GEOTECHNICAL INVESTIGATION REPORT
THOBURN ROAD RECONSTRUCTION
COLUMBUS, FRANKLIN COUNTY, OHIO

DHDC PROJECT NO.: C15-138

For:

Franklin County Engineer
970 Dublin Road
Columbus, Ohio 43215

Submitted by:

DHDC Engineering Consulting Services, Inc.
2390 Advanced Business Center Drive
Columbus, Ohio 43228

Date:

April 12, 2018

DHDC Engineering Consulting Services, Inc.
2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

April 12, 2018

James A. Pajk, P.E.
Deputy Engineer, Bridges and Highways
Franklin County Engineer
970 Dublin Road
Columbus, Ohio 43215

Subject: Geotechnical Investigation Report
Thoburn Road Reconstruction
Columbus, Franklin County, Ohio
DHDC Project No.: C15-138

Dear Mr. Pajk:

In compliance with your request, DHDC Engineering Consulting Services, Inc. (DHDC) has completed a subsurface exploration and geotechnical evaluation for the above referenced project. We appreciate the opportunity to be of service to you on this project. If you have any questions regarding our report or if we may be of further service, please contact us at your earliest convenience.

Respectfully submitted,

DHDC Engineering Consulting Services, Inc.

Mohammed O. Haque, P.E.
Geotechnical Engineer

STATE OF OHIO MOHAMMED O. HAQUE E-63310 REGISTERED PROFESSIONAL ENGINEER

Savvas P. Sophocleous
Project Manager

DHDC
Engineering Consulting Services, Inc.

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation and soils evaluation for the proposed Thoburn Road reconstruction project in Columbus, Franklin County, Ohio. The purpose and scope of DHDC's site exploration was to determine the soil profile at the proposed site to the depths explored, to evaluate the suitability of the subgrade materials for the support of the proposed pavement, and formulate recommendations relative to pavement design, earthwork operations, site preparation, drainage, and construction concerns for this project. The geotechnical investigation report also contains limited mix design analysis for Full Depth Reclamation (FDR). This report will also addresses geotechnical recommendation regarding the construction of storm water line.

The scope of this investigation included a review of available geologic and soils data for the project area, review of subsurface investigation information from three (3) soil borings (B-1 through B-3) performed for the previous geotechnical investigation, and review of subsurface information from five new soil borings (B-4 through B-6, P-1, and P-2) for this investigation, field and laboratory soil testing, and an engineering analysis and evaluation of the subsurface conditions encountered at this site. The boring locations are shown on the Boring Location Plan in the Appendix.

2.0 PROJECT AND SITE CHARACTERISTICS

In October of 2015, DHDC performed a geotechnical investigation for the proposed Thoburn Road reconstruction project. For that investigation, DHDC performed three (3) soil borings to depths of about 4.5 to 6.0 feet below the exposed grade. The scope of the geotechnical investigation report was to evaluate the suitability of the subgrade materials for the support of the proposed pavement, and formulate recommendations relative to pavement design, earthwork operations, site preparation, drainage, and construction concerns for this project.

Since then the scope of the proposed construction has changed. The proposed project will consist of the reconstruction of Thoburn Road between the intersections of Dublin Road and Indian Village Road and installation of storm water line on the north side of Thoburn Road to facilitate drainage. The edge of the proposed pavement will be 7.5 ft. right of centerline of right of way on the south side and 14.5 ft. left of the centerline of right of way on the north side. The pavement will have a transverse slope to the north with no crown. It is DHDC's belief that the proposed pavement grade will closely match the existing pavement grade.

The subgrade of the proposed pavement will most likely be constructed as full depth reclamation (FDR). As part of the FDR, after the removal of few inches of existing asphaltic concrete, the remaining asphaltic concrete will be pulverized and mixed with granular base material and subgrade soil to a depth of about twelve (12) to fourteen (14) inches. The composite material will then be chemically stabilized using additives (possibly cement) and will be compacted. Asphaltic concrete pavement will be constructed on the chemically stabilized subgrade.

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

3.0 INVESTIGATIVE PROCEDURES

As part of this geotechnical investigation, DHDC performed three (3) soil borings through the grassy areas located on the north side of the proposed pavement and two (2) shallow soil borings through the existing asphaltic concrete pavement. The boring locations were selected and staked in the field by DHDC and Franklin County Engineer. The soil samples were returned to DHDC soil mechanics laboratory in Columbus, Ohio for the required analysis, testing, and evaluation.

The test borings were performed in accordance with geotechnical investigative procedures outlined in American Society for Testing and Materials (ASTM) Standards D-1452 and D-5434. The test borings performed during this investigation were drilled with a drill rig utilizing 2 1/4-inch inside diameter hollow-stem augers.

Split-spoon samples were obtained by the Standard Penetration Test (SPT) Method (ASTM D-1586), which consists of driving a 2.0-inch outside diameter split-spoon sampler into the soil with a 140-pound weight falling freely through a distance of 30 inches. The sampler was driven in three successive 6-inch increments with the number of blows per increment being recorded. The sum of the number of blows required to advance the sampler the second and third 6-inch increments is termed the Standard Penetration Resistance (N-value) and is presented on the Boring Logs attached to this report. The split-spoon samples were sealed in jars and transported to our laboratory for further classification and testing.

Soil conditions encountered in the test borings are presented in the Boring Logs, along with information related to sample data, SPT results, water conditions observed in the borings, and laboratory test data. It should be noted that these logs have been prepared on the basis of laboratory classification and testing as well as on field logs of the encountered soils.

All samples of the subsoils were visually or manually classified using the Unified Group Soil Classification System (ASTM D-2487 and D-2488). The soil samples were tested in the laboratory for moisture content and selected ones for Pocket Penetrometer (approximate Unconfined Compressive Strength) tests. Atterberg Limits (ASTM D-4318), and Sieve Analysis (ASTM C-136) were performed on near surface subgrade soil collected for FDR. DHDC also performed limited mix design analysis for FDR. The results of these tests are presented on the soil boring logs attached to this report and also in the appendix.

DHDC Engineering Consulting Services, Inc.
2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 Site Geologic Conditions

The project area is located in the northwestern quadrant of Franklin County, Ohio. The project area is covered by both the Illinoian and the Wisconsinan age glaciation. The shallow soils in the region typically consist primarily of fine-grained moderate-plasticity soils. Glacial till covers the area to variable depths. Geologic mapping indicates that the natural soils are glacial in origin and consist of silts, silty clays, sandy clays, and clays with variable sand and gravel components. Glacial tills in this portion of Ohio are typically cohesive with low to moderate plasticity; however, the glacial tills close to the interface with bedrock can have higher plasticities. The underlying bedrock material is Ohio Shale. Ohio Shale ranges in thickness from about 250 to over 500 feet.

Ohio Department of Natural Resources (ODNR) Water Well Log and Drilling Report (Well Log Number: 117654) located at 3740 and 3474 Dublin road located near the intersection of Thoburn Road, reported the following subsurface information:

Formations	From	To
Clay	0	6
Limestone	6	124

Formations	From	To
Clay	0	8
Limestone	8	122

4.2 Soil Profile

Surface Material

Soil Borings P-1 and P-2 were drilled through the existing asphalt paved roadway. Approximately 9.0± inches of asphaltic concrete was encountered at the soil borings. A thin layer of granular base was encountered below the asphaltic concrete, which ranged in thickness from about 5.0 to 6.0 inches. It should be noted that no granular base material was encountered below the asphaltic concrete in the previously drilled soil Borings B-1 through B-3.

Soil Borings B-4 through B-6 were drilled through the grassy area. Approximately 4.0 to 5.0 inches of topsoil was encountered in these borings. Topsoil is dark clayey silt containing considerable organic matter as a result of the past vegetation. Topsoil is generally unsuitable for structural support and should be wasted or stockpiled for later landscaping use.

Naturally Occurring Soil

Below the asphaltic concrete, silty clay soil containing little amounts of sand and gravel and occasional rock fragments were encountered in Borings P-1 and P-2 to the maximum depth explored of 3.0 feet below the exposed grade. Due to the presence of rock fragments, the standard Penetration Test (N-values) in cohesive silty clay soils ranged from 46 to 50 blows per foot (bpf).

Below the topsoil, silty clay soil containing trace to little amounts of sand and gravel was encountered in all three soil borings to depths ranging from 2.0 to 5.5 feet below the exposed grade. The deeper depth silty clay soil contained rock fragments. The N-values in cohesive silty clay soils were in the range of 4 to 12 blows per foot (bpf), but were mostly between 7 to 12 bpf. The natural moisture content of the cohesive soils varied between 18 to 25 percent. The cohesive silty clay soil is glacial till and based on the appearance and laboratory test results this soil can be classified as low plasticity CL soil according to the Unified Soil Classification System (USCS).

