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AN EMPLOYEE OWNED COMPANY
Established 1927
Consulting Engineer – Testing – Inspection Services – Analytical Laboratories

January 21, 2020

Village of Covington
1 South High Street
Covington, Ohio 45318

Attention: Michael Busse

Reference: **Report on Geotechnical Subgrade Exploration - Final**
MIA-High Street Improvements
PID 105753
Covington, OH – Miami County
CTL Project No. 18050026WAP

Mr. Busse:

CTL Engineering, Inc. has completed the geotechnical exploration for the above referenced project. The purpose of this exploration was to evaluate the subsurface conditions and provide recommendations and soil parameters for the pavement reconstruction within the Village of Covington. Various empirical correlations have been made in analyzing the subsurface soils of the site. These correlations were made using generally accepted geotechnical engineering practice and published documents.

Thank you for the opportunity to be of service to you on this project. If you have any questions, please contact our office.

Respectfully Submitted,

CTL ENGINEERING, INC.

Frederick L. Schoen, P.E.
Project Engineer

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REPORT ON GEOTECHNICAL SUBGRADE EXPLORATION

MIA-HIGH STREET IMPROVEMENTS

STATE ROUTE 48
VILLAGE OF COVINGTON
MIAMI COUNTY, OHIO
PID #105753

CTL PROJECT NO.: 18050026WAP

PREPARED FOR:

VILLAGE OF COVINGTON
1 SOUTH HIGH STREET
COVINGTON, OHIO 45318

PREPARED BY:

CTL ENGINEERING, INC.
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JANUARY 21, 2020

RECORD OF REVISIONS

Date of Transmittal	Description	Remarks
3/29/19	1st Submittal of Draft Report	--
1/21/20	Submittal of Final Report	Modified Table 3

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I. EXECUTIVE SUMMARY

The project involves the full depth reconstruction of the existing roadway, State Route 48 (SR 48 and/or High Street). Work will include replacement of the existing pavements; improving the subgrade soils; and possible utility, sidewalk, and curb modifications. The work will begin at the intersection of East Troy Pike (State Route 41) and State Route 48 and will end at the intersection with East Broadway Street (US Route 36). SR 48 is a two-lane, bi-directional roadway having an asphalt surface and side parking. The roadway surface was observed to exhibit some areas of fatigue and linear cracking, and roadway runs in a north-south direction through Covington, Ohio, with residential and commercial properties on both sides of the street. The Stillwater River is oriented parallel with SR 48, located approximately 300 feet west of the road.

No historical borings were found within the project limits when using the Ohio Department of Transportation's (ODOT) Transportation Information Mapping System (TIMS).

Eight (8) soil test borings, designated B-001-0-18 through B-008-0-18, were drilled and sampled through the existing paved roadway, into the subgrade soils to depths of 10.0 feet below the existing roadway surface. Borings were performed on June 4, 2018 utilizing a truck mounted, rotary drill rig with 4.0-in. outside diameter solid-flight augers.

Existing pavement materials were found to consist of 3.0 to 4.0 inches of asphalt over 4.0 to 6.0 inches of brick and/or 3.0 to 12.0 inches of visually classified aggregate base material. Subgrade soils were visually and mechanically classified as gravel and/or stone fragments (A-1-a), gravel and/or stone fragments with sand and silt (A-2-4), sandy silt (A-4a), silt and clay (A-6a), silty clay (A-6b), and clay (A-7-6). Weathered bedrock was encountered in borings B-006-0-18 through B-008-0-18 and was visually classified as limestone. Some of these subgrade soils were visually classified as being previously placed fill. Groundwater was not encountered during our exploration. Bore-hole cave-in occurred only in test boring B-007-0-18 at a depth of 7.5 feet. Subgrade soils were also subject to water soluble sulfate testing (ODOT S1122). Testing indicated that six of the eight soil samples having sulfate contents of less than 100 parts per million (ppm); and samples from borings B-004-0-18 and B-007-0-18 exhibited values of 520 and 480 ppm, respectively.

Subgrade stabilization will likely be required during construction. Subgrade stabilization may consist of undercutting and replacing with ODOT Item 703.16.C, Type B and/or Type C Granular Material, or chemical stabilization. GB1 guidelines indicate that cement be considered as the chemical modifying agent for this project. The depth for chemical stabilization from the GB1 spreadsheet is 12 inches.

Group Index values correspond to an estimated California Bearing Ratio (CBR) value of 8.0 percent.

II. INTRODUCTION

It is understood that the Village of Covington has intentions of reconstructing High Street (State Route 48), from East Troy Pike (State Route 41) to East Broadway Street (US Route 36). The length of the street reconstruction is approximately 2,500 feet. The reconstruction will include replacement of the existing pavements; improving the subgrade soils; storm sewer improvements, and sidewalk, and curb modifications. Plan and profile drawings provided by Access Engineering Solutions (Access) and dated February 19, 2019 show details of the proposed improvements.

III. GEOLOGY AND OBSERVATIONS OF THE PROJECT

A. Geology

According to the Soil Survey of Miami County, Ohio; surficial soils at the site include Eldean silt loam, 2 to 6 percent slopes (EmB); Miamian silt loam, limestone substratum, 0 to 2 percent slopes (MkA); Miamian silt loam, limestone substratum, 6 to 12 percent slopes, moderately eroded (MkC2); and Milton silt loam, 2 to 6 percent slopes (MpB), as defined by the United States Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS). These mapped soils are described as having a low to high potential for frost action, a low risk for corrosion to buried concrete, and a moderate to high risk of unprotected steel corrosion.

The majority of Miami County, including the project site, lies within the Central Ohio Clayey Till Plain physiographic region which falls inside the Central Lowlands Province of Ohio. Before and during the Pleistocene Epoch, several glacial events occurred in west-central Ohio. Most recently, the Wisconsin ice sheet covered this portion of Miami County, and most of northern Ohio. The surficial glacial deposits of Miami County are mostly in the form of well-defined moraines with intervening flat-lying ground moraine and intermorainal lake basins. The project site is located on a ground moraine, which is characterized as extensive, broad, flat-surfaced deposits of glacial till. The till was deposited discontinuously by ice advancing over bedrock or over older glacial deposits and is predominantly unsorted, unconsolidated, and unstratified soil composed of a heterogeneous mixture of clay, silt, sand, gravel, and coarser rocks.

The overburden soils within the project site are underlain by Lockport Dolomite (Sl) of the Silurian Age. According to published mapping prepared by the ODNR Division of Geological Survey this rock formation may be found near elevations 900 to 930 feet Above Mean Sea Level (AMSL). The rock consists of dolomite and is characterized as having shades of white to medium gray, medium to massive bedded, fine to coarse crystalline; fossiliferous; and vuggy. Approximately 500 feet to the west of the project site, the bedrock changes into interbedded shale, dolomite and limestone of the Ordovician-aged Cincinnati

Group (Oc) near elevation 850 to 900 feet. The variation in bedrock surface elevation and rock formation within the Covington area is a due to the presence of a tributary of the prehistoric Deep Stage or Teays River system. These ancient rivers eroded the bedrock surface on the order of 250 feet. No known karst or underground mine related incidents exist at the project site.

B. Observations of the Project

State Route 48 (SR 48) is a two-lane, bi-directional roadway having an asphalt surface. The roadway surface was noted to exhibit some areas of fatigue and linear cracking. Ground surface elevations along the roadway range from elevation 903 to 929 feet. The roadway runs in a north-south direction through Covington, Ohio, with residential and commercial properties on both sides of the street for the full length of the project area. The Stillwater River is oriented parallel with SR 48, located approximately 300 feet west of the road.

IV. EXPLORATION

No historical borings were found within the project limits when using the Ohio Department of Transportation's (ODOT) Transportation Information Mapping System (TIMS).

Eight (8) soil test borings, designated B-001-0-18 and B-008-0-18, were advanced to a depth of 10.0 feet below the existing ground surface within the SR 48 roadway. The number and location of the soil test borings along with the sampling intervals were selected by CTL to meet ODOT guidelines and provide a general profile of the subsurface conditions across the site. The test borings were located in the field by CTL personnel and were adjusted to avoid underground and overhead utilities. Test boring coordinates, station and offset, along with ground surface elevations were acquired from the plan and profile drawings provided by Access. Actual test locations are shown on the Boring Location Plans and Soil Profile sheets found in *Appendices A and C* of this report, and are presented in *Table 1*.

Test borings and pavement cores were performed by Wright's Drilling, under the supervision of CTL Engineering, on June 4, 2018; using a truck-mounted rotary drill rig and 4.0-inch outside diameter, solid flight augers (SFA). Standard Penetration Tests (SPTs) were conducted in test borings during drilling using an automatic 140-pound hammer falling 30 inches to drive 2.0-inch outside diameter split-spoon sampler for 18 inches. The SPTs were performed at 2.5-foot intervals. The automatic hammer used with the drill rig for the project was previously calibrated on June 23, 2017, and has a drill rod energy ratio of 70.7 percent.

Table 1 – Testing Locations, Depths, Elevations, and Coordinates

Boring - Core No.	Property Development Location	Ground Surface Elevation (ft.)	Latitude* (N-Parallel)	Longitude* (W-Meridian)	Boring Depth (ft.)
B-001-0-18	High Street	923.8	40.114800	-84.354599	10.0
B-002-0-18	High Street	924.8	40.115631	-84.354523	10.0
B-003-0-18	High Street	925.1	40.116467	-84.354644	10.0
B-004-0-18	High Street	927.5	40.117235	-84.354566	10.0
B-005-0-18	High Street	927.6	40.118219	-84.354701	10.0
B-006-0-18	High Street	912.4	40.119294	-84.354648	10.0
B-007-0-18	High Street	904.0	40.120273	-84.354743	10.0
B-008-0-18	High Street	907.8	40.120938	-84.354680	10.0

Drilling, sampling, and field testing were performed in accordance with standard geotechnical engineering practices and current ASTM procedures. Soil samples obtained from drilling operations were marked and preserved in glass jars or sealed in moisture-proof containers, visually classified in the field, then delivered to CTL for laboratory testing and analysis.

Laboratory testing was performed in accredited laboratories by trained technicians. Results from field and laboratory tests are shown on the enclosed boring records and the soil profile sheets found in *Appendices B and C.*

V. FINDINGS

A. General Subsurface Conditions

Pavement materials were encountered at the ground surface in each of the test borings. The type of pavement materials encountered and their thicknesses are presented in Table 2.

Coarse grained (sand and gravel) and fine grained (silt and clay) materials were encountered beneath the surficial materials in each of the test borings and were described as brown, light brown and/or gray; loose to medium dense or very stiff to hard; gravel and/or stone fragments (A-1-a), gravel and/or stone fragments with sand and silt (A-2-4), sandy silt (A-4a), silt and clay (A-6a), silty clay (A-6b), and clay (A-7-6). Standard Penetration Test (SPT) N_{60}-values ranged from 7 to 71 blows per foot (bpf) in these materials, averaging 21.2 bpf.

Table 2 – Existing Pavement Thickness

Boring	Existing Pavement Thickness (in.)			
	Surface Asphalt	Brick	Granular Base	Total Pavement
B-001-0-18	3.0	6.0	--	9.0
B-002-0-18	4.0	--	8.0	12.0
B-003-0-18	3.0	4.0	6.0	13.0
B-004-0-18	4.0	6.0	12.0	22.0
B-005-0-18	4.0	--	6.0	10.0
B-006-0-18	3.0	6.0	3.0	12.0
B-007-0-18	4.0	--	8.0	12.0
B-008-0-18	3.0	6.0	--	9.0
Averages	3.5	5.6	7.2	12.4

Groundwater was not encountered in any of the borings at the time of drilling, or after the completion of drilling operations. Bore-hole cave-in occurred only in test boring B-007-0-18 at a depth of 7.5 feet.

Further details of the subsurface conditions are presented on the test boring records in *Appendix B.*

B. Laboratory Test Results

Soil samples obtained from split spoon sampling were subject of laboratory testing. Each sample was tested to identify its natural moisture content. The natural moisture content values determined for the samples tested ranged from 4 to 25 percent with an average value of 11 percent.

Laboratory testing also included Atterberg Limits and grain size distribution testing, where two samples from each test boring were subjected to these classification tests. Testing exhibited Liquid Limits (LL) of the fine grained materials ranging from 16 to 56, and the Plasticity Indices (PI) ranging from 3 to 35. An average Plasticity Index value of 14.5 was determined for the project cohesive soils.

Additionally, five granular soil samples were also subjected to classification testing. Three of them were determined to be non-plastic and the Liquid Limits of the remaining two granular soil samples were 18 and 27, and the Plasticity Indices were 6 and 8.

