



**REPORT OF ROADWAY EXPLORATION
(FINAL)
AUG-33-15.65 INTERCHANGE
IMPROVEMENTS**

PID: 118055
Auglaize County, Ohio

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Report of Roadway Exploration (FINAL)
AUG-33-15.65 Interchange Improvements

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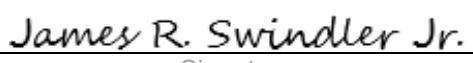
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Executive Summary

The Ohio Department of Transportation (ODOT) is planning to improve the interchange at I-75 and US Route 33 by widening eastbound US 33 near the interchange, adding a roundabout east of I-75 aligned with the on and off ramps to northbound I-75, abandoning westbound US 33, and making current eastbound US 33 both eastbound and westbound. The project is located near Wapakoneta in Auglaize County, Ohio. The proposal also includes lighting improvements along the northwest, southwest and southeast quadrants of the interchange. Stantec Consulting Services Inc. (Stantec) was contracted by TranSystems to perform the geotechnical exploration and provide design recommendations for this project.

Eighteen borings and four pavement cores were advanced to obtain geotechnical data for the geotechnical exploration for proposed widening and roundabout near US Route 33 interchange with I-75. Six borings were advanced to a depth of 25 feet for lighting improvements along the ramp. Out of the six, two borings were used dually for lighting and subgrade. Two borings each at the northwest, southwest and southeast quadrants of the interchange were drilled for the lighting purposes. Twelve subgrade borings were advanced to a depth of 7.5 feet for the proposed roundabout and along widenings.

The soils encountered in the borings consisted of approximately 1 to 1.5 feet of topsoil or approximately 1 to 1.5 feet of roadway materials. The fine-grained soils were classified as sandy silt (A-4a), silt and clay (A-6a), silty clay (A-6b) and clay (A-7-6). The soils were described as brown and gray, medium stiff to hard, damp to wet and having low to moderate plasticity. Coarse-grained soils were encountered ranging in thickness from 1 to 9 feet. These coarse-grained soils were described as brown to gray, loose to dense, dry to moist and having no plasticity. Sulfate test results ranged from 7 to 5700 parts per million. Groundwater was encountered during drilling at depths ranging from 13 to 22 feet in four of the borings. A couple of hours after drilling, the groundwater level was measured at depths ranging from 8 to 19 feet in the same borings. Pavement cores were taken from the paved shoulders of westbound US Route 33. The asphalt pavement depth ranged from 8 to 8.5 inches.

A design CBR of 6 was determined based on the subgrade analysis. Soils categorized as unsuitable or unstable were present along the alignment in 25 percent of the subgrade borings. Excavate and replace to a depth of 12 inches with a geotextile is the recommended stabilization method. Spot stabilization is recommended at the following locations along US 33 Mainline:

- Station 408+00 through 411+00
- Station 419+00 through 421+00



Acronyms / Abbreviations

ASTM	American Society for Testing and Materials
DGE	District Geotechnical Engineer
ER	Energy Ratio
GDM	Geotechnical Design Manual
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
PCF	Pounds per Cubic Foot
PPM	Parts Per Million
PSF	Pounds per Square Foot
SGE	Specifications for Geotechnical Exploration
SPT	Standard Penetration Test
TSF	Tons per Square Foot
TIMS	Traffic Information Management System
USDA	United States Department of Agriculture



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INTRODUCTION

1 INTRODUCTION

The Ohio Department of Transportation (ODOT) is planning to improve the interchange at I-75 and US Route 33 by widening eastbound US 33 near the interchange, adding a roundabout east of I-75 aligned with the on and off ramps to northbound I-75, abandoning westbound US 33, and making current eastbound US 33 both eastbound and westbound. The project is located near Wapakoneta in Auglaize County, Ohio. The proposal also includes lighting improvements along the northwest, southwest and southeast quadrants of the interchange. Stantec Consulting Services Inc. (Stantec) was contracted by TranSystems to perform the geotechnical exploration and provide design recommendations for this project. Figure 1 shows the site vicinity. Appendix A shows the proposed configuration of the widening and roundabout.

