
INITIAL	4.5	▽	2/27/2018
AT COMPLETION	5.0	▼	2/27/2018
OTHER	N/A	▼	N/A

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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JOB NO. **183404**

BORING STARTED **2/27/18** | BORING COMPLETED **2/27/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

3 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1131.7'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
0.0				TOPSOIL (10")			
1.0	1A			Medium stiff brown lean CLAY with sand (trace gravel) - moist	3 4 6	◇ 10	
2.0							
3.0							
4.0	2A			Medium dense brown clayey SAND with gravel (trace cobbles) - wet	12		
5.0				Very stiff brown sandy lean CLAY (trace gravel) - moist (Sand seam at 4.6')	10 13	◇ 23	
6.0							
7.0	3A			Very stiff gray sandy lean CLAY (trace gravel) - moist (Sand seam at 7.0')	8 7 14	◇ 21	
8.0							
9.0	4A			(Sand seam at 9.0')	8 9 11	◇ 20	
10.0				Bottom of boring at 10.0 feet			
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	3.5	2/27/2018
AT COMPLETION	2.6	2/27/2018
OTHER	0.5	24HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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PROJECT
Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **2/27/18** | BORING COMPLETED **2/27/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

4 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1134.3'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
0.0				TOPSOIL (13")			
1.0	1A			Stiff brown lean CLAY with sand (trace gravel) - moist	4 5 6	◇11	▼
3.0	2A			(Becomes medium stiff at 3.5')	5 5 3	◇8	
6.0	3A			Very stiff brown sandy lean CLAY (trace gravel) - moist	2 8 15	◇23	▽
9.0	4A			Very stiff gray sandy lean CLAY (trace gravel) - moist	8 12 18	◇30	▼
14.0	5A			(Becomes hard at 13.5')	10 15 21	◇36	
15.0				Bottom of boring at 15.0 feet			

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	6.0 ▽	2/27/2018
AT COMPLETION	10.8 ▼	2/27/2018
OTHER	1.3 ▼	24HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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PROJECT
Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **2/27/18** | BORING COMPLETED **2/27/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

5 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1134.6'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
0.0				TOPSOIL (7")			
1.0	1A			Medium stiff brown lean CLAY with sand (trace gravel) - moist	3 3 4	◇ 7	▼
2.0							
3.0							▼
4.0	2A			Very stiff brown sandy lean CLAY (trace gravel) - moist	7 9 8	◇ 17	
5.0							
6.0	3A			(Becomes gray at 6.5')	6 13	◇ 26	▽
7.0				Medium dense brown SAND with gravel (some clay, some silt) - wet	13		
8.0							
9.0	4A			(Trace cobbles at 8.5')	10 9	◇ 15	
10.0				Stiff gray sandy lean CLAY (trace gravel) - moist	6		
11.0							
12.0							
13.0							
14.0	5A			(Becomes very stiff at 13.5')	5 7 9	◇ 16	
15.0				Bottom of boring at 15.0 feet			
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

COMMENTS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	6.8 ▽	2/27/2018
AT COMPLETION	2.9 ▼	2/27/2018
OTHER	0.8 ▼	24HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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PROJECT
Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **2/27/18** | BORING COMPLETED **2/27/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

6 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1133.6'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				TOPSOIL (8")			
1.0	1A			Stiff brown lean CLAY with sand (trace gravel) - moist	5 5 6	◇11	▼ ▼
2.0							
3.0				(Becomes soft at 3.5')	3		▽
4.0	2A			Very loose brown clayey SAND (trace gravel) - wet	2 3	◇5	
5.0							
6.0	3A			Very stiff gray sandy lean CLAY (trace gravel) - moist (Sand seam at 6.6')	5 11 11	◇22	
7.0							
8.0				(Becomes hard at 8.5')	13		
9.0	4A				16 20	◇36	
10.0				Bottom of boring at 10.0 feet			
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	3.5 ▽	2/27/2018
AT COMPLETION	2.2 ▼	2/27/2018
OTHER	1.2 ▼	24HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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PROJECT
Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **2/27/18** | BORING COMPLETED **2/27/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

7 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1135.6'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
0.0				TOPSOIL (12")			
1.0				Medium stiff brown lean CLAY with sand (trace gravel) - moist	3		
2.0	1A			Loose brown silty SAND (some clay, trace gravel) - moist	4 4	8	
3.0							
4.0	2A			(Becomes medium dense at 3.5')	7 7 9	16	
5.0							
6.0				(Becomes wet at 6.0')	5		
7.0	3A				8 9	17	
8.0							
9.0	4A			Very stiff gray sandy lean CLAY (trace gravel) - moist	7 11		
10.0				(Sand seam at 9.5')	15	26	
11.0							
12.0							
13.0							
14.0	5A			(Sand seam at 14.0')	6 9 12	21	
15.0				Bottom of boring at 15.0 feet			
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

COMMENTS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	6.0	2/27/2018
AT COMPLETION	2.8	2/27/2018
OTHER	1.7	24HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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CLIENT
Palestine-Hollansburg Joint Sewer District

PROJECT
Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **2/28/18** | BORING COMPLETED **2/28/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

8 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1134.7'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
0.0				TOPSOIL (6")			
1.0	1A			Medium stiff brown lean CLAY with sand (trace gravel) - moist	4 4 6	◇ 10	▼
3.0							▼
4.0	2A				3 4 4	◇ 8	
6.0							▽
7.0	3A			Very loose brown silty SAND (trace clay, trace gravel) - wet	1 1 4	◇ 5	
9.0	4A			(Becomes medium dense at 8.5')	3 5		
10.0				Stiff gray sandy lean CLAY (trace gravel) - moist	7	◇ 12	
				Bottom of boring at 10.0 feet			

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	6.0 ▽	2/28/2018
AT COMPLETION	3.5 ▼	2/28/2018
OTHER	1.8 ▼	2.5HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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JOB NO. **183404**

BORING STARTED **2/28/18** | BORING COMPLETED **2/28/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

9 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1134.1'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
0.0				TOPSOIL (8")			
1.0	1A			Stiff brown lean CLAY with sand (trace gravel) - moist	4 5 6	11	▼
3.0				(Becomes medium stiff at 3.5')			
4.0	2A			(Sand seam at 3.7')	2 4 5	9	
5.0				Very stiff gray sandy lean CLAY (trace gravel) - moist			▽
6.0	3A				5 7 10	17	▼
8.0				(Becomes stiff at 8.5')			
9.0	4A			(Sand seam at 9.0')	4 6 8	14	
10.0				Bottom of boring at 10.0 feet			
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

COMMENTS

REMARKS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	6.0 ▽	2/28/2018
AT COMPLETION	7.5 ▼	2/28/2018
OTHER	2.6 ▼	1.5HRS

A — SPLIT SPOON
B — ROCK CORE
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E — AUGER CUTTINGS
F — SONIC

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PROJECT
Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **3/2/18** | BORING COMPLETED **3/2/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

10 Boring No.

Sheet 1 of 2

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **93.2'***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE	REMARKS
				(FILL) ASPHALT pavement (7")			
				(FILL) GRANULAR base (6")			
1.0 – 3.0	1A			(FILL) Medium stiff gray lean CLAY with sand (trace gravel) - moist	2 3 6	9	
4.0 – 5.0	2A			(ORIGINAL) Very stiff brown sandy lean CLAY (trace gravel) - moist	8 12 15	27	
6.0 – 7.0	3A				7 10 12	22	
8.0 – 9.0	4A				5 9 11	20	
10.0 – 13.0					7		
14.0 – 15.0	5A			Medium dense brown silty SAND (trace gravel) - moist	12 15	27	▽
16.0 – 17.0				Very stiff gray sandy lean CLAY (trace gravel) - moist			
18.0 – 19.0	6A				5 7 9	16	
20.0 – 22.0							

Continued Next Page

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	14.2 ▽	3/2/2018
AT COMPLETION	23.0 ▼	3/2/2018
OTHER	N/A ▼	N/A

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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JOB NO. **183404**

BORING STARTED **3/2/18** | BORING COMPLETED **3/2/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

10 Boring No.

Sheet 2 of 2

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **93.2'***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
23.0				Very stiff gray sandy lean CLAY (trace gravel) - moist			▼
24.0	7A				7 12 13	◇25	
25.0							
26.0							
27.0							
28.0							
29.0	8A			(Becomes hard at 28.5')	10 17 25	◇42	
30.0				Bottom of boring at 30.0 feet			
31.0							
32.0							
33.0							
34.0							
35.0							
36.0							
37.0							
38.0							
39.0							
40.0							
41.0							
42.0							
43.0							
44.0							
45.0							
46.0							
47.0							
48.0							

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PROJECT
Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **3/1/18** | BORING COMPLETED **3/1/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

11 Boring No.

Sheet 1 of 2

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **100.1'***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE	REMARKS
				(FILL) ASPHALT pavement (3")			
				(FILL) GRANULAR base (3.5")			
1.0 – 3.0	1A			(FILL) Very stiff gray lean CLAY with sand (trace gravel) - moist	7 9 11	20	
4.0 – 5.0	2A			(ORIGINAL) Hard brown sandy lean CLAY (trace gravel) - moist	10 13 18	31	
6.0 – 7.0	3A			(Becomes very stiff at 6.0')	6 9 17	26	
8.0 – 10.0	4A				8 11 13	24	
11.0 – 15.0	5A			Stiff gray sandy lean CLAY (trace gravel) - moist	4 6 8	14	
16.0 – 20.0	6A			(Becomes very stiff at 18.5')	7 9 11	20	
21.0 – 22.0							

Continued Next Page

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	28.5	3/1/2018
AT COMPLETION	28.0	3/1/2018
OTHER	N/A	N/A

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
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JOB NO. **183404**

BORING STARTED **3/1/18** | BORING COMPLETED **3/1/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

11 Boring No.

Sheet 2 of 2

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **100.1'***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
23.0				Very stiff gray sandy lean CLAY (trace gravel) - moist			
24.0	7A				6 10 12	◇22	
25.0							
26.0							
27.0							
28.0							▼ ▽
29.0	8A			Very dense gray clayey SAND with gravel (trace silt) - wet	17 37 50/5"	◇87	
30.0				Bottom of boring at 30.0 feet			
31.0							
32.0							
33.0							
34.0							
35.0							
36.0							
37.0							
38.0							
39.0							
40.0							
41.0							
42.0							
43.0							
44.0							
45.0							
46.0							
47.0							
48.0							

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BORING STARTED **3/1/18** | BORING COMPLETED **3/1/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

12 Boring No.

Sheet 1 of 2

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **101.6'***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

N VALUE, blows/ft.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE	REMARKS
0.0				(FILL) ASPHALT pavement (5")			
0.4				(FILL) GRANULAR base (13")			
1.0					6		
2.0	1A			(ORIGINAL) Medium stiff brown sandy lean CLAY (trace gravel) - moist	4 4	8	
3.0							
4.0	2A			(Becomes stiff at 3.5')	5 6 9	15	
5.0							
6.0	3A				4 6 7	13	
8.0							
9.0	4A				5 6 6	12	
10.0							
13.0							▼ ▽
14.0	5A			Very loose brown silty SAND (trace clay, trace gravel) - wet	2 1 2	3	
15.0							
18.0							
19.0	6A			Medium dense brown SAND with gravel (trace silt) - moist	7 9 12	21	
22.0							