Subgrade soils were also subject to water soluble sulfate testing (ODOT S1122). A sample from each boring was selected for testing. Testing indicated that six of the eight soil samples having sulfate contents of less than 100 parts per million (ppm); and samples from borings B-004-0-18 and B-007-0-18 exhibited values of 520 and 480 ppm, respectively.

V. ANALYSES AND RECOMMENDATIONS

Surficial soils across the project consist mostly of previously placed soil fill materials and native granular and cohesive soils. 47 percent of the subgrade soils tested were granular soils described as A-1-a, A-2-4, and A-4a soils, and 41 percent were cohesive soils described as A-6a, A-6b, or A-7-6 soils. Furthermore, 9 percent of the subgrade soils were estimated to have excessively high moisture contents, and 63 percent of the soils are suspected to be unstable when proofrolled.

Subgrade stabilization will likely be required during construction. Subgrade stabilization may consist of undercutting and replacing with ODOT Item 703.16.C, Type B and/or Type C Granular Material, or chemical stabilization. Utilization of a chemical agent will aid in reducing the moisture sensitivity and any potential expansiveness of the soils.

Excavation of soils represented by the test borings can be accomplished using conventional earth moving equipment. Deep excavations below approximately elevation 900 feet may require rock excavation equipment.

Surface drainage across the site may be altered with the proposed construction. It is recommended that all surface water run-off be collected or directed away from pavements into storm sewers or drainage ditches so that subgrade soils under pavements do not become saturated and lose strength. Any subgrade drainage tiles disturbed during construction should be reconnected, and groundwater flow should be redirected away from pavement areas.

Based upon the subsurface information obtained from the field and laboratory testing, the following recommendations are provided.

A. Subgrade Considerations

A subgrade analysis was performed utilizing the subsurface information from the drilled borings along with the recommended methods presented as ODOT Geotechnical Bulletin 1 (GB1) guidelines. The GB1 is an analysis tool used by ODOT to aid in the evaluation of pavement subgrade conditions and determine standardize pavement subgrade remediation methods.

The follow summary was analyzed using GB1 of the near surface subgrade soils.

- The lowest N_{60}-value (N_{60L}) from each boring ranged from 4 to 22 blows per foot (bpf), averaging 12 bpf.
- Liquid Limit (LL) values ranged from 16 to 56 percent, averaging 30 percent.
- Plasticity Index (PI) values ranged 3 to 35 percent, averaging 13 percent.
- Moisture content values ranged from 4 to 25 percent, averaging 11 percent.
- The estimated Optimum Moisture Content (OMC) values, based on the soil types per ODOT's Specification for Geotechnical Explorations (SGE), ranged from 0 to 19 percent, averaging 11 percent.
- Group Index values were calculated for each of the subgrade samples tested. Group Index values for the samples tested ranged from 0 to 19, with an average value of 5.
- These Group Index values correspond to an estimated average California Bearing Ratio (CBR) value of 8.0 percent.

The provided plan and profile drawings for the project indicate that cut and fill depths at the test boring locations are less than 1 foot throughout the project area.

The surficial materials along the entire length of construction should be stripped and removed. The GB1 analysis indicates some sections of the roadway alignment, within the upper 6.0 feet of the proposed ground surface, require excavation and backfill. *Table 3* summarizes where excavation and replacement with engineered fill is expected to be required across the proposed roadway alignment.

Table 3. - Summary of Roadway Subgrade Excavation and Backfill

Station	Depth of Excavation & Backfill, (inches)	Reason for Improvement
Sta. 723+06 to 726+00	12	High Moisture
Sta. 726+00 to 730+50	15	Low N_{60L}
Sta. 730+50 to 732+50	15	Low N_{60L}
Sta. 732+50 to 736+50	No Undercut	--
Sta. 736+50 to 741+50	12	Low N_{60L} & High Moisture
Sta. 741+50 to 744+00	12	Low N_{60L}
Sta. 744+00 to 747+00	No Undercut	Compact Existing A-1-a Subgrade to Improve N_{60L}
Sta. 747+00 to 748+57	No Undercut	--

The excavation and backfill areas should be restored to the proposed grade using Item 703.16, Type B, C or D Granular Material and Item 712.09 Geotextile Fabric, Type D or if desirable suitable engineered fill that is compacted to 100 percent of the material's maximum dry density.

Low plasticity material such as A-4a, A-6a and A-6b materials are considered suitable for placement as engineered fill. Some of the subgrade materials encountered during the exploration included clay (A-7-6) soils with relatively high moisture contents. These high moisture, plastic soils are not considered suitable for use as engineered fill for long term satisfactory performance of the pavement, unless they are chemically modified.

Results of the GB1 subgrade analysis also indicate that chemical stabilization with cement is an option for subgrade improvement as an alternative to excavation and backfill. The chemical stabilization should be performed along the entire roadway within the project area. The GB1 subgrade analysis indicates that the subgrade improvement should extend to a depth of 12 inches.

B. <u>Pipe Support (Open-Cut Method)</u>

The subgrade for any proposed storm sewer work will vary along the alignment. The soils at this site, in their native conditions, would generally be expected to provide adequate support for the pipe. However, cohesive soils exposed to standing water can swell and soften. In such an event that unsuitable soils are encountered, it is recommended that a minimum of 8 inches be over excavated and that this over excavation is backfilled with coarse gravel (such as AASHTO No. 8 stone). The gravel will provide uniform support for the pipe, can be utilized in any dewatering process, and can act as a mud mat to protect the soils from disturbance by water and construction activities.

Limestone bedrock was encountered below elevation 905 feet in borings located north of Sta. 740+00, and perhaps elsewhere.

Provided that above stated recommendations are adhered to, additional recommendations for the design and construction of pipe support are listed below.

1. Groundwater seepage may occur in excavations depending on the depth and location of the excavation. Seepage water trapped in the upper soil layers could also be encountered depending upon time of construction and amount of precipitation. Localized sumps and pumps may be used to dewater excavations.

2. On-site excavated soils, except topsoil, are considered suitable for use for backfill in areas outside the influence of any structures and pavements, provided proper moisture content is maintained during placement. Some of the excavated soils may exhibit natural moisture contents above the optimum moisture. Such soils may require air-drying and/or chemical modification prior to use as backfill. Additional fill, if required, may consist of sandy silt, sand and gravel materials, flowable fill, or as otherwise directed by the Engineer.

3. If the excavated material, crushed aggregate, sand, and/or gravel is used, the backfill material should be placed in layers not exceeding 8 inches in loose lift thickness, with each layer compacted to meet the appropriate requirements listed below, or as otherwise specified by the Project Engineer. The engineered fill should not be placed in a frozen condition or over a frozen subgrade.

4. Trenches within the influence zone of roadways, sidewalks, houses or any structures should be backfilled with approved granular backfill meeting ODOT standards, compacted to 98 percent of the material's Standard Proctor maximum dry density (MDD) as determined by ASTM D 698 to reduce the potential risk for settlement of the fill beneath the surface supported features.

5. Trenches in existing lawn areas and areas outside the influence line for support of any structures or pavement should be compacted to at least the density of the surrounding ground, but not less than 90 percent of the material's Standard Proctor maximum dry density (MDD) as determined by ASTM D 698, or as otherwise specified by the Engineer.

6. Pipe installation, trench width, bedding and backfill compaction should be performed in accordance with applicable project codes and/or ODOT Standard Specifications

C. Corrosion Protection

According to the Soil Survey of Miami County, Ohio; surficial soils at the site are described as being Eldean silt loam, 2 to 6 percent slopes (EmB); Miamian silt loam, limestone substratum, 0 to 2 percent slopes (MkA); Miamian silt loam, limestone substratum, 6 to 12 percent slopes, moderately eroded (MkC2); and Milton silt loam, 2 to 6 percent slopes (MpB), as defined by the United States Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS). These mapped soils are described as having a low rating for the corrosion of buried concrete and a high rating for buried steel.

1. Metal pipe and fittings should be coated with an asphaltic coating, encased in a concrete collar where possible, and/or wrapped in polyethylene. A corrosion engineer specializing in cathodic protection of below grade metal structures should be consulted to design a corrosion protection system for any permanent metal structural components.

2. Material for pipe bedding, haunches and pipe embedment of proposed utility lines may consist of natural sand and gravel or other approved material designated by the project's design team or local authority. Corrosive clays and open-graded crushed aggregate are not recommended for iron pipe. Standard Type I cement may be used in Portland cement concrete production.

D. General Construction and Earthwork

In addition to the recommendations provided above, general construction and earthwork recommendations are provided below. Site preparation and earthwork should be performed in accordance with the ODOT Construction and Material Specifications.

1. Embankments for roadway construction should follow ODOT Specifications, Section 203 and related sections.

2. Any pavement not scheduled to remain should be removed.

3. Topsoil over existing embankments and within embankment construction limits should be stripped. Stripping (scalping) should be performed in accordance with ODOT Specifications, Section 201.

4. During construction, adequate drainage should be provided on the surface of the exposed soils. Absorption of heavy rainfall, accumulations of water and heavy construction traffic may result in softening these soils, hence, severely weakening the subgrade soils.

5. Compaction of the subgrade materials should be performed in accordance with ODOT Item 204. Any soft soils encountered during the compaction operations which will not readily compact should be removed and replaced with engineered fill.

6. Backfill or engineered fill required to restore grades or construct embankments should be placed and compacted in accordance with ODOT Standard Specifications, Section 203 and related sections.

7. Temporary excavations in excess of 4.0 feet in depth should be sloped, benched or shored in accordance with OSHA regulations.

VI. CHANGED CONDITIONS

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 using generally accepted geotechnical engineering practices. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates drilled, they are not necessarily representative of the subsurface conditions between boring locations or subsurface conditions during other seasons of the year.

In the event that changes in the project are proposed, additional information becomes available, or if it is apparent that subsurface conditions are different from those provided in this report, CTL Engineering should be notified so that our recommendations can be modified, if required.

VII. TESTING AND OBSERVATION

During the design process, it is recommended that CTL Engineering work with the project designers to confirm that the geotechnical recommendations are properly incorporated into the final plans and specifications, and to assist with establishing criteria for the construction observation and testing.

VIII. CLOSING

The report was prepared by CTL Engineering, Inc. (Consultant) solely for the use of the Client in accordance with an executed contract. The Client's use of or reliance on this report is limited by the terms and conditions of the contract and by the qualifications and limitations stated in the report. It is also acknowledged that the Client's use of and reliance of this report is limited for reasons which include: actual site conditions that may change with time; hidden conditions, not discoverable within the scope of the assessment, may exist at the site; and the scope of the investigation may have been limited by time, budget and other constraints imposed by the Client.

Neither the report, nor its contents, conclusions or recommendations, are intended for the use of any party other than the Client. Consultant and the Client assume no liability for any reliance placed on this report by such party. The rights of the Client under contract may not be assigned to any person or entity, without the consent of the Consultant which consent shall not be unreasonably withheld.

This geotechnical report does not address the environmental conditions of the site. The Consultant is not responsible for consequences or conditions arising from facts that were concealed, withheld, or not fully disclosed at the time the assessment was conducted.

To the fullest extent permitted by law, the Consultant and Client agree to indemnify and hold each other, and their officers and employees harmless from and against claims, damages, losses and expenses arising out of unknown or concealed conditions. Furthermore, neither the Consultant nor its employees shall be liable to the Owner in an amount in excess of the available professional liability insurance coverage of the Consultant. In addition, Client and Consultant agree neither shall be liable for any special, indirect or consequential damages of any kind or nature.

The Consultant's services have been provided consistent with its professional standard of care. No other warranties are made, either expressed or implied.

Thank you for the opportunity to be of service to you on this project. If you have any questions regarding our services, please contact our office.

