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FINAL REPORT
OF
SUBGRADE EXPLORATION

NORTON ROAD AND JOHNSON ROAD INTERSECTION IMPROVEMENTS

Franklin County, Ohio
PID 102047, SJN 467744

Prepared For:

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DLZ Job No. 1721-3001.00

August 8, 2017

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EXECUTIVE SUMMARY

As part of the Norton Road and Johnson Road intersection improvement (FRA-CR3-06.79, PID 102047) a subgrade geotechnical exploration was performed along the proposed alignments in Grove City, Franklin County, Ohio. The project reportedly consists of replacing the existing two-way stop crossroad with a westward shifted roundabout from the existing intersection location with approach lanes offset from existing to accommodate.

A total of eleven (11) borings (B-001-0-17 through B-011-0-17) were drilled to depths ranging from 8.5 to 10.0 feet below existing grade for this geotechnical exploration performed on February 28 and March 2, 2017. Samples of the subsurface materials were obtained for classification, general index testing and strength testing. Fill and possible fill was encountered in six of the borings to depths of between 1.5 and 4.5 feet beneath the existing ground surface. Fill or possible fill consisted of generally very soft to stiff, cohesive, fine-grained soils. Natural soils were encountered underlying surficial materials generally consisting of soft to very stiff, cohesive, fine-grained soil. Samples within the natural overburden soils occasionally contained root hairs, iron oxide stains, and rock fragments. Sulfate content within the upper two soil samples of each boring ranged from 0 to 200 parts per million (ppm). Loss of Ignition (LOI) testing was performed on three (3) samples identified as containing organic materials and ranged from 4.34 to 15.29 percent, corresponding to descriptions of moderately to highly organic (ODOT SGE Table 600-7). Bedrock was not encountered.

Subgrade analyses were performed in accordance with ODOT Geotechnical Bulletin No. 1 (GB-1). Based on the conditions encountered in the borings, the soils at the site are generally conducive to support of the proposed paved roadway. However, the GB-1 analysis identified numerous areas that will require subgrade stabilization. Unsuitable soils were not encountered along the proposed alignments. Based on the results of the GB-1 analyses, a CBR value of 5 is recommended for design of the proposed roadway.

Considering the high soil moisture contents encountered in the majority of the borings performed for this exploration, installation of a drainage system including construction underdrains and adequate ditches are recommended as a practical solution to promote drainage of the subgrade and improve subgrade stability. Global subgrade stabilization is also recommended to increase life time of the roadway. Table A summarizes the recommended global stabilization alternatives, limits and minimum depths.

Table A: Recommended Global Subgrade Stabilization Alternatives

Subgrade Stabilization Alternatives	Project Limits	Minimum Depths
Undercut and Replace with Item 204 Granular Material	Full Length	18 Inches
Undercut and Replace with Item 204 Granular Material and SS CMS 861 Geogrid	Full Length	12 Inches
Chemical Stabilized Subgrade Item 206 with Lime	Full Length	12 inches

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APPENDIX

1.0 INTRODUCTION

This report presents the findings of the geotechnical exploration performed for the intersection improvement (FRA-CR3-06.79, PID 102047, SJN 467744) located at County Road 3 (Norton Road) and Township Road 293 (Johnson Road) in Grove City, Franklin County, Ohio. The project limits are approximately from straight line mile (SLM) 6.6 to SLM 7.0 on Norton Road (primary roadway) and from approximately SLM 1.6 to SLM 2.0 on Johnson Road. The project reportedly consists of replacing the existing two-way stop crossroad with a roundabout. Preliminary design information calls for a westward shift of the roundabout from the existing intersection location with approach lanes offset from existing to accommodate.

The purpose of this exploration was to: 1) determine the subsurface conditions to the depths of the borings, 2) evaluate the engineering characteristics of the subsurface materials, and 3) provide information to assist in the design and construction of the proposed intersection.

The exploration presented in this report was performed in accordance with DLZ Ohio, Inc.'s (DLZ) proposal with Orchard, Hiltz & McCliment, Inc. (OHM) dated October 6, 2016. This exploration was also performed in general accordance with the Ohio Department of Transportation (ODOT) Specifications for Geotechnical Exploration (SGE) dated July 2016.

The geotechnical engineer has planned and supervised the performance of the geotechnical engineering services, considered the findings, and prepared this report in accordance with generally accepted geotechnical engineering practices. No other warranties, either expressed or implied, are made as to the professional advice included in this report.

2.0 GEOLOGY AND OBSERVATIONS OF THE PROJECT

The project site lays within the Darby Plain, part of the Southern Ohio Loamy Till Plain physiographic region of the Till Plains geological section. The Darby Plain is characteristically moderately low relief, broad hummocky ground moraine with several broad, indistinct recessional moraines, and poorly drained swales between hummocks. Soils are commonly loamy, high-lime Wisconsinan-age till and sparse outwash over carbonate rocks and shale.

Mapping from the Ohio Department of Natural Resources (ODNR) indicates that bedrock underlying the project site is more than 100 feet below existing ground surface, mapped at an elevation of approximately 780 feet on the eastern end of the project sloping downward to the west where it is at an elevation of approximately 700 feet.

A field reconnaissance of the project was performed by personnel from DLZ on February 16, 2017. No geohazard conditions were observed at the time of reconnaissance. The project area is generally agricultural land with residential properties located in the southeastern quadrant of the site. The surrounding topography is rolling, with approximately 10 feet in elevational changes. Pavement conditions along Norton Road were observed to be in good condition, with occasional longitudinal, transitional, and edge cracking. The pavement conditions along Johnson Road were observed to have a greater degree of cracking, with occasional potholes and patches.

3.0 EXPLORATION

3.1 FIELD EXPLORATION

A total of eleven (11) borings (B-001-0-17 through B-011-0-17) were performed for this geotechnical exploration on February 28 and March 2, 2017. Borings B-001-0-17 through B-007-0-17 were drilled in and along the existing Norton Road, while borings B-008-0-17 through B-011-0-17 were drilled in and along the existing Johnson Road. Six (6) borings were drilled in the existing roadway to a depth of between 8.5 and 9 feet below existing grade; five (5) borings were drilled within the new alignment of the proposed roadway to a depth of between 9 and 10 feet below existing grade.

The borings were drilled using either a track or truck-mounted drill rig, and were advanced between sampling intervals with 3¼-inch ID Hollow-Stem Augers (HSA). In general, disturbed soil samples were obtained with a 2-inch OD split-barrel sampler in general accordance with ASTM D-1586 (AASHTO T206) continuously through the soil overburden. The two hammer systems used were calibrated on May 20, 2016 and February 22, 2017 and had average drill rod energy efficiency ratios (ER) of 94.4 and 95.3 percent, respectively. The borings were backfilled with a soil/bentonite mixture at completion and the pavement was patched with asphalt cold patch for borings drilled in the roadway.

The surveyed boring locations are shown on the soil profile sheets presented in the Appendix. Boring logs and information concerning the drilling procedures are also presented in Appendix I. The boring locations and ground surface elevation at each boring were provided by OHM. The surveyed locations and ground surface elevations at the boring locations are listed on the individual boring logs.

3.2 LABORATORY TESTING PROGRAM

The laboratory testing program consisted of visual classifications, and general index tests. The soils were classified in general accordance with the ODOT SGE Section 600 Laboratory Testing. The general index tests consisted of grain-size analyses, moisture content, and plasticity determinations. The results of the classifications, grain-size analyses, moisture content, and plasticity determinations are shown on the boring logs in the Appendix. Sulfate testing (method TEX-145-E) was performed on one of the upper two samples from each boring. Loss on Ignition testing (AASHTO T-267) was also performed on select samples. Results of the sulfate and loss on ignition testing are presented in the Appendix.

4.0 FINDINGS

The subsurface conditions encountered in the borings generally consisted of pavement materials or topsoil generally over fill and possible fill, underlain by natural fine-grained cohesive soils. The following section presents the generalized subsurface conditions encountered by the borings. For more detailed information, please refer to the boring logs presented in the Appendix. Please note that the strata contact lines shown on the boring logs represent approximate boundaries between soil types. In the field, the actual soil transition might be different both vertically and laterally.

Table 1 below summarizes the thickness of the surficial materials and depth of fill/possible fill encountered at each soil boring.

Table 1: Summary of Geotechnical Exploration Findings

Boring ID	Alignment	Latitude/Longitude (deg)	Ground Surface Elevation (ft)	Surficial Material & Thickness (in)[1]	Existing Depth of Fill/Possible Fill[2] (ft)
B-001-0-17	Proposed Norton Road	39.889672, -83.155353	892.755	Asphalt (10), Base (3)	2.5
B-002-0-17	Proposed Norton Road	39.890553, -83.154927	891.395	Asphalt (10), Base (4)	N/A
B-003-0-17	Roundabout[3]	39.891227, -83.154804	886.916	N/A	1.5
B-004-0-17	Roundabout[3]	39.891516, -83.154603	891.172	Asphalt (13), Base (4)	4.5
B-005-0-17	Proposed Norton Road	39.892027, -83.154557	893.499	N/A	N/A
B-006-0-17	Proposed Norton Road	39.89275, -83.154145	893.941	N/A	3.0
B-007-0-17	Proposed Norton Road	39.893359, -83.153929	893.007	Asphalt (10), Base (4)	4.0
B-008-0-17	Proposed Johnson Road	39.891401, -83.155971	885.155	Asphalt (10)	N/A
B-009-0-17	Roundabout[3]	39.891426, -83.154928	888.719	N/A	3.0
B-010-0-17	Proposed Johnson Road	39.891316, -83.154145	892.079	Asphalt (8), Base (4)	N/A
B-011-0-17	Proposed Johnson Road	39.891282, -83.153396	890.955	Topsoil (2)	3.0

[1]Thickness measurements represent the approximate measurement obtained in the field from the side of the bore hole.
[2]Depth measured from the existing ground surface.
[3]Roundabout Reference Line "CC" from OHM was utilized for alignment references.

4.1 OVERBURDEN CONDITIONS

At the ground surface, the borings located within the existing roadway encountered between 8 and 13 inches of asphalt pavement. Beneath the asphalt pavement, approximately 0 to 4 inches of aggregate base was

encountered. Topsoil was only reported to be encountered in boring B-011-0-17 at a thickness of 2 inches. Material reported as either fill or possible fill was recorded within six (6) borings to depths ranging from 1.5 to 4.5 feet below the existing surface. The fill or possible fill material encountered generally consisted of very soft to stiff, cohesive, fine-grained soils of moderate to high plasticity, visually or mechanically classified as being Silt and Clay (A-6a), Silty Clay (A-6b), or Clay (A-7-6). However, one sample of medium dense granular fill soil was encountered within B-001-0-17, mechanically tested to be Gravel (A-1-a). Underlying the surficial materials, the borings encountered natural soils consisting of generally soft to very stiff, cohesive, fine-grained soils visually or mechanically classified as being Sandy Silt (A-4a), Silt and Clay (A-6a), Silty Clay (A-6b), and Clay (A-7-6). One sample in B-007-0-17 contained loose, granular, natural soil visually classified as Gravel with Sand, Silt, and Clay (A-2-6). Samples within the natural overburden soils occasionally contained root hairs, iron oxide stains, and rock fragments. Sulfate content within the upper two soil samples of each boring ranged from 0 to 200 parts per million (ppm). Loss of Ignition (LOI) testing was performed on three (3) samples identified as containing organic materials and are presented in Table 2.

Table 2: Summary of Sulfate Test Data

Boring ID	Sample #	Depth (ft)	LOI	ODOT SGE Table 600-7 Description
B-007-0-17	SS-2	3.0-4.5	5.63	Moderately Organic
B-009-0-17	SS-1	0.0-1.5	4.34	Moderately Organic
B-011-0-17	SS-1	0.0-1.5	15.29	Highly Organic

4.2 BEDROCK CONDITIONS

Bedrock was not encountered within any borings performed as part of this subgrade exploration.

4.3 GROUNDWATER CONDITIONS

Seepage or free groundwater was not encountered within the depths of the borings during and upon completion of drilling. It should be noted that groundwater conditions may vary seasonally and with the passage of time. Therefore, the contractor should be equipped to deal with possible groundwater, seepage, and surface water that may accumulate in the open excavations during construction.

Although the groundwater table was not encountered in the borings, the subgrade soils at several boring locations were found to exhibit high moisture contents, and it is critical that effective measures to promote drainage of groundwater and surface water (i.e. grading of subgrade and surface, berms, ditches, etc.) be incorporated into the roadway design to prolong the pavement life.

5.0 GENERAL INFORMATION

The project reportedly consists of replacing the existing two-way stop crossroad with a roundabout. Preliminary design information calls for a westward shift of the roundabout from the existing intersection location with approach lanes offset from existing to accommodate. Proposed alignment shifts will require up to approximately one (1) foot of cut and up to approximately eight (8) feet of fill to bring existing ground surface up to the proposed grade. If the proposed roadway alignments differ from these assumptions, DLZ should be notified to provide revised recommendations as necessary. Additionally, it was assumed that the proposed work will be constructed in general accordance with the latest version of the ODOT Construction and Materials Specifications (CMS).

5.1 GENERAL EMBANKMENT CONSTRUCTION AND SUBGRADE PREPARATION

Embankment construction and subgrade preparation should be performed in accordance with ODOT CMS Items 203 and 204. Prior to embankment construction or subgrade preparation, perform clearing and grubbing, including removal of stumps and roots, in accordance with ODOT CMS Item 201; remove existing pavement and base materials, as well as other structures or obstructions, as necessary, in accordance with ODOT CMS Item 202. The embankment foundation and pavement subgrade should then be prepared by stripping any topsoil, organics, or other deleterious or unsuitable materials. Topsoil, pavement materials, and fill thicknesses encountered in the borings are listed in Table 1 of Section 4.0 of this report. It is anticipated that the areas of cultivated land will have greater organic soil thicknesses at the surface than encountered in the borings. Where new embankment fill is placed on existing slopes steeper than 4H:1V, Special Benching per ODOT Geotechnical Bulletin No. 2 (GB-2) is recommended.

Material to be utilized as borrow should be restricted to conform to Item 203.02R and 203.3 for embankment construction and Item 204.02 for subgrade. Both the embankment and subgrade materials specifications listed above allow the use of Item 703.16, A. (natural soil), and Item 703.16, B. (granular embankment). Note that the top 12 inches within the subgrade is required to have a minimum dry density of 100 pounds per cubic foot, pcf. All embankment materials should be spread and compacted in accordance with Items 204.07 and 204.03. Frozen materials should not be incorporated into any new fill nor should new fill, pavement materials, or structures be placed on top of frozen materials.

5.2 PAVEMENT SUBGRADE RECOMMENDATIONS

In general, the borings encountered fine-grained, cohesive soils at or near the anticipated pavement subgrade level consisting of soft to very stiff, cohesive, fine-grained soils classified as Sandy Silt, Silt and Clay, Silty Clay, and Clay (A-4a, A-6a, A-6b, and A-7-6) with lesser amounts of loose to medium dense, granular soils classified as either Gravel or Gravel with Sand, Silt, and Clay (A-1-a and A-2-6). It should be noted that the subgrade materials discussed contained material that was visually identified as fill or possible fill in six of the ten pavement borings.