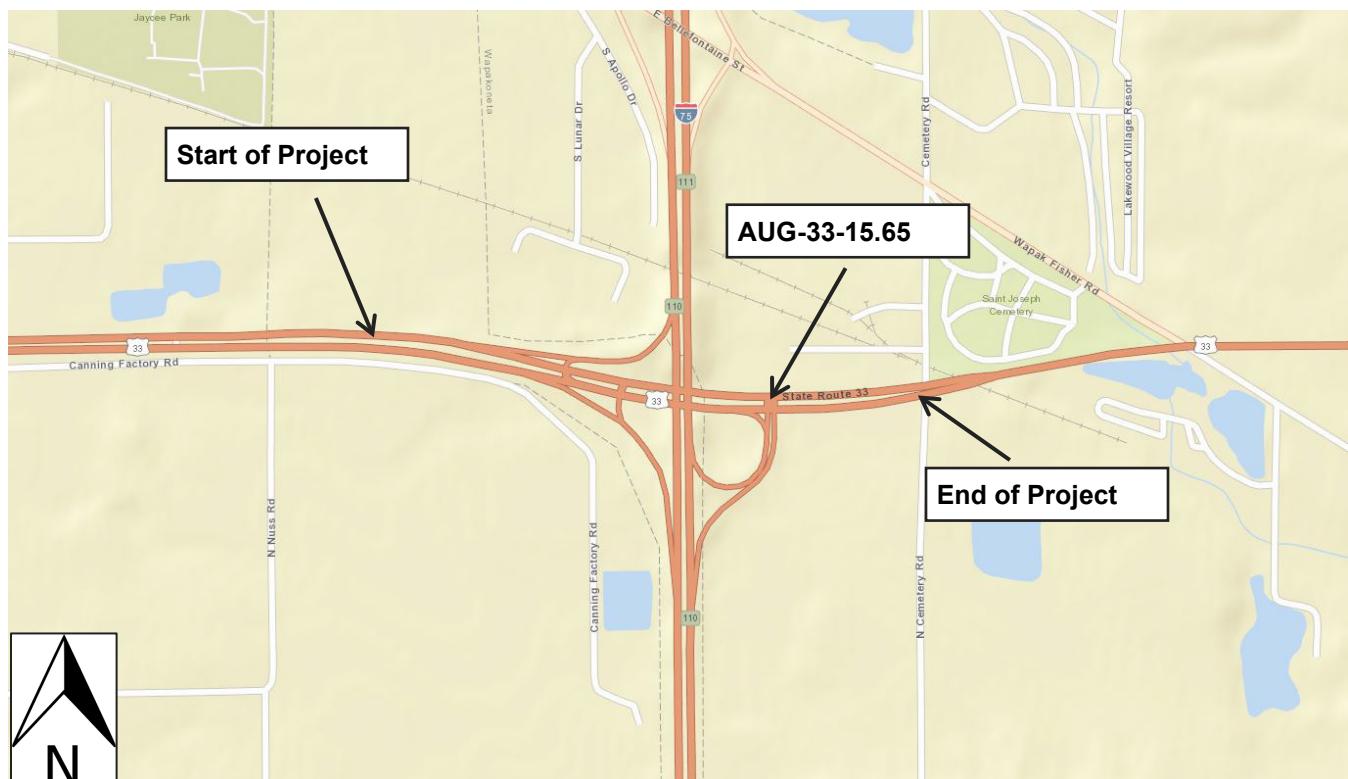


Figure 1: Site Vicinity

(Ohio Department of Natural Resources Ohio Geology Interactive Map, 2024)



2 GEOLOGY AND OBSERVATIONS OF THE PROJECT

2.1 GENERAL

The *Physiographic Regions of Ohio Map* (Ohio Department of Natural Resources [ODNR], 1998) indicates that the project is located within the Central Ohio Clayey Till Plain Region of the Till Plains. The Central Ohio Clayey Till Plain region is described as a surface of clayey till consisting of well-defined moraines with intervening flat-lying ground moraine and intermorainal lake basins, no boulder belts, and about a dozen silt, clay and till-filled lake basins ranging in area from a few to 200 square miles. It also consists of few large streams and limited sand and gravel outwash. The region has moderate relief (about 100 feet) with elevations of 700 to 1,150 feet.

2.2 SOIL GEOLOGY

According to the *Quaternary Geology of Ohio* map (ODNR, 1999), the project site is underlain by clayey till from Late Wisconsinan era. These soils include ground moraine; flat to gently undulating. The soil survey (*Web Soil Survey of Auglaize County, Ohio*, United States Department of Agriculture [USDA], 2024) indicates that the project site is underlain by soils from the loamy rolling Udothents. These soils are typically classified as loams, silt loams, or clay loams. The soil is intended to be poorly drained with a moderately high capacity of transmitting water. The *Drift Thickness Map of Ohio* (ODNR, 2004) indicates that the project site is in a glaciated region of Ohio with drift thickness of 51 to 80 feet.