Dark brown to black weathered shale and limestone fragments fragment were encountered between the depths of 2.0 to 6.0 feet below the exposed grade in Boring B-5. The N-values in this material ranged from 5 to 66 bpf.

Below the overburden cohesive silty clay soils in Borings B-4 and B-6 and below the weathered shale and limestone fragments in Boring B-5, gray soft to hard, weathered to intact limestone was encountered to the spoon and auger refusal depths ranging from about 5.5 to 8.0 feet below the boring surface grades. Auger refusal is defined as the depth at which conventional drilling procedures cannot advance the borehole due to a hard soil stratum or rock.

4.3 Groundwater Conditions

The topography along the alignment of the proposed roadway can be described as relatively flat to gently rolling from west to east. Groundwater observations were made during the drilling operations (by noting the depth of water on the drilling tools) and at completion of the drilling operations. No groundwater was encountered in any of the three (3) recent and three (3) previously drilled soil borings for this investigation. Although no groundwater was encountered in any of the borings, it is possible that some trapped or perched groundwater can be encountered at the interface of overburden soil and weathered to intact limestone bedrock.

Groundwater in Ohio glacial tills is typically contained in discontinuous sand and gravel layers within the cohesive soil matrix. Groundwater conditions should be anticipated to fluctuate depending on variations in precipitation, surface runoff, infiltration, site topography, and drainage.

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

5.0 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

Based upon our analysis of the soil conditions and the preliminary design details supplied for this project by the client as previously outlined, the following recommendations were developed. If the project characteristics are changed from those assumed herein, or if different subsurface conditions are encountered during construction, DHDC should be notified so that our recommendations can be reviewed to see whether any modifications are needed.

5.1 Existing Pavement Condition

Soil Borings P-1 and P-2 were drilled through the existing pavement. Approximately 9.0± inches of asphaltic concrete was encountered at the soil boring locations. A thin layer of granular material was encountered below the asphaltic concrete pavement. The granular material was a mixture of asphaltic concrete grinding material and rock fragments. No granular base material was encountered in the three previously drilled soil borings.

DHDC's recent site reconnaissance indicates that the existing pavement is in poor to average condition and shows typical signs of wearing, pot holes, edge cracking, and areas of failing pavement. It appears that in order to keep the asphaltic concrete pavement in working condition, periodic maintenance work had been performed.

5.2 Important Findings

DHDC's previous and recent soil borings revealed the following important subsurface information:

- Below the topsoil and below the granular base materials, naturally occurring silty clay soil was encountered in the soil borings. Based on the N-values, the silty clay soils are mostly medium stiff in soil consistency. However, the silty clay soil encountered in Boring B-3 to a depth of about 3.5 appeared to be soft in consistency. The moisture content of the silty clay soils ranged from 16 to 25 percent, but were mostly in low twenties. DHDC's experience with similar soils as well as GB-1 analysis report indicate that the Optimum Moisture Content of the silty clay soils will be in mid-teens. Hence, based on the laboratory test results it appears that the moisture contents of the silty clay soils are about 5 to 10 percent higher than the anticipated Optimum Moisture Content. It should be noted that the soils containing natural moisture content higher than the Optimum Moisture Content will tend to pump during proofroll. Other than organic odor and staining within the silty clay soil in Borings B-2 and B-3, no other deleterious materials were encountered within the subgrade soils. It is possible that pockets of original decomposed topsoil may be encountered just below the granular base material.

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

5.3 Full Depth Reclamation (FDR) – Mix Design

DHDC performed limited mix design for Full Depth Reclamation (FDR). The soil samples collected for FDR consisted of auger cuttings and near surface subgrade soils (silty clay) from Borings B-4 through B-6, and mixture of asphaltic concrete and granular base materials from Borings P-1 and P-2. The composite sample consisted of a mixture of 70% silty clay and 30% asphaltic concrete and granular base material. The composite samples were blended with Portland cement at 3%, 5%, and 7%, by dry weight of the samples to prepare the test cylinders. The Maximum Dry Density and Optimum Moisture content of the untreated soil, as well as cement mixed samples were obtained from ODOT family of curves. Three cylinders were molded for untreated and each of the required percentages. The Maximum Dry Density and Optimum Moisture Content of the test specimen are as follows:

Sample	Maximum Dry Density/Optimum Moisture Content			
	Cement Content			
	0%	3%	5%	7%
A mixture of 70% silty clay and 30% asphaltic concrete and granular base material	119.3/12.7	119.3/12.7	117.0/13.5	117.0/13.5

The following table shows the compressive strength of the fabricated cylinders at various percentages of cement:

Percent Cement	Total Load (lbs.)	Compressive Strength (psi)	Average Compressive Strength (psi)
0%	895	71	72
	970	77	
	840	67	
3%	2545	203	196
	2390	190	
	2435	194	
5%	3405	271	261
	3205	255	
	3245	258	
7%	4090	326	300
	3585	285	
	3645	290	

The unconfined compressive strength (UCS) of FDR with cement bases is typically higher than that of other stabilized base methods such as asphalt emulsions, lime, or fly ash. Although the Portland Cement Association (PCA) recommends a seven-day target UCS of 300 to 400 psi; however, UCS of at least 200 psi in a 7-Day ambient cure period is considered adequate for this kind of project.

It is DHDC's belief that the required depth of FDR will be at least 14 inches. Based on the limited mix-design analysis, it appears that the test specimen prepared with 3.6% of dry unit weight of cement will achieve 200 psi compressive strength at 7-day. It is DHDC's belief that the variations of the natural moisture content of the composite material, uneven spreading of cement and mixing with subgrade soil will affect the performance of FDR of subgrade. Hence, some areas of the subgrade may fail to achieve the required minimum strength. Due to those reasons, DHDC recommends 5% minimum spreading percentage rate (field application rate). Field quality control is vital for the performance of cement subgrade FDR. It is recommended that DHDC perform field compaction tests, and perform field verification of the mix design.

5.4 Subgrade Preparation

DHDC is providing the following pavement subgrade construction recommendations:

- DHDC recommends the removal of topsoil, soils with abundance of organics (if any), and six (6) inches of asphaltic concrete. DHDC recommends that the remaining asphaltic concrete be pulverized and mixed with granular base material and subgrade soil to a depth of at least fourteen (14) inches. The subgrade soil and the composite materials then be chemically stabilized using 5.0% of the dry weight of cement and be compacted in accordance with the recommendations contained in Section 5.6 of the geotechnical investigation report.

- Since the asphaltic concrete will not be entirely removed and will be pulverized and mixed with granular base material and subgrade soil, thus preparing subgrade as full depth reclamation, the finished grade of the new pavement will be few inches in higher elevation than the existing one.

- Some fill will be required within the northern portion of the proposed pavement area to bring the existing grade to the desired finished subgrade elevation. It is DHDC's recommendation that after the removal of topsoil and abundance of organics (if any), the exposed subgrade should be proof rolled as outlined in Item 204.06 of the ODOT CMS. In general the proofroll can be performed using a tandem axle dump truck loaded with at least 4 cubic yards of material (gross weight of the tandem axle truck plus the material should be at least 20-ton). The proof roll should be observed by a geotechnical engineer or his representative.

  If the moisture content of the yielding and pumping subgrade soil is higher than the optimum moisture content, then the subgrade soil should be moisture conditioned through tilling, disking, and pulverizing, to allow the soil to dry for a period of 24 to 48 hours. The subgrade soils should then should be re-compacted and re-proofrolled. If after the moisture conditioning, the subgrade

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

doesn't pass proofroll, then the subgrade should be stabilized by undercutting or can be cement stabilized (5% dry unit weight of the subgrade soil).

- Prior to placement of additional fill, all existing sloping surfaces on which new fill is to be placed should be benched in accordance with Item 203.05. 4. For Item 204 Embankment material, it is safe to construct fill at a side slope not steeper than 2H:1V. Any portion of the proposed roadway steeper than 2:1 slope needs to be stabilized by the most economical stabilization method. According to CMS Item 204, the top 12 inches of the subgrade should be compacted and the subgrade should be proof rolled to 18 inches beyond the edge of the surface of the pavement, paved shoulders, or paved medians, including under new curbs and gutters.