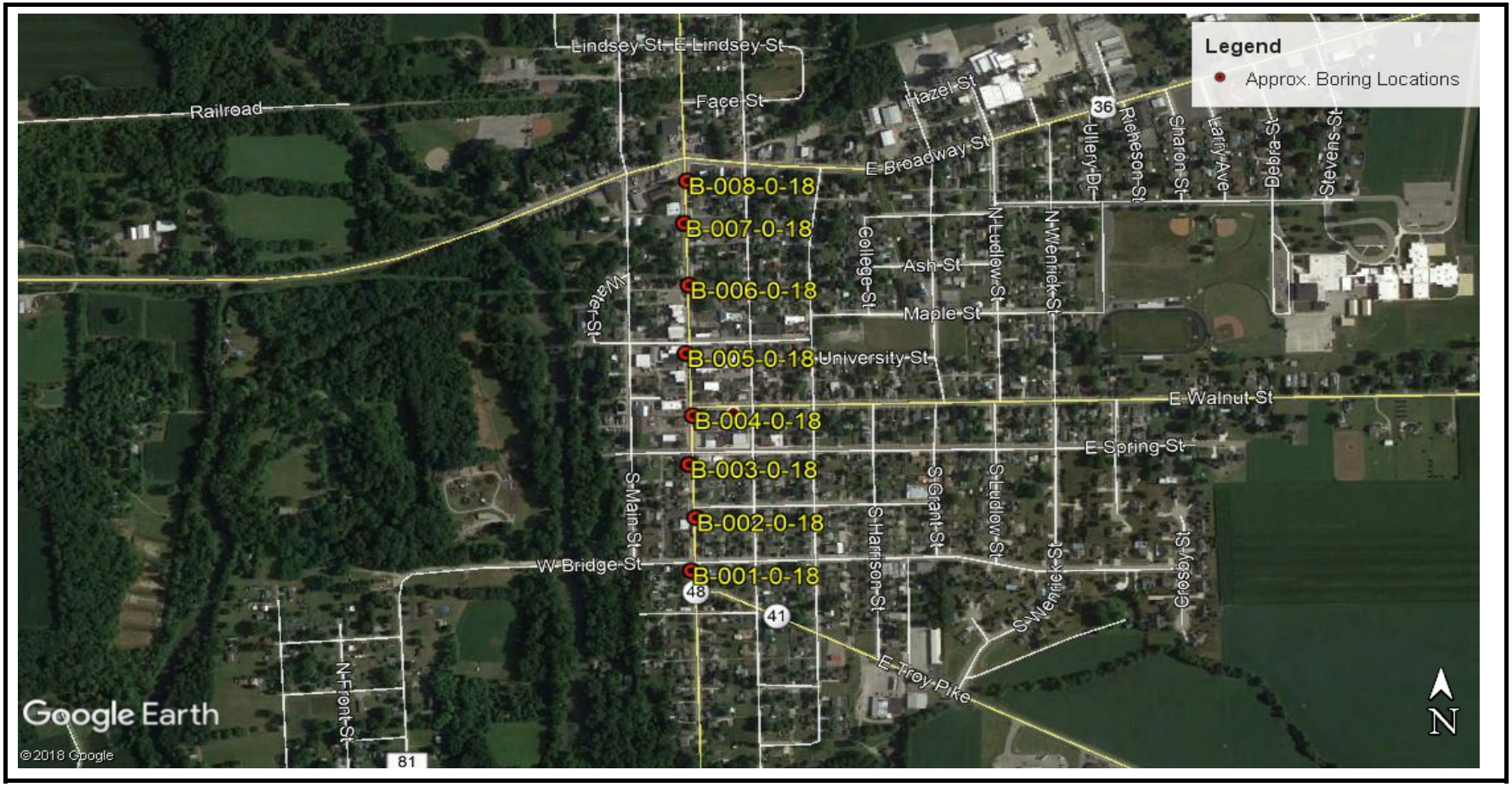
Respectfully Submitted,
CTL ENGINEERING, INC.

Josh Williams
Project Engineer

Frederick Schoen, P.E.
Project Manager / Technical Reviewer

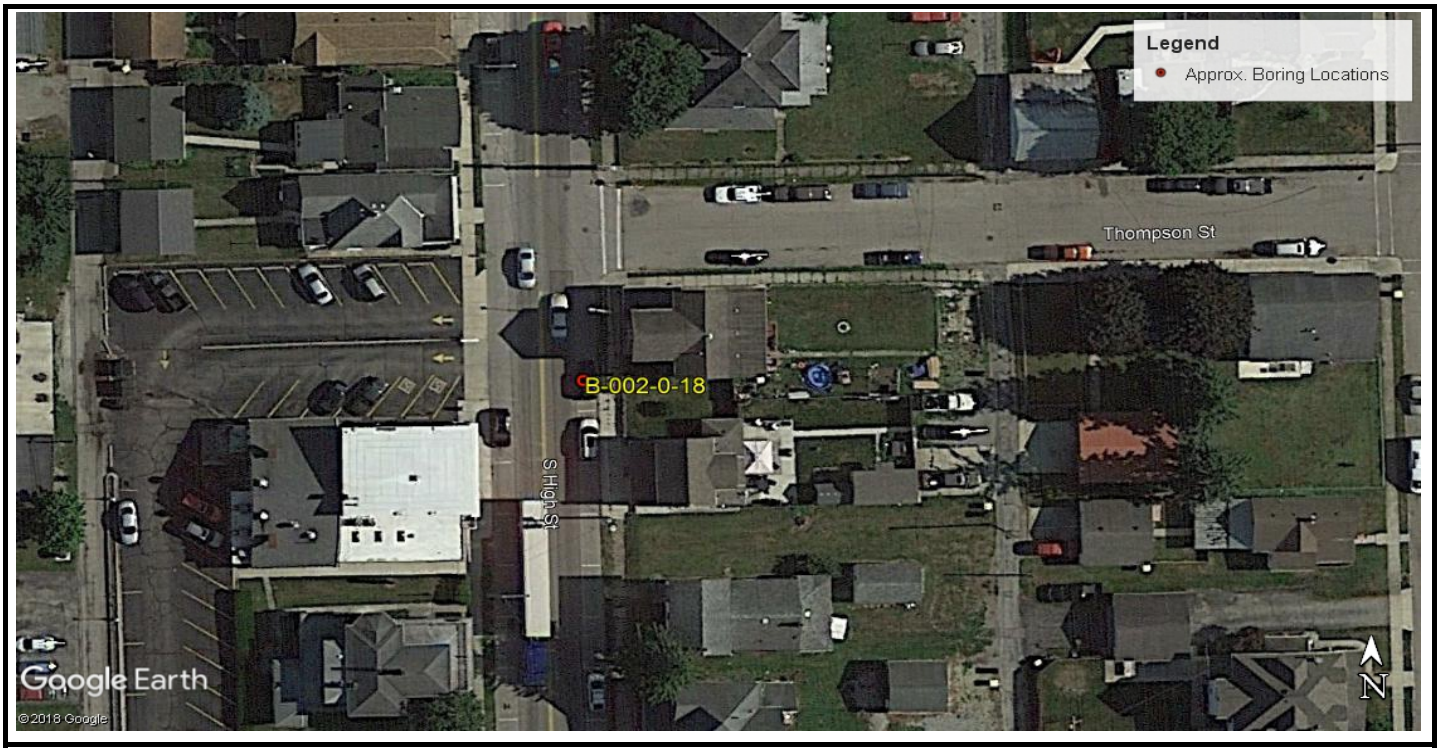
APPENDIX A

BORING LOCATION PLANS

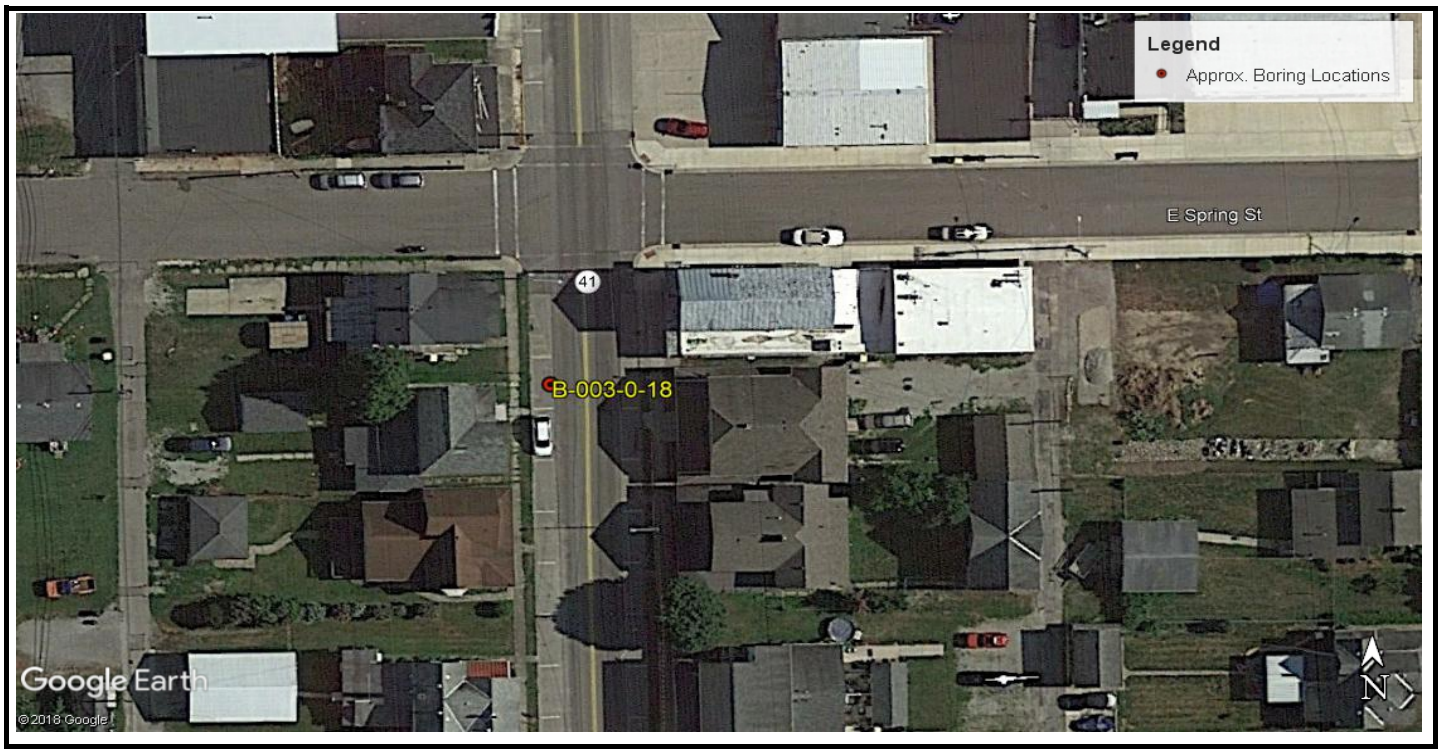


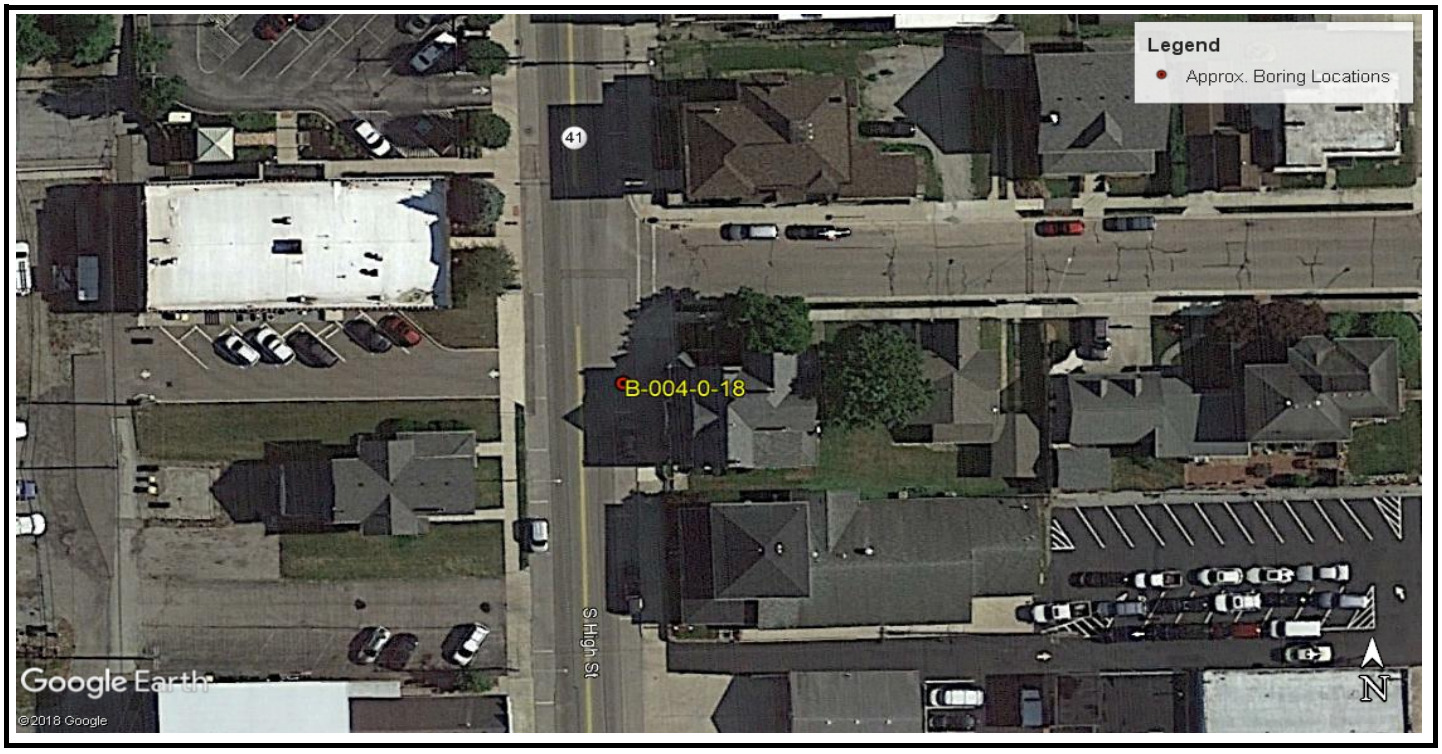
	SITE LOCATION MAP			
	Date 3/8/2019	Village of Covington MIA-HIGH STREET IMPROVEMENTS State Routes 41 & 48 (High Street) Covington, OH - Miami County		
CTL ENGINEERING, INC. GEOTECHNICAL ENGINEERS TESTING * INSPECTION LABORATORY SERVICES	Scale None			
	Drawn By FS	Reviewed By	Page 1 of 2	Project No. 18050026WAP