2.3 BEDROCK GEOLOGY

Bedrock mapping (*Ohio Geology Interactive Map*, ODNR, 2024) and *Descriptions of Geologic Map Units* (ODNR, 2011) indicate that the project site is underlain by sedimentary bedrock of the Lockport Dolomite Group from the Silurian System. It is comprised of dolomite with minor limestone, chert, and shale. The bedrock is described as shades of bluish gray to gray; weathers reddish gray to gray and ranges in thickness from 20 to 80 feet. The diagnostic feature of the bedrock includes the presence of fossiliferous dolomite and distinct planar to irregular bedding.

According to the *Ohio Oil and Gas Well Viewer* map (ODNR, 2024), there are no oil and gas wells within 10-mile radius of the project site. The closest wells were drilled approximately 10 miles east of the project site. The log indicates that the site is underlain by limestone.

According to the *Ohio Mine Locator* (ODNR, 2024), there are twelve mines within a two-mile radius of the project footprint. All mines are historic surface mines producing sand and gravel. The *Karst Interactive Map* (ODNR, 2024) indicates there are no known karst features nearby the project site. The nearest karst geology is located 20 miles east of the project site.



2.4 HYDROLOGY

The Auglaize River is located about 2 miles north of the project site. Drainage from the site is carried northward 65 miles to the Maumee River near Defiance, Ohio. The Maumee River then flows northeast into Lake Erie.

2.5 HYDROGEOLOGY

The *Ohio Geology Interactive Map* shows that the site is underlain by Coldwater Complex Aquifer, which has a yield of 5 to 25 gallons per minute. According to the Groundwater Resources of Auglaize County map (ODNR, 2024), the project site is in an area where wells with yields of 1 to 20 gallons per minute can be achieved. The principal aquifer in the area is sand and gravel.

A search was performed using the ODNR *Ohio Water Wells Map* (2024) to determine if any water wells are located near the project site. According to the map, eleven water wells have been drilled within a 0.5-mile radius of the project footprint. The well logs indicate that bedrock depth ranges from 149 to 259 feet. The bedrock encountered at these wells was described as limestone. The logs also indicate a considerable variation of the static water depth in the area surrounding the site, ranging from 3 to 32 feet.

2.6 SEISMIC

A review of the seismic data available in the project vicinity was completed using the ODNR *Ohio Earthquake Epicenters Map* (2024). Overall, Ohio has a relatively limited amount of seismic activity. Within a 5-mile radius of the project, there have been no earthquake epicenters. The nearest earthquake epicenter with a magnitude of 4.9 was located 6.5 miles from the project site. The available data reviewed included events that occurred in Ohio from 1886 to present day.

2.7 SITE RECONNAISSANCE

Stantec representatives visited the site on June 18, 2024, to make observations of the site and mark borehole locations. The land surrounding the project site was described as primarily residential, with some business locations nearby. US 33 is a divided 4-lane highway with two lanes travelling eastbound and two lanes travelling west bound. Two bridges for northbound and southbound I-75 traffic crossing over US 33 are present near the center of the project site and appear to be in good condition. Interstate ramps on and off US 33 are in a partial cloverleaf configuration for I-75 northbound and diamond interchanges for I-75 southbound. The US 33 and I-75 interchange pavement was observed to be generally in fair to poor condition, most likely due to heavy vehicle and semi-truck traffic. Most areas where widening and roundabout are planned are either covered with pavement or grass. Embankment fill for roadways and ramps were vegetated and showed no signs of stability issues. According to ODOT Traffic Information Management System (TIMS) structure mapping, 8 culverts are located along US 33 and 5 culverts are located along I-75 ramps in the project area. Culverts that were observable were in good condition.



3 EXPLORATION

3.1 HISTORIC EXPLORATION PROGRAMS

The ODOT TIMS provides documentation for three geotechnical explorations performed near the US 33 and I-75 interchange.

The AUG-25-5.04 project for bridge structure at section AUG-33-(11.48) (16.69) consisted of two boreholes advanced along the proposed US 33 alignment in 1957. The overburden soils predominantly classified as coarse and fine sand (A-3a), silt and clay (A-6a), silty clay (A-6b), and clay (A-7-6). Bedrock was encountered at approximately 47 to 48 feet and described as gray limestone. The structure for this project is the I-75 bridge crossing US 33 today.