Continued Next Page

WATER LEVEL MEASUREMENTS

	DEPTH		DATE
INITIAL	13.5	▽	3/1/2018
AT COMPLETION	13.0	▼	3/1/2018
OTHER	N/A	▼	N/A

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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JOB NO. **183404**

BORING STARTED **3/1/18** | BORING COMPLETED **3/1/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

12 Boring No.

Sheet 2 of 2

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **101.6'***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
23.0				Very stiff gray sandy lean CLAY (trace gravel) - moist			
24.0	7A				10 9 10	◇19	
25.0							
26.0							
27.0							
28.0							
29.0	8A			(Becomes hard at 28.5')	10 16 18	◇34	
30.0				Bottom of boring at 30.0 feet			
31.0							
32.0							
33.0							
34.0							
35.0							
36.0							
37.0							
38.0							
39.0							
40.0							
41.0							
42.0							
43.0							
44.0							
45.0							
46.0							
47.0							
48.0							

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PROJECT
Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **5/22/18** | BORING COMPLETED **5/22/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

13 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1138.0'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
0.0				TOPSOIL (8")			
1.0	1A			Stiff brown lean CLAY with sand (trace gravel) - moist	3 5 6	11	
3.0				(Becomes medium stiff at 3.5')	3 2 4	6	▼
5.0	2A						
6.0					2 3 4	7	▽ ▼
8.0	3A						
9.0	4A			Medium dense brown SAND (trace gravel) - wet	15 17 11	28	
10.0				Very stiff gray sandy lean CLAY (trace gravel) - moist			
13.0					4 7 10	17	
15.0	5A						
18.0					5 9 12	21	
19.0	6A						
20.0				Bottom of boring at 20.0 feet			
22.0							

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	6.0	5/22/2018
AT COMPLETION	7.0	5/22/2018
OTHER	3.8	7HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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JOB NO. **183404**

BORING STARTED **5/22/18** | BORING COMPLETED **5/22/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

14 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1140.0'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				TOPSOIL (7")			
1.0				Medium stiff brown lean CLAY with sand (trace gravel) - moist	3		
2.0	1A				4 3	◇ 7	
3.0							
4.0				(Becomes stiff at 3.5')	5		
5.0	2A				7 8	◇ 15	
6.0				(Becomes very soft at 6.0')	3		
7.0	3A			Very loose brown clayey SAND with gravel - wet	2 1	◇ 3	▼ ▼
8.0							
9.0				(Becomes medium dense at 8.5')	8		
10.0	4A				8 10	◇ 18	
11.0							
12.0							
13.0				Medium stiff gray sandy lean CLAY (trace gravel) - moist	3		
14.0	5A				3 5	◇ 8	
15.0							
16.0							
17.0							
18.0							
19.0				(Becomes stiff at 18.5')	4		
20.0	6A				6 8	◇ 14	
21.0				Bottom of boring at 20.0 feet			
22.0							

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	6.7	5/22/2018
AT COMPLETION	7.0	5/22/2018
OTHER	6.5	5HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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JOB NO. **183404**

BORING STARTED **5/22/18** | BORING COMPLETED **5/22/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

15 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1136.5'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	BLOW COUNTS	N VALUE, blows/ft.	REMARKS
			COMMENTS	
0.0			TOPSOIL (11")	
1.0	1A	2 3 5	Medium stiff gray lean CLAY with sand (trace gravel) - moist	
2.0				
3.0				
4.0	2A	2 2 3	(Becomes soft at 3.5')	
5.0				
6.0	3A	10 10 11	Medium dense brown clayey SAND with gravel - wet	
7.0				
8.0				
9.0	4A	17 18 14	(Becomes dense at 8.5')	
10.0				
11.0				
12.0	5A	5 8 10	Very stiff gray sandy lean CLAY (trace gravel) - moist	
13.0				
14.0				
15.0				
16.0				
17.0				
18.0	6A	4 5 8	(Becomes stiff at 18.5')	
19.0				
20.0			Bottom of boring at 20.0 feet	
21.0				
22.0				

N VALUE, blows/ft.: 10 20 30 40 50 60 70 80 90

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	6.0	5/22/2018
AT COMPLETION	5.2	5/22/2018
OTHER	2.3	3HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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JOB NO. **183404**

BORING STARTED **5/22/18** | BORING COMPLETED **5/22/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

16 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1137.9'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				TOPSOIL (8")			
1.0				Soft brown lean CLAY with sand (trace gravel) - moist	2		
2.0	1A				2 3	◇5	
3.0							
4.0	2A			(Becomes medium stiff at 3.5')	4		▼
5.0					4 5	◇9	
6.0				Medium dense brown silty SAND with gravel - wet	8		▽
7.0	3A				10	◇22	▼
8.0				Very stiff brown sandy lean CLAY with sand (trace gravel) - moist	12		
9.0	4A				7 8	◇19	
10.0					11		
11.0							
12.0							
13.0							
14.0	5A			Medium dense brown SAND with gravel (some silt) - wet	6		
15.0					8 9	◇17	
16.0							
17.0				Very stiff gray sandy lean CLAY (trace gravel) - moist			
18.0					5		
19.0	6A				8	◇21	
20.0				Bottom of boring at 20.0 feet	13		
21.0							
22.0							

COMMENTS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	6.0 ▽	5/22/2018
AT COMPLETION	7.5 ▼	5/22/2018
OTHER	4.3 ▼	2HRS

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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Soil Study for Proposed Wastewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

JOB NO. **183404**

BORING STARTED **5/22/18** | BORING COMPLETED **5/22/18**

DRILLER **dc** | METHOD **3 1/4" HSA**

TYPED BY **cr**

17 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **39°59'51"** LONG. **84°47'37"**

SURFACE ELEVATION **1139.5'**

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

VISUAL CLASSIFICATION OF THE MATERIAL

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				TOPSOIL (8")			
1.0	1A			Medium stiff brown lean CLAY with sand (trace gravel) - moist	3 4 6	◇10	
2.0							
3.0							
4.0	2A			(Becomes stiff at 3.5')	6 7 8	◇15	
5.0							
6.0	3A				5 6 9	◇15	
7.0							
8.0				Hard brown and gray sandy lean CLAY (trace gravel, trace cobbles) - moist			
9.0	4A				8 17 22	◇39	
10.0							
11.0							
12.0							
13.0				Very stiff gray sandy lean CLAY (trace gravel) - moist			
14.0	5A				7 9 12	◇21	
15.0							
16.0							
17.0							
18.0							
19.0	6A			(Becomes stiff at 18.5')	4 6 7	◇13	
20.0				Bottom of boring at 20.0 feet			
21.0							
22.0							

COMMENTS

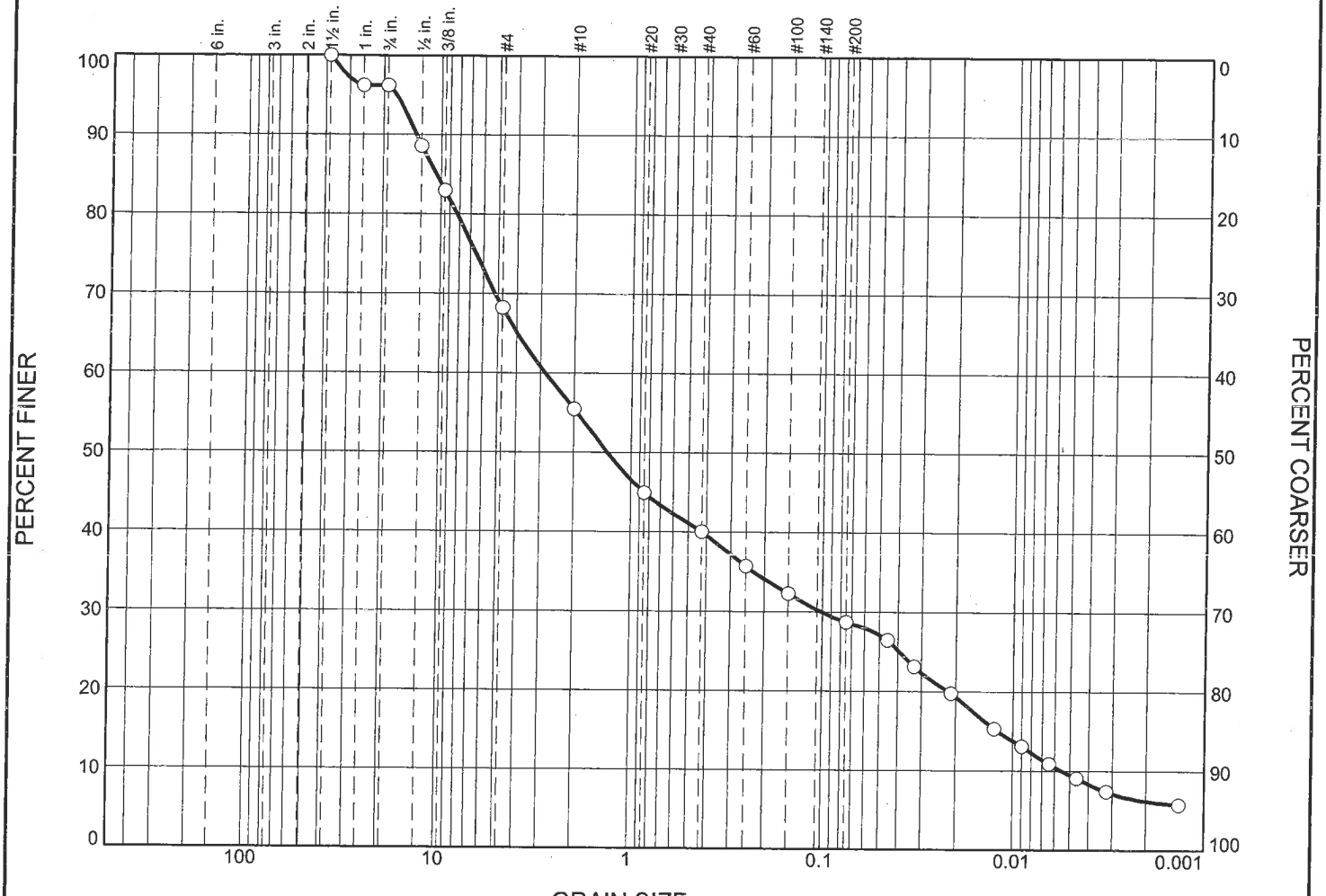
WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	NONE	5/22/2018
AT COMPLETION	NONE	5/22/2018
OTHER	N/A	N/A

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

Bowser-Morner, Inc.
Telephone:
Fax:
BOWSER MORNER

GRAIN SIZE DISTRIBUTION REPORT



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	3.8	28.0	12.7	15.5	11.3	19.2	9.5

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	22	17	10.5858	2.8230	1.3268	0.1008	0.0120	0.0055	0.65	513.19

Material Description	USCS	AASHTO
○ brown silty, clayey SAND with gravel	SC-SM	A-2-4(0)

Project No. 183404 **Client:** Palestine-Hollansburg Joint

Project: Soil Study - Water Treat Lagoons

○ **Source of Sample:** B-2 **Depth:** 6.0' - 7.5' **Sample Number:** S-3

Remarks:

○ As Received

Moisture Content: 12.0%

BOWSER-MORNER, INC.