- No free groundwater was encountered at any soil borings drilled for this study. However, the subgrade soils contain higher moisture content than the optimum moisture content of such soils. The possible reasons of such higher moisture contents are due to the surface runoff from the adjacent pavement to the shoulder areas, infiltration of water through the cracks of the pavement, improper grading of the subgrade and the pavement surface, and improper compaction of the subgrade soil. Although not specifically encountered at this site, these conditions may contribute to the ponding of water and deterioration of the pavement subgrade, which also contribute to long-term maintenance and performance problems. DHDC recommends that both the subgrade and the pavement surface should have a minimum slope of one quarter (1/4) inch per foot to promote drainage. A means of water outlet should be provided at the pavement edges by extending the aggregate base course through to daylight or to surface drainage features such as storm inlets.

5.5 Pavement Section

DHDC is recommending the following pavement section for the FDR subgrade.

- *Assumed Parameters:*
  - Design Period: 20 years
  - Reliability: 80%
  - Overall Standard Deviation: 0.49
  - Design Serviceability: 2.5 (for Flexible Pavement)
  - CBR Value: 8% (14" Cement Treated Subgrade Soil)
  - Subgrade Resilient Modulus: 9,600 psi (for Lime or Cement Treated Subgrade Soil)
  - Modulus of Subgrade Reaction, k: 140 lb/in^3

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

- *Flexible Pavement Structural Coefficients:*

  - Items 448 - AC Surface Course: 0.43
  - Items 302 - AC Base Course: 0.36
  - Cement Treated Subgrade Soil: 0.08 (Based on Research Data)

  Full Depth Asphalt

  - Item No. 448 – 1 ¼ " Asphaltic Concrete Surface Course
  - Item No. 448 – 1 ¾ " Asphaltic Concrete Intermediate Course
  - Item No. 301 – 5" Asphaltic Concrete Base
  - Item No. 304 – No Aggregate Base
  - Item No. 204 – 14" Cement Stabilized Subgrade.

  Asphalt and Granular Base

  - Item No. 448 – 1 ¼ " Asphaltic Concrete Surface Course
  - Item No. 448 – 1 ¾ " Asphaltic Concrete Intermediate Course
  - Item No. 301 – 2.5" Asphaltic Concrete Base
  - Item No. 304 – 6" ODOT Item No. 304 Stone
  - Item No. 204 – 14" Cement Stabilized Subgrade.

DHDC recommends that adequacy of the pavement section thicknesses should be evaluated with anticipated traffic volume.

5.6 Fill for Pavement Subgrade

The proposed structural fill material should comply with the requirement of CMS. In general, the proposed fill should have a plasticity index value no higher than 25, a liquid limit no higher than 50, and a maximum dry density of at least 100 pounds per cubic foot. In general, any non-organic naturally-occurring soils can be used for structural fill. Most of the on-site silty clay soil from the cut areas can be used as compacted engineered fill. However, due to the high moisture content of the silty clay, some moisture conditioning of this material will be required prior to their use as compacted engineered fill.

The fill should be placed in lifts of uniform thickness. The lift thickness should not exceed that which can be properly compacted throughout its entire depth with the equipment available. All subgrade and structural fills supporting pavements should be prepared and compacted in accordance with Item No. 254 and as per Columbus CMS 203 and Item No. 204.06. For proper and timely construction of the fills, the soils should be placed at or near the optimum moisture content as determined by the specified Proctor test. Suitable equipment for either aerating or adding water should be available as the soil moisture and weather conditions dictate.

5.7 Storm Water Line Installation

It is DHDC's understanding that the bottom of the proposed storm water line will be about 8.0 to 10.0 feet below the boring surface grades. Based on the soil boring information, hard intact limestone bedrock will be encountered along the proposed sewer line alignment.

It is anticipated that there will be minimal difficulty experience in excavating the overburden soils at this site with conventional equipment and methods. Excavations in the very thin upper layer of weathered limestone may be achievable with conventional earth moving equipment, with some difficulty. Any excavations that extend into the hard limestone bedrock below the auger refusal depths will probably require removal by blasting or with jack hammers or hoe rams.

All temporary excavations for the installation of the storm line should be properly laid back or braced in accordance with Occupational Safety and Health Administration (OSHA) requirements. It is our opinion that the naturally occurring cohesive soils designated as medium stiff can be considered as OSHA Type "C" soils. OSHA Type "C" soils require side slopes for excavations deeper than 5 feet to be no steeper than 1.5H:1.0V or that they be properly braced during construction for safety purposes. Temporary shoring can be in the form of sheet piling, soldier piles and lagging or trench boxes. Based on the subsurface information it appears that trench boxes may be preferable for this project. However, it is recommended that the contractor be permitted to select the shoring method to be used, with the method to be approved by the engineer. It is our opinion that the bedrock encountered in the test borings can be considered as "Stable Rock" per OSHA. Per OSHA requirements a "competent person" should review the actual excavation conditions and provide as assessment of the safety and stabilization measures of the field conditions revealed at the time of construction. Some groundwater can be encountered at the interface of overburden soil and limestone bedrock. Seasonal influences typically cause a rise and fall in groundwater levels.

Backfill for the storm line should consist primarily of compacted granular material such as crushed ODOT No. 57 or 467 stone to a depth of 1 foot above and around the pipe. Storm line excavations (if any) within the roadway should be backfilled entirely with granular material or controlled density fill (CDF). The city or county roadway authority should be consulted regarding the specific requirements of roadway backfilling.

In areas outside of the street pavement, any non-organic, naturally-occurring soils with a Liquid Limit (LL) less than 50 and a Plasticity Index (PI) less than 25 can be used for fill above the pipeline. The fill should contain no pieces whose greatest dimension is larger than 3 inches in size. The naturally occurring cohesive soils encountered within the borings qualify as engineered fill above the pipeline. However, due to the compaction difficulty of these cohesive soils in narrow trenches, these materials shouldn't be used to backfill the trenches. The naturally occurring well graded sand and gravel can be reused as compacted engineered fill above the pipeline.

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

DHDC recommendation that all backfill placed over the storm line be compacted in about 8 inch lifts to at least 95 percent of the maximum Standard Proctor dry density (ASTM D-698). For proper and timely construction of the fills, the soils should be placed at or near the optimum moisture content as determined by the specified Proctor test. Appropriate measures should be taken to avoid damage to the new pipeline or adjacent existing facilities by the compaction equipment.

It is recommended that a representative of DHDC be present during the excavation and backfilling for the storm line to verify that the actual field conditions are similar to the results of the test borings, and to monitor the compaction of the backfill.