Subgrade analyses in accordance with ODOT Geotechnical Bulletin No. 1 (GB-1) were performed for borings located along the proposed alignments of Norton Road, Johnson Road, and the roundabout. The results of the analyses are included in the Appendix. The GB-1 analyses calculated a design California Bearing Ratio (CBR) of 6 for Norton Road, the roundabout, and the entire project analyses; and a CBR of 5 was calculated for the Johnson Road analysis. The design CBR calculated by the GB-1 spreadsheet is an estimated average value of all

the subgrade samples based on correlations using the laboratory index testing results and/or ODOT soil classification. The cut and fill at each boring location are included in the analyses. The minimum calculated CBR value of 5 is recommended for pavement design along the project. A reduced CBR value has been recommended based on engineering judgment.

Generally, subgrade soils with a moisture content exceeding the optimum moisture content of the soil by three or more percentage points, or that have low N-values, are considered to be problematic soils (ref. ODOT GB-1, page 3 of 11). The results calculated by the GB-1 spreadsheet indicate that a majority of the borings encountered soils within 6.0 feet of the anticipated finished subgrade have low N-values and/or natural moisture contents exceeding their optimum moisture content by more than three percentage points. The high moisture contents in the majority of the samples are an indication of poor drainage along the alignment.

Sulfate contents of soil samples obtained from each boring were all tested to be under 3,000 parts per million (ppm) which is the upper limit concentration for ODOT screening criteria for consideration of chemical stabilization. However, plasticity Index (PI) values ranged from 10 to 31 and exceeded 20 frequently in mechanically tested soil samples; therefore, Chemically Stabilized Subgrade (Item 206) utilizing cement may not be used. Chemically Stabilized Subgrade (Item 206) could be utilized to stabilized the subgrade if lime stabilization methods are used. The ODOT GB-1 spreadsheet analysis for the entire project recommends a chemical stabilization depth of 12 inches.

Considering the general presence of both high moisture content and low blow count soils in the borings performed for this exploration, *global subgrade stabilization is recommended*. Furthermore, underdrains are recommended in an effort to promote drainage of the subgrade. Table 3 presents the recommended global subgrade stabilization alternatives for unstable subgrade.

Table 3: Recommended Global Subgrade Stabilization Alternatives

Subgrade Stabilization Alternatives	Project Limits	Minimum Depths
Undercut and Replace with Item 204 Granular Material	Full Length	18 Inches
Undercut and Replace with Item 204 Granular Material and SS CMS 861 Geogrid	Full Length	12 Inches
Chemical Stabilized Subgrade Item 206 with Lime	Full Length	12 inches

New embankment fill within 6 feet of the subgrade should have a CBR of 7 or above. Borrow sources for new embankment fill should be tested to confirm the materials meets these criteria along with the other required criteria described in this report and ODOT CMS Items 203 and 204.

If Item 204 Excavate and Replace is utilized, per ODOT GB-1, it is recommended that ODOT Plan Note G122 be included in the plans. The actual depths and limits of undercutting (Item 204 Excavate and Replace) should be determined by the Project Engineer in the field based on the results of proof rolling and subgrade observations

in accordance with ODOT CMS Item 204 as well as guidance provided under Item 204 in the ODOT Construction Administration Manual of Procedures (MOP). Any areas that exhibit rutting, instability, or other indications of soft or loose soils should be over excavated and replaced in accordance with ODOT CMS Item 204. Where the Item 204 Excavate and Replace (i.e. undercut) depth due to unstable subgrade is greater than 18 inches replacement using geogrid is recommended, where feasible. Use Item 703.16 Type B backfill in conjunction with geogrid and place geotextile at the base of the excavation. Supplemental specification 861 should be included in the plans if replacement with geogrid is utilized. The undercuts should extend 18 inches beyond the edge of the surface of the pavement, paved shoulder, or paved medians.

5.2.1 UNSUITABLE SUBGRADE

Unsuitable subgrade soils including soils classified as A-4b, A-2-5, A-7-5, A8-a and A8-b, soils with Liquid Limit greater than 65, and rock, shale or coal were not encountered in the performed borings within the excavation depths.

5.2.1.1 Rock Subgrade

Bedrock was not encountered within the performed borings of this exploration.

6.0 CLOSING REMARKS

We appreciate having the opportunity to be of service to you on this project. Please do not hesitate to call if you have any questions concerning this report.

Respectfully submitted,

DLZ OHIO, INC.

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APPENDIX

General Information-Drilling Procedures and Logs of Borings
Legend-Boring Log Terminology
Soil Profile Sheets (6)
Boring Logs (11)
Laboratory Testing Results
ODOT GB-1 Spreadsheets

GENERAL INFORMATION
DRILLING PROCEDURES AND LOGS OF BORINGS

Drilling and sampling were conducted in accordance with the Ohio Department of Transporation (ODOT) Specifications for Geotechnical Exploration (SGE) dated July 17, 2015. Borings were drilled with either a truck-mounted or ATV-mounted drill rig.

Drive split-barrel sampling was performed in 1.5 foot increments at intervals not exceeding 5 feet. In the event the sampler encountered resistance to penetration of 6 inches or less after 50 blows of the drop hammer, the sampling increment was discontinued. Standard penetration data were recorded and one or more representative samples were preserved from each sampling increment.

In borings where rock was cored, NXM or NQ size diamond coring tools were used.

In the laboratory all samples were visually classified by a geotechnical engineer. Moisture contents of all soil samples were determined. A limited number of samples, based on SGE requirements, were selected for performance of grain-size analyses and plasticity characteristics tests. The results of these tests are shown on the boring logs.

The boring logs included in the Appendix have been prepared on the basis of the field record of drilling and sampling, and the results of the laboratory examination and testing of samples. Stratification lines on the boring logs indicating changes in soil stratigraphy represent depths of changes approximated by the driller, by sampling effort and recovery, and by laboratory test results. Actual depths to changes may differ somewhat from the estimated depths, or transitions may occur gradually and not be sharply defined. The boring logs presented in this report therefore contain both factual and interpretative information and are not an exact copy of the field log.

Although it is considered that the borings have disclosed information generally representative of site conditions, it should be expected that between borings conditions may occur which are not precisely represented by any one of the borings. Soil deposition processes and natural geologic forces are such that soil and rock types and conditions may change in short vertical intervals and horizontal distances.

Soil/rock samples will be stored at our laboratory for a period as dictated by the requirement of the SGE. After this period of time, they will be discarded, unless notified to the contrary by the client.

LEGEND – BORING LOG TERMINOLOGY

Explanation of each column, progressing from left to right

1. Depth (in feet) – refers to distance below the ground surface.

2. Elevation (in feet) – is referenced to mean sea level, unless otherwise noted.

3. Standard Penetration (N) – the number of blows required to drive a 2-inch O.D., 1-3/8 inch I.D., split-barrel sampler, using a 140-pound hammer with a 30-inch free fall. The blows are recorded in 6-inch drive increments. Standard penetration resistance is determined from the total number of blows required for one foot of penetration by summing the second and third 6-inch increments of an 18-inch drive.

   50/n – indicates number of blows (50) to drive a split-barrel sampler a certain number of inches (n) other than the normal 6-inch increment.

4. The length of the sampler drive is indicated graphically by horizontal lines across the "Standard Penetration" and "Recovery" columns.

5. Sample recovery from each drive is indicated numerically in the column headed "Recovery".

6. The drive sample location is designated by the heavy vertical bar in the "Sample No., Drive" column.

7. The length of hydraulically pressed "Undisturbed" samples is indicated graphically by horizontal lines across the "Press" column.

8. Sample numbers are designated consecutively, increasing in depth.

9. Soil Description

   a. The following terms are used to describe the relative compactness and consistency of soils:

   Granular Soils – Compactness

Term	Blows/Foot Standard Penetration
Very Loose	less than 5
Loose	5 – 10
Medium Dense	11 – 30
Dense	31 – 50
Very Dense	over 50

   Cohesive Soils – Consistency

Term	Unconfined Compression tons/sq.ft.	Blows/Foot Standard Penetration	Hand Manipulation
Very Soft	less than 0.25	less than 2	Easily penetrated 2-in. by fist
Soft	0.25 – 0.50	2 – 4	Easily penetrated 2-in. by thumb
Medium Stiff	0.50 – 1.0	5 – 8	Penetrated by thumb with moderate effort
Stiff	1.0 – 2.0	9 – 15	Readily indented by thumb but not penetrated
Very Stiff	2.0 – 4.0	16 – 30	Readily indented by thumbnail
Hard	over 4.0	over 30	Indented with difficulty by thumbnail

   b. Color – If a soil is a uniform color throughout, the term is single, modified by such adjective as light and dark. If the predominant color is shaded by a secondary color, the secondary color precedes the primary color. If two major and distinct colors are swirled throughout the soil, the colors are modified by the term "mottled".

   c. Texture is based on the Ohio Department of Transportation Classification System. Soil particle size definitions are as follows:

Description		Size	Description		Size
Boulders		Larger than 12"	Sand	– Coarse	2.0 mm to 0.42 mm
Cobbles		12" to 3"		– Fine	0.42 mm to 0.074 mm
Gravel	– Coarse	3" to ¾"	Silt		0.074 mm to 0.005 mm
	– Fine	¾" to 2.0 mm	Clay		smaller than 0.005 mm

d. The main soil component is listed first. The minor components are listed in order of decreasing percentage of particle size.

e. Modifiers to main soil descriptions are indicated as a percentage by weight of particle sizes.

trace	0 to 10%
little	10 to 20%
some	20 to 35%
"and"	35 to 50%

f. Moisture content of **cohesionless soils** (sands and gravels) is described as follows:

Term	Relative Moisture or Appearance
Dry	Soil leaves no moisture when pressed between fingers
Damp	Soil leaves very little moisture when pressed between fingers.
Moist	Soil leaves small amount of moisture when pressed between fingers.
Wet	The pore space is filled with water and water can be poured from sample with ease.

g. The moisture content of **cohesive soils** (silts and clays) is expressed relative to plastic properties.

Term	Relative Moisture or Appearance
Dry	Brittle to powdery; Moisture content well below plastic limit
Damp	Moisture content below plastic limit
Moist	Moisture content above plastic limit to -3% liquid limit
Wet	Moisture content near or above liquid limit

10. Rock Hardness and Rock Quality Designation

a. The following terms are used to describe the relative strength of the **bedrock**.

Term	Description
Very Weak	Core can be carved with a knife and scratched by fingernail. Can be excavated readily with a point of a pick. Pieces 1-inch or more in thickness can be broken by finger pressure.
Weak	Core can be grooved or gouged readily by a knife or pick. Can be excavated in small fragments by moderate blows of a pick point. Small, thin pieces can be broken by finger pressure.
Slightly Strong	Core can be grooved or gouged 0.05 inch deep by firm pressure of a knife or pick point. Can be excavated in small chips to pieces about 1-inch maximum size by hard blows of the point of a geologist's pick.
Moderately Strong	Core can be scratched with a knife or pick. Grooves or gouges to ¼" deep can be excavated by hand blows of a geologist's pick. Requires moderate hammer blows to detach hand specimen.
Strong	Core can be scratched with a knife or pick only with difficulty. Requires hard hammer blows to detach hand specimen. Sharp and resistant edges are present on hand specimen.
Very Strong	Core cannot be scratched by a knife or sharp pick. Breaking of hand specimens requires hard repeated blows of the geologist hammer.
Extremely Strong	Core cannot be scratched by a knife or sharp pick. Chipping of hand specimens requires hard repeated blows of the geologist hammer.

b. Rock Quality Designation, RQD – This value is expressed in percent and is an indirect measure of rock soundness. It is obtained by summing the total length of all core pieces which are at least four inches long, and then dividing this sum by the total length of the core run.

11. Gradation – when tests are performed, the percentage of each particle size is listed in the appropriate column (defined in Item 9c).

12. When a test is performed to determine the natural moisture content, liquid limit moisture content, or plastic limit moisture content, the moisture content is indicated in tabular form.

13. The corrected standard penetration (N_{60}) value in blows per foot is indicated in tabular form.

PROJECT DESCRIPTION

INTERSECTION IMPROVEMENTS AT THE INTERSECTIONS OF NORTON ROAD AND JOHNSON ROAD IN GROVE CITY, FRANKLIN COUNTY, OHIO. THE PROJECT INCLUDES THE ADDITION OF A ROUNDABOUT AND A WESTWARD SHIFT IN THE EXISTING INTERSECTION.

GEOLOGY

THE PROJECT IS LOCATED WITHIN DARBY PLAIN, PART OF THE SOUTHERN OHIO LOAMY TILL PLAIN PHYSIOGRAPHIC REGION. THE DARBY PLAIN IS GENERALLY MODERATELY LOW RELIEF WITH GROUND AND RECESSIONAL MORAINES WITH POORLY DRAINED SWALES BETWEEN HUMMOCKS. TYPICAL NATIVE OVERBURDEN SOIL IS COMPRISED OF LOAMY, HIGH-LIME WISCONSINAN-AGE TILL AND SPARSE OUTWASH.

BEDROCK IS MAPPED AS BEING 100 FEET OR MORE BELOW THE EXISTING GROUND SURFACE, RANGING IN ELEVATION FROM APPROXIMATELY 700 TO 780 FEET.

RECONNAISSANCE

A SITE RECONNAISSANCE WAS PERFORMED BY DLZ ON FEBRUARY 16, 2017. NO GEOHAZARDS WERE OBSERVED. SURROUNDING LAND USAGE IS PRIMARILY RESIDENTIAL AND CULTIVATED LAND. EXISTING PAVEMENT CONTAINED OCCASIONAL LONGITUDINAL, TRANSITIONAL, AND EDGE CRACKING ALONG NORTON ROAD AND MORE SEVERE CRACKING WITH OCCASIONAL POTHOLES AND PATCHES ALONG JOHNSON ROAD.

SUBSURFACE EXPLORATION

A TOTAL OF 11 BORINGS WERE DRILLING ON FEBRUARY 28 AND MARCH 2, 2017. BORINGS WERE ADVANCED USING ATV- OR TRUCK-MOUNTED ROTARY DRILL RIG WITH 3 ¼-INCH I.D. HOLLOW-STEM AUGERS TO DEPTHS RANGING FROM 8.5 TO 10.0 FEET BELOW GROUND SURFACE. SOIL SAMPLES WERE COLLECTED AT CONTINUOUS INTERVALS BY METHODS OF STANDARD PENETRATION TESTING (ASTM D-1586). AUTOMATIC HAMMER SYSTEMS WERE CALIBRATED ON MAY 20, 2016 AND FEBRUARY 22, 2017 WITH AVERAGE DRILL ROD ENERGY RATIOS (ER) OF 94.4% AND 95.3%.