	SITE LOCATION MAP			
	Date 3/8/2019	Village of Covington MIA-HIGH STREET IMPROVEMENTS State Routes 41 & 48 (High Street) Covington, OH - Miami County		
CTL ENGINEERING, INC. GEOTECHNICAL ENGINEERS TESTING * INSPECTION LABORATORY SERVICES	Scale None			
	Drawn By FS	Reviewed By	Page 2 of 2	Project No. 18050026WAP



	BORING LOCATION PLAN			
	Date 3/8/2019	Village of Covington MIA-HIGH STREET IMPROVEMENTS State Routes 41 & 48 (High Street) Covington, OH - Miami County		
CTL ENGINEERING, INC. GEOTECHNICAL ENGINEERS TESTING * INSPECTION LABORATORY SERVICES	**Scale** As Shown			
	Drawn By FS	**Reviewed By**	**Page** 1 of 4	**Project No.** 18050026WAP





	BORING LOCATION PLAN			
	Date 3/8/2019	Village of Covington MIA-HIGH STREET IMPROVEMENTS State Routes 41 & 48 (High Street) Covington, OH - Miami County		
CTL ENGINEERING, INC. GEOTECHNICAL ENGINEERS TESTING * INSPECTION LABORATORY SERVICES	**Scale** As Shown			
	Drawn By FS	**Reviewed By**	**Page** 2 of 4	**Project No.** 18050026WAP

	BORING LOCATION PLAN			
	Date 3/8/2019	Village of Covington MIA-HIGH STREET IMPROVEMENTS State Routes 41 & 48 (High Street) Covington, OH - Miami County		
CTL ENGINEERING, INC. GEOTECHNICAL ENGINEERS TESTING * INSPECTION LABORATORY SERVICES	**Scale** As Shown			
	Drawn By FS	**Reviewed By**	**Page** 3 of 4	**Project No.** 18050026WAP

	BORING LOCATION PLAN			
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	Drawn By FS	Reviewed By	Page 4 of 4	Project No. 18050026WAP

TIMS TRANSPORTATION INFORMATION MAPPING SYSTEM

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Date: 4/3/2018

APPENDIX B

TEST BORING RECORDS

KEY TO SYMBOLS

CTL ENGINEERING, INC.

PROJECT HIGH STREET RECON. **PID** _____

OGE NUMBER Covington High Street Reconstruction **PROJECT TYPE** ROADWAY

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)

- A-1-A: Ohio DOT: A-1-a, gravel and/or stone fragments
- A-2-4: Ohio DOT: A-2-4, gravel and/or stone fragments with sand and silt
- A-4A: Ohio DOT: A-4a, sandy silt
- A-6A: Ohio DOT: A-6a, silt and clay
- A-6B: Ohio DOT: A-6b, silty clay
- A-7-6: Ohio DOT: A-7-6, clay
- LIMESTONE: Ohio DOT: Limestone
- PAVEMENT OR BASE: Ohio DOT: Pavement or Aggregate base

SAMPLER SYMBOLS

WELL CONSTRUCTION SYMBOLS

- Asphalt or Concrete Pavement Patch
- Soil Cuttings Backfill

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION

- Water Level at Time Drilling, or as Shown
- Water Level at End of Drilling, or as Shown
- Water Level After 24 Hours, or as Shown

KEY TO SYMBOLS - OH DOT.GDT - 6/27/18 15:23 - L:\2018\WAP\PROJECTS\05\18050026WAP ACCESSENG.COVINGTONHIGHSTRECONSTRUCTION\4_ANALYSIS-REPORTING\4.3_GINT\18050026WAP.GPJ

EXPLANATION OF TERMS AND SOIL DESCRIPTIONS
(ODOT Specifications of Geotechnical Explorations)

CONSISTENCY AND RELATIVE DENSITY DESCRIPTIONS

Descriptors for soil consistency used in this report are based upon the Standard Penetration Test (SPT), ASTM D 1587, with the penetration (N) values corrected to N_{60}, based upon the efficiency of the SPT Hammer (Energy Ratio) used for the soil sampling.

NON-COHESIVE SOILS

Consistency	SPT-N_{60} (bpf)
Very Loose	< 5
Loose	5 – 10
Medium Dense	11 – 30
Dense	31 - 50
Very Dense	> 50

COHESIVE SOILS

Consistency	SPT-N_{60} (bpf)	Qu (tsf)
Very Soft	< 2	< 0.25
Soft	2 – 4	0.25 – 0.5
Medium Stiff	5 – 8	0.5 – 1.0
Stiff	9 – 15	1.0 – 2.0
Very Stiff	16 – 30	2.0 – 4.0
Hard	> 30	> 4.0

COMPONENT MODIFIERS

SOIL MODIFIERS

Modifier	% by Weight
Trace	0 – 10
Little	10 – 20
Some	20 – 35
"And"	35 – 50

ORGANIC CONTENT

Modifier	% by Weight
Organic	$LL_{oven}/LL_{air} < 0.75$
Slightly	2 – 4
Moderately	4 – 10
Highly	> 10

MOISTURE DESCRIPTIONS

Terms	Non-Cohesive Soils	Cohesive Soils
Dry	Moisture Absent	Powdery
Damp	Some Moisture	Below Plastic Limit
Moist	Damp to the Touch	Between Plastic and Liquid Limits
Wet	Visible Water	Above Liquid Limit

PARTICLE SIZE DESCRIPTIONS

Component	AASHTO Particle Size
Boulders	≥ 12-in. (300 mm)
Cobbles	< 12-in. (300 mm) to 3-in. (75 mm)
Coarse Gravel	< 3-in. (75 mm) to ¾-in. (19 mm)
Fine Gravel	< ¾-in. (19 mm) to #10 Sieve (2.0 mm)
Coarse Sand	< #10 Sieve (2.0 mm) to #40 Sieve (0.42 mm)
Fine Sand	< #40 Sieve (0.42 mm) to #200 Sieve (0.074 mm)
Silt	< #200 Sieve (0.074 mm) to 0.005 mm
Clay	< 0.005 mm

CTL ENGINEERING INC

PROJECT: HIGH STREET IMPROV.	DRILLING FIRM / OPERATOR: WRIGHTS / D WRIGHT	DRILL RIG: WRIGHTS	STATION / OFFSET: 725+54, 14' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: WRIGHTS / B WRIGHT	HAMMER: CME AUTOMATIC	ALIGNMENT: EXISTING
PID: 105753 SFN:	DRILLING METHOD: 4.0" SFA	CALIBRATION DATE: 6/23/17	ELEVATION: 923.8 (MSL) EOB: 10.0 ft.
START: 6/4/18 END: 6/4/18	SAMPLING METHOD: SPT	ENERGY RATIO (%): 70.7	LAT / LONG: 40.114800, -84.354599

EXPLORATION ID B-001-0-18

PAGE 1 OF 1

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
	923.8																	
Asphalt (3")	923.6																	
Brick (6")	923.1																	
VERY STIFF, BROWN, **SANDY SILT**, AND GRAVEL, LITTLE CLAY, FILL, DAMP		1, 2	12, 12, 13	29	61	SS-1	3.50	41	8	15	25	11	19	15	4	13	A-4a (0)	
		3, 4, 5	7, 7, 7	16	100	SS-2	4.00	20	13	20	32	15	17	14	3	11	A-4a (2)	
	917.8																	
HARD, BROWN, **SILT AND CLAY**, LITTLE SAND, TRACES OF GRAVEL, DAMP		6, 7	5, 5, 10	18	100	SS-3	4.50	-	-	-	-	-	-	-	-	12	A-6a (V)	
	915.8																	
HARD, GRAY, **SILTY CLAY**, LITTLE SAND, TRACES OF GRAVEL, DAMP		8, 9	10, 14, 20	40	100	SS-4	4.50	-	-	-	-	-	-	-	-	12	A-6b (V)	
	913.8	EOB 10																

NOTES: NO BOREHOLE CAVE-IN RECORDED. SS-1: SULFATE CONTENT <100 PPM

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/29/19 06:17 - F:\18050026WAP ACCESSENG.COVINGTONHIGHSTRECONSTRUCTION\4_ANALYSIS-REPORTING\4.3_GINT\180

PROJECT: HIGH STREET IMPROV.	DRILLING FIRM / OPERATOR: WRIGHTS / D WRIGHT	DRILL RIG: WRIGHTS	STATION / OFFSET: 728+85, 14' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: WRIGHTS / B WRIGHT	HAMMER: CME AUTOMATIC	ALIGNMENT: EXISTING
PID: 105753 SFN:	DRILLING METHOD: 4.0" SFA	CALIBRATION DATE: 6/23/17	ELEVATION: 924.8 (MSL) EOB: 10.0 ft.
START: 6/4/18 END: 6/4/18	SAMPLING METHOD: SPT	ENERGY RATIO (%): 70.7	LAT / LONG: 40.115631, -84.354523

EXPLORATION ID B-002-0-18

PAGE 1 OF 1

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
	924.8																	
Asphalt (4")	924.5																	
Base course (8")	923.8																	
VERY STIFF, BROWN, **CLAY**, SOME SILT, SOME SAND, LITTLE STONE FRAGMENTS, FILL, DAMP	921.3	1 2 3	7 3 3	7	44	SS-1	3.50	11	9	21	27	32	53	22	31	14	A-7-6 (14)	
HARD, BROWN, **SANDY SILT**, LITTLE CLAY, LITTLE GRAVEL, POSSIBLE FILL, DAMP	918.8	4 5	3 6 7	15	89	SS-2	4.50	15	13	26	33	13	19	15	4	9	A-4a (2)	
HARD, BROWN, **SILT AND CLAY**, LITTLE TO SOME SAND, LITTLE TO TRACE GRAVEL, DAMP	914.8	6 7 8 9 10 EOB	2 2 10	14	78	SS-3	4.50	-	-	-	-	-	-	-	-	10	A-6a (V)	
			4 9 12	25	100	SS-4	4.50	-	-	-	-	-	-	-	-	12	A-6a (V)	

NOTES: NO BOREHOLE CAVE-IN RECORDED. SS-1: SULFATE CONTENT <100 PPM

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/29/19 06:17 - F:\18050026WAP ACCESSENG.COVINGTONHIGHSTRECONSTRUCTION\4_ANALYSIS-REPORTING\4.3_GINT\180

PROJECT: HIGH STREET IMPROV.	DRILLING FIRM / OPERATOR: WRIGHTS / D WRIGHT	DRILL RIG: WRIGHTS	STATION / OFFSET: 731+61, 14' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: WRIGHTS / B WRIGHT	HAMMER: CME AUTOMATIC	ALIGNMENT: EXISTING
PID: 105753 SFN:	DRILLING METHOD: 4.0" SFA	CALIBRATION DATE: 6/23/17	ELEVATION: 925.1 (MSL) EOB: 10.0 ft.
START: 6/4/18 END: 6/4/18	SAMPLING METHOD: SPT	ENERGY RATIO (%): 70.7	LAT / LONG: 40.116467, -84.354644