The AUG-33-(11.48) (16.62) for new roadway alignment consisted of 65 holes advanced along the current US 33 alignment in 1957. The overburden soils predominantly classified as gravel fragments with sand (A-1-b), gravel with sand, silt and clay (A-2-6), coarse and fine sand (A-3a), sandy silt (A-4a), silt and clay (A-6a), silty clay (A-6b), and clay (A-7-6). The borings were shallow subgrade borings thus no bedrock was encountered.

The AUG-25-4.71 Canning Factory Road for new roadway alignment consisted of 73 borings advanced along US 25 about 1500 feet west of the project site. The overburden soils predominantly consisted of gravel fragments (A-1-a), gravel fragments with sand (A-1-b), coarse and fine sand (A-3a), sandy silt (A-4a), silt (A-4b), silt and clay (A-6a), silty clay (A-6b), and clay (A-7-6). The borings were shallow subgrade borings thus no bedrock was encountered.

3.2 PROJECT EXPLORATION PROGRAM

Eighteen borings and four pavement cores were advanced to obtain geotechnical data for the proposed widening and roundabout near the US Route 33 interchange with I-75. Six borings were advanced to a depth of 25 feet for lighting improvements along the ramps within the northwest, southwest, and southeast quadrants. Out of the six, two borings were used dually for lighting as well as subgrade. Twelve subgrade borings were advanced to depths of 7.5 feet for the proposed roundabout and along widenings accordance with the ODOT Specification for Geotechnical Exploration (SGE) at approximate 200 to 400-foot intervals. These borings were in areas of new and existing pavement and in areas with proposed embankment widening. Borings were surveyed after drilling by Woolpert. A summary of these borings is shown in Table 1. Boring locations are shown on the geotechnical profile sheets in Appendix A.



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Table 1. Boring Summary

Boring No.	Station (feet)	Offset (feet)	Alignment	Ground Surface Elevation (feet)	Bottom of Boring Elevation (feet)
B-001-0-23	9+19	24 Rt.	US 33	921.2	895.7
B-002-0-23	15+27	41 Lt.	US 33	928.4	903.4
B-004-0-23	11+17	26 Lt.	US 33	929.0	904.0
B-005-0-23	9+30	29 Lt.	US 33	930.5	905.5
B-007-0-23	239+58	20 Lt.	US 33	914.8	907.3
B-008-0-23	241+17	22 Lt.	US 33	915.2	907.7
B-009-0-23	245+19	21 Rt.	US 33	915.8	908.3
B-010-0-23	400+86	25 Lt.	US 33	920.6	913.1
B-011-0-23	406+05	23 Rt.	US 33	920.1	895.1
B-012-0-23	408+91	29 Lt.	US 33	918.3	910.8
B-013-0-23	410+65	25 Lt.	US 33	917.5	910.0
B-014-0-23	413+03	26. Lt.	US 33	917.0	909.5
B-015-0-23	415+48	49 Lt.	US 33	917.3	909.8
B-016-0-23	416+59	4 Lt.	US 33	919.7	894.7
B-017-0-23	418+25	5 Lt.	US 33	920.7	913.2
B-018-0-23	419+82	24 Rt.	US 33	921.4	913.9
B-019-0-23	421+90	14 Lt.	US 33	920.0	912.5
B-020-0-23	424+02	14 Lt.	US 33	920.0	912.5
X-009-0-23	156+64	19 Lt.	US 33	921.5	922.2
X-012-0-23	162+92	18 Lt.	US 33	917.8	918.5
X-015-0-23	170+13	18 Lt.	US 33	918.2	918.9
X-019-0-23	176+17	19 Lt.	US 33	920.2	920.9

The borings were performed with a CME 45B truck-mounted drill rig using 3 1/4-inch inside diameter (ID) hollow stem augers to advance the borings through soil. Standard Penetration Test (SPT) sampling was performed continuously or at 2.5 feet intervals to predetermined depths ranging from 7 to 25 feet. The



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energy ratio (ER) of the CME automatic hammer and drill rod system was measured to be 79 percent on March 8, 2024. The depths and elevations of the SPTs with the corresponding N_{60} -values are shown on the geotechnical profile sheets in Appendix A and the boring logs in Appendix B.

The materials encountered were logged by a geotechnical engineer, with attention given to soil type, consistency, and moisture. The borings were checked for the presence of groundwater during drilling and at its conclusion with the depth of water recorded. The borings were sealed according to the ODOT SGE with auger cuttings mixed with bentonite chips and repaired with asphalt cold patch for borings performed in the roadway.