6.0 QUALIFICATION OF RECOMMENDATIONS

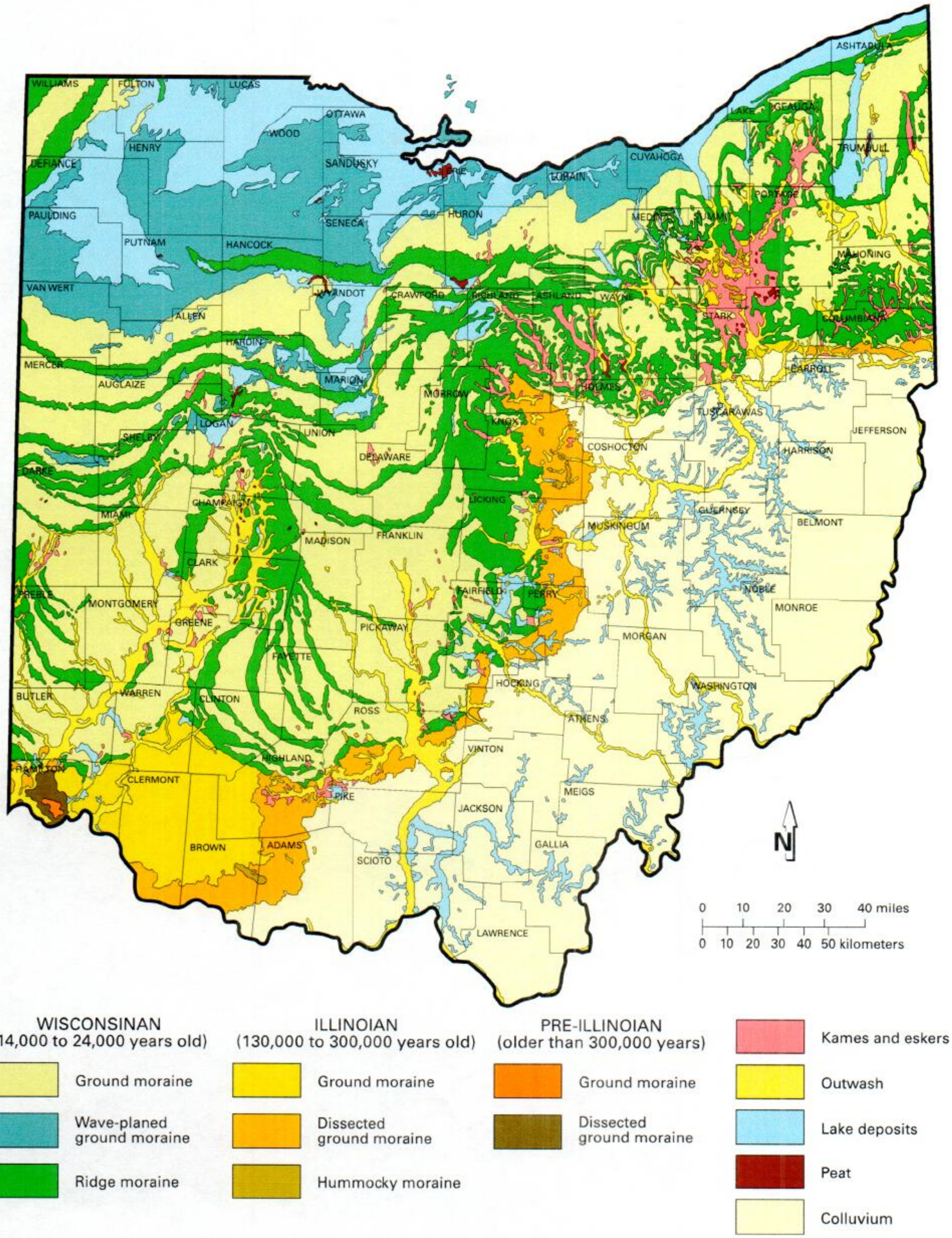
Our evaluation has been based on our understanding of the site and project information and the data obtained during our field investigation. The general subsurface conditions were based on interpretation of the subsurface data at specific boring locations. Regardless of the thoroughness of a subsurface investigation, there is the possibility that conditions will differ from those encountered at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. It is recommended that DHDC be retained to perform a review of the project plans and specifications and to perform a continuous review (full time observation) of the soils related phases of the construction of this project. If DHDC is not retained as the QA/QC firm, we assume no responsibility for construction compliance with the design concepts, specifications, or our recommendations. As part of this review, stripping, undercutting, filling and foundation excavation should be examined by a qualified technician. Field density tests should be performed as frequently as necessary to assist in the evaluation of the fill with respect to the above recommendations.

Our professional services have been performed, our findings derived, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. DHDC is not responsible for the conclusions, opinions, or recommendations of others based on this data.

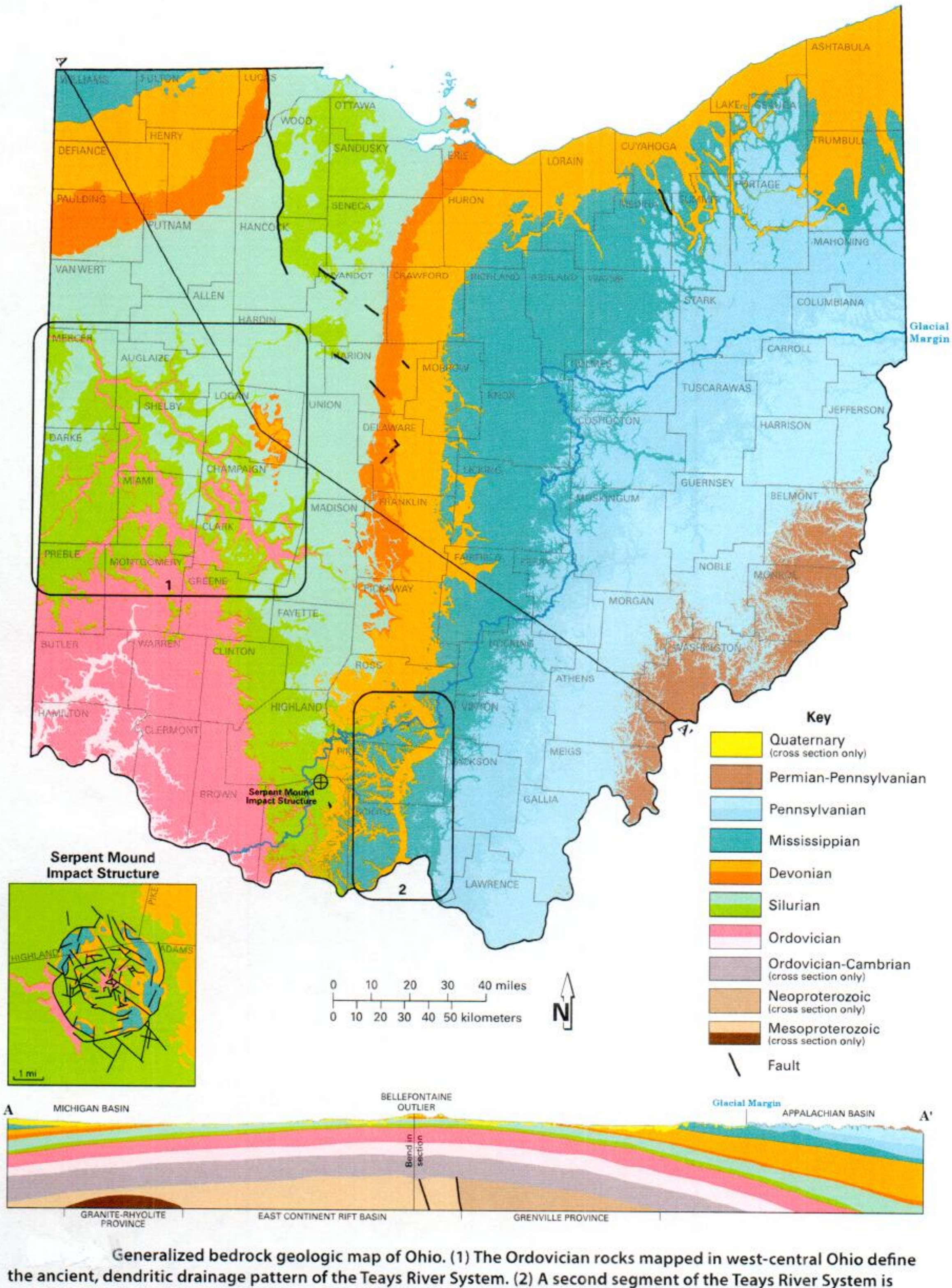
DHDC
Engineering Consulting Services, Inc.