EXPLORATION FINDINGS

IN GENERAL, SURFICIAL MATERIAL ENCOUNTERED BY THE BORINGS CONSISTED OF: 1) BETWEEN 8 TO 13 INCHES OF ASPHALT PAVEMENT OVER APPROXIMATELY 0 TO 4 INCHES OF AGGREGATE BASE IN BORINGS PERFORMED IN THE ROADWAY, 2) APPROXIMATELY 0 TO 2 INCHES OF TOPSOIL IN BORINGS PERFORMED OUTSIDE OF THE ROADWAY, AND 3) APPROXIMATELY 0 TO 4.5 FEET OF FILL OR POSSIBLE FILL MATERIAL WITHIN SIX (6) OF THE BORINGS. FILL OR POSSIBLE FILL MATERIAL WAS GENERALLY VERY SOFT TO STIFF COHESIVE FINE-GRAINED SOIL CLASSIFIED AS EITHER A-6A, A-6B, OR A-7-6; ONE SAMPLE IDENTIFIED AS FILL WAS MEDIUM DENSE GRANULAR SOIL CLASSIFIED AS A-1-A. NATURAL SOIL WAS ENCOUNTERED UNDERLYING SURFICIAL MATERIAL, CONSISTING OF GENERALLY SOFT TO VERY STIFF COHESIVE FINE-GRAINED SOILS CLASSIFIED AS EITHER A-4A, A-6A, A-6B, OR A-7-6, WITH THE EXCEPTION OF ONE SAMPLE OF LOOSE GRANULAR SOIL CLASSIFIED AS A-2-6. NATURAL SOIL WAS IDENTIFIED AS OCCASIONALLY CONTAINING ROOT HAIRS, IRON OXIDE STAINS, AND ROCK FRAGMENTS.

SPECIFICATIONS

THIS GEOTECHNICAL EXPLORATION WAS PERFORMED IN ACCORDANCE WITH THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, OFFICE OF GEOTECHNICAL ENGINEERING, SPECIFICATIONS FOR GEOTECHNICAL EXPLORATIONS, DATED JULY 2016.

AVAILABLE INFORMATION

ALL AVAILABLE SOIL AND BEDROCK INFORMATION THAT CAN BE CONVENIENTLY SHOWN ON THE GEOTECHNICAL EXPLORATION SHEETS HAS BEEN SO REPORTED. ADDITIONAL EXPLORATIONS MAY HAVE BEEN MADE TO STUDY SOME SPECIAL ASPECT OF THE PROJECT. COPIES OF THIS DATA, IF ANY, MAY BE INSPECTED IN THE DISTRICT DEPUTY DIRECTOR'S OFFICE OR THE OFFICE OF GEOTECHNICAL ENGINEERING AT 1980 WEST BROAD STREET.

LEGEND

DESCRIPTION	ODOT CLASS	CLASSIFIED MECH./VISUAL	
GRAVEL AND/OR STONE FRAGMENTS	A-1-a	1	-
GR. AND/OR ST. FRAGS. WITH SAND, SILT & CLAY	A-2-6	-	1
SANDY SILT	A-4a	2	5
SILT AND CLAY	A-6a	7	12
SILTY CLAY	A-6b	4	11
CLAY	A-7-6	8	9
	TOTAL	22	38
PAVEMENT OR BASE = X = APPROXIMATE THICKNESS	*VISUAL*		
SOD AND TOPSOIL = X = APPROXIMATE THICKNESS	*VISUAL*		

BORING LOCATION - PLAN VIEW.

DRIVE SAMPLE AND/OR ROCK CORE BORING PLOTTED TO VERTICAL SCALE ONLY. HORIZONTAL BAR INDICATES A CHANGE IN STRATIGRAPHY.

WC INDICATES WATER CONTENT IN PERCENT.

N_{60} INDICATES STANDARD PENETRATION RESISTANCE NORMALIZED TO 60% DRILL ROD ENERGY RATIO.

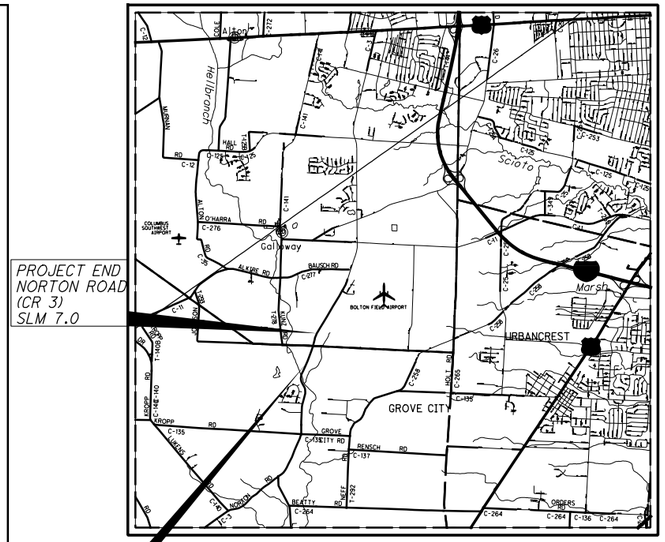
X/Y/Z NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT):
X= NUMBER OF BLOWS FOR FIRST 6 INCHES.
Y= NUMBER OF BLOWS FOR SECOND 6 INCHES.
Z= NUMBER OF BLOWS FOR THIRD 6 INCHES.

● INDICATES A PLASTIC MATERIAL WITH A MOISTURE CONTENT EQUAL TO OR GREATER THAN THE LIQUID LIMIT MINUS 3.

* INDICATES A SAMPLE TAKEN WITHIN 3 FT OF PROPOSED GRADE.

SS INDICATES A SPLIT SPOON SAMPLE.

NP INDICATES A NON-PLASTIC SAMPLE.



LOCATION MAP
SCALE IN MILES

PARTICLE SIZE DEFINITIONS

12"	3"	2.0 mm	0.42 mm	0.074 mm	0.005 mm
BOULDERS | COBBLES		GRAVEL	COARSE SAND	FINE SAND	SILT | CLAY
		No. 10 SIEVE	No. 40 SIEVE	No. 200 SIEVE	

INDEX OF SHEETS

SUMMARY OF SOIL TEST DATA, SHEET 2.

LOCATION FROM STA.	TO STA.	PLAN VIEW SHEET	PROFILE SHEET	CUT MAX.	FILL EMB. MAX.
NORTON ROAD					
BEGIN	206+00	3	3	<1 FT	8 FT
206+00	END	4	4	<1 FT	<1 FT
JOHNSON ROAD					
BEGIN	END	5	5	<1 FT	5 FT
ROUNDABOUT					
BEGIN	END	6	6	-	6 FT

RECON. - DML - 2/16/2017
DRILLING - DLZ - 2/28 & 3/3/2017
DRAWN - DML - 4/2-14/2017
REVIEWED - VBP - 4/12/2017

DLZ
4511 HUNTLEY ROAD • COLUMBUS, OHIO 43228

PID NO. 102047

SOIL PROFILE

FRA-CR3-06.79

1 / 6

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SUMMARY OF SOIL TEST DATA
NORTON ROAD

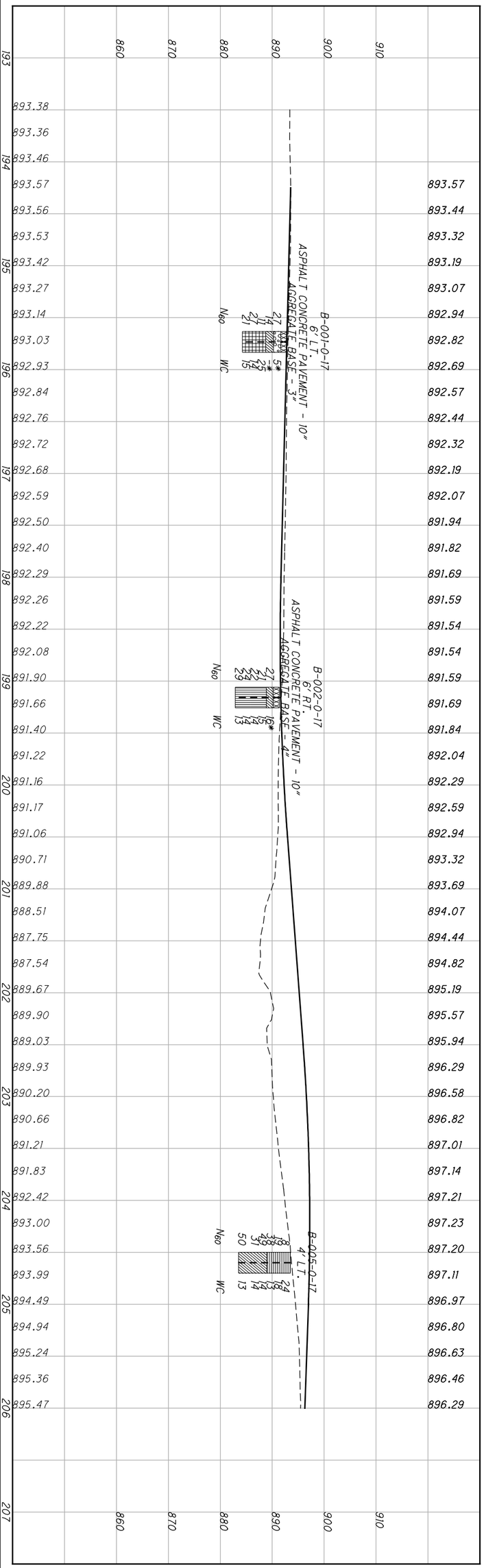
EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	N60	% REC	HP tsf	% GR	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	OHIO CLASS	SO4 ppm
B-001-0-17	01.00	02.50	1	16	11	-	89	6	2	3		NP	NP	NP	5	A-1-a (0)	-
STA. 195+73.3	02.50	04.00	2	9	0	-	BROWN AND GRAY, SILT AND CLAY								-	A-6a (V)	0
LATITUDE = 39.889672	04.00	05.50	3	7	78	1.50	0	3	9	34	54	44	17	27	25	A-7-6 (16)	-
LONGITUDE = -83.155353	05.50	07.00	4	16	94	2.00	SAME AS SS-3								14	A-7-6 (V)	-
	07.00	08.50	5	12	100	2.00	SAME AS SS-3								15	A-7-6 (V)	-
B-002-0-17	01.00	02.50	1	16	78	2.00	12	8	13	27	40	30	16	14	16	A-6a (8)	127
STA. 199+15.8	02.50	04.00	2	12	94	2.00	5	9	15	31	40	26	16	10	15	A-4a (7)	-
LATITUDE = 39.890553	04.00	05.50	3	13	100	1.75	SAME AS SS-2								14	A-4a (V)	-
LONGITUDE = -83.154927	05.50	07.00	4	14	100	2.00	SAME AS SS-2								14	A-4a (V)	-
	07.00	08.50	5	17	100	2.25	SAME AS SS-2								13	A-4a (V)	-
B-005-0-17	00.00	01.50	1	5	61	0.50	SAME AS SS-2								24	A-6b (V)	-
STA. 204+63.7	01.50	03.00	2	11	78	1.75	6	6	11	30	47	34	18	16	18	A-6b (10)	200
LATITUDE = 39.892027	03.00	04.50	3	23	100	3.00	SAME AS SS-2								13	A-6b (V)	-
LONGITUDE = -83.154557	04.50	06.00	4	29	100	3.00	8	9	13	31	39	30	17	13	14	A-6a (8)	-
	06.00	07.50	5	19	100	1.50	SAME AS SS-4								14	A-6a (V)	-
	08.50	10.00	6	30	100	3.50	SAME AS SS-4								13	A-6a (V)	-
B-006-0-17	00.00	01.50	1	6	67	0.75	SAME AS SS-2								24	A-6b (V)	0
STA.	01.50	03.00	2	6	33	0.75	21	7	9	23	40	40	20	20	22	A-6b (10)	-
LATITUDE =	03.00	04.50	3	6	94	1.00	0	3	9	25	63	48	22	26	29	A-7-6 (16)	-
LONGITUDE =	04.50	06.00	4	9	100	1.25	SAME AS SS-3								23	A-7-6 (V)	-
	06.00	07.50	5	4	78	0.50	SAME AS SS-3								23	A-7-6 (V)	-
	08.50	10.00	6	8	100	1.00	SAME AS SS-3								15	A-7-6 (V)	-
B-007-0-17	01.00	02.50	1	7	6	1.00	DARK BROWN, SILTY CLAY								14	A-6b (V)	-
STA. 209+81.9	02.50	04.00	2	8	72	1.25	1	3	8	26	62	42	19	23	27	A-7-6 (14)	73
LATITUDE = 39.893359	04.00	05.50	3	7	11	BROWN, GR. AND/OR STONE FRAGS WITH SA, SI, AND CL									12	A-2-6 (V)	-
LONGITUDE = -83.153929	05.50	07.00	4	6	17	1.00	SAME AS SS-5								24	A-6a (V)	-
	07.00	08.50	5	12	100	2.00	13	8	13	27	39	29	17	12	14	A-6a (7)	-