EXPLORATION ID B-003-0-18

PAGE 1 OF 1

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
	925.1																	
Asphalt (3")	924.9																	
Brick (4")	924.5																	
Base course (6")	924.0																	
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, FILL, DAMP	921.6	1	16 6 3	11	67	SS-1	4.50	36	16	13	24	11	27	19	8	9	A-2-4 (0)	
VERY STIFF, BROWN, **SANDY SILT**, SOME CLAY, SLIGHTLY ORGANIC, TRACES OF GRAVEL, POSSIBLE FILL, MOIST	919.1	2	2 3 3	7	100	SS-2	3.50	4	6	22	48	20	29	20	9	22	A-4a (7)	
HARD, BROWN, **SILT AND CLAY**, SOME TO LITTLE SAND, TRACES OF GRAVEL, DAMP		6	2 3 5	9	56	SS-3	4.50	-	-	-	-	-	-	-	-	13	A-6a (V)	
	915.1	9	5 9 11	24	100	SS-4	4.50	-	-	-	-	-	-	-	-	11	A-6a (V)	
		EOB 10																

NOTES: NO BOREHOLE CAVE-IN RECORDED. SS-1: SULFATE CONTENT <100 PPM

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/29/19 06:17 - F:\18050026WAP ACCESSENG.COVINGTONHIGHSTRECONSTRUCTION\4_ANALYSIS-REPORTING\4.3_GINT\180

PROJECT: HIGH STREET IMPROV.	DRILLING FIRM / OPERATOR: WRIGHTS / D WRIGHT	DRILL RIG: WRIGHTS	STATION / OFFSET: 734+43, 15' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: WRIGHTS / B WRIGHT	HAMMER: CME AUTOMATIC	ALIGNMENT: EXISTING
PID: 105753 SFN:	DRILLING METHOD: 4.0" SFA	CALIBRATION DATE: 6/23/17	ELEVATION: 927.5 (MSL) EOB: 10.0 ft.
START: 6/4/18 END: 6/4/18	SAMPLING METHOD: SPT	ENERGY RATIO (%): 70.7	LAT / LONG: 40.117235, -84.354566

EXPLORATION ID B-004-0-18

PAGE 1 OF 1

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
	927.5																	
Asphalt (4")	927.2																	
Brick (6")	926.7	1	50/5"	-	100													
Base course (12")	925.7	2				SS-1	-	54	23	11	7	5	NP	NP	NP	7	A-1-a (0)	
MEDIUM DENSE, GRAY, **GRAVEL AND/OR STONE FRAGMENTS**, AND SAND, TRACES OF SILT/CLAY, FILL, DAMP	924.5	3																
HARD, BROWN, **SANDY SILT**, LITTLE CLAY, LITTLE STONE FRAGMENTS, FILL, DAMP		4	8 8 11	22	100	SS-2	4.50	16	16	24	29	15	16	13	3	9	A-4a (2)	
	921.5	5																
HARD, BROWN, **SILT AND CLAY**, LITTLE SAND, TRACES OF GRAVEL, POSSIBLE FILL, DAMP		6	8 10 11	25	100	SS-3	4.50	-	-	-	-	-	-	-	-	12	A-6a (V)	
	919.0	7																
HARD, BROWN, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, POSSIBLE FILL, DAMP		8																
	917.5	9	15 30 30	71	100	SS-4	-	-	-	-	-	-	-	-	-	10	A-4a (V)	
		EOB 10																

NOTES: NO BOREHOLE CAVE-IN RECORDED. SS-1: SULFATE CONTENT 520 PPM

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/29/19 06:17 - F:\18050026WAP ACCESSENG.COVINGTONHIGHSTRECONSTRUCTION\4_ANALYSIS-REPORTING\4.3_GINT\180

PROJECT: HIGH STREET IMPROV.	DRILLING FIRM / OPERATOR: WRIGHTS / D WRIGHT	DRILL RIG: WRIGHTS	STATION / OFFSET: 738+02, 14' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: WRIGHTS / B WRIGHT	HAMMER: CME AUTOMATIC	ALIGNMENT: EXISTING
PID: 105753 SFN:	DRILLING METHOD: 4.0" SFA	CALIBRATION DATE: 6/23/17	ELEVATION: 927.6 (MSL) EOB: 10.0 ft.
START: 6/4/18 END: 6/4/18	SAMPLING METHOD: SPT	ENERGY RATIO (%): 70.7	LAT / LONG: 40.118219, -84.354701

EXPLORATION ID B-005-0-18

PAGE 1 OF 1

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
	927.6																	
Asphalt (4")	927.3																	
Base course (6')	926.8																	
VERY STIFF, BROWN, **CLAY**, SOME SILT, SOME SAND, TRACE GRAVEL, SLIGHTLY ORGANIC, FILL, MOIST	924.1	1 2 3	5 5 5	12	56	SS-1	4.00	1	6	19	33	41	50	20	30	25	A-7-6 (18)	
HARD, BROWN WITH GRAY, **SANDY SILT**, LITTLE CLAY, LITTLE GRAVEL, DAMP		4 5	3 4 9	15	100	SS-2	4.50	20	11	21	32	16	21	14	7	12	A-4a (3)	
@6.0'; TRACE GRAVEL	919.1	6 7 8	5 8 8	19	89	SS-3	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)	
HARD, BROWNISH GRAY, **SILT AND CLAY**, LITTLE GRAVEL, LITTLE SAND, DAMP	917.6	9 10 EOB	6 6 9	18	100	SS-4	4.50	-	-	-	-	-	-	-	-	10	A-6a (V)	

NOTES: NO BOREHOLE CAVE-IN RECORDED. SS-1: SULFATE CONTENT <100 PPM

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/29/19 06:17 - F:\18050026WAP ACCESSENG.COVINGTONHIGHSTRECONSTRUCTION\4_ANALYSIS-REPORTING\4.3_GINT\180

PROJECT: HIGH STREET IMPROV.	DRILLING FIRM / OPERATOR: WRIGHTS / D WRIGHT	DRILL RIG: WRIGHTS	STATION / OFFSET: 742+13, 12' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: WRIGHTS / B WRIGHT	HAMMER: CME AUTOMATIC	ALIGNMENT: EXISTING
PID: 105753 SFN:	DRILLING METHOD: 4.0" SFA	CALIBRATION DATE: 6/23/17	ELEVATION: 912.4 (MSL) EOB: 10.0 ft.
START: 6/4/18 END: 6/4/18	SAMPLING METHOD: SPT	ENERGY RATIO (%): 70.7	LAT / LONG: 40.119294, -84.354648

EXPLORATION ID B-006-0-18

PAGE 1 OF 1

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
	912.4																	
Asphalt (3")	912.2																	
Brick (6")	911.7																	
Base course (3")	911.4																	
HARD, BROWN, **CLAY**, AND SILT, TRACES OF SAND, LITTLE STONE FRAGMENTS, FILL, DAMP	909.4	1	3 4 4	9	56	SS-1	4.25	14	4	5	43	34	56	21	35	14	A-7-6 (19)	
HARD, BROWN, **SILTY CLAY**, SOME SAND, TRACES OF GRAVEL, POSSIBLE FILL, MOIST		2 3 4 5	3 4 5	11	83	SS-2	4.50	6	7	14	33	40	39	17	22	18	A-6b (12)	
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, TRACES OF CLAY, DAMP	906.1	6 7 8	3 4 21	29	89	SS-3	-	-	-	-	-	-	-	-	-	8	A-2-4 (V)	
LIMESTONE, LIGHT BROWN, HIGHLY WEATHERED, WEAK.	903.9 TR	9	32 32 30	73	78	SS-4	-	-	-	-	-	-	-	-	-	4	Rock (V)	
	902.4 EOB	10																

NOTES: NO BOREHOLE CAVE-IN RECORDED. SS-1: SULFATE CONTENT <100 PPM

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/29/19 06:17 - F:\18050026WAP ACCESSENG.COVINGTONHIGHSTRECONSTRUCTION\4_ANALYSIS-REPORTING\4.3_GINT\180

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/29/19 06:17 - F:\18050026WAP ACCESSENG.COVINGTONHIGHSTRECONSTRUCTION\4_ANALYSIS-REPORTING\4.3_GINT\180

PROJECT: HIGH STREET IMPROV.	DRILLING FIRM / OPERATOR: WRIGHTS / D WRIGHT	DRILL RIG: WRIGHTS	STATION / OFFSET: 745+47, 14' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: WRIGHTS / B WRIGHT	HAMMER: CME AUTOMATIC	ALIGNMENT: EXISTING
PID: 105753 SFN:	DRILLING METHOD: 4.0" SFA	CALIBRATION DATE: 6/23/17	ELEVATION: 904.0 (MSL) EOB: 10.0 ft.
START: 6/4/18 END: 6/4/18	SAMPLING METHOD: SPT	ENERGY RATIO (%): 70.7	LAT / LONG: 40.120273, -84.354743

EXPLORATION ID B-007-0-18

PAGE 1 OF 1

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
904.0																		
Asphalt (4")	903.7																	
Base course (8")	903.0																	
LOOSE, GRAY, **GRAVEL AND/OR STONE FRAGMENTS**, SOME SAND, TRACES OF SILT/CLAY, FILL, DAMP		1	3 3 3	7	39	SS-1	-	64	15	7	9	5	NP	NP	NP	4	A-1-a (0)	
	900.3	TR 2 3																
LIMESTONE, LIGHT BROWN, HIGHLY WEATHERED, WEAK.		4	8 10 47	67	44	SS-2	-	59	12	17	9	3	NP	NP	NP	7	A-1-a (0)	
		5																
		6	50/5"	-	100	SS-3	-	-	-	-	-	-	-	-	-	4	Rock (V)	
		7																
		8																
		9	50/5"	-	60	SS-4	-	-	-	-	-	-	-	-	-	6	Rock (V)	
	894.0	EOB 10																

NOTES: BOREHOLE CAVE-IN AT 7.5 FT.. SS-1: SULFATE CONTENT 480 PPM

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

PROJECT: HIGH STREET IMPROV.	DRILLING FIRM / OPERATOR: WRIGHTS / D WRIGHT	DRILL RIG: WRIGHTS	STATION / OFFSET: 747+95, 21' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: WRIGHTS / B WRIGHT	HAMMER: CME AUTOMATIC	ALIGNMENT: EXISTING
PID: 105753 SFN:	DRILLING METHOD: 4.0" SFA	CALIBRATION DATE: 6/23/17	ELEVATION: 907.8 (MSL) EOB: 10.0 ft.
START: 6/4/18 END: 6/4/18	SAMPLING METHOD: SPT	ENERGY RATIO (%): 70.7	LAT / LONG: 40.120938, -84.354680

EXPLORATION ID B-008-0-18

PAGE 1 OF 1

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
	907.8																	
Asphalt (3")	907.6																	
Brick (6")	907.1																	
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, TRACES OF CLAY, FILL, DAMP	904.8	1 2	30 10 10	24	89	SS-1	3.50	34	18	17	21	10	18	12	6	9	A-2-4 (0)	
VERY STIFF, BROWN, **SILT AND CLAY**, SOME SAND, SOME GRAVEL, DAMP	902.3	3 4 5	4 6 10	19	78	SS-2	3.00	29	15	20	23	13	24	13	11	11	A-6a (0)	
VERY STIFF, BROWN, **SANDY SILT**, AND GRAVEL, SOME CLAY, DAMP	899.8	6 7	8 9 11	24	56	SS-3	-	-	-	-	-	-	-	-	-	7	A-4a (V)	
LIMESTONE, GRAY, SEVERELY WEATHERED, VERY WEAK.	897.8	TR 8 9 EOB 10	50/5"	-	60	SS-4	-	-	-	-	-	-	-	-	-	5	Rock (V)	

NOTES: NO BOREHOLE CAVE-IN RECORDED. SS-1: SULFATE CONTENT <100 PPM

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/29/19 06:17 - F:\18050026WAP ACCESSENG.COVINGTONHIGHSTRECONSTRUCTION\4_ANALYSIS-REPORTING\4.3_GINT\180

APPENDIX C

SOIL PROFILE SHEETS

PROJECT DESCRIPTION

THE PROJECT INVOLVES THE FULL DEPTH RECONSTRUCTION OF THE EXISTING ROADWAY, STATE ROUTE 48 (HIGH STREET). WORK WILL INCLUDE REPLACEMENT OF THE EXISTING PAVEMENTS, IMPROVING THE SUBGRADE SOILS, AND POSSIBLE UTILITY, SIDEWALK, AND CURB MODIFICATIONS. THE WORK WILL BEGIN AT THE INTERSECTION OF EAST TROY PIKE (STATE ROUTE 41) AND STATE ROUTE 48 AND WILL END AT THE INTERSECTION WITH EAST BROADWAY STREET (US ROUTE 36).