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

APPENDIX: GEOLOGICAL MAPS



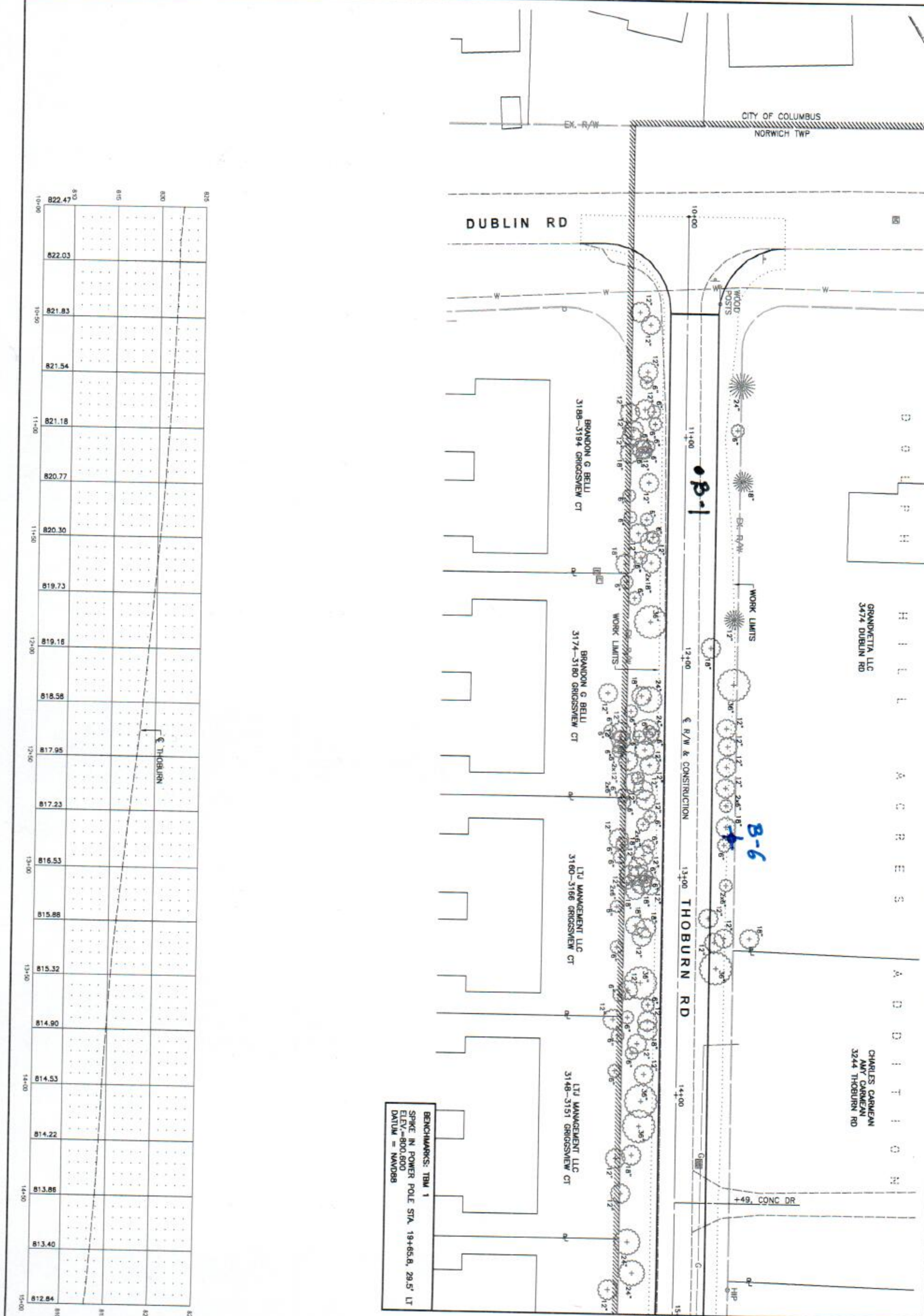
Glacial map of Ohio.



Generalized bedrock geologic map of Ohio. (1) The Ordovician rocks mapped in west-central Ohio define the ancient, dendritic drainage pattern of the Teays River System. (2) A second segment of the Teays River System is well illustrated by the Devonian rocks mapped in central Scioto and Pike Counties and eastern Ross County located in southern Ohio.

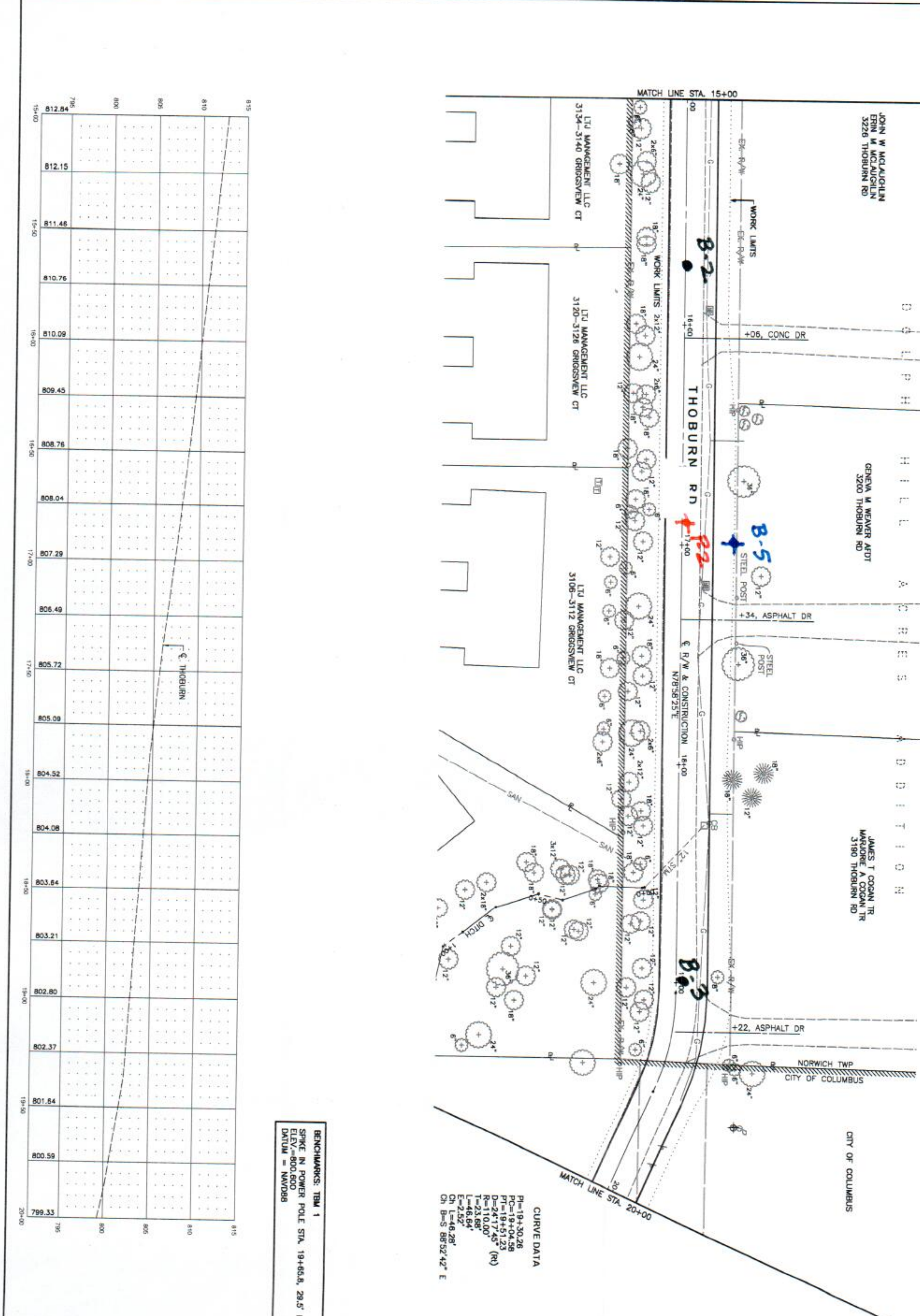
DHDC
Engineering Consulting Services, Inc.
2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

APPENDIX: BORING LOCATION PLAN



THOBURN ROAD	PLAN & PROFILE	DRAWN BY DOW	HORIZONTAL SCALE IN FEET
NOR. TWP. RD. NO. T-2258	STA. 10+00 TO STA. 15+00	CHECKED RND	