SUMMARY OF SOIL TEST DATA
JOHNSON ROAD

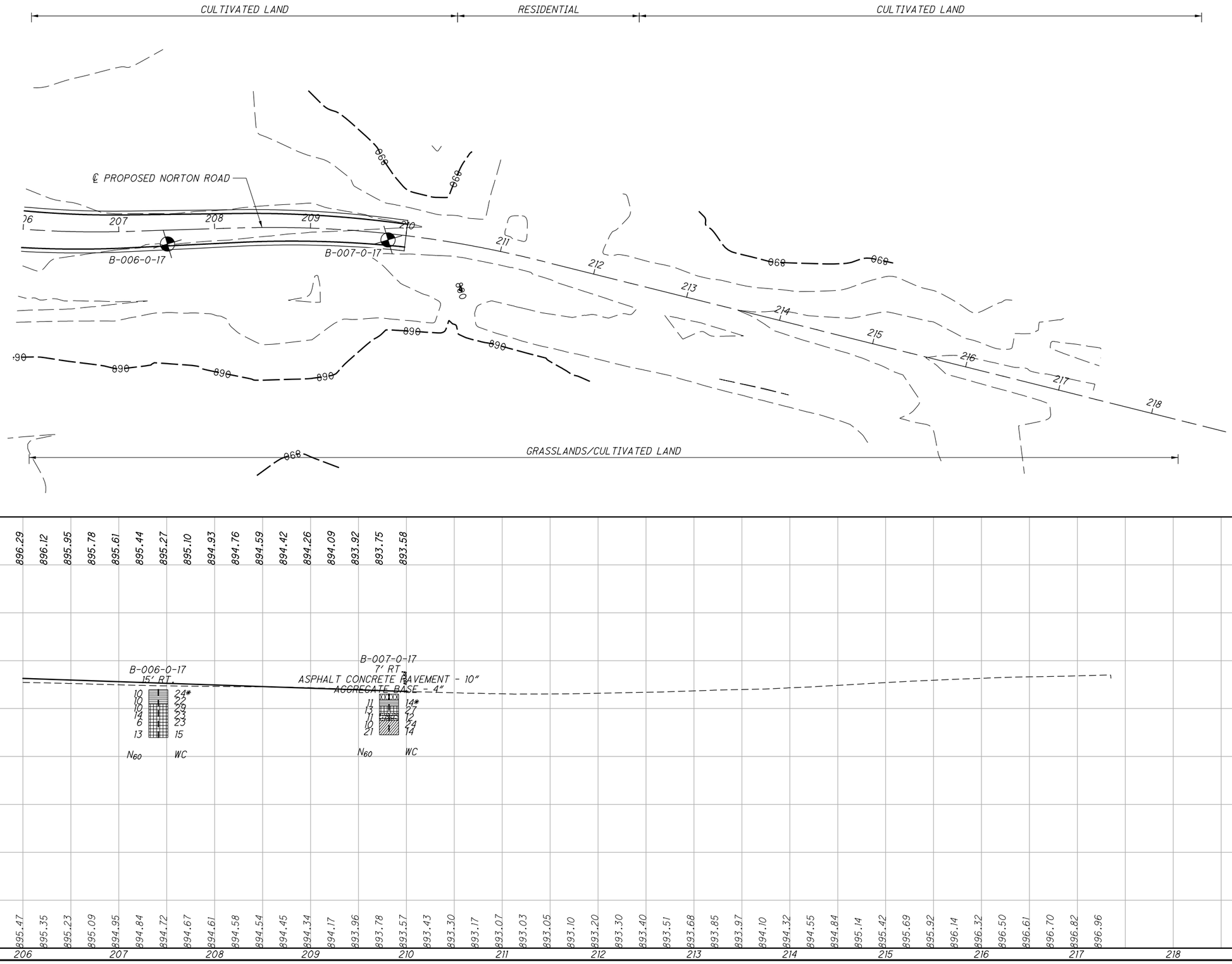
EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	N60	% REC	HP tsf	% GR	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	OHIO CLASS	SO4 ppm
B-008-0-17	01.00	02.50	1	14	83	2.50	6	4	9	22	59	44	21	23	26	A-7-6 (14)	87
STA. 26+18.52	02.50	04.00	2	14	0	SAME AS SS-1									-	A-7-6 (V)	-
LATITUDE = 39.891401	04.00	05.50	3	15	89	2.75	10	7	12	31	40	27	16	11	13	A-6a (8)	-
LONGITUDE = -83.155971	05.50	07.00	4	17	100	3.00	SAME AS SS-3								17	A-6a (V)	-
	07.00	08.50	5	14	100	2.75	SAME AS SS-3								16	A-6a (V)	-
B-010-0-17	01.00	02.50	1	11	72	1.50	0	2	4	34	60	37	18	19	20	A-6b (12)	60
STA. 31+33.1	02.50	04.00	2	10	89	1.50	SAME AS SS-1								23	A-6b (V)	-
LATITUDE = 39.891316	04.00	05.50	3	18	100	2.50	5	9	14	32	40	26	16	10	14	A-4a (7)	-
LONGITUDE = -83.154145	05.50	07.00	4	25	100	3.00	SAME AS SS-3								16	A-4a (V)	-
	07.00	08.50	5	14	83	2.50	SAME AS SS-3								15	A-4a (V)	-
B-011-0-17	00.00	01.50	1	2	56	0.25	SAME AS SS-2								33	A-7-6 (V)	-
STA. 33+43.4	01.50	03.00	2	7	50	1.00	0	2	7	27	64	50	19	31	25	A-7-6 (18)	147
LATITUDE = 39.891282	03.00	04.50	3	10	83	1.75	9	3	6	29	53	33	20	13	18	A-6a (9)	-
LONGITUDE = -83.153396	04.50	06.00	4	32	50	3.00	SAME AS SS-3								18	A-6a (V)	-
	06.00	07.50	5	15	100	2.50	SAME AS SS-3								15	A-6a (V)	-
	07.50	09.00	6	18	56	2.50	SAME AS SS-3								12	A-6a (V)	-

SUMMARY OF SOIL TEST DATA
ROUNDABOUT

EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	N60	% REC	HP tsf	% GR	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	OHIO CLASS	SO4 ppm
B-003-0-17	00.00	01.50	1	4	67	0.50	BLACK, SILTY CLAY, CONT. ROOTS, SLIGHTLY ORGANIC								32	A-6b (V)	-
STA. 3+38.8	01.50	03.00	2	5	100	0.50	1	2	7	29	61	45	20	25	27	A-7-6 (15)	140
LATITUDE = 39.891227	03.00	04.50	3	4	83	0.50	1	3	11	28	57	39	19	20	25	A-6b (12)	-
LONGITUDE = -83.154804	04.50	06.00	4	4	50	0.50	SAME AS SS-3								21	A-6b (V)	-
	06.00	07.50	5	20	100	3.00	SAME AS SS-3								13	A-6b (V)	-
	08.50	10.00	6	19	100	3.00	SAME AS SS-3								15	A-6b (V)	-
B-004-0-17	01.50	03.00	1	7	56	1.00	7	6	11	32	44	31	17	14	21	A-6a (10)	80
STA. 1+60.0	03.00	04.50	2	4	94	0.50	SAME AS SS-1								23	A-6a (V)	-
LATITUDE = 39.891516	04.50	06.00	3	7	100	1.25	1	2	5	27	65	49	20	29	29	A-7-6 (17)	-
LONGITUDE = -83.154603	06.00	07.50	4	9	83	1.25	SAME AS SS-3								21	A-7-6 (V)	-
	07.50	09.00	5	10	100	1.50	SAME AS SS-3								13	A-7-6 (V)	-
B-009-0-17	00.00	01.50	1	3	67	0.25	BROWN, SILT AND CLAY								27	A-6a (V)	-
STA. 0+16.0	01.50	03.00	2	4	67	0.50	1	3	9	27	60	43	20	23	26	A-7-6 (14)	120
LATITUDE = 39.891426	03.00	04.50	3	8	78	1.00	2	7	12	33	46	29	16	13	17	A-6a (9)	-
LONGITUDE = -83.154928	04.50	06.00	4	8	44	1.00	SAME AS SS-3								15	A-6a (V)	-
	06.00	07.50	5	15	78	2.00	SAME AS SS-3								15	A-6b (V)	-
	08.50	10.00	6	21	100	3.00	SAME AS SS-3								9	A-6b (V)	-



	3/6	FRA-CR3-06.79	SOIL PROFILE PROJECT BEGIN TO STA. 206+00 NORTON RD	DRAWN DML CHECKED VBP	0 50 25 100 HORIZONTAL SCALE IN FEET	N



HORIZONTAL SCALE IN FEET
0 25 50 100

DRAWN DML
CHECKED VBP

SOIL PROFILE
STA. 206+00 TO PROJECT END NORTON RD

FRA-CR3-06.79

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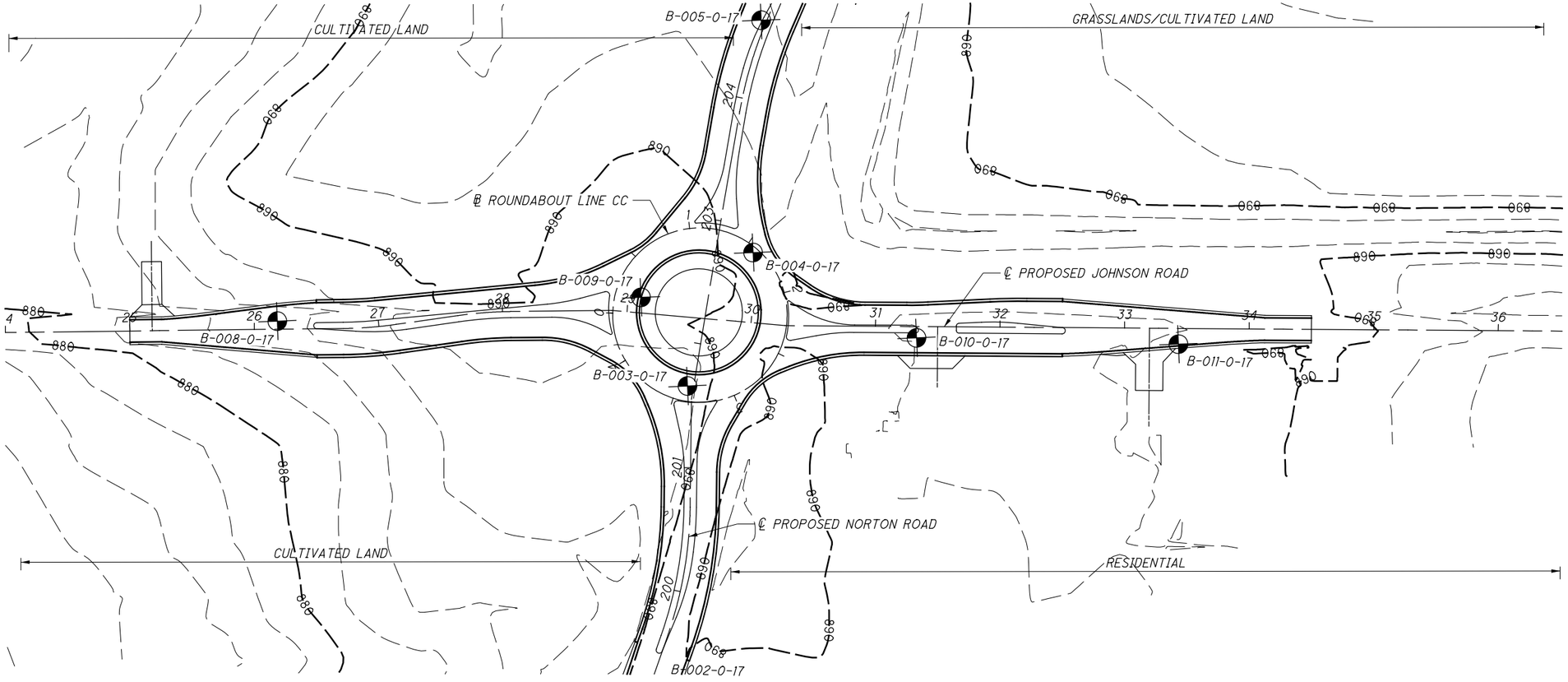

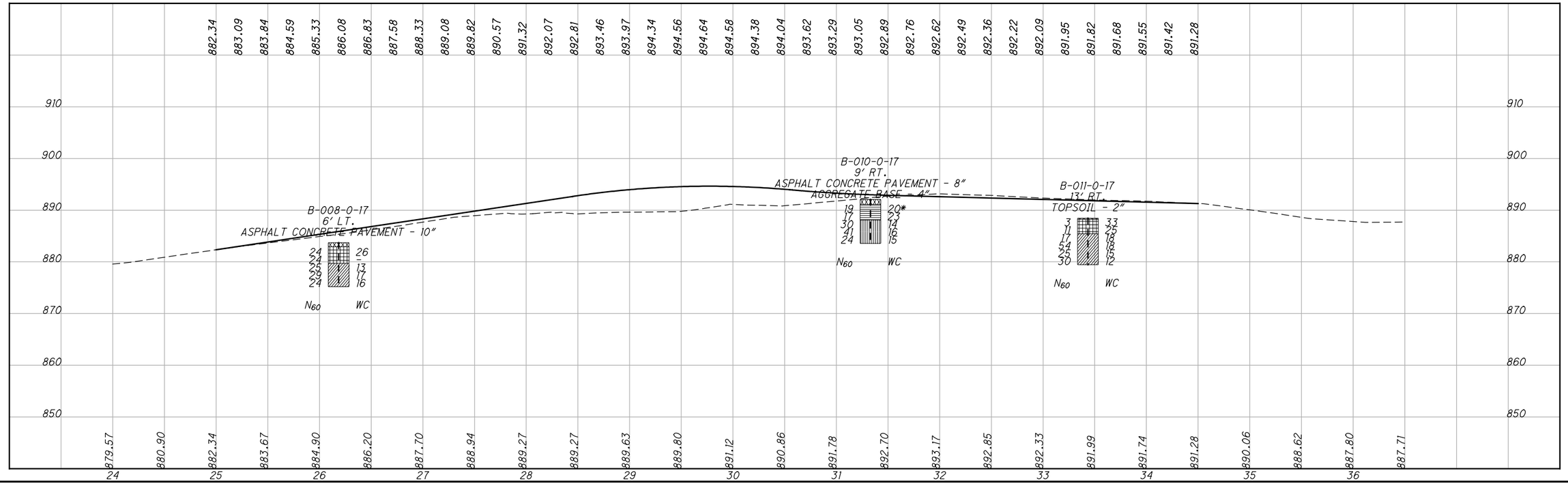

SOIL PROFILE

PROJECT BEGIN TO END JOHNSON ROAD

FRA-CR3-06.79

DRAWN DML CHECKED VBP

HORIZONTAL SCALE IN FEET
0 25 50 100

5 / 6

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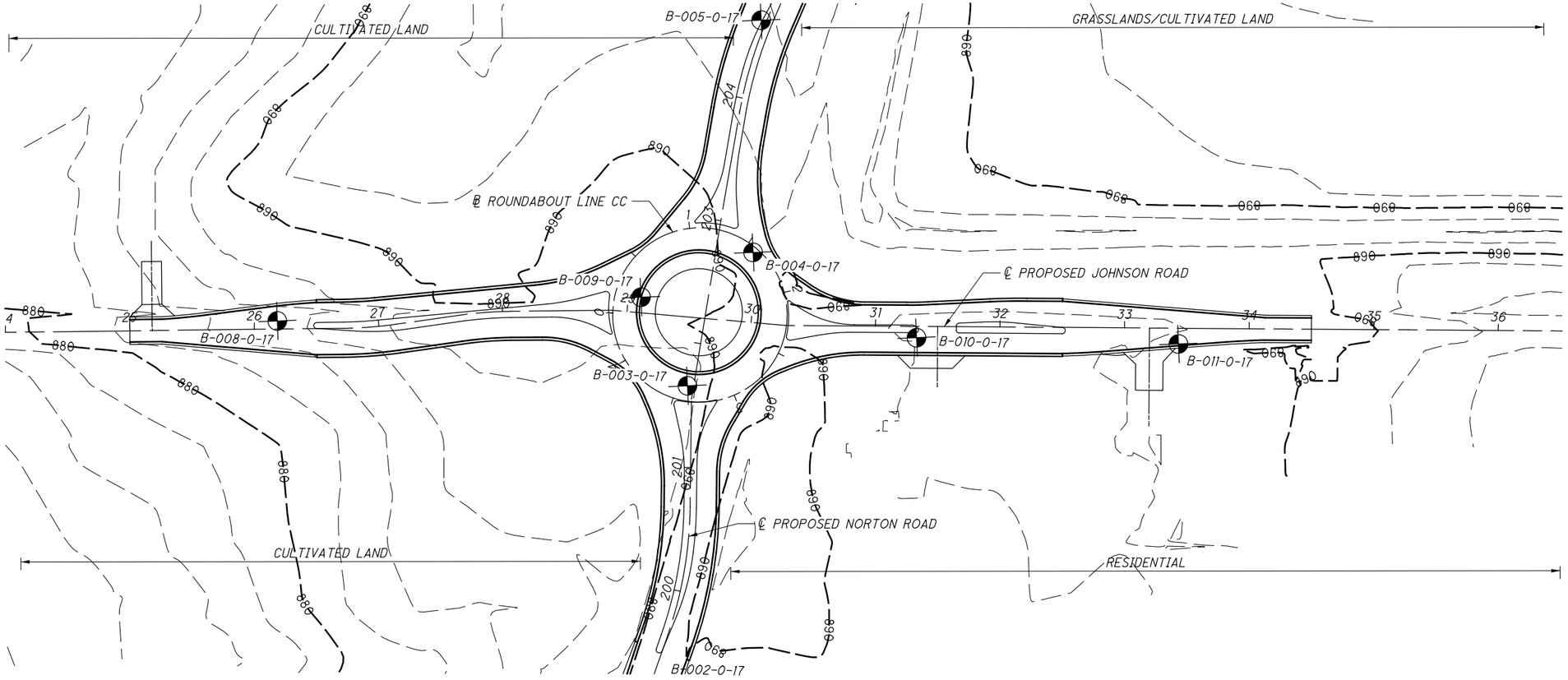