Dayton, Ohio

GRAIN SIZE DISTRIBUTION TEST DATA

4/12/2018

Client: Palestine-Hollansburg Joint
Project: Soil Study - Water Treat Lagoons
Project Number: 183404
Location: B-2
Depth: 6.0' - 7.5'
Sample Number: S-3
Material Description: brown silty, clayey SAND with gravel
Liquid Limit: 22
Plastic Limit: 17
USCS Classification: SC-SM
AASHTO Classification: A-2-4(0)
Testing Remarks: As Received
Moisture Content: 12.0%

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
911.10	232.13	0.00	1.50	0.00	100.0	0.0
			1.00	25.52	96.2	3.8
			0.75	25.52	96.2	3.8
			0.50	77.43	88.6	11.4
			0.375	115.44	83.0	17.0
			#4	215.69	68.2	31.8
			#10	302.34	55.5	44.5
49.87	0.00	0.00	#20	9.46	44.9	55.1
			#40	13.88	40.0	60.0
			#60	17.75	35.7	64.3
			#100	20.84	32.3	67.7
			#200	24.06	28.7	71.3

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 55.5
Weight of hydrometer sample =50.02
Hygroscopic moisture correction:
Moist weight and tare = 46.29
Dry weight and tare = 46.24
Tare weight = 31.21
Hygroscopic moisture = 0.3%
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -5.5
Meniscus correction only = 0.0
Specific gravity of solids = 2.65
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.294964 - 0.164 - 0.164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	21.5	29.0	23.8	0.0134	29.0	11.5	0.0455	26.5	73.5
2.00	21.5	26.0	20.8	0.0134	26.0	12.0	0.0329	23.1	76.9
5.00	21.5	23.0	17.8	0.0134	23.0	12.5	0.0212	19.8	80.2
15.00	21.5	19.0	13.8	0.0134	19.0	13.2	0.0126	15.3	84.7
30.00	21.5	17.0	11.8	0.0134	17.0	13.5	0.0090	13.1	86.9
60.00	21.5	15.0	9.8	0.0134	15.0	13.8	0.0064	10.9	89.1
120.00	21.0	13.5	8.2	0.0135	13.5	14.1	0.0046	9.1	90.9
250.00	21.0	12.0	6.7	0.0135	12.0	14.3	0.0032	7.4	92.6
1440.00	21.0	10.5	5.2	0.0135	10.5	14.6	0.0014	5.8	94.2

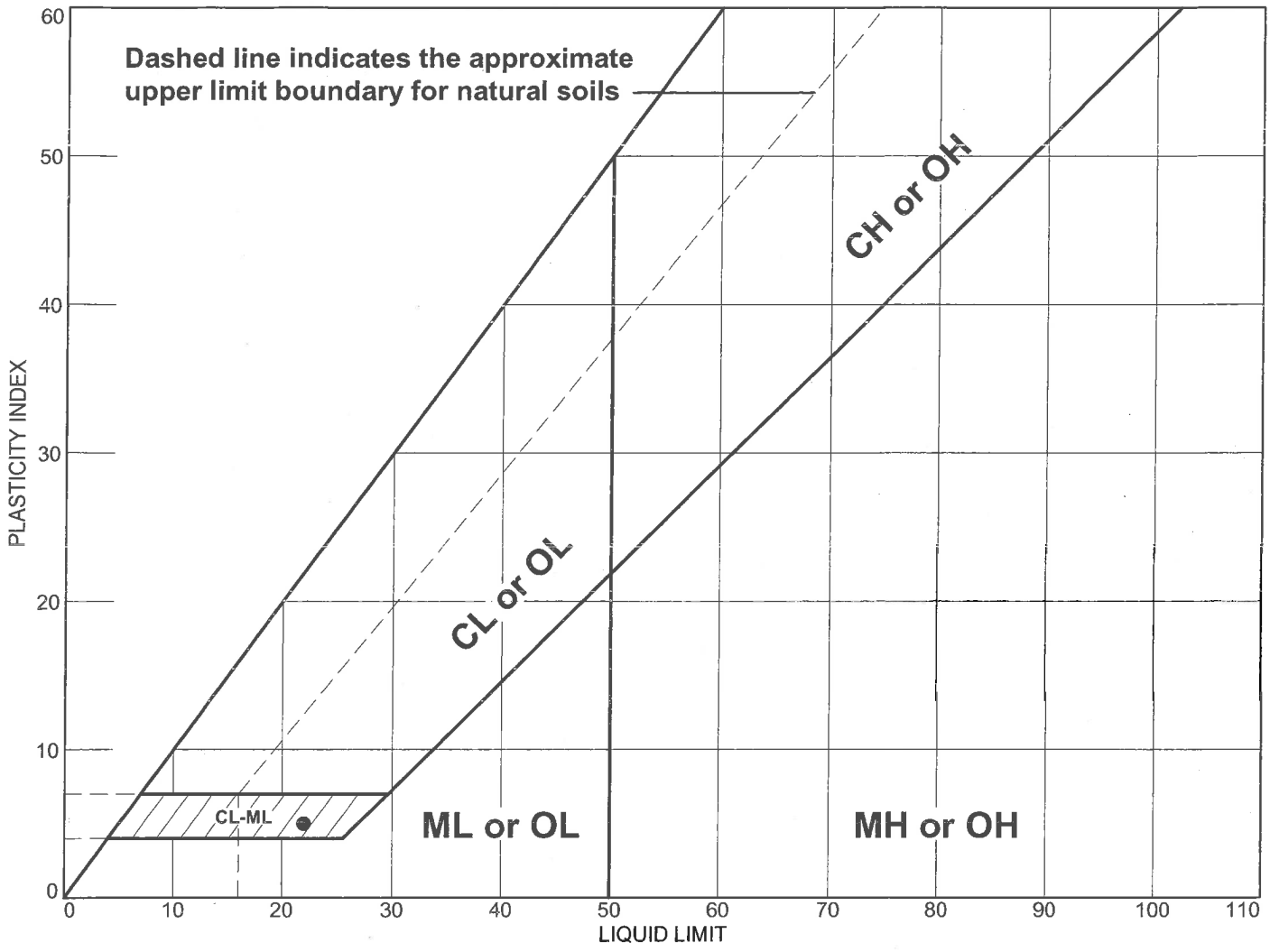
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	3.8	28.0	31.8	12.7	15.5	11.3	39.5	19.2	9.5	28.7

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0055	0.0120	0.0218	0.1008	0.4232	1.3268	2.8230	8.2285	10.5858	13.5208	17.1472

Fineness Modulus	C_u	C_c
3.35	513.19	0.65

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown silty, clayey SAND with gravel	22	17	5	40.0	28.7	SC-SM

Project No. 183404 **Client:** Palestine-Hollansburg Joint

Project: Soil Study - Water Treat Lagoons

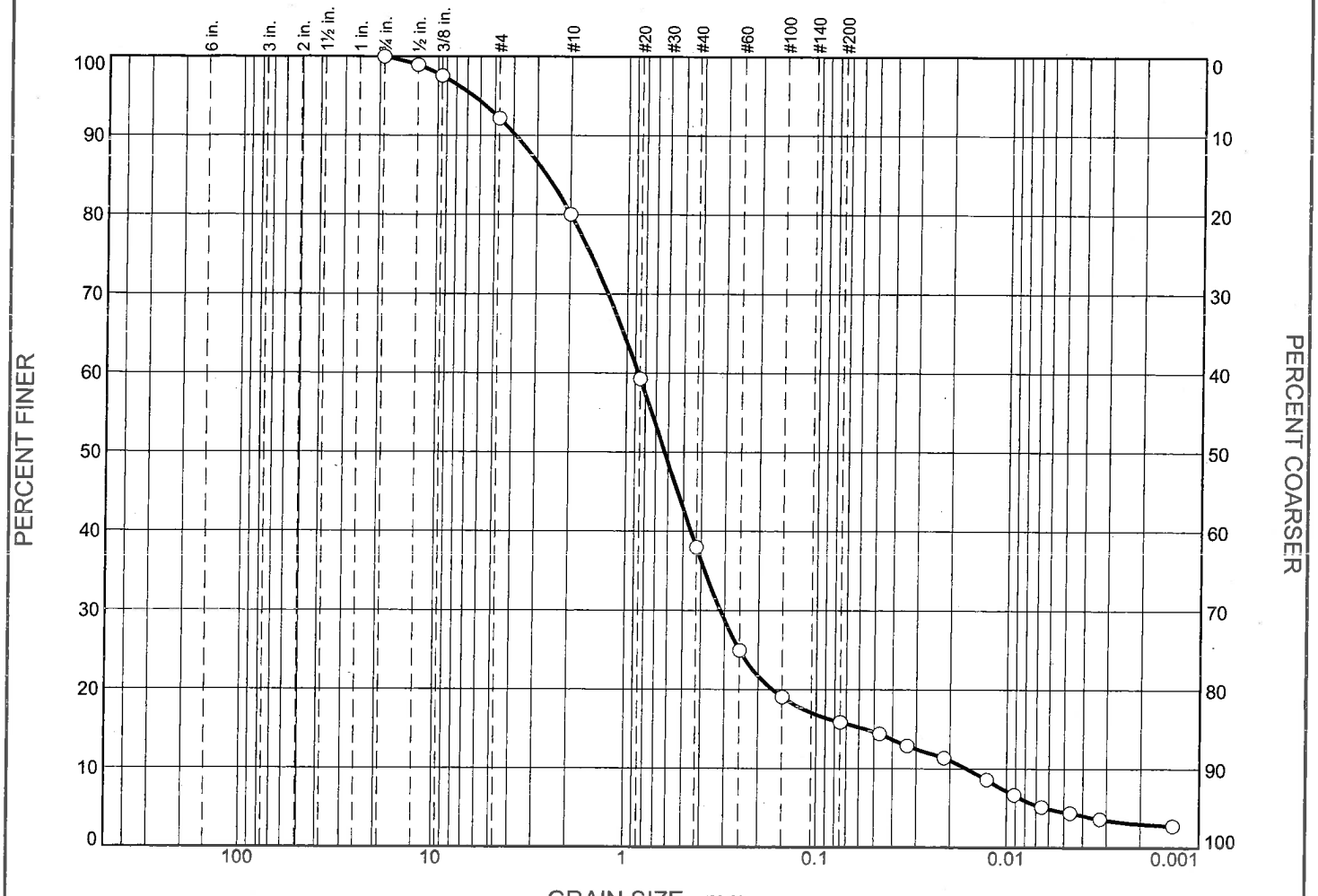
● **Source of Sample:** B-2 **Depth:** 6.0' - 7.5' **Sample Number:** S-3

Remarks:

BOWSER-MORNER, INC.

Dayton, Ohio

GRAIN SIZE DISTRIBUTION REPORT



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	7.8	12.2	42.0	22.1	11.3	4.6

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	2.6727	0.8716	0.6280	0.3169	0.0549	0.0162	7.13	53.90

Material Description	USCS	AASHTO
○ gray silty SAND	SM	A-1-b

Project No. 183404 **Client:** Palestine-Hollansburg Joint

Project: Soil Study - Water Treat Lagoons

○ **Source of Sample:** B-7 **Depth:** 6.0' - 7.5' **Sample Number:** S-3

Remarks:

○ As Received

Moisture Content: 16.0%

BOWSER-MORNER, INC.