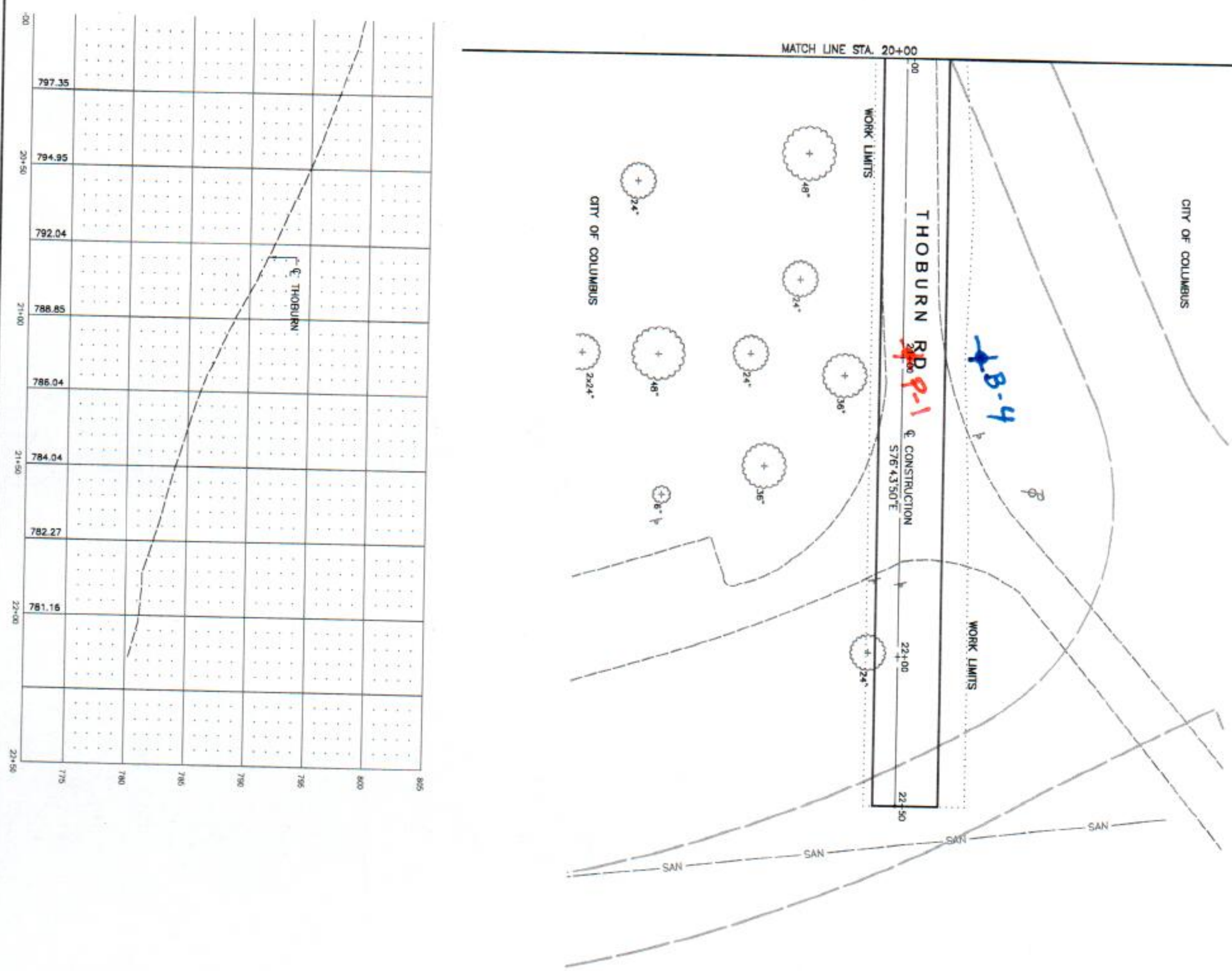
March 02, 2016, 2:52pm



THOBURN ROAD	PLAN & PROFILE	DRAWN BY: DOW
NOR. TWP. RD. NO. T-2258	STA. 15+00 TO STA. 20+00	CHECKED: RND

HORIZONTAL SCALE IN FEET

DRAWING: O:\SDSKPROJ\TOWNSHIPS\NORWICH\206868_Thoburn Road_2015\FCEO\Record dwgs\Data xref\Source Drawings\Topo.dwg
March 02, 2016, 3:53pm



BENCHMARKS: TBM 1
SPIKE IN POWER POLE STA. 19+65.8, 29.5' LT
ELEV.=800.600
DATUM = NAVD88

THOBURN ROAD NOR. TWP. RD. NO. T-2258	PLAN & PROFILE STA. 20+00 TO STA. 22+00	DRAWN BY DOW CHECKED RND	HORIZONTAL SCALE IN FEET (0, 10, 20, 40)	N

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

APPENDIX: SOIL TERMS

DHDC
Engineering Consulting Services, Inc.

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

DESCRIPTION OF SOIL TERMS

The following terminology was used to describe soils throughout this report and is generally adapted from ASTM 2487/2488 and ODOT Geotechnical Specifications.

GRANULAR SOILS – The relative compactness of granular soils is described as:
Adapted from "Foundation Engineering Handbook" by Hsaf-Yang Fang, 1991.

Description	Blows per foot – SPT (N)		
Very Loose	2	–	4
Loose	5	–	10
Medium Dense	11	–	30
Dense	31	–	50
Very Dense	Over	–	50

COHESIVE SOILS – The relative consistency of cohesive soils is described as:
Adapted from "Foundation Analysis and Design" by Joseph Bowels, 1977, and "ODOT Specifications for Subsurface Investigations", 1995. Correlation is for estimating purposes only.

Description	Blows per foot – SPT (N)			Unconfined UCS (ksf)		
Very Soft	Below	–	2	Less Than	–	0.50
Soft	2	–	5	0.50	–	1.00
Medium Stiff	6	–	10	1.00	–	2.00
Stiff	11	–	15	2.00	–	4.00
Very Stiff	16	–	30	4.00	–	8.00
Hard	Over	–	30	Over	–	8.00

GRADATION – The following size related denominations are used to describe soils:

Soil Fraction	USCS Size	ODOT Size
Boulders	Larger than 12"	Larger than 12"
Cobbles	12" to 3"	12" to 3"
Gravel – Coarse	3" to 3/4"	3" to 3/4"
Gravel – Fine	3/4" to 4.75 mm	3/4" to 2.0 mm (#10)
Sand – Coarse	4.77 mm to 2.0 mm	2.0 mm to 0.42 mm (#40)
Sand – Medium	2.0 mm to 0.42 mm	
Sand – Fine	0.42 mm to 0.074 mm	0.42 mm to 0.074 mm (#200)
Silt	0.074 mm to 0.005 mm	0.074 mm to 0.005 mm
Clay	< 0.005 mm	< 0.005 mm

MODIFIERS OF COMPONENTS – Modifiers of components are as follows:

Term	Range		
Trace	0%	–	10%
Little	10%	–	20%
Some	20%	–	35%
And	35%	–	50%

DHDC
Engineering Consulting Services, Inc.

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

APPENDIX: BORING LOGS (8)

BORING NUMBER B-1

DHDC Engineering Consulting Services, Inc.

CLIENT Franklin County Engineers
PROJECT NAME Thoburn Road Reconstruction
PROJECT NUMBER C15-138
PROJECT LOCATION Thoburn Road & Dublin Road, Columbus, Ohio
DATE STARTED 10/8/15 **COMPLETED** 10/8/15
GROUND ELEVATION **HOLE SIZE** inches
DRILLING CONTRACTOR DHDC
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Don **CHECKED BY** M.O.H.
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		**ASPHALTIC CONCRETE** (9")											
		Medium stiff, Dark brown, **SILTY CLAY** (CL), with trace sand [glacial till], Very moist		SS 1	67	3-4-5 (9)	1.75		21				
2.5		Stiff, Reddish brown, **SILTY CLAY** (CL), with trace sand and gravel [glacial till], Moist		SS 2	94	4-5-8 (13)	2.0		19				
				SS 3	54	5-6-11-11 (17)	2.25		18				
5.0		Very stiff, Mottled brown with trace gray, **SILTY CLAY** (CL), with trace to little sand and gravel [glacial till], Moist ...weathered soft limestone at the bottom of sample...											

Boring discontinued at 6.0 feet.
No groundwater encountered.

BORING NUMBER B-2

DHDC Engineering Consulting Services, Inc.

CLIENT Franklin County Engineers
PROJECT NAME Thoburn Road Reconstruction
PROJECT NUMBER C15-138
PROJECT LOCATION Thoburn Road & Dublin Road, Columbus, Ohio
DATE STARTED 10/8/15 **COMPLETED** 10/8/15
GROUND ELEVATION **HOLE SIZE** inches
DRILLING CONTRACTOR DHDC
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Don **CHECKED BY** M.O.H.
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		**ASPHALTIC CONCRETE** (9")											
		Medium stiff, Dark brown, **SILTY CLAY** (CL), with trace sand [glacial till], Moist ...dark spotty staining in sample...		SS 1	78	3-4-6 (10)	1.75		16				
2.5		Medium stiff to very stiff, Reddish brown, **SILTY CLAY** (CL), with trace sand and gravel [glacial till], Moist		SS 2	89	7-15-23 (38)			12				
		Very stiff, Mottled brown and gray, **SILTY SANDY CLAY** (CL), with little gravel [glacial till], Moist											
		Weathered soft **LIMESTONE**		SS 3	40	50/5"							

Boring discontinued at 4.5 feet due to spoon refusal.
No groundwater encountered.

BORING NUMBER B-3

DHDC Engineering Consulting Services, Inc.

CLIENT Franklin County Engineers
PROJECT NAME Thoburn Road Reconstruction
PROJECT NUMBER C15-138
PROJECT LOCATION Thoburn Road & Dublin Road, Columbus, Ohio
DATE STARTED 10/8/15 **COMPLETED** 10/8/15
GROUND ELEVATION **HOLE SIZE** inches
DRILLING CONTRACTOR DHDC
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Don **CHECKED BY** M.O.H.
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		**ASPHALTIC CONCRETE** (9")											
		Soft, Dark gray, **SILTY CLAY** (CL), with trace sand and strong organic odor, Moist Organic content= 5%		SS 1	89	2-2-2 (4)	1.0		20				
2.5		Soft to medium stiff, Reddish brown, **SILTY CLAY** (CL), with trace sand and gravel [glacial till], Very moist		SS 2	100	4-4-8 (12)	1.5		14				
		Stiff, Mottled brown and gray, **SILTY SANDY CLAY** (CL), with little gravel [glacial till], Moist											
		Weathered soft **LIMESTONE**		SS 3	100	50/3"			25				

Boring discontinued at 4.3 feet due to spoon refusal.
No groundwater encountered.