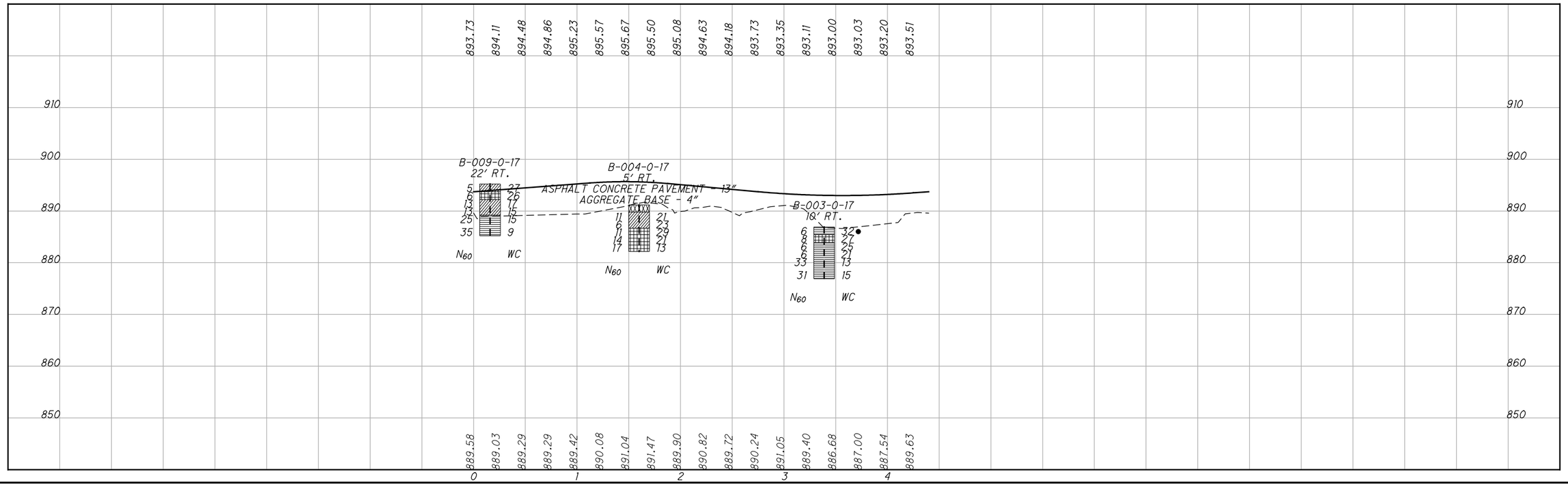

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HORIZONTAL SCALE IN FEET
0 25 50 100

DRAWN DML CHECKED VBP

SOIL PROFILE
ROUNDABOUT LINE CC

FRA-CR3-06.79

6 / 6

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / K. CONRAD	DRILL RIG: CME 75-KC-77	STATION / OFFSET: 195+73, 6' LT.	EXPLORATION ID B-001-0-17
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: PROPOSED NORTON ROAD	
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/22/17	ELEVATION: 892.8 (MSL) EOB: 8.5 ft.	PAGE 1 OF 1
START: 2/28/17 END: 2/28/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 95.3	LAT / LONG: 39.889672, -83.155353	

MATERIAL DESCRIPTION AND NOTES	ELEV. 892.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
ASPHALT CONCRETE PAVEMENT - 10" AGGREGATE BASE - 3"	891.7																	
MEDIUM DENSE, BROWN, **GRAVEL AND STONE FRAGMENTS**, TRACE SAND, DAMP [FILL] @1.0'-2.5', LOW RECOVERY, DROVE ON LARGE AGGREGATES.	890.3	1	12 9 8	27	11	SS-1	-	89	6	2	3	-	NP	NP	NP	5	A-1-a (0)	
STIFF, BROWN AND GRAY, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, MOIST @2.5'-4.0', NO RECOVERY, COLLECTED SOIL CUTTINGS.	888.8	2 3 4	4 5 4	14	0	SS-2	-	-	-	-	-	-	-	-	-	-	A-6a (V)	
STIFF TO VERY STIFF, BROWN AND GRAY, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST @5.5'-8.5', BROWN.	884.3	5 6 7 8	3 3 4	11	78	SS-3	1.50	0	3	9	34	54	44	17	27	25	A-7-6 (16)	
	EOB		6 7 10	27	94	SS-4	2.00	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
			7 7 6	21	100	SS-5	2.00	-	-	-	-	-	-	-	-	15	A-7-6 (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; POURED 25 LB. HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / K. CONRAD	DRILL RIG: CME 75-KC-77	STATION / OFFSET: 199+16, 6' RT.	EXPLORATION ID B-002-0-17
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: PROPOSED NORTON ROAD	
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/22/17	ELEVATION: 891.4 (MSL) EOB: 8.5 ft.	PAGE 1 OF 1
START: 2/28/17 END: 2/28/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 95.3	LAT / LONG: 39.890553, -83.154927	

MATERIAL DESCRIPTION AND NOTES	ELEV. 891.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
ASPHALT CONCRETE PAVEMENT - 10" AGGREGATE BASE - 4"	890.2																	
VERY STIFF, BROWN, **SILT AND CLAY**, LITTLE SAND, LITTLE GRAVEL, MOIST	888.9	1	8 8 9	27	78	SS-1	2.00	12	8	13	27	40	30	16	14	16	A-6a (8)	
STIFF TO VERY STIFF, BROWN, **SANDY SILT**, "AND" CLAY, TRACE GRAVEL, DAMP		2																
@2.5'-5.5', CONTAINS IRON OXIDE STAINS.		3	7 7 6	21	94	SS-2	2.00	5	9	15	31	40	26	16	10	15	A-4a (7)	
		4																
		5	6 7 7	22	100	SS-3	1.75	-	-	-	-	-	-	-	-	14	A-4a (V)	
@5.5'-8.5', BROWN AND GRAY MOTTLED.		6	9 7 8	24	100	SS-4	2.00	-	-	-	-	-	-	-	-	14	A-4a (V)	
@7.0'-8.5', CONTAINS ROCK FRAGMENTS.	882.9	7	6 8 10	29	100	SS-5	2.25	-	-	-	-	-	-	-	-	13	A-4a (V)	
		8 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; POURED 25 LB. HOLE PLUG; SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 8/2/17 14:18 - S:\DEPT\GEOTECHNICAL\GINT\PROJECTS\1721-3001.00 NORTON RAB.GPJ

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / V. DEARING	DRILL RIG: CME 55-TATV-26	STATION / OFFSET: 3+39, 10' RT.	EXPLORATION ID B-003-0-17
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: ROUNDABOUT	
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 5/20/16	ELEVATION: 886.9 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 3/2/17 END: 3/2/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 94.4	LAT / LONG: 39.891227, -83.154804	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
SOFT TO MEDIUM STIFF, BLACK, **SILTY CLAY**, TRACE TO LITTLE SAND, TRACE GRAVEL; CONTAINS ROOTS, SLIGHTLY ORGANIC, MOIST [FILL]	886.9		1 2 2	6	67	SS-1	0.50	-	-	-	-	-	-	-	-	32	A-6b (V)	
SOFT, BROWN AND GRAY, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, MOIST	885.4	1	1 2 3	8	100	SS-2	0.50	1	2	7	29	61	45	20	25	27	A-7-6 (15)	
SOFT, BROWN AND GRAY, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, MOIST @3.0'-4.5', BROWN AND GRAY MOTTLED. @4.5'-6.0', CONTAINS ROOT HAIRS.	883.9	2	1 2 2	6	83	SS-3	0.50	1	3	11	28	57	39	19	20	25	A-6b (12)	
		3	1 1 3	6	50	SS-4	0.50	-	-	-	-	-	-	-	-	21	A-6b (V)	
@6.0'-10.0', VERY STIFF, GRAYISH BROWN, CONTAINS ROCK FRAGMENTS.		4																
		5																
		6	2 9 12	33	100	SS-5	3.00	-	-	-	-	-	-	-	-	13	A-6b (V)	
		7																
		8																
		9	8 8 12	31	100	SS-6	3.00	-	-	-	-	-	-	-	-	15	A-6b (V)	
	876.9	EOB 10																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 25 LB. HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / K. CONRAD	DRILL RIG: CME 75-KC-77	STATION / OFFSET: 1+60, 5' RT.
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: ROUNDABOUT
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/22/17	ELEVATION: 891.2 (MSL) EOB: 9.0 ft.
START: 2/28/17 END: 2/28/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 95.3	LAT / LONG: 39.891516, -83.154603

EXPLORATION ID B-004-0-17

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 891.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
ASPHALT CONCRETE PAVEMENT - 13" AGGREGATE BASE - 4"	889.8	1																
SOFT TO MEDIUM STIFF, GRAY, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL; CONTAINS ROCK FRAGMENTS, SLIGHTLY ORGANIC, MOIST [POSSIBLE FILL]	886.7	2	4 4 3	11	56	SS-1	1.00	7	6	11	32	44	31	17	14	21	A-6a (10)	
		3	2 2 2	6	94	SS-2	0.50	-	-	-	-	-	-	-	-	23	A-6a (V)	
STIFF, GRAYISH BROWN, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, DAMP TO MOIST		4	2 3 4	11	100	SS-3	1.25	1	2	5	27	65	49	20	29	29	A-7-6 (17)	
@6.0'-9.0', BROWN AND GRAY MOTTLED.		5	2 4 5	14	83	SS-4	1.25	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
@7.5'-9.0', LITTLE TO SOME FINE TO COARSE SAND, CONTAINS IRON OXIDE STAINS.	882.2	6	5 6 5	17	100	SS-5	1.50	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
		EOB 9																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; POURED 25 LB. HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / V. DEARING	DRILL RIG: CME 55-TATV-26	STATION / OFFSET: 204+64, 4' LT.	EXPLORATION ID B-005-0-17
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: PROPOSED NORTON ROAD	
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 5/20/16	ELEVATION: 893.5 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 3/2/17 END: 3/2/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 94.4	LAT / LONG: 39.892027, -83.154557	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
MEDIUM STIFF TO STIFF, BROWN, **SILTY CLAY**, LITTLE SAND, TRACE TO LITTLE GRAVEL, DAMP TO MOIST	893.5	1	WOH 2 3	8	61	SS-1	0.50	-	-	-	-	-	-	-	-	24	A-6b (V)	
@3.0'-4.5', VERY STIFF.	889.0	2 3 4	2 3 9	19	78	SS-2	1.75	6	6	11	30	47	34	18	16	18	A-6b (10)	
			5 10 14	38	100	SS-3	3.00	-	-	-	-	-	-	-	-	13	A-6b (V)	
STIFF TO VERY STIFF, BROWN AND GRAY MOTTLED, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, DAMP @4.5'-6.0', SLIGHTLY ORGANIC. @6.0'-10.0', BROWN.		5 6 7	7 13 18	49	100	SS-4	3.00	8	9	13	31	39	30	17	13	14	A-6a (8)	
			7 8 12	31	100	SS-5	1.50	-	-	-	-	-	-	-	-	14	A-6a (V)	
	883.5	EOB 8 9 10	5 12 20	50	100	SS-6	3.50	-	-	-	-	-	-	-	-	13	A-6a (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 25 LB. HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / K. CONRAD	DRILL RIG: CME 75-KC-77	STATION / OFFSET: 207+41, 15' RT.	EXPLORATION ID B-006-0-17
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: PROPOSED NORTON ROAD	
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/22/17	ELEVATION: 893.9 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 2/28/17 END: 2/28/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 95.3	LAT / LONG: 39.892750, -83.154145	

MATERIAL DESCRIPTION AND NOTES	ELEV. 893.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
MEDIUM STIFF, DARK BROWN, **SILTY CLAY**, LITTLE SAND, SOME GRAVEL, CONTAINS ROOTS, SLIGHTLY ORGANIC, MOIST [FILL]			2 2 4	10	67	SS-1	0.75	-	-	-	-	-	-	-	-	24	A-6b (V)	
	890.9		3 3 3	10	33	SS-2	0.75	21	7	9	23	40	40	20	20	22	A-6b (10)	
MEDIUM STIFF TO STIFF, DARK BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST			2 3 3	10	94	SS-3	1.00	0	3	9	25	63	48	22	26	29	A-7-6 (16)	
@4.5'-10.0', BROWN.			3 4 5	14	100	SS-4	1.25	-	-	-	-	-	-	-	-	23	A-7-6 (V)	
			2 2 2	6	78	SS-5	0.50	-	-	-	-	-	-	-	-	23	A-7-6 (V)	
	883.9	EOB	3 4 4	13	100	SS-6	1.00	-	-	-	-	-	-	-	-	15	A-7-6 (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 25 LB. HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / K. CONRAD	DRILL RIG: CME 75-KC-77	STATION / OFFSET: 209+82, 7' RT.	EXPLORATION ID B-007-0-17
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: PROPOSED NORTON ROAD	
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/22/17	ELEVATION: 893.0 (MSL) EOB: 8.5 ft.	PAGE 1 OF 1
START: 2/28/17 END: 2/28/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 95.3	LAT / LONG: 39.893359, -83.153929	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
	893.0																	
ASPHALT CONCRETE PAVEMENT - 10" AGGREGATE BASE - 4"	891.8																	
MEDIUM STIFF TO STIFF, DARK BROWN, **SILTY CLAY**, LITTLE TO SOME SAND, LITTLE GRAVEL, MOIST [POSSIBLE FILL] @1.2'-2.5', LOW RECOVERY, DROVE ON GRAVEL.	890.5	1 2	12 4 3	11	6	SS-1	1.00	-	-	-	-	-	-	-	-	14	A-6b (V)	
STIFF, GRAY, **CLAY**, LITTLE SAND, SOME GRAVEL, SLIGHTLY ORGANIC, MOIST [POSSIBLE FILL] @3.0'-4.5', MODERATELY ORGANIC (LOI = 5.63%)	889.0	3	3 2 6	13	72	SS-2	1.25	1	3	8	26	62	42	19	23	27	A-7-6 (14)	
	887.5	4	9 4 3	11	11	SS-3	-	-	-	-	-	-	-	-	-	12	A-2-6 (V)	
LOOSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND, SILT, AND CLAY**, CONTAINS LARGE ROCK FRAGMENTS, MOIST @4.0'-5.5', LOW RECOVERY, GRAVEL IN SPLIT-SPOON TIP.		5 6	3 3 3	10	17	SS-4	1.00	-	-	-	-	-	-	-	-	24	A-6a (V)	
	884.5	7	4 6 7	21	100	SS-5	2.00	13	8	13	27	39	29	17	12	14	A-6a (7)	
MEDIUM STIFF TO STIFF, BROWN AND GRAY, **SILT AND CLAY**, LITTLE SAND, LITTLE GRAVEL, DAMP TO MOIST @5.5'-7.0', LOW RECOVERY.		8 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; POURED 25 LB. HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / K. CONRAD	DRILL RIG: CME 75-KC-77	STATION / OFFSET: 26+19, 6' LT.
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: PROPOSED JOHNSON ROAD
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/22/17	ELEVATION: 885.2 (MSL) EOB: 8.5 ft.
START: 2/28/17 END: 2/28/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 95.3	LAT / LONG: 39.891401, -83.155971