Dayton, Ohio

GRAIN SIZE DISTRIBUTION TEST DATA

4/12/2018

Client: Palestine-Hollansburg Joint
Project: Soil Study - Water Treat Lagoons
Project Number: 183404
Location: B-7
Depth: 6.0' - 7.5'
Sample Number: S-3
Material Description: gray silty SAND
Liquid Limit: NV
Plastic Limit: NP
USCS Classification: SM
AASHTO Classification: A-1-b
Testing Remarks: As Received
Moisture Content: 16.0%

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
1046.20	226.55	0.00	0.75	0.00	100.0	0.0
			0.50	8.58	99.0	1.0
			0.375	19.97	97.6	2.4
			#4	64.07	92.2	7.8
			#10	163.53	80.0	20.0
104.84	0.00	0.00	#20	27.22	59.3	40.7
			#40	55.10	38.0	62.0
			#60	72.17	24.9	75.1
			#100	79.88	19.1	80.9
			#200	84.06	15.9	84.1

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 80.0
Weight of hydrometer sample =105.05
Hygroscopic moisture correction:
Moist weight and tare = 58.25
Dry weight and tare = 58.20
Tare weight = 28.22
Hygroscopic moisture = 0.2%
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -5.5
Meniscus correction only = 0.0
Specific gravity of solids = 2.65
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.294964 - 0.164 - 0.164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	22.0	24.0	18.9	0.0133	24.0	12.4	0.0468	14.4	85.6
2.00	22.0	22.0	16.9	0.0133	22.0	12.7	0.0335	12.9	87.1
5.00	22.0	20.0	14.9	0.0133	20.0	13.0	0.0215	11.4	88.6
15.00	21.5	16.5	11.3	0.0134	16.5	13.6	0.0127	8.6	91.4
30.00	21.5	14.0	8.8	0.0134	14.0	14.0	0.0092	6.7	93.3
60.00	21.5	12.0	6.8	0.0134	12.0	14.3	0.0065	5.2	94.8
120.00	21.5	11.0	5.8	0.0134	11.0	14.5	0.0047	4.4	95.6
250.00	21.5	10.0	4.8	0.0134	10.0	14.7	0.0032	3.7	96.3
1440.00	21.0	9.0	3.7	0.0135	9.0	14.8	0.0014	2.8	97.2

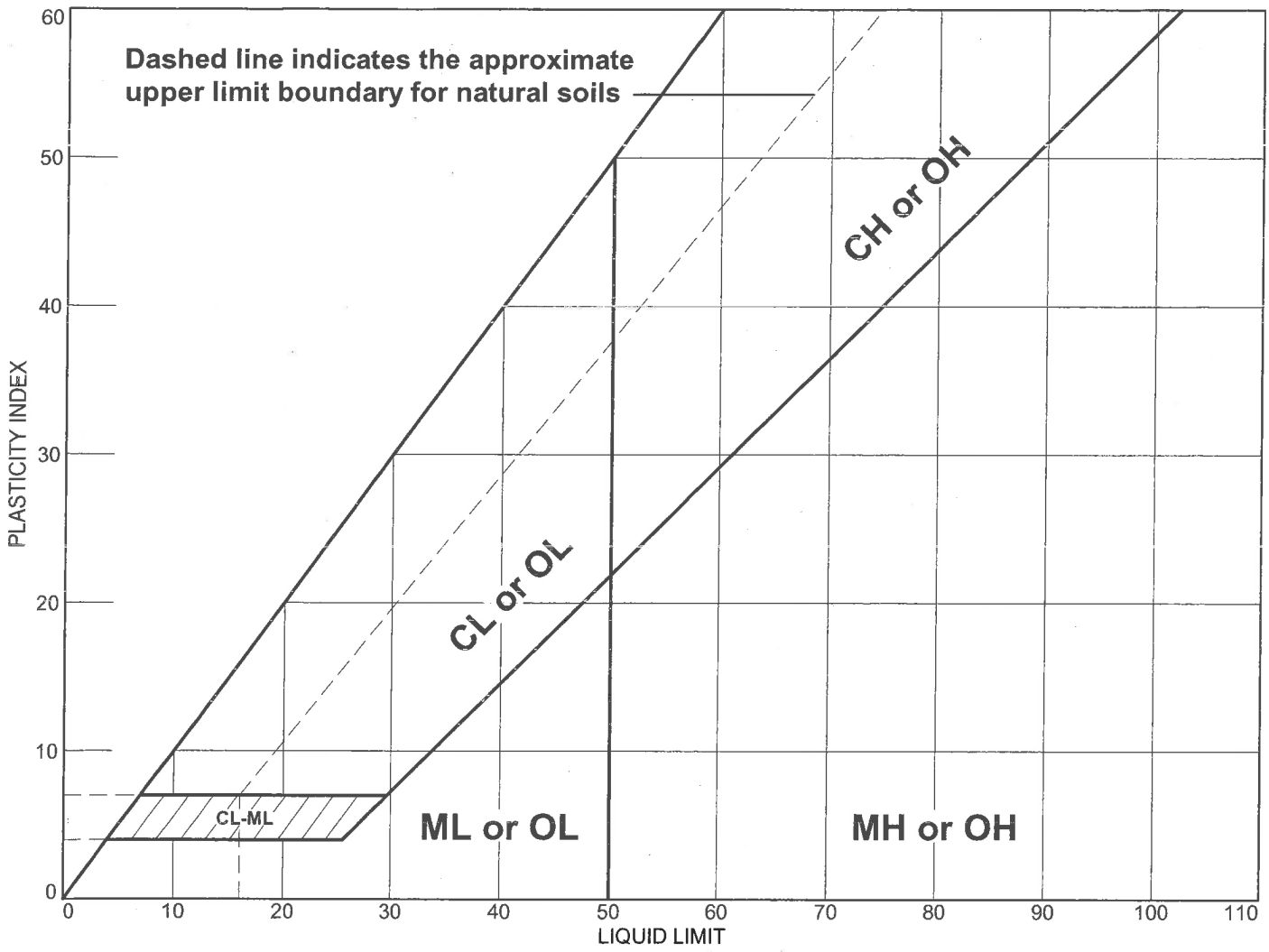
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	7.8	7.8	12.2	42.0	22.1	76.3	11.3	4.6	15.9

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0062	0.0162	0.0549	0.1692	0.3169	0.4549	0.6280	0.8716	1.9948	2.6727	3.8803	6.5166

Fineness Modulus	C_u	C_c
2.63	53.90	7.13

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	gray silty SAND	NV	NP	NP	38.0	15.9	SM

Project No. 183404 **Client:** Palestine-Hollansburg Joint

Project: Soil Study - Water Treat Lagoons

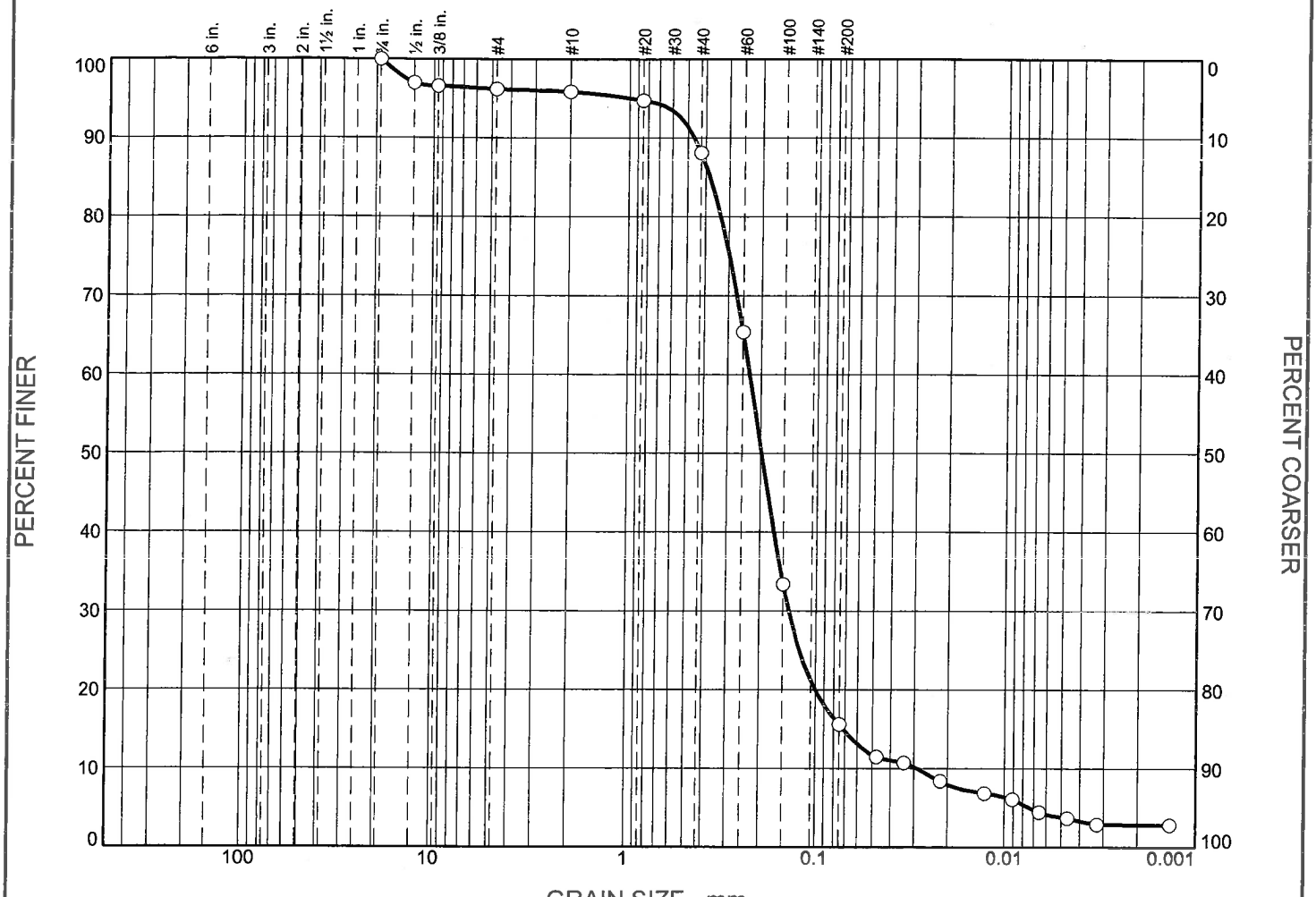
● **Source of Sample:** B-7 **Depth:** 6.0' - 7.5' **Sample Number:** S-3

Remarks:

BOWSER-MORNER, INC.

Dayton, Ohio

GRAIN SIZE DISTRIBUTION REPORT



	% Boulders	% +3"	% Gravel		% Sand		% Fines	
			Coarse	Fine	Coarse	Fine	Silt	Clay
○	0.0	0.0	0.0	4.1	7.8	72.5	11.8	3.8

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.3813	0.2295	0.1973	0.1395	0.0713	0.0289	2.94	7.95

Material Description	USCS	AASHTO
○ brown silty SAND	SM	A-2-4(0)

Project No. 183404 **Client:** Palestine-Hollansburg Joint

Project: Soil Study - Water Treat Lagoons

○ **Source of Sample:** B-13 **Depth:** 8.5' - 10.0' **Sample Number:** 4A

Remarks:

○ As Received

Moisture Content: 21.8%

BOWSER-MORNER, INC.