BORING NUMBER B-4

DHDC Engineering Consulting Services, Inc.

CLIENT Franklin County Engineers
PROJECT NAME Thoburn Road Reconstruction
PROJECT NUMBER C15-138
PROJECT LOCATION Thoburn Road & Dublin Road, Columbus, Ohio
DATE STARTED 3/22/18 **COMPLETED** 3/22/18
GROUND ELEVATION **HOLE SIZE** inches
DRILLING CONTRACTOR DHDC
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Kenny **CHECKED BY** M.O.H.
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		**TOPSOIL** (4")											
		Medium Stiff. Dark Brown, **SILTY CLAY** (CL), with little sand and gravel, Moist ---Trace hair roots---		SS 1	56	3-4-3 (7)			25				
2.5		Soft, Brown, **SILTY CLAY** (CL), with little sand and gravel, Moist ---Few rock fragments in sample---		SS 2	44	2-1-3 (4)			19				
5.0		Medium Stiff. Mottled Brown and Gray, **SILTY CLAY** (CL), with trace to little sand and gravel, Moist ---Few rock fragments in sample---		SS 3	100	3-4-5 (9)			18				
		Gray, Weathered to intact Soft to Hard, **LIMESTONE**		SS 4	50	50/2"							

Boring discontinued at 5.7 feet due to spoon and auger refusal
No groundwater

BORING NUMBER B-5

DHDC Engineering Consulting Services, Inc.

CLIENT Franklin County Engineers
PROJECT NAME Thoburn Road Reconstruction
PROJECT NUMBER C15-138
PROJECT LOCATION Thoburn Road & Dublin Road, Columbus, Ohio
DATE STARTED 3/22/18 **COMPLETED** 3/22/18
GROUND ELEVATION **HOLE SIZE** inches
DRILLING CONTRACTOR DHDC
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Kenny **CHECKED BY** M.O.H.
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		**TOPSOIL** (5")											
		Stiff, Dark Brown, **SILTY CLAY** (CL), with little sand and gravel, Moist		SS 1	100	1-4-7 (11)	1.5		22				
2.5		Dark Brown to Black, Weathered **SHALE** and Brown **LIMESTONE** fragments		SS 2	83	18-34-32 (66)			3				
5.0				SS 3	22	3-2-3 (5)			12				
7.5		Gray, Weathered to intact Soft to Hard, **LIMESTONE**		SS 4	11	8-24-13 (37)			3				

Boring discontinued at 8.0 feet due to auger refusal
No groundwater

BORING NUMBER B-6

DHDC Engineering Consulting Services, Inc.

CLIENT Franklin County Engineers

PROJECT NAME Thoburn Road Reconstruction

PROJECT NUMBER C15-138

PROJECT LOCATION Thoburn Road & Dublin Road, Columbus, Ohio

DATE STARTED 3/22/18 **COMPLETED** 3/22/18

GROUND ELEVATION **HOLE SIZE** inches

DRILLING CONTRACTOR DHDC

GROUND WATER LEVELS:

DRILLING METHOD Hollow Stem Auger

AT TIME OF DRILLING ---

LOGGED BY Kenny **CHECKED BY** M.O.H.

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		**TOPSOIL** (5")											
		Medium Stiff. Dark Brown, **SILTY CLAY** (CL), with trace sand and gravel, Moist		SS 1	56	1-2-4 (6)	1.5		21				
		Stiff. Dark Brown, **SILTY CLAY** (CL), with little sand and gravel, Moist		SS 2	78	3-5-7 (12)	3.0		21				
2.5													
		Stiff. Mottled Brown and Gray, **SILTY CLAY** (CL), with trace to little sand and gravel, Moist		SS 3	67	5-6-6 (12)	3.0		20				
5.0													
		Gray, Weathered to intact Soft to Hard, **LIMESTONE**											

Boring discontinued at 5.5 feet due to auger refusal
No groundwater

BORING NUMBER P-1

DHDC Engineering Consulting Services, Inc.

CLIENT Franklin County Engineers
PROJECT NAME Thoburn Road Reconstruction
PROJECT NUMBER C15-138
PROJECT LOCATION Thoburn Road & Dublin Road, Columbus, Ohio
DATE STARTED 3/22/18 **COMPLETED** 3/22/18
GROUND ELEVATION **HOLE SIZE** inches
DRILLING CONTRACTOR DHDC
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Kenny **CHECKED BY** M.O.H.
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		**ASPHALTIC CONCRETE** (9")											
		GRANULAR BASE (6")		SS 1	83	23-5-3 (8)			7				
2.5		Hard, Brown and Gray, **SILTY CLAY** (CL), with little sand and gravel, Moist ---Rock fragments in sample---		SS 2	56	2-23-27 (50)			22				

Boring discontinued at 3.0 feet depth

BORING NUMBER P-2

DHDC Engineering Consulting Services, Inc.

CLIENT Franklin County Engineers
PROJECT NAME Thoburn Road Reconstruction
PROJECT NUMBER C15-138
PROJECT LOCATION Thoburn Road & Dublin Road, Columbus, Ohio
DATE STARTED 3/22/18 **COMPLETED** 3/22/18
GROUND ELEVATION **HOLE SIZE** inches
DRILLING CONTRACTOR DHDC
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Kenny **CHECKED BY** M.O.H.
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		**ASPHALTIC CONCRETE** (9")											
		GRANULAR BASE (5")		SS 1	83	30-8-4 (12)			12				
		Hard, Brown and Gray, **SILTY CLAY** (CL), with little sand and gravel, Moist ---Rock fragments in sample---											
2.5				SS 2	100	8-23-23 (46)			12				

Boring discontinued at 3.0 feet depth

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 4/12/18 15:34 - \\DHDCINCFS01\D\ALMA\GINT\PROJECTS\THOBURN ROAD RECONSTRUCTION C15-138.GPJ

Engineering Consulting Services, Inc.
2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

APPENDIX: GB-1 ANALYSIS REPORT

DHDC Engineering Consulting Services, Inc.

3647 Commerce Drive
Franklin, Ohio 45005
O: 937.301.2595
www.dhdcinc.com

Subgrade Analysis

V. 13.00	08/16/16
Design CBR	6
Total Borings	6
Project No.	C15-138
Location	Thoburn Road, Columbus, Ohio

Global Options		
320	R&R	No
206	CS	?
	LS	?
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	2	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0
	13%												88%				
0%	13%								88%								

	N_{60}	N_{60L}	PI	Clay	M	M_{OPT}	GI
Average	19.4	8.5			17.6	14.8	8.75
Maximum	87	13			25	16	10
Minimum	5	5			3	6	0

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	67%
>=20	0%
M+	83%
R	0%

% Surface	
83%	
0%	83%
UC @ Surface	
Undercut	
13.8	
21	
12	

Rig	ER
A	79
B	
C	
D	
E	
F	
G	
H	

#	B #	Boring Location	Boring Depth	To	Cut Fill	Subgrade 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	Sulfate		Problem w/ Class	Problem w/ MN	UC Class	UC MN	Analysis / Comments
1			1.0	2.5	0.0	1.0	2.5	4	6	10	A	13								21	16	6b	10				MN		12	
	B-1		2.5	4.0		2.5	4.0	5	8	13		17								19	16	6b	10							
			4.0	6.0		4.0	6.0	6	11	17		22								18	16	6b	10							
													13																	
2			1.0	2.5	0.0	1.0	2.5	4	6	10	A	13								16	16	6b	10							
	B-2		2.5	4.0		2.5	4.0	15	23	38		50								12	16	6b	10							
													13																	
3			1.0	2.5	0.0	1.0	2.5	2	2	4	A	5								20	16	6b	10				N		21	
	B-3		2.5	4.0		2.5	4.0	4	8	12		16								14	16	6b	10							
													5																	
4			0.0	1.5	0.0	0.0	1.5	4	3	7	A	9								25	16	6b	10				N		12	
	B-4		1.5	3.0		1.5	3.0	1	3	4		5								19	16	6b	10				N		21	
			3.5	5.0		3.5	5.0	4	5	9		12								18	16	6b	10							
													5																	
5			0.0	1.5	0.0	0.0	1.5	4	7	11	A	14								22	16	6b	10				MN		12	
	B-5		1.5	3.0		1.5	3.0	34	32	66		87								3	6	1a	0							
			3.5	5.0		3.5	5.0	2	3	5		7								12	6	1a	0				N		---	
													7																	
6			0.0	1.5	1.0	1.0	2.5	2	4	6	A	8								21	16	6b	10				N		12	
	B-6		1.5	3.0		2.5	4.0	5	7	12		16								21	16	6b	10							
			3.5	5.0		4.5	6.0	6	6	12		16								20	16	6b	10							
													8																	