HISTORIC RECORDS

NO HISTORICAL BORINGS WERE FOUND WITHIN THE PROJECT LIMITS WHEN USING THE OHIO DEPARTMENT OF TRANSPORTATION'S (ODOT) TRANSPORTATION INFORMATION MAPPING SYSTEM (TIMS).

GEOLOGY

THE SURFICIAL GLACIAL DEPOSITS OF MIAMI COUNTY ARE MOSTLY IN THE FORM OF WELL-DEFINED MORAINES WITH INTERVENING FLAT-LYING GROUND MORAINE AND INTERMORAINAL LAKE BASINS. THE PROJECT SITE IS LOCATED ON A GROUND MORAINE, WHICH IS CHARACTERIZED AS EXTENSIVE, BROAD, FLAT-SURFACED DEPOSITS OF GLACIAL TILL. THE TILL WAS DEPOSITED DISCONTINUOUSLY BY ICE ADVANCING OVER BEDROCK OR OVER OLDER GLACIAL DEPOSITS AND IS PREDOMINANTLY UNSORTED, UNCONSOLIDATED, AND UNSTRATIFIED SOIL COMPOSED OF A HETEROGENEOUS MIXTURE OF CLAY, SILT, SAND, GRAVEL, AND COARSER ROCKS. THE OVERBURDEN SOILS WITHIN THE PROJECT SITE ARE UNDERLAIN BY LOCKPORT DOLOMITE (SL) OF THE SILURIAN AGE. NO KNOWN KARST OR UNDERGROUND MINE RELATED INCIDENTS EXIST AT THE PROJECT SITE.

RECONNAISSANCE

STATE ROUTE (SR) 48 IS A TWO-LANE, BI-DIRECTIONAL ROADWAY HAVING AN ASPHALT SURFACE. THE ROADWAY SURFACE WAS NOTED TO EXHIBIT SOME AREAS OF FATIGUE AND LINEAR CRACKING. GROUND SURFACE ELEVATIONS ALONG THE ROADWAY RANGE FROM ELEVATION 903 TO 929 FEET. THE ROADWAY RUNS IN A NORTH-SOUTH DIRECTION THROUGH COVINGTON, OHIO, WITH RESIDENTIAL AND COMMERCIAL PROPERTIES ON BOTH SIDES OF THE STREET FOR THE FULL LENGTH OF THE PROJECT AREA. THE STILLWATER RIVER IS ORIENTED PARALLEL WITH SR 48, LOCATED APPROXIMATELY 300 FEET WEST OF THE ROAD.

SUBSURFACE EXPLORATION

EIGHT (8) SOIL TEST BORINGS, DESIGNATED B-001-0-18 THROUGH B-008-0-18, WERE DRILLED AND SAMPLED THROUGH THE EXISTING PAVED ROADWAY, AND INTO THE SUBGRADE SOILS TO DEPTHS OF 10.0 FEET BELOW THE EXISTING ROADWAY SURFACE. BORINGS WERE PERFORMED ON JUNE 4, 2018 UTILIZING A TRUCK MOUNTED, ROTARY DRILL RIG WITH 4.0-IN. OUTSIDE DIAMETER SOLID-FLIGHT AUGERS. STANDARD PENETRATION TESTS WERE CONDUCTED IN THE TEST BORINGS USING AN AUTOMATIC 140-POUND HAMMER FALLING 30 INCHES TO DRIVE 2-INCH OUTSIDE DIAMETER SPLIT-SPOON SAMPLERS FOR 18 INCHES. SPLIT-SPOON SOIL SAMPLES WERE OBTAINED AT 2.5 FOOT INTERVALS, BEGINNING BELOW THE PAVEMENT MATERIALS. THE AUTOMATIC HAMMER USED WITH THE DRILL RIG FOR THE PROJECT WAS PREVIOUSLY CALIBRATED ON JUNE 23, 2017, AND HAS A DRILL ROD ENERGY RATIO OF 70.7 PERCENT.

EXPLORATION FINDINGS

EXISTING PAVEMENT MATERIALS WERE FOUND TO CONSIST OF 3.0 TO 4.0 INCHES OF ASPHALT OVER 4.0 TO 6.0 INCHES OF BRICK AND/OR 3.0 TO 12.0 INCHES OF VISUALLY CLASSIFIED AGGREGATE BASE MATERIAL.

SUBGRADE SOILS WERE VISUALLY AND MECHANICALLY CLASSIFIED AS GRAVEL AND/OR STONE FRAGMENTS (A-1-A), GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT (A-2-4), SANDY SILT (A-4A), SILT AND CLAY (A-6A), SILTY CLAY (A-6B), AND CLAY (A-7-6). WEATHERED BEDROCK WAS ENCOUNTERED IN BORINGS B-006-0-18 THROUGH B-008-0-18 AND WAS VISUALLY CLASSIFIED AS LIMESTONE. SOME OF THESE SUBGRADE SOILS WERE VISUALLY CLASSIFIED AS BEING PREVIOUSLY PLACED FILL.

GROUNDWATER WAS NOT ENCOUNTERED DURING OUR EXPLORATION. BORE-HOLE CAVE-IN OCCURRED ONLY IN TEST BORING B-007-0-18 AT A DEPTH OF 7.5 FEET.

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 2017.

AVAILABLE INFORMATION

ALL AVAILABLE SOIL 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, COLUMBUS, OHIO.

LEGEND

DESCRIPTION	ODOT CLASS	CLASSIFIED MECH.	CLASSIFIED VISUAL
GRAVEL AND/OR STONE FRAGMENTS	*A-1-a*	*3*	*-*
GRAVEL AND/OR STONE FRAGMENTS W/SAND AND SILT	*A-2-4*	*2*	*1*
SANDY SILT	*A-4a*	*7*	*2*
SILT AND CLAY	*A-6a*	*1*	*7*
SILTY CLAY	*A-6b*	*1*	*1*
CLAY	*A-7-6*	*3*	*-*
	TOTAL	*17*	*11*
LIMESTONE	*VISUAL*		
PAVEMENT OR BASE = X = APPROXIMATE THICKNESS	*VISUAL*		

EXPLORATION 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.

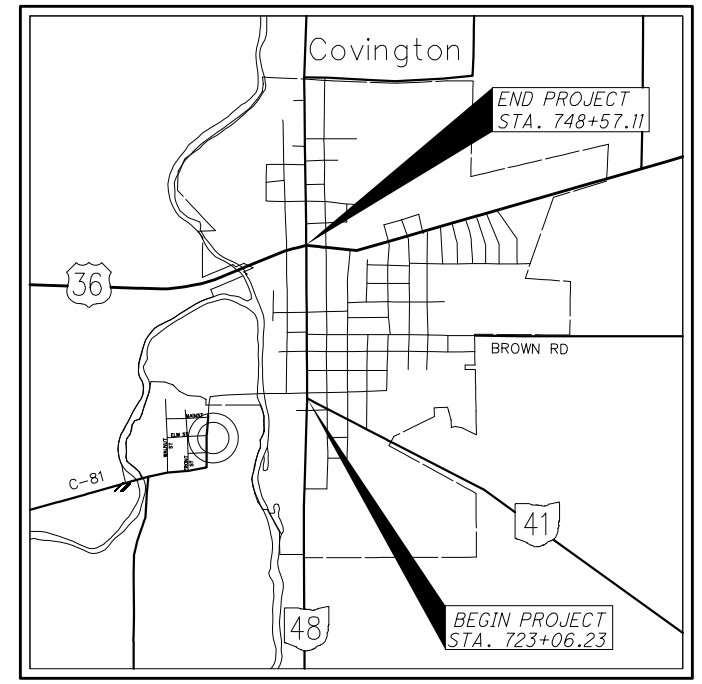
N_{60} INDICATES STANDARD PENETRATION RESISTANCE NORMALIZED TO 60% DRILL ROD ENERGY RATIO.

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

SS INDICATES A SPLIT-SPOON SAMPLE.

NP INDICATES A NON-PLASTIC SAMPLE.

TR INDICATES TOP OF ROCK.



LOCATION MAP

SCALE IN MILES

0 1 2 3 4

N

PARTICLE SIZE DEFINITIONS

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

INDEX OF SHEETS - SR 48						
LOCATION FROM STA.	TO STA.	PLAN VIEW SHEET	PROFILE SHEET	CROSS-SECTION SHEET	CUT MAX.	FILL EMB. MAX.
722+50.00	736+00.00	3	3	-	<1 FT	<1 FT
736+00.00	749+23.00	4	4	-	<1 FT	<1 FT