Dayton, Ohio

GRAIN SIZE DISTRIBUTION TEST DATA

6/29/2018

Client: Palestine-Hollansburg Joint
Project: Soil Study - Water Treat Lagoons
Project Number: 183404
Location: B-13
Depth: 8.5' - 10.0'
Sample Number: 4A
Material Description: brown silty SAND
Liquid Limit: NV
Plastic Limit: NP
USCS Classification: SM
AASHTO Classification: A-2-4(0)
Testing Remarks: As Received
Moisture Content: 21.8%

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
474.84	118.66	0.00	0.75	0.00	100.0	0.0
			0.50	10.76	97.0	3.0
			0.375	12.19	96.6	3.4
			#4	13.57	96.2	3.8
			#10	14.72	95.9	4.1
124.91	0.00	0.00	#20	1.44	94.8	5.2
			#40	10.08	88.1	11.9
			#60	39.72	65.4	34.6
			#100	81.41	33.4	66.6
			#200	104.58	15.6	84.4

Hydrometer Test Data

Hydrometer test uses material passing #4
Percent passing #4 based upon complete sample = 96.2
Weight of hydrometer sample =125.03
Hygroscopic moisture correction:
Moist weight and tare = 51.87
Dry weight and tare = 51.84
Tare weight = 31.65
Hygroscopic moisture = 0.1%
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -6.5
Meniscus correction only = 0.0
Specific gravity of solids = 2.65
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.294964 - 0.164 - 0.164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	22.0	21.0	14.9	0.0133	21.0	12.9	0.0477	11.5	88.5
2.00	22.0	20.0	13.9	0.0133	20.0	13.0	0.0340	10.7	89.3
5.00	22.0	17.0	10.9	0.0133	17.0	13.5	0.0219	8.4	91.6
15.00	22.0	15.0	8.9	0.0133	15.0	13.8	0.0128	6.9	93.1
30.00	22.0	14.0	7.9	0.0133	14.0	14.0	0.0091	6.1	93.9
60.00	21.5	12.0	5.8	0.0134	12.0	14.3	0.0065	4.5	95.5
120.00	21.5	11.0	4.8	0.0134	11.0	14.5	0.0047	3.7	96.3
250.00	21.5	10.0	3.8	0.0134	10.0	14.7	0.0032	2.9	97.1
1440.00	21.0	10.0	3.7	0.0135	10.0	14.7	0.0014	2.8	97.2

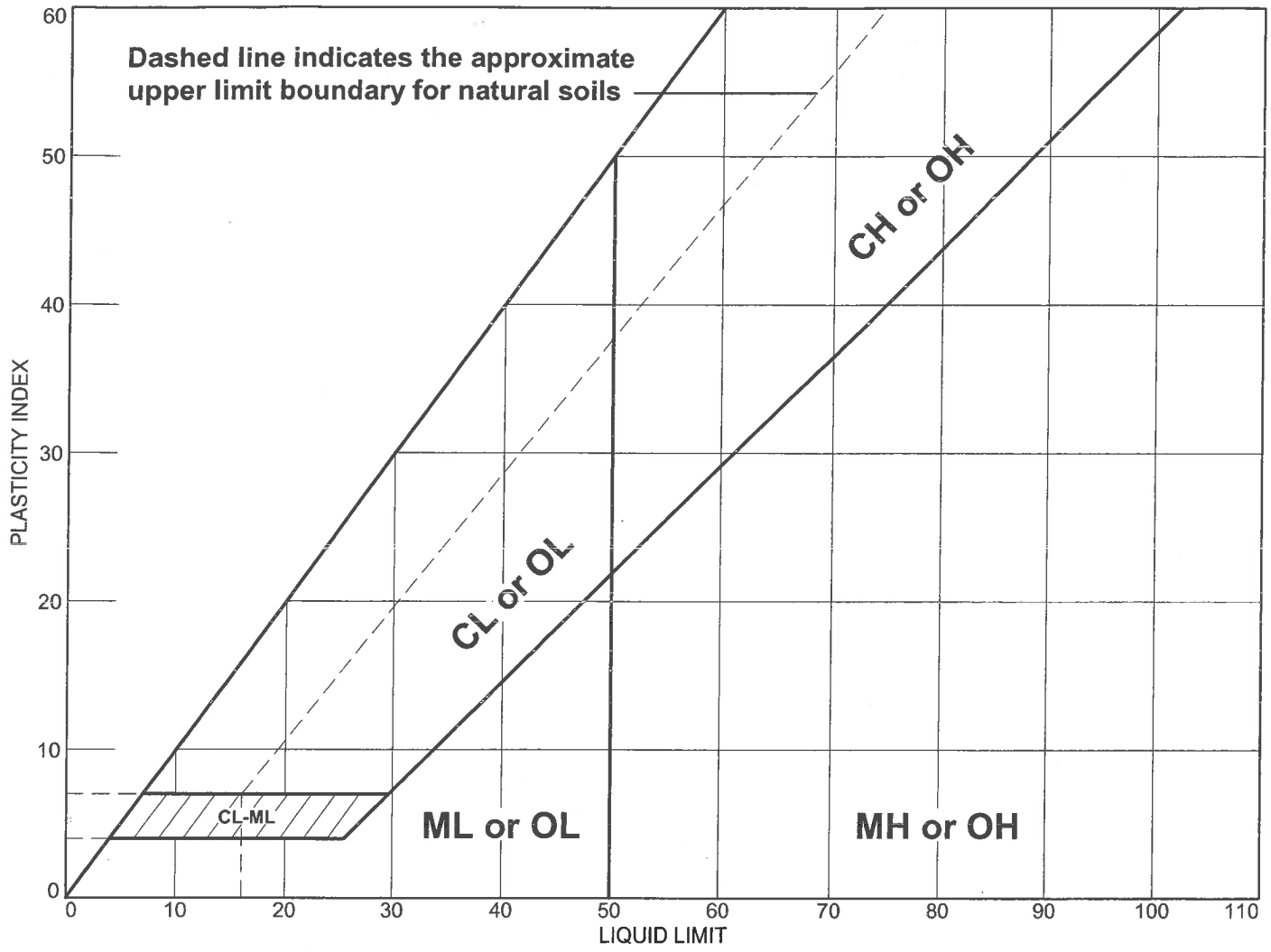
Fractional Components

Boulders	Cobbles	Gravel			Sand			Fines		
		Coarse	Fine	Total	Coarse	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	4.1	4.1	7.8	72.5	80.3	11.8	3.8	15.6

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0073	0.0289	0.0713	0.1004	0.1395	0.1689	0.1973	0.2295	0.3331	0.3813	0.4618	0.9826

Fineness Modulus	C_u	C_c
1.14	7.95	2.94

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown silty SAND	NV	NP	NP	88.1	15.6	SM

Project No. 183404 **Client:** Palestine-Hollansburg Joint

Project: Soil Study - Water Treat Lagoons

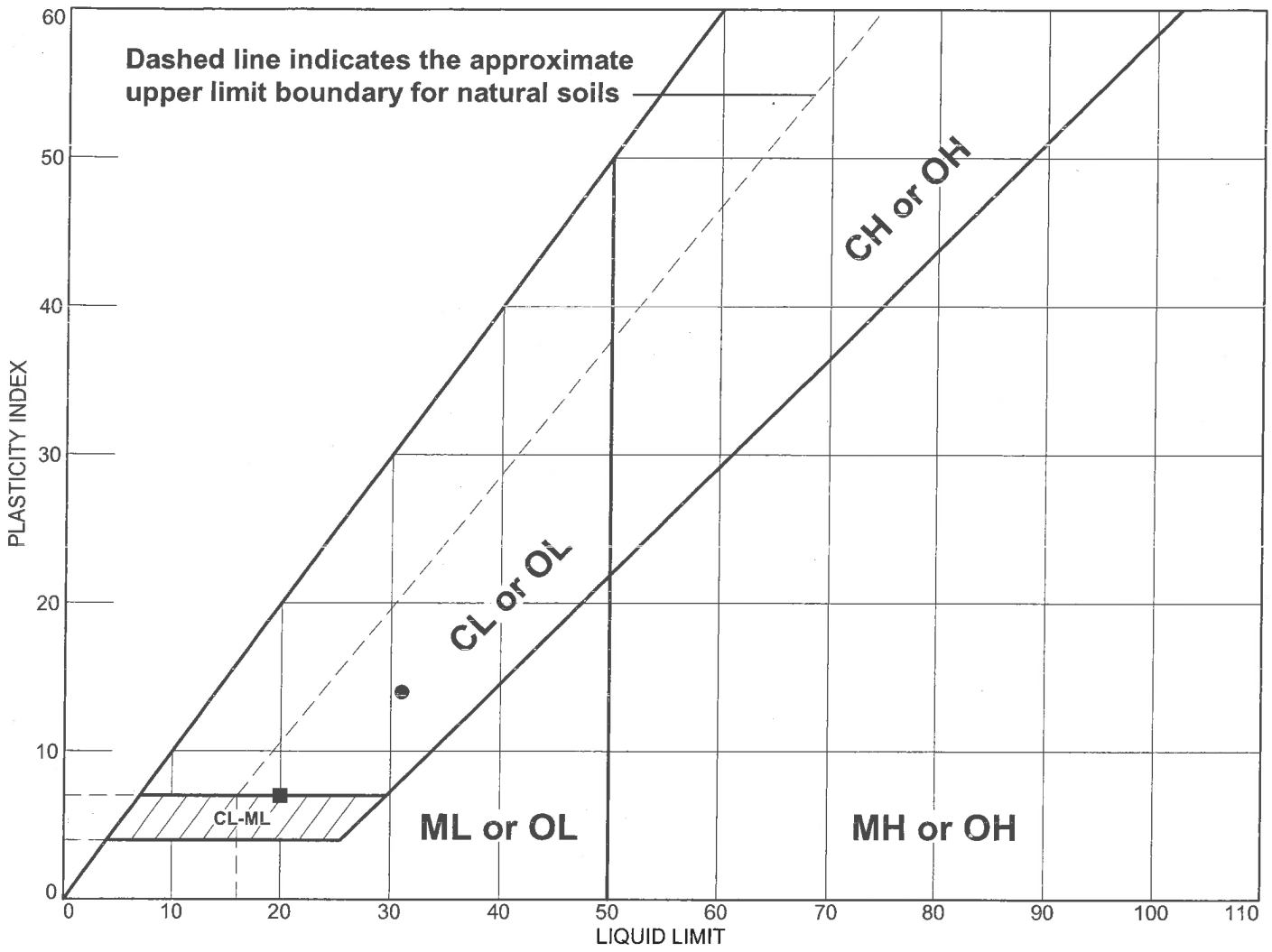
● **Source of Sample:** B-13 **Depth:** 8.5' - 10.0' **Sample Number:** 4A

Remarks:

BOWSER-MORNER, INC.