EXPLORATION ID B-008-0-17

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
	885.2																	
ASPHALT CONCRETE PAVEMENT - 10"	884.4																	
VERY STIFF, BROWN AND GRAY, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, CONTAINS IRON OXIDE STAINS, MOIST		1	7 7 8	24	83	SS-1	2.50	6	4	9	22	59	44	21	23	26	A-7-6 (14)	
@2.5'-4.0', NO RECOVERY, COLLECTED SOIL CUTTINGS.	881.2	2 3 4	4 6 9	24	0	SS-2	-	-	-	-	-	-	-	-	-	-	A-7-6 (V)	
VERY STIFF, BROWN AND GRAY MOTTLED, **SILT AND CLAY**, LITTLE SAND, LITTLE GRAVEL, DAMP TO MOIST		5	7 8 8	25	89	SS-3	2.75	10	7	12	31	40	27	16	11	13	A-6a (8)	
		6	9 8 10	29	100	SS-4	3.00	-	-	-	-	-	-	-	-	17	A-6a (V)	
	876.7	7 EOB 8	5 7 8	24	100	SS-5	2.75	-	-	-	-	-	-	-	-	16	A-6a (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; POURED 25 LB. HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / V. DEARING	DRILL RIG: CME 55-TATV-26	STATION / OFFSET: 0+16, 22' RT.	EXPLORATION ID B-009-0-17
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: ROUNDABOUT	
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 5/20/16	ELEVATION: 888.7 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 3/2/17 END: 3/2/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 94.4	LAT / LONG: 39.891426, -83.154928	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
VERY SOFT TO SOFT, BROWN, **SILT AND CLAY**, LITTLE TO SOME SAND, LITTLE GRAVEL; CONTAINS ROOTS, SLIGHTLY ORGANIC, MOIST [FILL]	888.7		WOH 1 2	5	67	SS-1	0.25	-	-	-	-	-	-	-	-	27	A-6a (V)	
@0.0'-1.5', MODERATELY ORGANIC (LOI = 4.34%)	887.2	1	1 2 2	6	67	SS-2	0.50	1	3	9	27	60	43	20	23	26	A-7-6 (14)	
SOFT TO MEDIUM STIFF, BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, CONTAINS ROOTS, DAMP TO MOIST [POSSIBLE FILL]	885.7	2 3 4	2 3 5	13	78	SS-3	1.00	2	7	12	33	46	29	16	13	17	A-6a (9)	
MEDIUM STIFF TO STIFF, BROWN AND GRAY MOTTLED, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST		5	2 4 4	13	44	SS-4	1.00	-	-	-	-	-	-	-	-	15	A-6a (V)	
@4.5'-6.0', CONTAINS ROCK FRAGMENTS.	882.7	6	2 6 10	25	78	SS-5	2.00	-	-	-	-	-	-	-	-	15	A-6b (V)	
STIFF TO VERY STIFF, BROWN AND GRAY, **SILTY CLAY**, LITTLE TO SOME SAND, TRACE TO LITTLE GRAVEL; CONTAINS ROCK FRAGMENTS, DAMP		7 8																
@8.5'-10.0', CONTAINS ROOT HAIRS.	878.7	EOB 9 10	3 10 12	35	100	SS-6	3.00	-	-	-	-	-	-	-	-	9	A-6b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 0.5 BAG HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / K. CONRAD	DRILL RIG: CME 75-KC-77	STATION / OFFSET: 31+33, 9' RT.	EXPLORATION ID B-010-0-17
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: PROPOSED JOHNSON ROAD	
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/22/17	ELEVATION: 892.1 (MSL) EOB: 8.5 ft.	PAGE 1 OF 1
START: 2/28/17 END: 2/28/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 95.3	LAT / LONG: 39.891316, -83.154145	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
ASPHALT CONCRETE PAVEMENT - 8" AGGREGATE BASE - 4"	892.1 / 891.1																	
STIFF, BROWN AND GRAY MOTTLED, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL; CONTAINS ROCK FRAGMENTS, DAMP TO MOIST	888.1	1–3	12 8 4	19	72	SS-1	1.50	0	2	4	34	60	37	18	19	20	A-6b (12)	
			3 4 7	17	89	SS-2	1.50	-	-	-	-	-	-	-	-	23	A-6b (V)	
VERY STIFF, BROWN AND GRAY, **SANDY SILT**, "AND" CLAY, TRACE GRAVEL, DAMP		4–5	6 9 10	30	100	SS-3	2.50	5	9	14	32	40	26	16	10	14	A-4a (7)	
		6–7	12 12 14	41	100	SS-4	3.00	-	-	-	-	-	-	-	-	16	A-4a (V)	
	883.6	EOB 8	10 9 6	24	83	SS-5	2.50	-	-	-	-	-	-	-	-	15	A-4a (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; POURED 25 LB. HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: FRA-CR3-06.79	DRILLING FIRM / OPERATOR: DLZ / K. CONRAD	DRILL RIG: CME 75-KC-77	STATION / OFFSET: 33+43, 13' RT.	EXPLORATION ID B-011-0-17
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: DLZ / T. SCHMITZ	HAMMER: CME AUTOMATIC	ALIGNMENT: PROPOSED JOHNSON ROAD	
PID: 102047 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/22/17	ELEVATION: 891.0 (MSL) EOB: 9.0 ft.	PAGE 1 OF 1
START: 2/28/17 END: 2/28/17	SAMPLING METHOD: SPT	ENERGY RATIO (%): 95.3	LAT / LONG: 39.891282, -83.153396	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
891.0																		
TOPSOIL - 2"	890.8		1															
@0.0'-1.5', HIGHLY ORGANIC (LOI = 15.29%)			1 1	3	56	SS-1	0.25	-	-	-	-	-	-	-	-	33	A-7-6 (V)	
SOFT TO MEDIUM STIFF, BLACK, **CLAY**, SOME SILT, TRACE SAND, CONTAINS ROOTS, LARGE ROCK FRAGMENTS, SEVERAL WOOD PIECES, MOIST [FILL]	888.0	1	WOH 2 5	11	50	SS-2	1.00	0	2	7	27	64	50	19	31	25	A-7-6 (18)	
STIFF TO VERY STIFF, BROWN AND GRAY MOTTLED, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, DAMP		2	3 5 6	17	83	SS-3	1.75	9	3	6	29	53	33	20	13	18	A-6a (9)	
		3	5 16 18	54	50	SS-4	3.00	-	-	-	-	-	-	-	-	18	A-6a (V)	
@6.0'-7.5', GRAYISH BROWN.		4	10 8 8	25	100	SS-5	2.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
@7.5'-9.0', BROWN, CONTAINS LARGE ROCK FRAGMENTS.	882.0	5	8 10 9	30	56	SS-6	2.50	-	-	-	-	-	-	-	-	12	A-6a (V)	
	EOB	6																
		7																
		8																
		9																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 25 LB. HOLE PLUG; SHOVELED SOIL CUTTINGS

DLZ

Sulfate Content Report

PROJECT NAME: Norton Rd. RAB | PROJECT NO.: 1721-3001.00 | SHEET 1 OF 2

CLIENT: OHM | PROCEDURE: Supplement 1122 | COMP. BY: BV | DATE: 3/14/2017

Boring No.	Sample No.	Depth	Initial Can No.	Can No. / Weight	Can No. / Weight	Bottle No.	Beaker No.	Readings w/Dilution of 1/20			Average (ppm)	Actual (ppm) (Avg x 20)
								1	2	3		
B-001-0-17	S-2	2.5'-4.0'	449	293 / 20.40	356 / 20.12	21	1014	0	0	0	0	0
B-002-0-17	S-1	1.0'-2.5'	439	328 / 20.18	215 / 20.77	15	1006	6	6	7	6	127
B-003-0-17	S-2	1.5'-3.0'	446	245 / 20.10	327 / 20.81	18	1013	7	7	7	7	140
B-004-0-17	S-1	1.5'-3.0'	440	270 / 21.16	373 / 20.91	9	1016	4	4	4	4	80
B-005-0-17	S-2	1.5'-3.0'	458	279 / 20.73	243 / 21.57	5	1010	10	10	10	10	200
B-006-0-17	S-1	0.0'-1.5'	464	361 / 20.90	297 / 20.49	7	10013	0	0	0	0	0
B-007-0-17	S-2	3.0'-4.5'	570	223 / 20.37	364 / 20.62	22	1009	3	4	4	4	73
B-008-0-17	S-1	1.0'-2.5'	2	241 / 20.37	268 / 20.50	8	1005	4	4	5	4	87
B-009-0-17	S-2	1.5'-3.0'	545	241 / 20.37	268 / 20.50	16	1002	6	6	6	6	120
B-010-0-17	S-1	1.0'-2.5'	SH	281 / 20.80	276 / 20.30	20	P	3	3	3	3	60

Remarks

DLZ

Sulfate Content Report

PROJECT NAME: Norton Rd. RAB | PROJECT NO.: 1721-3001.00 | SHEET: 2 OF 2

CLIENT: OHM | PROCEDURE: Supplement 1122 | COMP. BY: BV | DATE: 3/14/2017

Boring No.	Sample No.	Depth	Initial Can No.	Can No. / Weight	Can No. / Weight	Bottle No.	Beaker No.	Readings w/Dilution of 1/20			Average (ppm)	Actual (ppm) (Avg x 20)
								1	2	3		
B-011-0-17	S-2	1.5'-3.0'	526	335 / 20.02	394 / 20.00	14	1011	7	8	7	7	147

Remarks

Report on Loss of Ignition

(AASHTO T-267)

DLZ Project No.: 1721-3001.00

Client: OHM

Project Name: Norton Rd RAB

Date: 3/14/2017

Boring No. **B-007-0-17**

Sample No. **S-2**

Depth **3.0'-4.5'**

Muffle Furnace Crucible ID:	Y
Muffle Furnace Temperature	**455 ± 10°C**
Mass of crucible & oven dry soil (A)	97.59
Mass of crucible (B)	73.95
Mass of oven dry soil (C)	23.64
Mass of sample & crucible after ashed in muffle furnace (D)	96.26
Mass of crucible (B)	73.95
Mass of ashed soil sample (E)	22.31
Loss on Ignition = (C - E) / C * 100 =	**5.63**

Container No.	242
Wet Wt. + Container	229.58
Dry Wt. + Container	193.08
Wt. of Container	58.11
Dry Wt. of Soil	134.97
Moisture Content (%)	27.0

DLZ

Report on Loss of Ignition

(AASHTO T-267)

DLZ Project No.:	1721-3001.00	Boring No.	**B-009-0-17**
Client:	OHM	Sample No.	**S-1**
Project Name:	Norton Rd RAB	Depth	**0.0'-1.5'**
Date:	3/14/2017		

Muffle Furnace Crucible ID:	403
Muffle Furnace Temperature	**455 ± 10°C**
Mass of crucible & oven dry soil (A)	142.53
Mass of crucible (B)	106.58
Mass of oven dry soil (C)	35.95
Mass of sample & crucible after ashed in muffle furnace (D)	140.97
Mass of crucible (B)	106.58
Mass of ashed soil sample (E)	34.39
Loss on Ignition = (C - E) * 100 / C =	**4.34**

Container No.	298
Wet Wt. + Container	160.40
Dry Wt. + Container	137.66
Wt. of Container	56.75
Dry Wt. of Soil	80.91
Moisture Content (%)	28.1

DLZ

Report on Loss of Ignition

(AASHTO T-267)

DLZ Project No.:	1721-3001.00	Boring No.	**B-011-0-17**
Client:	OHM	Sample No.	**S-1**
Project Name:	Norton Rd RAB	Depth	**0.0'-1.5'**
Date:	3/14/2017		

Muffle Furnace Crucible ID:	417
Muffle Furnace Temperature	**455 ± 10°C**
Mass of crucible & oven dry soil (A)	116.95
Mass of crucible (B)	101.78
Mass of oven dry soil (C)	15.17
Mass of sample & crucible after ashed in muffle furnace (D)	114.63
Mass of crucible (B)	101.78
Mass of ashed soil sample (E)	12.85
Loss on Ignition = (C - E) / C * 100 =	**15.29**

Container No.	269
Wet Wt. + Container	153.56
Dry Wt. + Container	134.25
Wt. of Container	63.32
Dry Wt. of Soil	70.93
Moisture Content (%)	27.2

DLZ

Subgrade Analysis

V. 13.00 01/15/16

Design CBR 6

Global Options		
320	R&R	No
206	CS	Option
	LS	Option
206	Depth	12

Classification Counts by Sample																	
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	1	0	0	0	0	0	1	0	5	0	0	13	11	0	13	0	0
	2%						2%		11%			30%	25%		30%		
0%	5%								95%								

Surface Class		
2-5	0	
4b	0	
5	0	
7-5	0	
7-6	2	18%
8a	0	
8b	0	
R	0	

% Borings	
N_{60L}<= 5	18%
<=10	64%
>=20	18%
M+	100%
R	0%

% Surface	
64%	
0%	64%

UC @ Surface
Undercut
17.1
33
12

Rig	ER
A	95
B	94
C	
D	
E	
F	
G	
H	

		N_{60}	N_{60L}		PI	Clay		M	M_{OPT}		GI
Total Borings	11	Average	17.6	11.0		19.0		51.7		20.3	15.0		10.21
PID	25596	Maximum	54	24	50	31	34	65	94	33.3	19		18
Location	FRA-CR3-06.79	Minimum	3	3	26	10	3	39	3	5.3	6		0