RECON. - FS 06/01/18
DRILLING - DW 06/04/18
DRAWN - NKS 03/19/19
REVIEWED - JW 03/19/19

CTL ENGINEERING, INC.
102 COMMERCE DRIVE
WAPAKONETA, OHIO 45895
PHONE:(419)738-1447 FAX:(419)738-7670

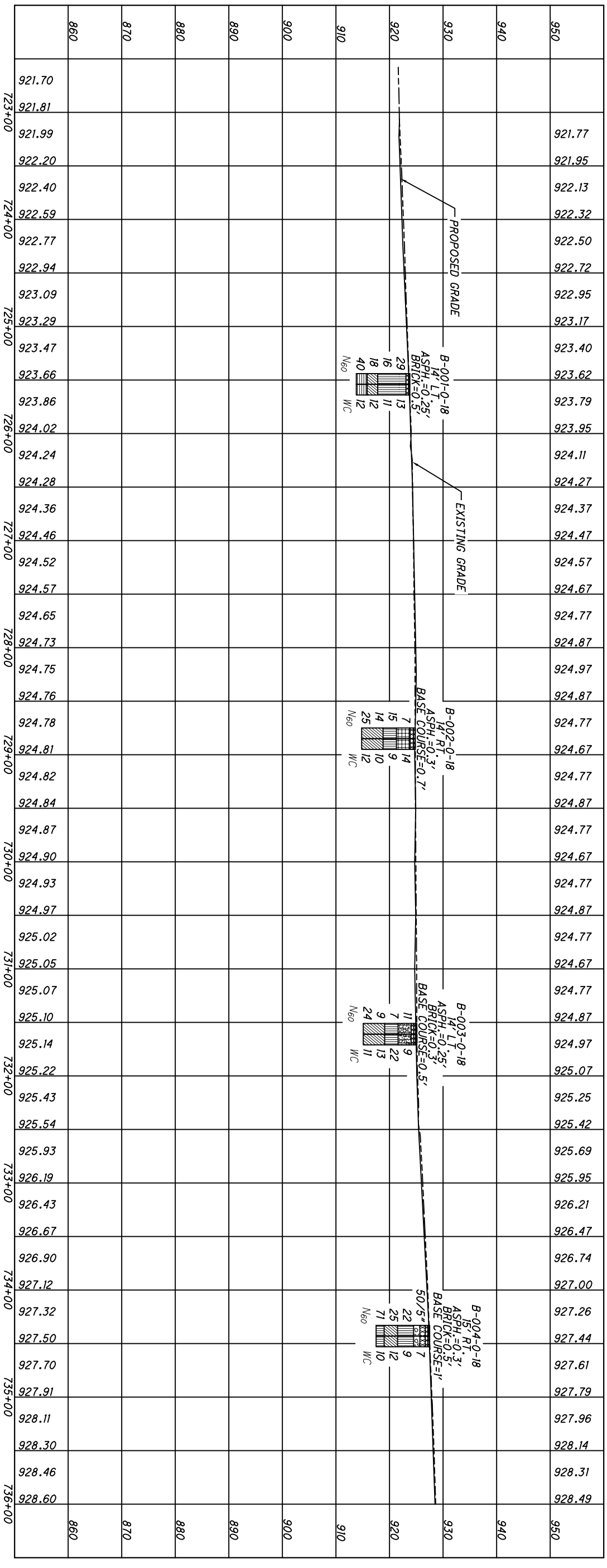
PID NO. **105753**

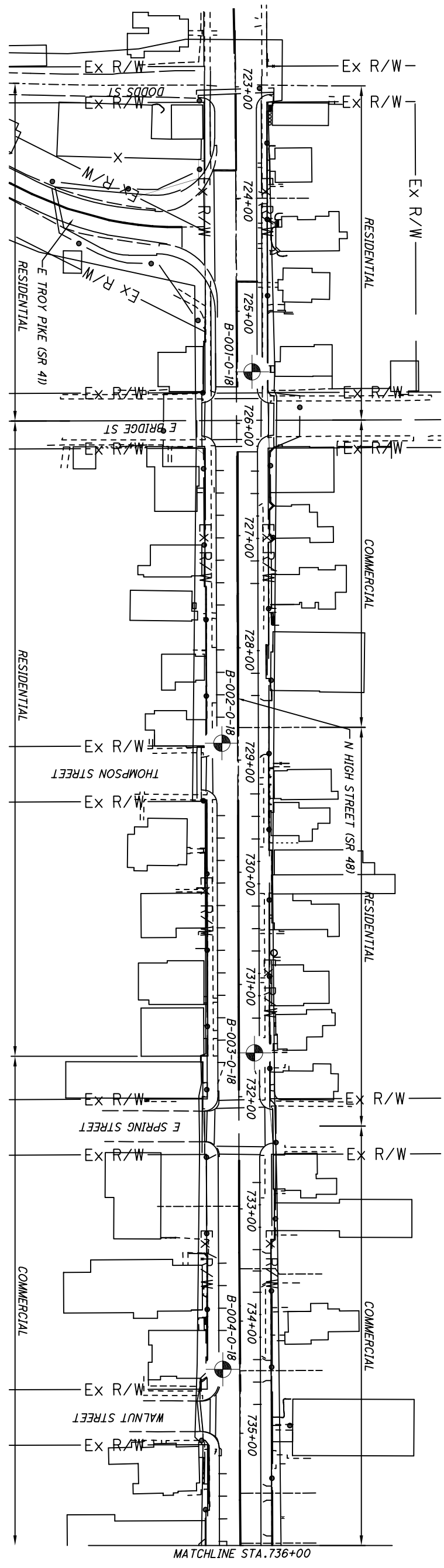
SOIL PROFILE

MIA - HIGH STREET IMPROVEMENTS

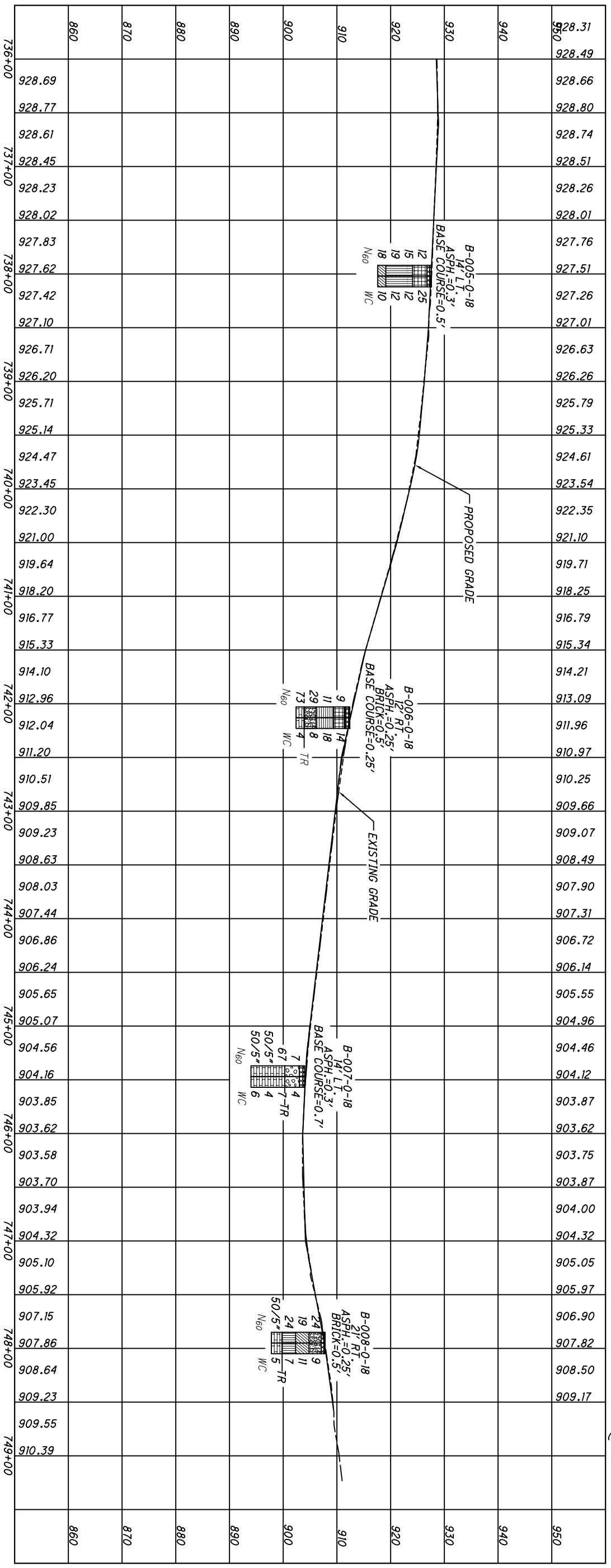
SUMMARY OF SOIL TEST DATA
SR 48

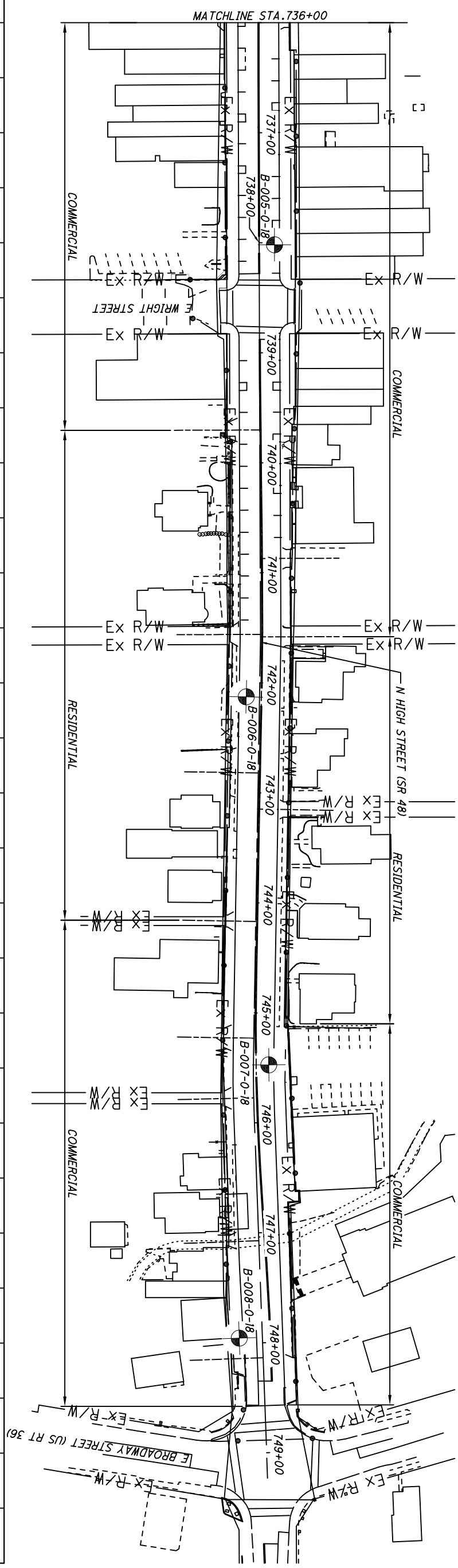
EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	N60	% REC	HP tsf	% GR	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS (GI)	ppm SO4
B-001-0-18	01.00-02.50	SS-1	29	61	3.50	41	8	15	25	11	19	15	4	13	A-4a (0)*	<100
STA. 725+54 ; 14' LT.	03.50-05.00	SS-2	16	100	4.00	20	13	20	32	15	17	14	3	11	A-4a (2)	-
LATITUDE = 40.114800	06.00-07.50	SS-3	18	100	4.50	BROWN SILT AND CLAY, DAMP								12	A-6a (VISUAL)	-
LONGITUDE = -84.354599	08.50-10.00	SS-4	40	100	4.50	GRAY SILTY CLAY, DAMP								12	A-6b (VISUAL)	-
B-002-0-18	01.00-02.50	SS-1	7	44	3.50	11	9	21	27	32	53	22	31	14	A-7-6 (14)*	<100
STA. 728+85 ; 14' RT.	03.50-05.00	SS-2	15	89	4.50	15	13	26	33	13	19	15	4	9	A-4a (2)	-
LATITUDE = 40.115631	06.00-07.50	SS-3	14	78	4.50	BROWN SILTY AND CLAY, DAMP								10	A-6a (VISUAL)	-
LONGITUDE = -84.354523	08.50-10.00	SS-4	25	100	4.50	SAME AS SS-3								12	A-6a (VISUAL)	-
B-003-0-18	01.00-02.50	SS-1	11	67	4.50	36	16	13	24	11	27	19	8	9	A-2-4 (0)*	<100
STA. 731+61 ; 14' LT.	03.50-05.00	SS-2	7	100	3.50	4	6	22	48	20	29	20	9	22	A-4a (7)	-
LATITUDE = 40.116467	06.00-07.50	SS-3	9	56	4.50	BROWN SILTY AND CLAY, DAMP								13	A-6a (VISUAL)	-
LONGITUDE = -84.354644	08.50-10.00	SS-4	24	100	4.50	SAME AS SS-3								11	A-6a (VISUAL)	-
B-004-0-18	01.00-02.50	SS-1	50/5"	100	-	54	23	11	7	5	NP	NP	NP	7	A-1-a (0)*	520
STA. 734+43 ; 15' RT.	03.50-05.00	SS-2	22	100	4.50	16	16	24	29	15	16	13	3	9	A-4a (2)	-
LATITUDE = 40.117235	06.00-07.50	SS-3	25	100	4.50	BROWN SILTY AND CLAY, DAMP								12	A-6a (VISUAL)	-
LONGITUDE = -84.354566	08.50-10.00	SS-4	71	100	-	BROWN SANDY SLIT, DAMP								10	A-4a (VISUAL)	-
B-005-0-18	01.00-02.50	SS-1	12	56	4.00	1	6	19	33	41	50	20	30	25	A-7-6 (18)*	<100
STA. 738+02 ; 14' LT.	03.50-05.00	SS-2	15	100	4.50	20	11	21	32	16	21	14	7	12	A-4a (3)	-
LATITUDE = 40.118219	06.00-07.50	SS-3	19	89	4.50	SAME AS SS-2								12	A-4a (VISUAL)	-
LONGITUDE = -84.354701	08.50-10.00	SS-4	18	100	4.50	BROWNISH GRAY SILT AND CLAY, DAMP								10	A-6a (VISUAL)	-
B-006-0-18	01.00-02.50	SS-1	9	56	4.25	14	4	5	43	34	56	21	35	14	A-7-6 (19)*	<100
STA. 742+13 ; 12' RT.	03.50-05.00	SS-2	11	83	4.50	6	7	14	33	40	39	17	22	18	A-6b (12)	-
LATITUDE = 40.119294	06.00-07.50	SS-3	29	89	-	BROWN GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT, DAMP								8	A-2-4 (VISUAL)	-
LONGITUDE = -84.354648	08.50-10.00	SS-4	73	78	-	LIGHT BROWN LIMESTONE, WEAK								4	Rock (VISUAL)	-
B-007-0-18	01.00-02.50	SS-1	7	39	-	64	15	7	9	5	NP	NP	NP	4	A-1-a (0)*	480
STA. 745+47 ; 14' LT.	03.50-04.50	SS-2	67	44	-	59	12	17	9	3	NP	NP	NP	7	A-1-a (0)	-
LATITUDE = 40.120273	06.00-06.41	SS-3	50/5"	100	-	LIGHT BROWN LIMESTONE, WEAK								4	Rock (VISUAL)	-
LONGITUDE = -84.354743	08.50-08.91	SS-4	50/5"	60	-	SAME AS SS-3								6	Rock (VISUAL)	-
B-008-0-18	01.00-02.50	SS-1	24	89	3.50	34	18	17	21	10	18	12	6	9	A-2-4 (0)*	<100
STA. 747+95 ; 21' RT.	03.50-05.00	SS-2	19	78	3.00	29	15	20	23	13	24	13	11	11	A-6a (0)	-
LATITUDE = 40.120938	06.00-07.50	SS-3	24	56	-	BROWN SANDY SILT, DAMP								7	A-4a (VISUAL)	-
LONGITUDE = -84.354680	08.50-08.91	SS-4	50/5"	60	-	GRAY LIMESTONE, WEAK								5	Rock (VISUAL)	-





3/4	MIA - HIGH STREET IMPROVEMENTS	SOIL PROFILE STA. 722+50.00 TO STA. 736+00.00	DRAWN N.K.S CHECKED JW	0 25 50 100 HORIZONTAL SCALE IN FEET	N





4/4	MIA - HIGH STREET IMPROVEMENTS	SOIL PROFILE STA. 736+00.00 TO STA. 749+23.00	DRAWN N.K.S CHECKED JW	0 25 50 100 HORIZONTAL SCALE IN FEET	N

APPENDIX D

ODOT GB1 SUBGRADE ANALYSIS

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

MIA-HIGH STREET IMPROVEMENTS
105753

Reconstruction of 2,500 ft. of High Street (SR 48), in the Covington,OH; including replacement of the ex. pavements, improving subgrade, and other features.