Dayton, Ohio

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	B-4, S3	31	17	14			
■	B-9, S3	20	13	7			

Project No. 183404 **Client:** Palestine-Hollansburg Joint

Project: Soil Study - Water Treat Lagoons

● **Source of Sample:** B-4 **Depth:** 6.0' - 7.5' **Sample Number:** S-3

■ **Source of Sample:** B-9 **Depth:** 6.0' - 7.3' **Sample Number:** S-3

Remarks:

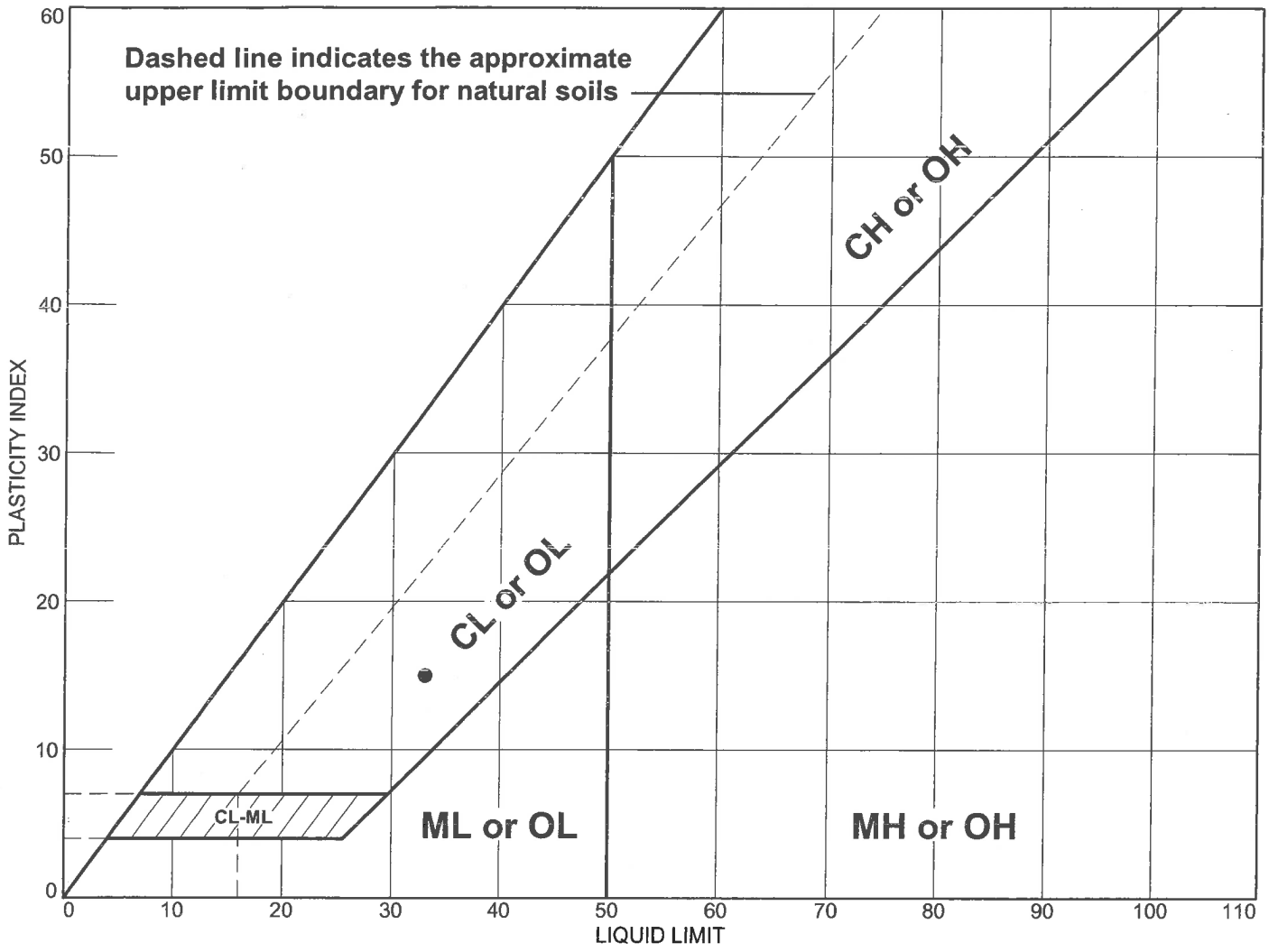
● As Received
Moisture Content: 14.0%

■ As Received
Moisture Content: 11.4%

BOWSER-MORNER, INC.

Dayton, Ohio

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	B-17, 1A	33	18	15			

Project No. 183404 **Client:** Palestine-Hollansburg Joint

Project: Soil Study - Water Treat Lagoons

● **Source of Sample:** B-17 **Depth:** 1.0' - 2.5' **Sample Number:** 1A

Remarks:

● As Received
Moisture Content: 16.4%

BOWSER-MORNER, INC.

Dayton, Ohio

Moisture Content of Soil

ASTM (D-2216)

BOWSER MORNER

Client: Palestine-Hollansburg Joint SD
Project: Soil Study - Water Treat Lagoons

Work Order No.: 183404
Date: 04/12/18

Boring Number	Sample Number	Depth, (ft)	Depth, (m)	Moisture Content, (%)
B-1	1	1.0 - 2.5	0.3 - 0.8	28.5
	2	3.5 - 5.0	1.1 - 1.5	Not Tested
	3	6.0 - 7.5	1.8 - 2.3	9.6
	4	8.5 - 10.0	2.6 - 3.0	Not Tested
B-2	1	1.0 - 2.5	0.3 - 0.8	Not Tested
	2	3.5 - 5.0	1.1 - 1.5	13.9
	3	6.0 - 7.5	1.8 - 2.3	12.0
	4	8.5 - 10.0	2.6 - 3.0	14.3
B-3	1	1.0 - 2.5	0.3 - 0.8	20.2
	2	3.5 - 5.0	1.1 - 1.5	Not Tested
	3	6.0 - 7.5	1.8 - 2.3	10.9
	4	8.5 - 10.0	2.6 - 3.0	12.9
B-4	1	1.0 - 2.5	0.3 - 0.8	Not Tested
	2	3.5 - 5.0	1.1 - 1.5	22.0
	3	6.0 - 7.5	1.8 - 2.3	14.0
	4	8.5 - 10.0	2.6 - 3.0	13.1
	5	13.5 - 15.0	4.1 - 4.6	Not Tested
B-5	1	1.0 - 2.5	0.3 - 0.8	24.3
	2	3.5 - 5.0	1.1 - 1.5	Not Tested
	3	6.0 - 7.5	1.8 - 2.3	11.4
	4	8.5 - 10.0	2.6 - 3.0	Not Tested
	5	13.5 - 15.0	4.1 - 4.6	12.8
B-6	1	1.0 - 2.5	0.3 - 0.8	25.2
	2	3.5 - 5.0	1.1 - 1.5	26.3
	3	6.0 - 7.5	1.8 - 2.3	Not Tested
	4	8.5 - 10.0	2.6 - 3.0	11.5
B-7	1	1.0 - 2.5	0.3 - 0.8	16.4
	2	3.5 - 5.0	1.1 - 1.5	Not Tested
	3	6.0 - 7.5	1.8 - 2.3	16.0
	4	8.5 - 10.0	2.6 - 3.0	13.8
	5	13.5 - 15.0	4.1 - 4.6	14.0
B-8	1	1.0 - 2.5	0.3 - 0.8	Not Tested
	2	3.5 - 5.0	1.1 - 1.5	22.8
	3	6.0 - 7.5	1.8 - 2.3	Not Tested
	4	8.5 - 10.0	2.6 - 3.0	15.4

Moisture Content of Soil

ASTM (D-2216)

BOWSER MORNER

Client: Palestine-Hollansburg Joint SD
Project: Soil Study - Water Treat Lagoons

Work Order No.: 183404
Date: 04/12/18

Boring Number	Sample Number	Depth, (ft)	Depth, (m)	Moisture Content, (%)
B-9	1	1.0 - 2.5	0.3 - 0.8	25.1
	2	3.5 - 5.0	1.1 - 1.5	Not Tested
	3	6.0 - 7.5	1.8 - 2.3	11.4
	4	8.5 - 10.0	2.6 - 3.0	Not Tested
B-10	1	1.0 - 2.5	0.3 - 0.8	Not Tested
	2	3.5 - 5.0	1.1 - 1.5	13.7
	3	6.0 - 7.5	1.8 - 2.3	Not Tested
	4	8.5 - 10.0	2.6 - 3.0	14.3
	5	13.5 - 15.0	4.1 - 4.6	Not Tested
	6	18.5 - 20.0	5.6 - 6.1	11.1
	7	23.5 - 25.0	7.2 - 7.6	Not Tested
	8	28.5 - 30.0	8.7 - 9.1	12.3
B-11	1	1.0 - 2.5	0.3 - 0.8	10.5
	2	3.5 - 5.0	1.1 - 1.5	Not Tested
	3	6.0 - 7.5	1.8 - 2.3	10.7
	4	8.5 - 10.0	2.6 - 3.0	Not Tested
	5	13.5 - 15.0	4.1 - 4.6	10.6
	6	18.5 - 20.0	5.6 - 6.1	Not Tested
	7	23.5 - 25.0	7.2 - 7.6	10.4
	8	28.5 - 30.0	8.7 - 9.1	Not Tested
B-12	1	1.0 - 2.5	0.3 - 0.8	Not Tested
	2	3.5 - 5.0	1.1 - 1.5	12.4
	3	6.0 - 7.5	1.8 - 2.3	Not Tested
	4	8.5 - 10.0	2.6 - 3.0	12.5
	5	13.5 - 15.0	4.1 - 4.6	Not Tested
	6	18.5 - 20.0	5.6 - 6.1	17.1
	7	23.5 - 25.0	7.2 - 7.6	Not Tested
	8	28.5 - 30.0	8.7 - 9.1	11.6