	Boring					Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Sulfate		Problem		Undercuts		Analysis / Comments
#	B #	Boring Location	Depth	To	Cut Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI			w/ Class	w/ MN	UC Class	UC MN	
1	B		1	2.5	0.0	1.0	2.5	9	8	17	A	27		NP	NP	NP	3		3	5	6	1a	0							
	001-0		2.5	4		2.5	4.0	5	4	9		14									14	6a	8	0			MN			
	17		4	5.5		4.0	5.5	3	4	7		11		44	17	27	34	54	88	25	18	7-6	16				N		12	
			5.5	7		5.5	7.0	7	10	17		27	11							14	18	7-6								
2	B		1	2.5	0.0	1.0	2.5	8	9	17	A	27		30	16	14	27	40	67	16	14	6a	8	127						
	002-0		2.5	4		2.5	4.0	7	6	13		21		26	16	10	31	40	71	15	11	4a	7							
	17		4	5.5		4.0	5.5	7	7	14		22								14	10	4a	5							
			5.5	7		5.5	7.0	7	8	15		24	21							14	10	4a								
3	B		0	1.5	6.0	6.0	7.5	2	2	4	B	6								32	16	6b		140			N		18	
	003-0		1.5	3		7.5	9.0	2	3	5		8		45	20	25	29	61	90	27	18	7-6					N		12	
	17		3	4.5		9.0	10.5	2	2	4		6		39	19	20	28	57	85	25	16	6b					N		18	
			4.5	6		10.5	12.0	1	3	4		6	6							21	16	6b					N		18	
4	B		1.5	3	4.5	6.0	7.5	4	3	7	A	11		31	17	14	32	44	76	21	14	6a		80			N		12	
	004-0		3	4.5		7.5	9.0	2	2	4		6								23	14	6a					N		18	
	17		4.5	6		9.0	10.5	3	4	7		11		49	20	29	27	65	92	29	18	7-6					N		12	
			6	7.5		10.5	12.0	4	5	9		14	6							21	18	7-6								
5	B		0	1.5	0.0	0.0	1.5	2	3	5	B	8								24	16	6b	10				N		12	
	005-0		1.5	3		1.5	3.0	3	9	12		19		34	18	16	30	47	77	18	16	6b	10	200						
	17		3	4.5		3.0	4.5	10	14	24		38								13	16	6b	10							
			4.5	6		4.5	6.0	13	18	31		49	8	30	17	13	31	39	70	14	14	6a	8							
6	B		0	1.5	0.0	0.0	1.5	2	4	6	A	10								24	16	6b	10	0			N		12	
	006-0		1.5	3		1.5	3.0	3	3	6		10		40	20	20	23	40	63	22	16	6b	10				N		12	
	17		3	4.5		3.0	4.5	3	3	6		10		48	22	26	25	63	88	29	19	7-6	16				N		12	
			4.5	6		4.5	6.0	4	5	9		14	10							23	18	7-6	14				MN		12	
7	B		1	2.5	0.0	1.0	2.5	4	3	7	A	11								14	16	6b	10				N		12	
	007-0		2.5	4		2.5	4.0	2	6	8		13		42	19	23	26	62	88	27	18	7-6	14	73			MN		12	
	17		4	5.5		4.0	5.5	4	3	7		11								12	10	2-6	2				N		12	
			5.5	7		5.5	7.0	3	3	6		10	10							24	14	6a					N		12	
8	B		1	2.5	2.0	3.0	4.5	7	8	15	A	24		44	21	23	22	59	81	26	18	7-6	14	87			M			
	008-0		2.5	4		4.5	6.0	6	9	15		24									18	7-6	14							
	17		4	5.5		6.0	7.5	8	8	16		25		27	16	11	31	40	71	13	14	6a								
			5.5	7		7.5	9.0	8	10	18		29	24							17	14	6a								
9	B		0	1.5	-1.0	-1.0	0.5	1	2	3	B	5								27	14	6a	8				N		21	
	009-0		1.5	3		0.5	2.0	2	2	4		6		43	20	23	27	60	87	26	18	7-6	14	120			N		18	
	17		3	4.5		2.0	3.5	3	5	8		13		29	16	13	33	46	79	17	14	6a	9							
			4.5	6		3.5	5.0	4	4	8		13	5							15	14	6a	8							
10	B		1	2.5	0.0	1.0	2.5	8	4	12	A	19		37	18	19	34	60	94	20	16	6b	12	60						
	010-0		2.5	4		2.5	4.0	4	7	11		17								23	16	6b	10				M			
	17		4	5.5		4.0	5.5	9	10	19		30		26	16	10	32	40	72	14	11	4a	7							
			5.5	7		5.5	7.0	12	14	26		41	17							16	10	4a					M			
11	B		0	1.5	3.3	3.3	4.8	1	1	2	A	3								33	18	7-6	14				N		33	
	011-0		1.5	3		4.8	6.3	2	5	7		11		50	19	31	27	64	91	25	18	7-6	18	147			N		12	
	17		3	4.5		6.3	7.8	5	6	11		17		33	20	13	29	53	82	18	15	6a								
			4.5	6		7.8	9.3	16	18	34		54	3							18	14	6a								

Subgrade Analysis

V. 13.00 01/15/16

Design CBR 6

Global Options		
320	R&R	No
206	CS	Option
	LS	Option
206	Depth	12

Classification Counts by Sample																	
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	1	0	0	0	0	0	1	0	5	0	0	13	11	0	13	0	0
	2%						2%		11%			30%	25%		30%		
0%	5%								95%								

Surface Class		
2-5	0	
4b	0	
5	0	
7-5	0	
7-6	2	18%
8a	0	
8b	0	
R	0	

% Borings	
N_{60L}<= 5	18%
<=10	64%
>=20	18%
M+	100%
R	0%

% Surface	
64%	
0%	64%

UC @ Surface
Undercut w/ 861 grid
14.1
24
12

Rig	ER
A	95
B	94
C	
D	
E	
F	
G	
H	

		N_{60}	N_{60L}			PI		Clay		M	M_{OPT}		GI
Total Borings	11	Average	17.6	11.0		19.0		51.7		20.3	15.0		10.21
PID	25596	Maximum	54	24	50	31	34	65	94	33.3	19		18
Location	FRA-CR3-06.79	Minimum	3	3	26	10	3	39	3	5.3	6		0

	Boring				Cut	Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Sulfate		Problem		Undercuts		Analysis /
#	B #	Boring Location	Depth	To	Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI		w/ Class	w/ MN	UC Class	UC MN	Comments
1	B		1	2.5	0.0	1.0	2.5	9	8	17	A	27		NP	NP	NP	3		3	5	6	1a	0						
	001-0		2.5	4		2.5	4.0	5	4	9		14									14	6a	8	0		MN			
	17		4	5.5		4.0	5.5	3	4	7		11		44	17	27	34	54	88	25	18	7-6	16			N		12	
			5.5	7		5.5	7.0	7	10	17		27	11							14	18	7-6							
2	B		1	2.5	0.0	1.0	2.5	8	9	17	A	27		30	16	14	27	40	67	16	14	6a	8	127					
	002-0		2.5	4		2.5	4.0	7	6	13		21		26	16	10	31	40	71	15	11	4a	7						
	17		4	5.5		4.0	5.5	7	7	14		22								14	10	4a	5						
			5.5	7		5.5	7.0	7	8	15		24	21							14	10	4a							
3	B		0	1.5	6.0	6.0	7.5	2	2	4	B	6								32	16	6b		140		N		12	
	003-0		1.5	3		7.5	9.0	2	3	5		8		45	20	25	29	61	90	27	18	7-6				N		12	
	17		3	4.5		9.0	10.5	2	2	4		6		39	19	20	28	57	85	25	16	6b				N		12	
			4.5	6		10.5	12.0	1	3	4		6	6							21	16	6b				N		12	
4	B		1.5	3	4.5	6.0	7.5	4	3	7	A	11		31	17	14	32	44	76	21	14	6a		80		N		12	
	004-0		3	4.5		7.5	9.0	2	2	4		6								23	14	6a				N		12	
	17		4.5	6		9.0	10.5	3	4	7		11		49	20	29	27	65	92	29	18	7-6				N		12	
			6	7.5		10.5	12.0	4	5	9		14	6							21	18	7-6							
5	B		0	1.5	0.0	0.0	1.5	2	3	5	B	8								24	16	6b	10			N		12	
	005-0		1.5	3		1.5	3.0	3	9	12		19		34	18	16	30	47	77	18	16	6b	10	200					
	17		3	4.5		3.0	4.5	10	14	24		38								13	16	6b	10						
			4.5	6		4.5	6.0	13	18	31		49	8	30	17	13	31	39	70	14	14	6a	8						
6	B		0	1.5	0.0	0.0	1.5	2	4	6	A	10								24	16	6b	10	0		N		12	
	006-0		1.5	3		1.5	3.0	3	3	6		10		40	20	20	23	40	63	22	16	6b	10			N		12	
	17		3	4.5		3.0	4.5	3	3	6		10		48	22	26	25	63	88	29	19	7-6	16			N		12	
			4.5	6		4.5	6.0	4	5	9		14	10							23	18	7-6	14			MN		12	
7	B		1	2.5	0.0	1.0	2.5	4	3	7	A	11								14	16	6b	10			N		12	
	007-0		2.5	4		2.5	4.0	2	6	8		13		42	19	23	26	62	88	27	18	7-6	14	73		MN		12	
	17		4	5.5		4.0	5.5	4	3	7		11								12	10	2-6	2			N		12	
			5.5	7		5.5	7.0	3	3	6		10	10							24	14	6a				N		12	
8	B		1	2.5	2.0	3.0	4.5	7	8	15	A	24		44	21	23	22	59	81	26	18	7-6	14	87		M			
	008-0		2.5	4		4.5	6.0	6	9	15		24									18	7-6	14						
	17		4	5.5		6.0	7.5	8	8	16		25		27	16	11	31	40	71	13	14	6a							
			5.5	7		7.5	9.0	8	10	18		29	24							17	14	6a							
9	B		0	1.5	-1.0	-1.0	0.5	1	2	3	B	5								27	14	6a	8			N		15	
	009-0		1.5	3		0.5	2.0	2	2	4		6		43	20	23	27	60	87	26	18	7-6	14	120		N		12	
	17		3	4.5		2.0	3.5	3	5	8		13		29	16	13	33	46	79	17	14	6a	9						
			4.5	6		3.5	5.0	4	4	8		13	5							15	14	6a	8						
10	B		1	2.5	0.0	1.0	2.5	8	4	12	A	19		37	18	19	34	60	94	20	16	6b	12	60					
	010-0		2.5	4		2.5	4.0	4	7	11		17								23	16	6b	10			M			
	17		4	5.5		4.0	5.5	9	10	19		30		26	16	10	32	40	72	14	11	4a	7						
			5.5	7		5.5	7.0	12	14	26		41	17							16	10	4a				M			
11	B		0	1.5	3.3	3.3	4.8	1	1	2	A	3								33	18	7-6	14			N		24	
	011-0		1.5	3		4.8	6.3	2	5	7		11		50	19	31	27	64	91	25	18	7-6	18	147		N		12	
	17		3	4.5		6.3	7.8	5	6	11		17		33	20	13	29	53	82	18	15	6a							
			4.5	6		7.8	9.3	16	18	34		54	3							18	14	6a							

Subgrade Analysis

V. 13.00 01/15/16

Design CBR 6

Global Options		
320	R&R	Option
206	CS	Option
	LS	Option
206	Depth	--

Classification Counts by Sample																	
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	1	0	0	0	0	0	1	0	3	0	0	4	6	0	5	0	0
	5%						5%		15%			20%	30%		25%		
0%	10%								90%								

Surface Class	
2-5	0
4b	0
5	0
7-5	0
7-6	0
8a	0
8b	0
R	0

% Borings	
N_{60L}<= 5	0%
<=10	60%
>=20	20%
M+	100%
R	0%

% Surface	
60%	
0%	60%

UC @ Surface
Undercut
12.0
12
12

Rig	ER
A	95
B	94
C	
D	
E	
F	
G	
H	

Total Borings	5
PID	25596
Location	Norton Road

	N_{60}	N_{60L}	PI	Clay	M	M_{OPT}	GI
Average	18.8	12.0	18.6	48.1	18.2	14.5	9.29
Maximum	49	21	27	63	28.7	19	16
Minimum	8	8	10	39	5.3	6	0

	Boring				Cut	Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Sulfate		Problem		Undercuts		Analysis /
#	B #	Boring Location	Depth	To	Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI			w/ Class	w/ MN	UC Class	UC MN	Comments
1	B		1	2.5	0.0	1.0	2.5	9	8	17	A	27		NP	NP	NP	3		3	5	6	1a	0							
	001-0		2.5	4		2.5	4.0	5	4	9		14									14	6a	8	0			MN			
	17		4	5.5		4.0	5.5	3	4	7		11		44	17	27	34	54	88	25	18	7-6	16				N		12	
			5.5	7		5.5	7.0	7	10	17		27	11							14	18	7-6								
2	B		1	2.5	0.0	1.0	2.5	8	9	17	A	27		30	16	14	27	40	67	16	14	6a	8	127						
	002-0		2.5	4		2.5	4.0	7	6	13		21		26	16	10	31	40	71	15	11	4a	7							
	17		4	5.5		4.0	5.5	7	7	14		22								14	10	4a	5							
			5.5	7		5.5	7.0	7	8	15		24	21							14	10	4a								
3	B		0	1.5	0.0	0.0	1.5	2	3	5	B	8								24	16	6b	10				N		12	
	005-0		1.5	3		1.5	3.0	3	9	12		19		34	18	16	30	47	77	18	16	6b	10	200						
	17		3	4.5		3.0	4.5	10	14	24		38								13	16	6b	10							
			4.5	6		4.5	6.0	13	18	31		49	8	30	17	13	31	39	70	14	14	6a	8							
4	B		0	1.5	0.0	0.0	1.5	2	4	6	A	10								24	16	6b	10	0			N		12	
	006-0		1.5	3		1.5	3.0	3	3	6		10		40	20	20	23	40	63	22	16	6b	10				N		12	
	17		3	4.5		3.0	4.5	3	3	6		10		48	22	26	25	63	88	29	19	7-6	16				N		12	
			4.5	6		4.5	6.0	4	5	9		14	10							23	18	7-6	14				MN		12	
5	B		1	2.5	0.0	1.0	2.5	4	3	7	A	11								14	16	6b	10				N		12	
	007-0		2.5	4		2.5	4.0	2	6	8		13		42	19	23	26	62	88	27	18	7-6	14	73			MN		12	
	17		4	5.5		4.0	5.5	4	3	7		11								12	10	2-6	2				N		12	
			5.5	7		5.5	7.0	3	3	6		10	10							24	14	6a					N		12	
6					0.0						A																			
7					0.0						A																			
8					2.0						A																			
9					-1.0						B																			
10					0.0						A																			
11					3.3						A																			