2390 Advanced Business Center Drive
Columbus, Ohio 43228
o: 614.527.7656
f: 614.527.7489
www.dhdcinc.com

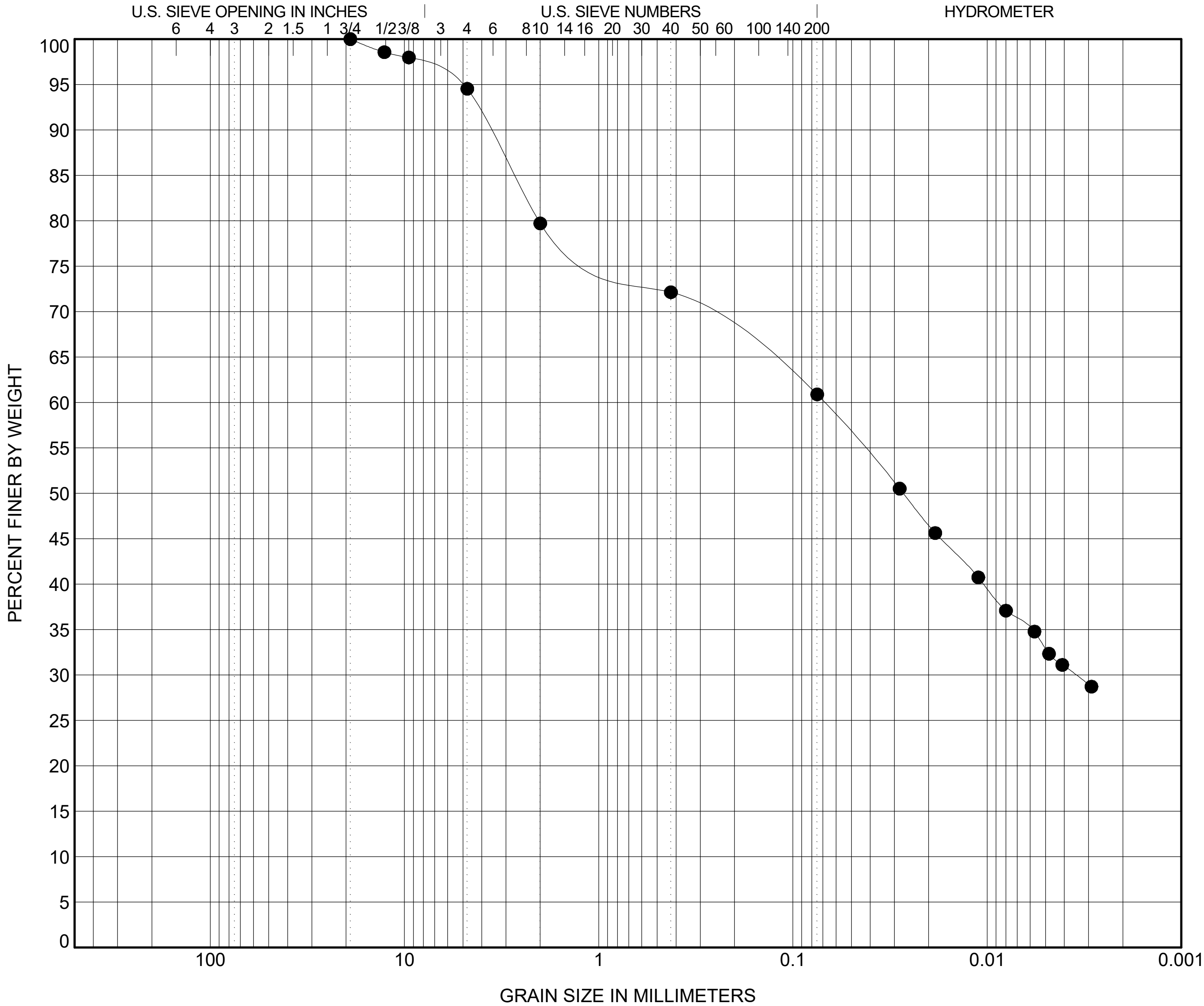
APPENDIX: LABORATORY TEST RESULTS

GRAIN SIZE DISTRIBUTION

DHDC Engineering Consulting Services, Inc.

CLIENT Franklin County Engineer **PROJECT NAME** Thoburn Road Reconstruction

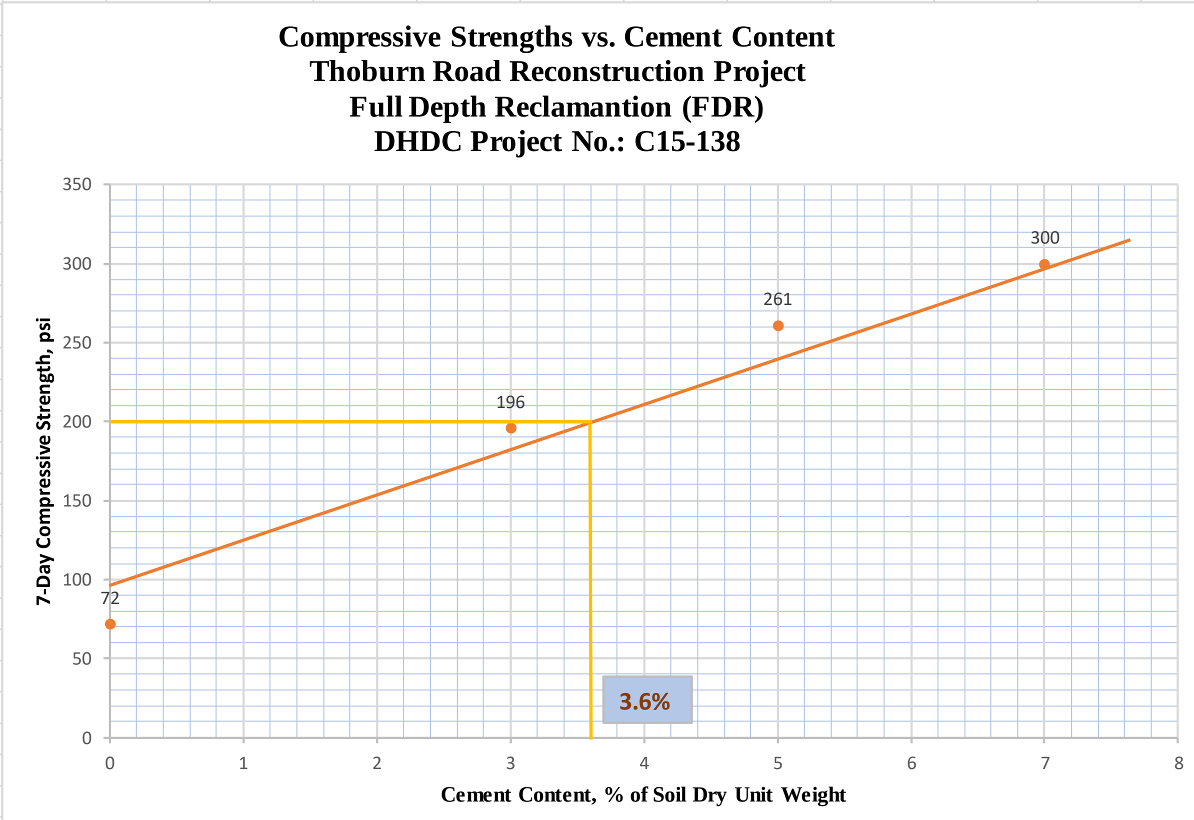
PROJECT NUMBER C15-138 **PROJECT LOCATION** Columbus, Ohio



	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**Auger Cutting**	**1.0**	**SANDY LEAN CLAY(CL)**	**33**	**20**	**13**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**Auger Cutting**	**1.0**	**19**	**0.069**	**0.003**		**5.5**	**33.6**	**28.0**	**32.9**

2390 Advanced Business Center Drive
Columbus, Ohio 43228
O: 614.527.7656
www.dhdcinc.com



DHDC Recommends Cement Spreading Percentage Rate of 5.0% of the Composite Material Dry Weight.