Moisture Content of Soil

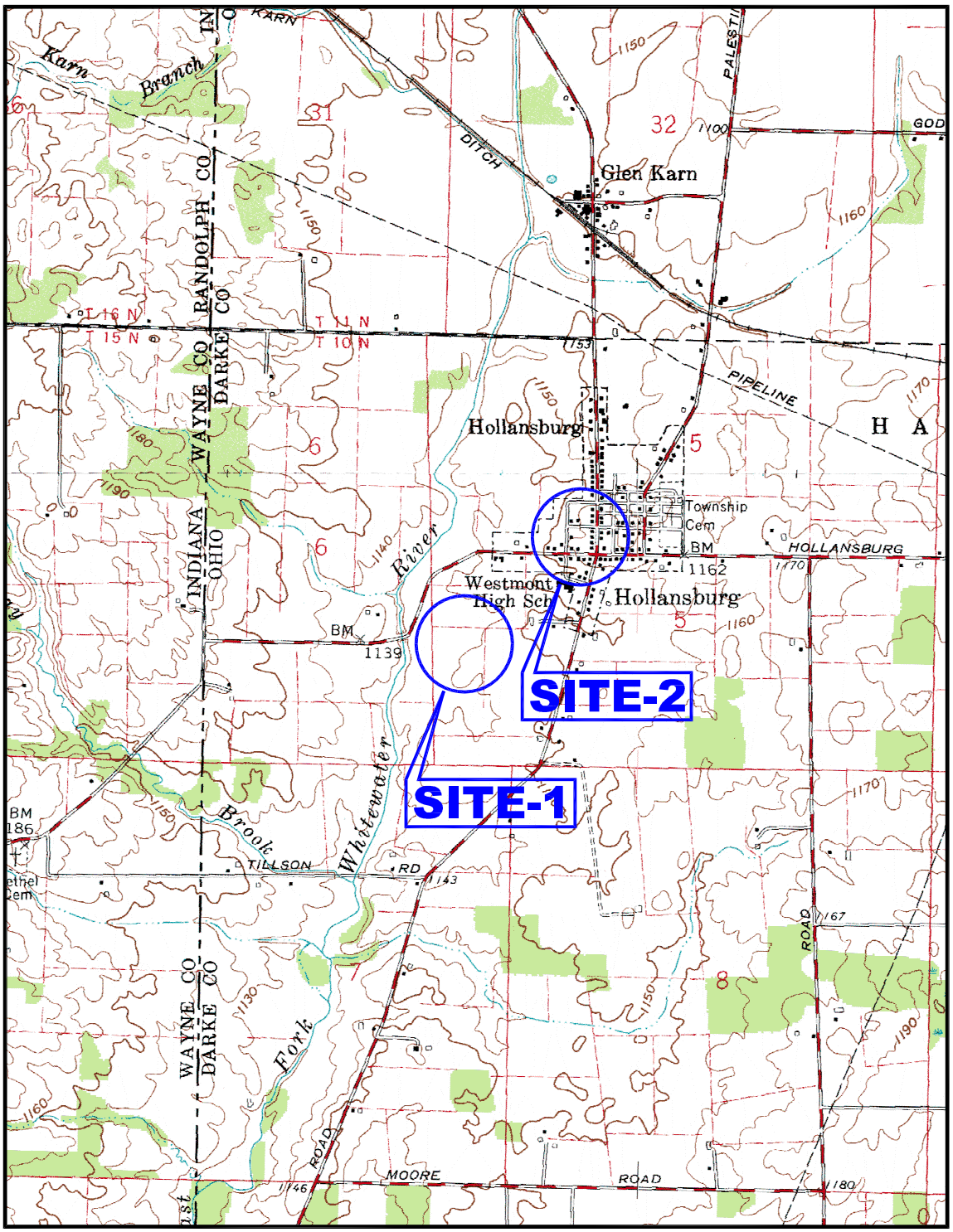
ASTM (D-2216)

BOWSER MORNER

Client: Palestine-Hollansburg Joint SD
Project: Soil Study - Water Treat Lagoons

Work Order No.: 183404
Date: 06/29/18

Boring Number	Sample Number	Depth, (ft)	Depth, (m)	Moisture Content, (%)
B-13	1	1.0 - 2.5	0.3 - 0.8	15.7
	2	3.5 - 5.0	1.1 - 1.5	Not Tested
	3	6.0 - 7.5	1.8 - 2.3	14.9
	4	8.5 - 10.0	2.6 - 3.0	21.8
	5	13.5 - 15.0	4.1 - 4.6	Not Tested
	6	18.5 - 20.0	5.6 - 6.1	14.0
B-14	1	1.0 - 2.5	0.3 - 0.8	21.3
	2	3.5 - 5.0	1.1 - 1.5	Not Tested
	3	6.0 - 7.5	1.8 - 2.3	11.6
	3			25.0
	4	8.5 - 10.0	2.6 - 3.0	12.9
	5	13.5 - 15.0	4.1 - 4.6	Not Tested
	6	18.5 - 20.0	5.6 - 6.1	15.4
B-15	1	1.0 - 2.5	0.3 - 0.8	29.0
	2	3.5 - 5.0	1.1 - 1.5	Not Tested
	3	6.0 - 7.5	1.8 - 2.3	15.8
	4	8.5 - 10.0	2.6 - 3.0	Not Tested
	5	13.5 - 15.0	4.1 - 4.6	12.1
	6	18.5 - 20.0	5.6 - 6.1	Not Tested
B-16	1	1.0 - 2.5	0.3 - 0.8	Not Tested
	2	3.5 - 5.0	1.1 - 1.5	19.1
	3	6.0 - 7.5	1.8 - 2.3	16.6
	3			10.4
	5	13.5 - 15.0	4.1 - 4.6	Not Tested
	6	18.5 - 20.0	5.6 - 6.1	12.9
B-17	1	1.0 - 2.5	0.3 - 0.8	16.4
	2	3.5 - 5.0	1.1 - 1.5	Not Tested
	6	6.0 - 7.5	1.8 - 2.3	12.1
	4	8.5 - 10.0	2.6 - 3.0	Not Tested
	5	13.5 - 15.0	4.1 - 4.6	10.9
	6	18.5 - 20.0	5.6 - 6.1	Not Tested



USGS QUAD: Ohio

Borings 1-9 & 13-17 - Latitude: 39°59'42"N Longitude: 84°47'58"W
Borings 10-12 - Latitude: 39°59'51"N Longitude: 84°47'37"W

VICINITY MAP

Soil Study for Proposed Watewater Treatment Lagoons,
Hollansburg-Arcanum Road, Hollansburg, Ohio

Client: Palestine-Hollansburg Joint Sewer District

3-18/SR

PROJECT NO.	183404
SCALE	1"=2000'
FIGURE NO.	1

BOWSER MORNER

#14
EL. 1140.0'

#15
EL. 1136.5'

#13
EL. 1138.0'

#16
EL. 1137.9'

#1
EL. 1133.7'

#17
EL. 1139.5'

#9
EL. 1134.1'

POND #1
94,487.6811 sqft / surface area
2.16 acres / surface area
10' depth
775,301.149 cuft
17.79 acre/ft
5,799,252.595 gallons

#8
EL. 1134.7'

#2
EL. 1132.4'

#5
EL.1134.6'

#7
EL. 1135.6'

STORAGE POND
166,244.6792 sqft surface area
3.816 acres / surface area
12' depth
1,667,348.566 cuft
38.277 acre/ft
12,471,767.27 gallons

POND #2
94,487.6811 sqft / surface area
2.16 acres / surface area
10' depth
775,301.149 cuft
17.79 acre/ft
5,799,252.595 gallons

#4
EL. 1134.3'

#3
EL. 1131.7'

#6
EL. 1133.6'

N

BOWSER MORNER

PROJECT NO. 183404

SCALE GRAPHIC

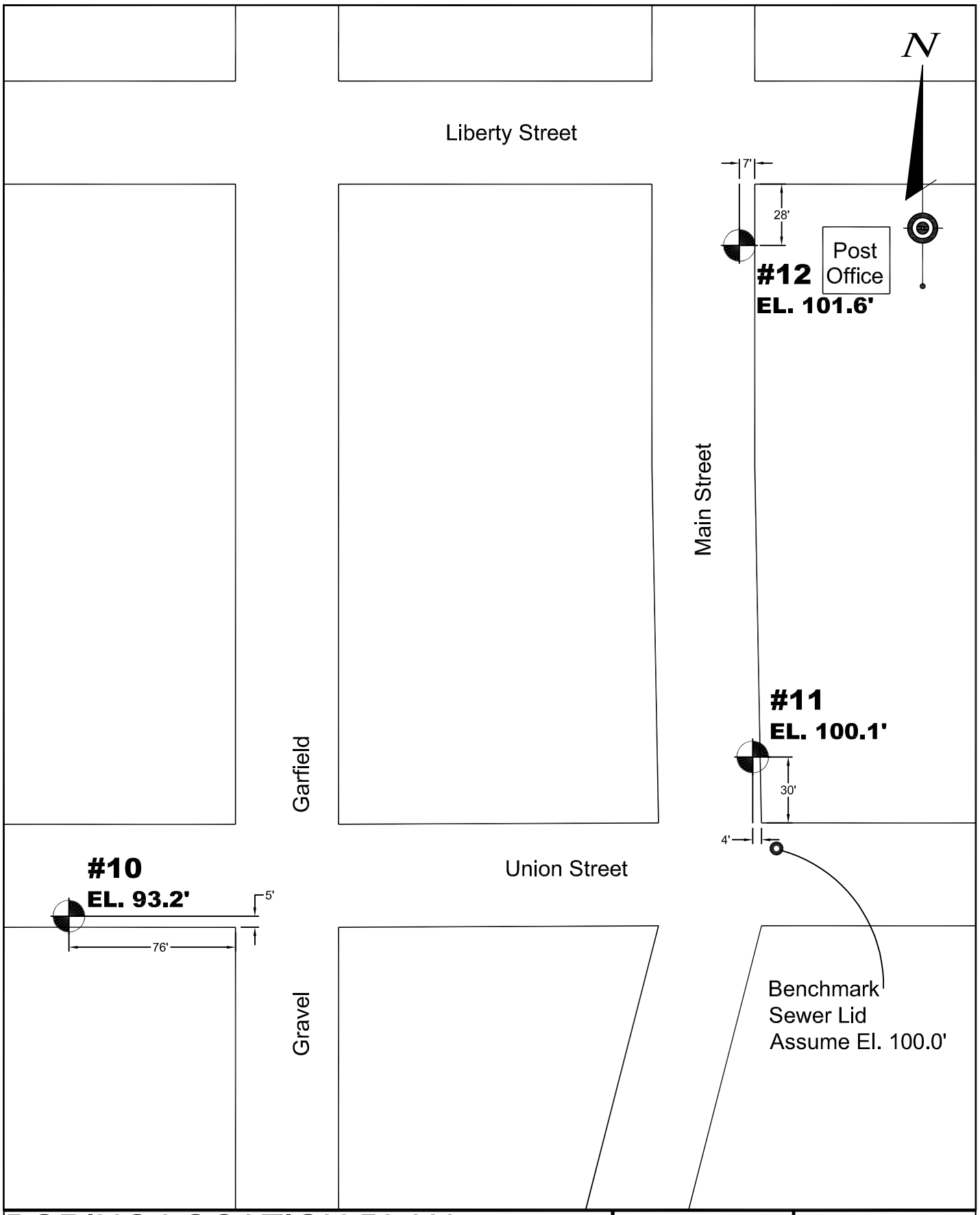
FIGURE NO. 2a

3-18/SR

BORING LOCATION PLAN

Soil Study for Proposed Watewater Treatment Lagoons, Hollansburg-Arcanum Road, Hollansburg, Ohio

Client: Palestine-Hollansburg Joint Sewer District



BORING LOCATION PLAN

Soil Study for Proposed Watewater Treatment Lagoons,
Hollansburg-Arcanum Road, Hollansburg, Ohio

Client: Palestine-Hollansburg Joint Sewer District

3-18/SR

PROJECT NO.	183404
SCALE	Not to Scale
FIGURE NO.	2b

BOWSER MORNER

ENGINEERING & ENVIRONMENTAL SERVICES:

- Geotechnical Engineering
- Subsurface Exploration
- Civil Engineering
- Environmental Services
- Due Diligence
- Permitting

LABORATORY SERVICES:

- Geotechnical Laboratories
- Construction Materials Laboratories
- Mineral Aggregates
- Concrete
- Stone & Masonry
- Asphalt
- Analytical Services Laboratories
- Industrial Minerals
- Product Testing
- Mechanical/Metallurgical Testing
- Calibration Services
- Chemistry Laboratory
- Consulting Geology
- Radon Reference Laboratory