CTL Engineering, Inc.

Prepared By: F. Schoen, P.E.
Date prepared: Friday, March 8, 2019

CTL Engineering
102 Commerce Dr.
P.O. Box 44
Wapakoneta, OH 45895
(419) 738-1447
fschoen@ctleng.com

NO. OF BORINGS: 8

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-001-0-18	Existing	725+54	14	Lt	Wrights	70.7	923.8	924.0	0.2 F
2	B-002-0-18	Existing	728+85	14	Rt	Wrights	70.7	924.8	924.7	0.1 C
3	B-003-0-18	Existing	731+61	14	Lt	Wrights	70.7	925.1	925.0	0.1 C
4	B-004-0-18	Existing	734+43	15	Rt	Wrights	70.7	927.5	927.4	0.1 C
5	B-005-0-18	Existing	738+02	14	Lt	Wrights	70.7	927.6	927.5	0.1 C
6	B-006-0-18	Existing	742+13	12	Rt	Wrights	70.7	912.4	912.5	0.1 F
7	B-007-0-18	Existing	745+47	14	Lt	Wrights	70.7	904.0	904.0	0.0
8	B-008-0-18	Existing	747+95	21	Rt	Wrights	70.7	907.8	907.8	0.0

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.0	2.5	1.2	2.7	29		3.5	19	15	4	25	11	36	13	10	A-4a	0	100		Mc			12" Undercut
	001-0	SS-2	3.5	5.0	3.7	5.2	16		4	17	14	3	32	15	47	11	10	A-4a	2						
	18	SS-3	6.0	7.5	6.2	7.7	18		4.5							12	14	A-6a							
		SS-4	8.5	10.0	8.7	10.2	30	16	4.5							12	16	A-6b							
2	B	SS-1	1.0	2.5	0.9	2.4	7		3.5	53	22	31	27	32	59	14	19	A-7-6	14	100		N_{60}		15"	15" Undercut with 204 Geotextile
	002-0	SS-2	3.5	5.0	3.4	4.9	15		4.5	19	15	4	33	13	46	9	10	A-4a	2						
	18	SS-3	6.0	7.5	5.9	7.4	14		4.5							10	14	A-6a							
		SS-4	8.5	10.0	8.4	9.9	25	7	4.5							12	14	A-6a							
3	B	SS-1	1.0	2.5	0.9	2.4	11		4.5	27	19	8	24	11	35	9	10	A-2-4	0	100		N_{60}		12"	15" Undercut with 204 Geotextile
	003-0	SS-2	3.5	5.0	3.4	4.9	7		3.5	29	20	9	48	20	68	22	15	A-4a	7						
	18	SS-3	6.0	7.5	5.9	7.4	9		4.5							13	14	A-6a							
		SS-4	8.5	10.0	8.4	9.9	24	7	4.5							11	14	A-6a							
4	B	SS-1	1.0	2.5	0.9	2.4	30		--	NP	NP	NP	7	5	12	7	6	A-1-a	0	520					
	004-0	SS-2	3.5	5.0	3.4	4.9	22		4.5	16	13	3	29	15	44	9	10	A-4a	2						
	18	SS-3	6.0	7.5	5.9	7.4	25		4.5							12	14	A-6a							
		SS-4	8.5	10.0	8.4	9.9	30	22	--							10	10	A-4a							
5	B	SS-1	1.0	2.5	0.9	2.4	12		4	50	20	30	33	41	74	25	18	A-7-6	18	100		N_{60} & Mc		12"	12" Undercut with 204 Geotextile
	005-0	SS-2	3.5	5.0	3.4	4.9	15		4.5	21	14	7	32	16	48	12	10	A-4a	3						
	18	SS-3	6.0	7.5	5.9	7.4	19		4.5							12	10	A-4a							
		SS-4	8.5	10.0	8.4	9.9	18	12	4.5							10	14	A-6a							
6	B	SS-1	1.0	2.5	1.1	2.6	9		4.25	56	21	35	43	34	77	14	18	A-7-6	19	100		N_{60}			12" Undercut with 204 Geotextile
	006-0	SS-2	3.5	5.0	3.6	5.1	11		4.5	39	17	22	33	40	73	18	16	A-6b	12						
	18	SS-3	6.0	7.5	6.1	7.6	29		--							8	10	A-2-4							
		SS-4	8.5	10.0	8.6	10.1	--	9	--							4	0	Rock							
7	B	SS-1	1.0	2.5	1.0	2.5	7		--	NP	NP	NP	9	5	14	4	6	A-1-a	0	480					Recompact
	007-0	SS-2	3.5	4.5	3.5	4.5	30		--	NP	NP	NP	9	3	12	7	6	A-1-a	0						
	18	SS-3	6.0	6.4	6.0	6.4	--		--							4	0	Rock							
		SS-4	8.5	8.9	8.5	8.9	--	7	--							6	0	Rock							
8	B	SS-1	1.0	2.5	1.0	2.5	24		3.5	18	12	6	21	10	31	9	10	A-2-4	0	100					
	008-0	SS-2	3.5	5.0	3.5	5.0	19		3	24	13	11	23	13	36	11	14	A-6a	0						
	18	SS-3	6.0	7.5	6.0	7.5	24		--							7	10	A-4a							
		SS-4	8.5	8.9	8.5	8.9	--	19	--							5	0	Rock							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID: 105753

County-Route-Section: MIA-HIGH STREET IMPROVEMENTS
No. of Borings: 8

Geotechnical Consultant: CTL Engineering, Inc.
Prepared By: F. Schoen, P.E.
Date prepared: 3/8/2019

Chemical Stabilization Options		
320	Rubblize & Roll	Option
206	Cement Stabilization	Option
	Lime Stabilization	No
206	Depth	12"

Excavate and Replace Stabilization Options	
Global Geotextile Override(N60L):	15"
Average(HP):	0"
Global Geogrid Override(N60L):	0"
Average(HP):	0"

Design CBR	8

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	32%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	9%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	32%	HP > 2	77%
M+	9%		
Rock	0%		
Unsuitable	13%		

Excavate and Replace at Surface	
Average	0"
Maximum	0"
Minimum	0"

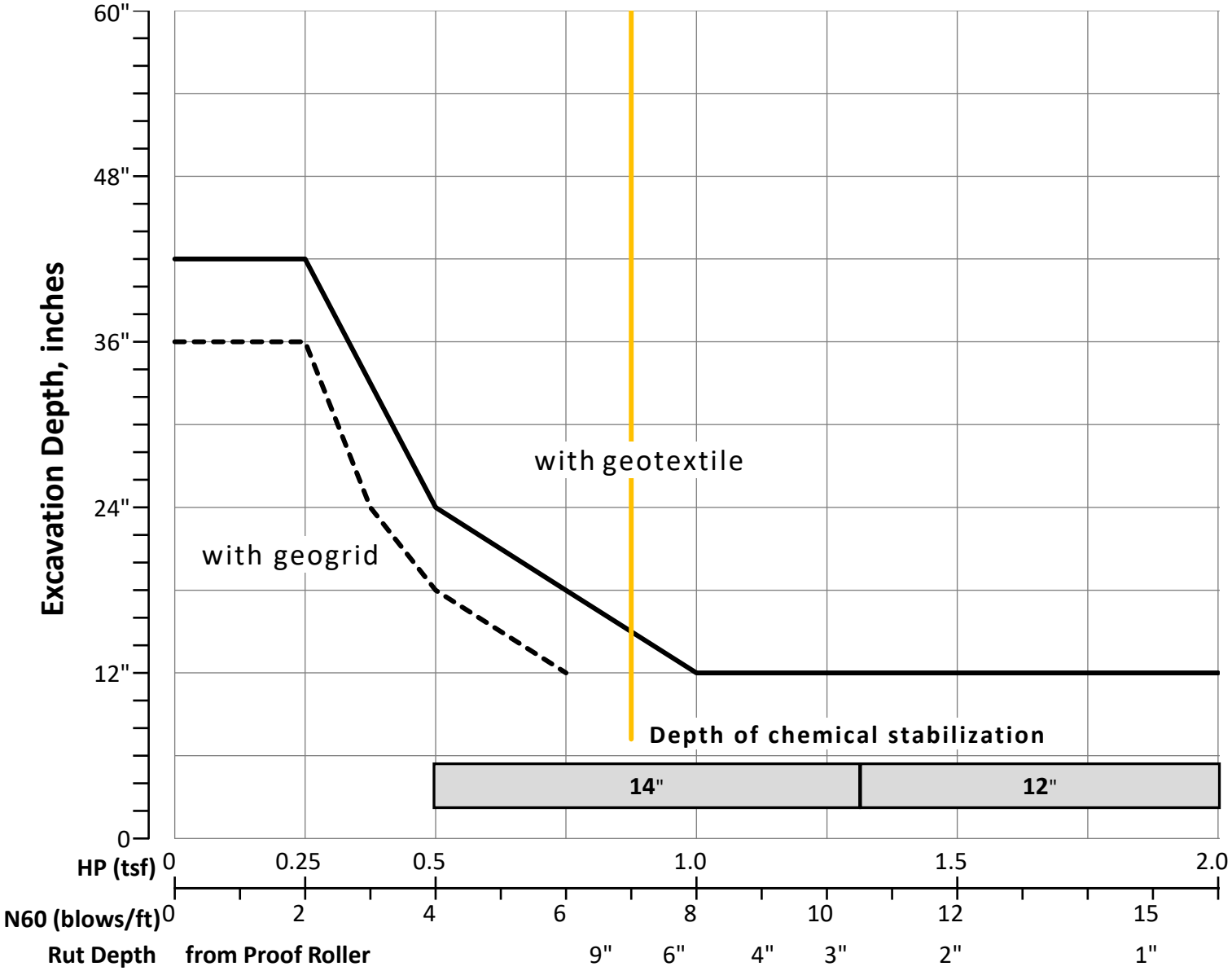
% Proposed Subgrade Surface	
Unstable & Unsuitable	63%
Unstable	63%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	19	12	4.19	30	17	13	27	18	45	11	11	5
Maximum	30	22	4.50	56	22	35	48	41	77	25	19	19
Minimum	7	7	3.00	16	12	3	7	3	12	4	0	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	4	3	0	3	0	0	0	0	0	9	0	0	8	2	0	3	0	0	32
Percent	13%	9%	0%	9%	0%	0%	0%	0%	0%	28%	0%	0%	25%	6%	0%	9%	0%	0%	100%
% Rock|Granular|Cohesive	13%	47%									41%								100%
Surface Class Count	0	2	0	2	0	0	0	0	0	1	0	0	0	0	0	3	0	0	8
Surface Class Percent	0%	25%	0%	25%	0%	0%	0%	0%	0%	13%	0%	0%	0%	0%	0%	38%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
4.19	3.50	☐ HP
12.38	7.00	☑ N60L

Average HP
Average N_{60L}

APPENDIX E

LABORATORY TEST RESULTS

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AN EMPLOYEE OWNED COMPANY

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Established 1927

Report on Samples of Soil

Project No.: 18050026WAP June 15, 2018

Client: Village of Covington
1 South Hight Street
Covington, Ohio 45318 – Attn: Mike Busse

Identification: Eight soil samples identified below collected by a CTL Engineering representative from High Street, Covington, Ohio and submitted to the laboratory on June 13, 2018.

Test Methods: ODOT S1122, "Determining Sulfate Content in Soils-Colorimetric Method."

Test Results:

Sample or Boring ID	Sample Depth	Soaking Time (hours)	Dilution Ratio	Replicate Sulfate Measurements (mg/L)			Average Sulfate Measurements (mg/L)	Sulfate Content (ppm)
				1	2	3		
B-1, SS-I	NA	24	20	< 5	< 5	< 5	< 5	< 100
B-2, SS-I	NA	24	20	< 5	< 5	< 5	< 5	< 100
B-3, SS-I	NA	24	20	< 5	< 5	< 5	< 5	< 100
B-4, SS-I	NA	24	20	26	26	26	26	520
B-5, SS-I	NA	24	20	< 5	< 5	< 5	< 5	< 100
B-6, SS-I	NA	24	20	< 5	< 5	< 5	< 5	< 100
B-7, SS-I	NA	24	20	24	24	24	24	480
B-8, SS-I	NA	24	20	< 5	< 5	< 5	< 5	< 100

Respectfully submitted,

Johnny Tjioe

Johnny Tjioe, Chemist

JT