Subgrade Analysis

V. 13.00 01/15/16

Design CBR 6

Global Options		
320	R&R	Option
206	CS	Option
	LS	Option
206	Depth	--

Classification Counts by Sample																	
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	1	0	0	0	0	0	1	0	3	0	0	4	6	0	5	0	0
	5%						5%		15%			20%	30%		25%		
0%	10%								90%								

Surface Class	
2-5	0
4b	0
5	0
7-5	0
7-6	0
8a	0
8b	0
R	0

% Borings	
N_{60L}<= 5	0%
<=10	60%
>=20	20%
M+	100%
R	0%

% Surface	
60%	
0%	60%

UC @ Surface
Undercut w/ 861 grid
12.0
12
12

Rig	ER
A	95
B	94
C	
D	
E	
F	
G	
H	

Total Borings	5
PID	25596
Location	Norton Road

	N_{60}	N_{60L}	PI	Clay	M	M_{OPT}	GI
Average	18.8	12.0	18.6	48.1	18.2	14.5	9.29
Maximum	49	21	48	22	27	34	63	88	28.7	19	16
Minimum	8	8	26	16	10	3	39	3	5.3	6	0

	Boring				Cut	Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Sulfate		Problem		Undercuts		Analysis /
#	B #	Boring Location	Depth	To	Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI		w/ Class	w/ MN	UC Class	UC MN	Comments
1	B		1	2.5	0.0	1.0	2.5	9	8	17	A	27		NP	NP	NP	3		3	5	6	1a	0						
	001-0		2.5	4		2.5	4.0	5	4	9		14									14	6a	8	0		MN			
	17		4	5.5		4.0	5.5	3	4	7		11		44	17	27	34	54	88	25	18	7-6	16			N		12	
			5.5	7		5.5	7.0	7	10	17		27	11							14	18	7-6							
2	B		1	2.5	0.0	1.0	2.5	8	9	17	A	27		30	16	14	27	40	67	16	14	6a	8	127					
	002-0		2.5	4		2.5	4.0	7	6	13		21		26	16	10	31	40	71	15	11	4a	7						
	17		4	5.5		4.0	5.5	7	7	14		22								14	10	4a	5						
			5.5	7		5.5	7.0	7	8	15		24	21							14	10	4a							
3	B		0	1.5	0.0	0.0	1.5	2	3	5	B	8								24	16	6b	10			N		12	
	005-0		1.5	3		1.5	3.0	3	9	12		19		34	18	16	30	47	77	18	16	6b	10	200					
	17		3	4.5		3.0	4.5	10	14	24		38								13	16	6b	10						
			4.5	6		4.5	6.0	13	18	31		49	8	30	17	13	31	39	70	14	14	6a	8						
4	B		0	1.5	0.0	0.0	1.5	2	4	6	A	10								24	16	6b	10	0		N		12	
	006-0		1.5	3		1.5	3.0	3	3	6		10		40	20	20	23	40	63	22	16	6b	10			N		12	
	17		3	4.5		3.0	4.5	3	3	6		10		48	22	26	25	63	88	29	19	7-6	16			N		12	
			4.5	6		4.5	6.0	4	5	9		14	10							23	18	7-6	14			MN		12	
5	B		1	2.5	0.0	1.0	2.5	4	3	7	A	11								14	16	6b	10			N		12	
	007-0		2.5	4		2.5	4.0	2	6	8		13		42	19	23	26	62	88	27	18	7-6	14	73		MN		12	
	17		4	5.5		4.0	5.5	4	3	7		11								12	10	2-6	2			N		12	
			5.5	7		5.5	7.0	3	3	6		10	10							24	14	6a				N		12	
6					0.0						A																		
7					0.0						A																		
8					2.0						A																		
9					-1.0						B																		
10					0.0						A																		
11					3.3						A																		

Subgrade Analysis

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Design CBR **5**

Global Options		
320	R&R	Option
206	CS	Option
	LS	Option
206	Depth	--

Classification Counts by Sample																	
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	0	0	0	0	0	0	0	0	2	0	0	4	2	0	4	0	0
									17%			33%	17%		33%		
0%	0%								100%								

Surface Class		
2-5	0	
4b	0	
5	0	
7-5	0	
7-6	2	67%
8a	0	
8b	0	
R	0	

% Borings	
N_{60L}<= 5	33%
<=10	33%
>=20	33%
M+	100%
R	0%

% Surface	
33%	
0%	33%

UC @ Surface
Undercut
33.0
33
33

Rig	ER
A	95
B	94
C	
D	
E	
F	
G	
H	

Total Borings	3																											
PID	25596																											
Location	Johnson Road																											
											N_{60}	N_{60L}			PI		Clay		M	M_{OPT}		GI						
									Average		24.5	14.7			17.8		52.7		20.3	15.2		12.71						
									Maximum		54	24	50	21	31	34	64	94	33.3	18		18						
									Minimum		3	3	26	16	10	22	40	71	13.3	10		7						

	Boring					Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Sulfate		Problem		Undercuts		Analysis / Comments
#	B #	Boring Location	Depth	To	Cut Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI			w/ Class	w/ MN	UC Class	UC MN	
1	B		1	2.5	2.0	3.0	4.5	7	8	15	A	24		44	21	23	22	59	81	26	18	7-6	14	87			M			
	008-0		2.5	4		4.5	6.0	6	9	15		24									18	7-6	14							
	17		4	5.5		6.0	7.5	8	8	16		25		27	16	11	31	40	71	13	14	6a								
			5.5	7		7.5	9.0	8	10	18		29	24							17	14	6a								
2	B		1	2.5	0.0	1.0	2.5	8	4	12	A	19		37	18	19	34	60	94	20	16	6b	12	60						
	010-0		2.5	4		2.5	4.0	4	7	11		17								23	16	6b	10				M			
	17		4	5.5		4.0	5.5	9	10	19		30		26	16	10	32	40	72	14	11	4a	7							
			5.5	7		5.5	7.0	12	14	26		41	17							16	10	4a					M			
3	B		0	1.5	3.3	3.3	4.8	1	1	2	A	3								33	18	7-6	14				N		33	
	011-0		1.5	3		4.8	6.3	2	5	7		11		50	19	31	27	64	91	25	18	7-6	18	147			N		12	
	17		3	4.5		6.3	7.8	5	6	11		17		33	20	13	29	53	82	18	15	6a								
			4.5	6		7.8	9.3	16	18	34		54	3							18	14	6a								
4					0.0						A																			
5					0.0						A																			
6					0.0						A																			
7					0.0						A																			
8					0.0						A																			
9					0.0						A																			
10					0.0						A																			
11					0.0						A																			

Subgrade Analysis

V. 13.00 01/15/16

Design CBR 5

Global Options		
320	R&R	Option
206	CS	Option
	LS	Option
206	Depth	--

Classification Counts by Sample																	
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	0	0	0	0	0	0	0	0	2	0	0	4	2	0	4	0	0
									17%			33%	17%		33%		
0%	0%								100%								

Surface Class		
2-5	0	
4b	0	
5	0	
7-5	0	
7-6	2	67%
8a	0	
8b	0	
R	0	

% Borings	
N_{60L}<= 5	33%
<=10	33%
>=20	33%
M+	100%
R	0%

% Surface	
33%	
0%	33%

UC @ Surface
Undercut w/ 861 grid
24.0
24
24

Rig	ER
A	95
B	94
C	
D	
E	
F	
G	
H	

		N_{60}	N_{60L}		PI	Clay		M	M_{OPT}		GI
Total Borings	3	Average	24.5	14.7		17.8		52.7		20.3	15.2		12.71
PID	25596	Maximum	54	24	50	21	31	34	64	94	33.3	18		18
Location	Johnson Road	Minimum	3	3	26	16	10	22	40	71	13.3	10		7

	Boring					Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Sulfate		Problem		Undercuts		Analysis / Comments
#	B #	Boring Location	Depth	To	Cut Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI			w/ Class	w/ MN	UC Class	UC MN	
1	B		1	2.5	2.0	3.0	4.5	7	8	15	A	24		44	21	23	22	59	81	26	18	7-6	14	87			M			
	008-0		2.5	4		4.5	6.0	6	9	15		24									18	7-6	14						
	17		4	5.5		6.0	7.5	8	8	16		25		27	16	11	31	40	71	13	14	6a							
			5.5	7		7.5	9.0	8	10	18		29	24							17	14	6a							
2	B		1	2.5	0.0	1.0	2.5	8	4	12	A	19		37	18	19	34	60	94	20	16	6b	12	60						
	010-0		2.5	4		2.5	4.0	4	7	11		17								23	16	6b	10				M			
	17		4	5.5		4.0	5.5	9	10	19		30		26	16	10	32	40	72	14	11	4a	7							
			5.5	7		5.5	7.0	12	14	26		41	17							16	10	4a					M			
3	B		0	1.5	3.3	3.3	4.8	1	1	2	A	3								33	18	7-6	14				N		24	
	011-0		1.5	3		4.8	6.3	2	5	7		11		50	19	31	27	64	91	25	18	7-6	18	147			N		12	
	17		3	4.5		6.3	7.8	5	6	11		17		33	20	13	29	53	82	18	15	6a								
			4.5	6		7.8	9.3	16	18	34		54	3							18	14	6a								
4					0.0						A																			
5					0.0						A																			
6					0.0						A																			
7					0.0						A																			
8					0.0						A																			
9					0.0						A																			
10					0.0						A																			
11					0.0						A																			

Subgrade Analysis

V. 13.00 01/15/16

Design CBR 6

Global Options		
320	R&R	No
206	CS	No
	LS	Option
206	Depth	15

Classification Counts by Sample																	
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	0	0	0	0	0	0	0	0	0	0	0	5	3	0	4	0	0
												42%	25%		33%		
0%	0%								100%								

Surface Class	
2-5	0
4b	0
5	0
7-5	0
7-6	0
8a	0
8b	0
R	0

% Borings	
N_{60L}<= 5	33%
<=10	100%
>=20	0%
M+	100%
R	0%

% Surface		
100%		
0%	100%	

UC @ Surface
Undercut
17.0
21
12

Rig	ER
A	95
B	94
C	
D	
E	
F	
G	
H	

Total Borings	3
PID	25596
Location	Roundabout

	N_{60}	N_{60L}	PI	Clay	M	M_{OPT}	GI
Average	8.8	5.7	20.7	55.5	23.6	15.8	9.75
Maximum	14	6	49	20	29	33	65	92	32.2	18	14
Minimum	5	5	29	16	13	27	44	76	14.6	14	8

	Boring				Cut	Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Sulfate		Problem		Undercuts		Analysis /
#	B #	Boring Location	Depth	To	Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI		w/ Class	w/ MN	UC Class	UC MN	Comments
1	B		0	1.5	6.0	6.0	7.5	2	2	4	B	6								32	16	6b		140			N		18	
	003-0		1.5	3		7.5	9.0	2	3	5		8		45	20	25	29	61	90	27	18	7-6					N		12	
	17		3	4.5		9.0	10.5	2	2	4		6		39	19	20	28	57	85	25	16	6b					N		18	
			4.5	6		10.5	12.0	1	3	4		6	6							21	16	6b					N		18	
2	B		1.5	3	4.5	6.0	7.5	4	3	7	A	11		31	17	14	32	44	76	21	14	6a		80			N		12	
	004-0		3	4.5		7.5	9.0	2	2	4		6								23	14	6a					N		18	
	17		4.5	6		9.0	10.5	3	4	7		11		49	20	29	27	65	92	29	18	7-6					N		12	
			6	7.5		10.5	12.0	4	5	9		14	6							21	18	7-6								
3	B		0	1.5	-1.0	-1.0	0.5	1	2	3	B	5								27	14	6a	8				N		21	
	009-0		1.5	3		0.5	2.0	2	2	4		6		43	20	23	27	60	87	26	18	7-6	14	120			N		18	
	17		3	4.5		2.0	3.5	3	5	8		13		29	16	13	33	46	79	17	14	6a	9							
			4.5	6		3.5	5.0	4	4	8		13	5							15	14	6a	8							
4											A																			
5					0.0						A																			
6					0.0						A																			
7					0.0						A																			
8					2.0						A																			
9					0.0						A																			
10					0.0						A																			
11					0.0						A																			

Subgrade Analysis

V. 13.00 01/15/16

Design CBR 6

Global Options		
320	R&R	No
206	CS	No
	LS	Option
206	Depth	15

Classification Counts by Sample																	
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	0	0	0	0	0	0	0	0	0	0	0	5	3	0	4	0	0
												42%	25%		33%		
0%	0%								100%								

Surface Class	
2-5	0
4b	0
5	0
7-5	0
7-6	0
8a	0
8b	0
R	0

% Borings	
N_{60L}<= 5	33%
<=10	100%
>=20	0%
M+	100%
R	0%

% Surface	
100%	
0%	100%

UC @ Surface
Undercut w/ 861 grid
13.0
15
12

Rig	ER
A	95
B	94
C	
D	
E	
F	
G	
H	

Total Borings	3
PID	25596
Location	Roundabout

	N_{60}	N_{60L}			PI		Clay		M	M_{OPT}		GI
Average	8.8	5.7			20.7		55.5		23.6	15.8		9.75
Maximum	14	6	49	20	29	33	65	92	32.2	18		14
Minimum	5	5	29	16	13	27	44	76	14.6	14		8

	Boring				Cut	Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Sulfate		Problem		Undercuts		Analysis /
#	B #	Boring Location	Depth	To	Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI		w/ Class	w/ MN	UC Class	UC MN	Comments
1	B		0	1.5	6.0	6.0	7.5	2	2	4	B	6								32	16	6b		140			N		12	
	003-0		1.5	3		7.5	9.0	2	3	5		8		45	20	25	29	61	90	27	18	7-6					N		12	
	17		3	4.5		9.0	10.5	2	2	4		6		39	19	20	28	57	85	25	16	6b					N		12	
			4.5	6		10.5	12.0	1	3	4		6	6							21	16	6b					N		12	
2	B		1.5	3	4.5	6.0	7.5	4	3	7	A	11		31	17	14	32	44	76	21	14	6a		80			N		12	
	004-0		3	4.5		7.5	9.0	2	2	4		6								23	14	6a					N		12	
	17		4.5	6		9.0	10.5	3	4	7		11		49	20	29	27	65	92	29	18	7-6					N		12	
			6	7.5		10.5	12.0	4	5	9		14	6							21	18	7-6								
3	B		0	1.5	-1.0	-1.0	0.5	1	2	3	B	5								27	14	6a	8				N		15	
	009-0		1.5	3		0.5	2.0	2	2	4		6		43	20	23	27	60	87	26	18	7-6	14	120			N		12	
	17		3	4.5		2.0	3.5	3	5	8		13		29	16	13	33	46	79	17	14	6a	9							
			4.5	6		3.5	5.0	4	4	8		13	5							15	14	6a	8							
4											A																			
5					0.0						A																			
6					0.0						A																			
7					0.0						A																			
8					2.0						A																			
9					0.0						A																			
10					0.0						A																			
11					0.0						A																			