CONSTRUCTION SUPPORT SERVICES:

- General Construction
- Construction Quality Assurance
- Building Code Special Inspections
- Transportation Projects:
  - Contractor QA/QC
  - Material Supplier QA/QC
  - Owner Quality Assurance
- Materials Consulting:
  - Construction Engineering

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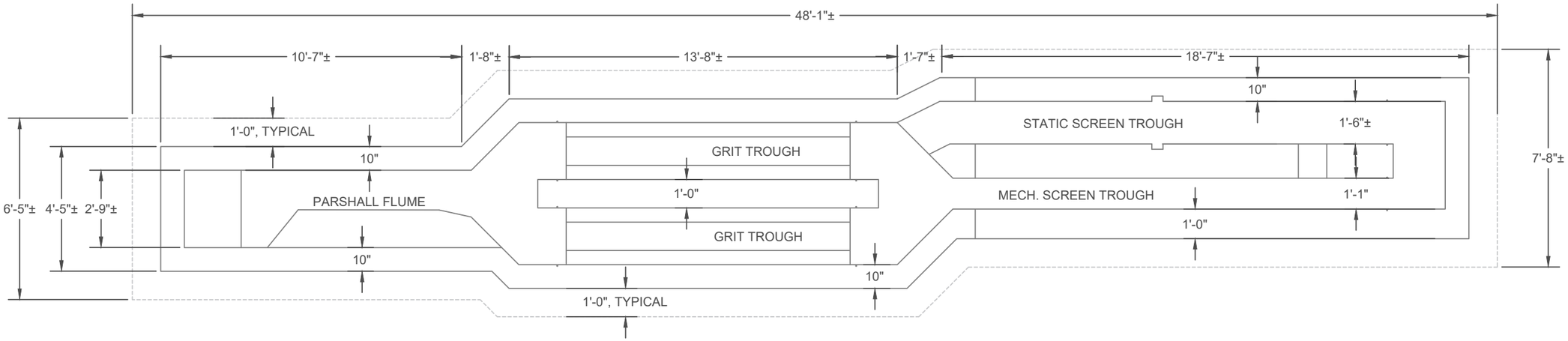
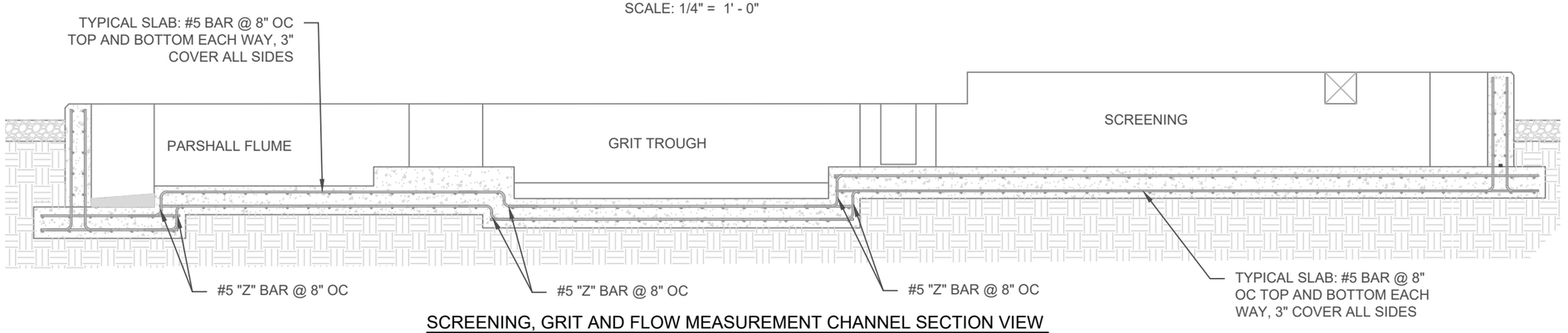


SCREENING, GRIT AND FLOW MEASUREMENT CHANNEL PLAN VIEW

SCALE: 1/4" = 1' - 0"



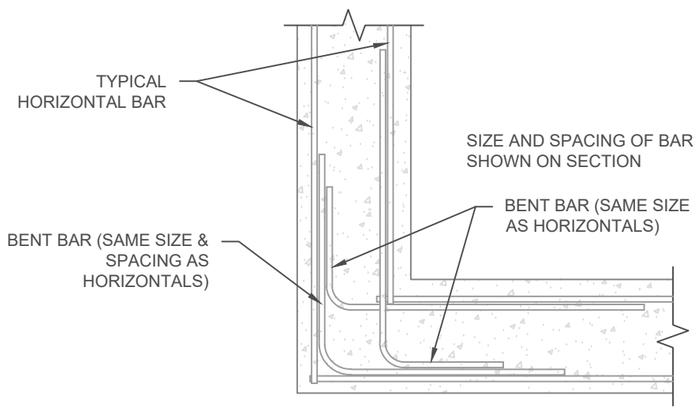
SCREENING, GRIT AND FLOW MEASUREMENT CHANNEL SECTION VIEW

SCALE: 1/4" = 1' - 0"

CONCRETE NOTES:

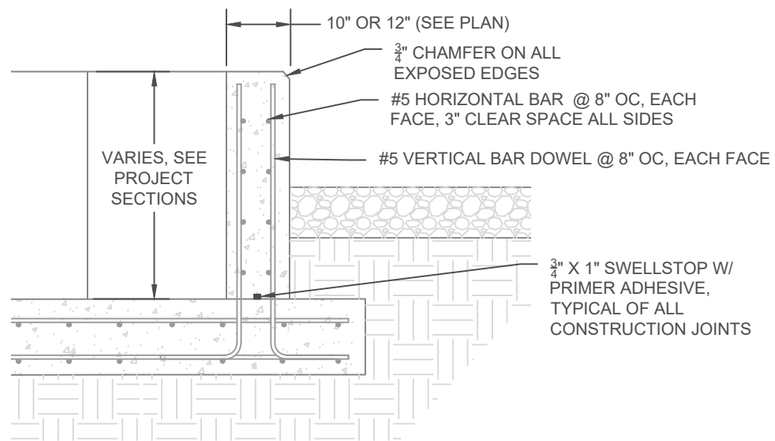
MATERIALS: (f'c BASED ON 28 DAY UNLESS NOTED)

A. CONCRETE UNLESS NOTED: f'c = 4500 PSI, (4.5% TO 7.5% ENTRAINED AIR), MAXIMUM WATER/CEMENTITIOUS RATIO = 0.42.
B. REINFORCING STEEL: ASTM A615 60 KSI YIELD DEFORMED BARS.
C. FLY ASH: ASTM C618, TYPE F OR C. WHEN USED, FLY ASH-TO- TOTAL CEMENTITIOUS RATIO SHALL BE 15% MINIMUM.
D. GROUND GRANULATED BLAST FURNACE SLAG: ASTM C989. TOTAL GROUND GRANULATED BLAST FURNACE SLAG -TO- TOTAL CEMENTITIOUS RATIO SHALL NOT EXCEED 50% MAXIMUM.
E. FLY ASH, NATURAL POZZOLANS, SILICA FUME, OR GROUND GRANULATED BLAST FURNACE SLAG: WHEN EXPOSED TO DEICING CHEMICALS, LIMIT THE MAXIMUM WEIGHT TO THE PERCENTAGES OF THE TOTAL WEIGHT OF CEMENTITIOUS MATERIALS GIVEN IN TABLE 4.2.2.8 OF ACI 301-99.
F. PLASTICIZING ADMIXTURE: ASTM C1017.
G. WATER REDUCING ADMIXTURE: ASTM C494.
H. CHLORIDE CONTENT OF CONCRETE: LIMIT TOTAL CHLORIDE ION CONTENT TO AMOUNT INDICATED IN TABLE 4.2.2.6 OF ACI 301-99. ADMIXTURES CONTAINING CHLORIDE ARE NOT PERMITTED IN REINFORCED CONCRETE OR CONCRETE CONTAINING METALS.
I. PROVIDE $\frac{3}{4}$" CHAMFER AT CORNERS OF EXPOSED CONCRETE.



TYPICAL CORNER DETAIL

SCALE: NONE



TYPICAL INTERIOR/EXTERIOR CHANNEL WALL

SCALE: 1/2" = 1' - 0"

Mote & Associates
Engineering, Land Surveying
Address: 214 W. Fourth St., Greenville, OH 45331
Phone: 937.548.7511
Website: www.moteassociates.com

REVISIONS:

HEADWORKS SCREENING & GRIT REINFORCEMENT
CENTRALIZED WASTEWATER SYSTEM
PALESTINE-HOLLANSBURG JOINT SEWER DISTRICT

PROJ. NO: PS07121516	DWG. NO:		SCALE: NO SCALE
DRAWN: CMB	CHECKED: MJB	DATE: 8/6/21	SHEET NO: 1 OF 1

PROJECT SPOILS AREA

475±

415'±

CONTRACTOR TO CONSTRUCT OWN DRIVEWAYS TO ACCESS SPOILS AREAS AS NEEDED FOR OFFLOADING. GRADE TO SHED RAIN WATER. AT PROJECT END, SEED PER SPECIFICATIONS. ONLY CLEAN SOILS ARE TO BE USED. NO ASPHALT OR OTHER NON-ORGANIC MATERIALS ALLOWED. MAINTAIN AND FULLY COMPLY WITH ALL OHIO EPA EROSION CONTROL REQUIREMENTS.

ALL DRIVEWAYS WITHIN THE WWTP FENCE SHALL BE COMPLETED BY CONTRACT "B"

12" RCP CULVERT, INSTALLED BY CONTRACT "A"

12" RCP CULVERT, INSTALLED BY CONTRACT "A"

CONTRACT "A" TO INSTALL DRIVEWAY & CULVERTS TO PROPOSED WWTP FENCELINE AS PER DRIVEWAY/ROADWAY DETAIL ON SHEET 6 IN THE GENERAL DETAILS.

IF BUILDING ALTERNATE IS CHOSEN, CONTRACT "B" IS TO INSTALL THIS DRIVEWAY TO WELL

PROJECT SPOILS AREA

CONTRACTOR TO CONSTRUCT OWN DRIVEWAYS TO ACCESS SPOILS AREAS AS NEEDED FOR OFFLOADING. GRADE TO SHED RAIN WATER. AT PROJECT END, SEED PER SPECIFICATIONS. ONLY CLEAN SOILS ARE TO BE USED. NO ASPHALT OR OTHER NON-ORGANIC MATERIALS ALLOWED. MAINTAIN AND FULLY COMPLY WITH ALL OHIO EPA EROSION CONTROL REQUIREMENTS.

200'±

325'±

Mote & Associates
Engineering, Land Surveying
214 W. Fourth St., Greenville, OH 45331 937.548.7511 www.moteassociates.com

WWTP ACCESS DRIVE ADDENDUM #2
CENTRALIZED WASTEWATER SYSTEM
PALESTINE - HOLLANSBURG JSD

PROJ. NO: PS07121516	DWG. NO:		SCALE: NO SCALE
DRAWN: CMB	CHECKED: MJB	DATE: 8/6/21	SHEET NO: 1 OF 1