Four pavement cores were performed near borings B-009-0-23, B-012-0-23, B-015-0-23, and B-019-0-23 in US 33 westbound lane. A 4-inch diameter core barrel was used to cut the asphalt pavement.

The soil samples obtained from the borings were returned to NEAS's geotechnical laboratory for visual classification and tested for water content. Engineering classification testing was performed on samples taken near proposed subgrade and samples reflecting each of the main soil horizons. The engineering classification tests conducted on the samples were sieve and hydrometer analysis (ASTM D 422) and Atterberg limits (ASTM D 4318). The samples were classified according to the ODOT classification method. Sulfate content testing was performed on one sample from each boring in accordance with the Colormetric Method (ODOT Supplement 1122). The results of laboratory testing are shown in the Summary of Soil Test Data on the geotechnical profile sheets in Appendix A and the boring logs in Appendix B.



4 FINDINGS

The soils encountered in the borings consisted of approximately 1 to 1.5 feet of topsoil or approximately 1 to 1.5 feet of roadway materials (asphalt thickness ranging from 9 to 14 inches and base thickness ranging from 2 to 3 inches). Fine-grained soils with low to moderate plasticity were typically encountered, with lesser amounts of coarse-grained soils.

The fine-grained soils were classified as sandy silt (A-4a), silt and clay (A-6a), silty clay (A-6b) and clay (A-7-6). The soils were described as brown and gray, medium stiff to hard (SPT N_{60} values ranging 5 to 62 with an average of 19 blows/foot), damp to wet (moisture contents of 10 to 30 percent with an average of 16 percent) and having low to high plasticity (Plasticity Indices of 6 to 25 with an average of 17).

Borings B-001-0-23, B-002-0-23, B-003-0-23, B-011-0-23, and B-016-0-23 contained approximately 1 to 9 feet of coarse-grained soils. Borings B-001-0-23, B-003-0-23, and B-011-0-23 contained 1.5 to 5 feet layer of coarse and fine sand (A-3a). Borings B-001-0-23 and B-016-0-23 contained approximately 3.5 to 5.5 feet of gravel and stone fragments with sand (A-1-b). Similarly, Borings B-013-0-23 and B-016-0-23 contained 2.5 to 3 feet of stone fragments with sand and silt (A-2-4) and Boring B-002-0-23 contained 2.5 feet of gravel with sand, silt and clay (A-2-6).

These coarse-grained soils were described as brown to gray, loose to dense (SPT N_{60} values ranging from 7 to 28 with an average of 21 blows per foot), dry to moist (moisture content of 7 to 14 percent with an average of 11 percent) and having no plasticity.

Sulfate test results ranged from 7 to 5700 parts per million (ppm). Groundwater was encountered during drilling at depths of 13, 22, 18 and 17 feet for borings B-001-0-23, B-002-0-23, B-011-0-23 and B-016-0-23 respectively. Groundwater was measured at the end of drilling and the groundwater was encountered at depths of 14, 19, 8 and 10 feet, respectively, for borings B-001-0-23, B-002-0-23, B-011-0-23 and B-016-0-23. Boring logs with laboratory test results are provided in Appendix B.

Pavement cores X-009-0-23, X-012-0-23, X-015-0-23 and X-019-0-23 were taken from the paved shoulders of westbound US Route 33. The asphalt pavement depth ranged from 8 to 8.5 inches. The pavement was in fair condition with some longitudinal cracks and rutting observed in the vicinity of the core location. Core logs are presented in Appendix B.



5 ANALYSIS AND RECOMMENDATIONS

5.1 GENERAL

The recommendations that follow are based on the information discussed in this report and the interpretation of the subsurface conditions encountered at the site during the fieldwork. If future design changes are made, Stantec should be notified so that such changes can be reviewed, and the recommendations amended as necessary.

These conclusions and recommendations are based on data and subsurface conditions from the borings advanced during this exploration using the degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. No warranties can be made regarding the continuity of conditions.

5.2 ROADWAY

5.2.1 SUBGRADE

The ODOT Geotechnical Design Manual (GDM) outlines a procedure for estimating the methods and limits of subgrade treatment that will be required to stabilize pavement subgrade prior to construction of the pavement section. The procedure is based upon the results of the borings, field testing, and laboratory testing.

A subgrade analysis was completed at the intersection of I-75 and US 33 in accordance with the GDM. The subgrade analysis spreadsheet is provided in Appendix C. Cut and fill values were estimated from current design profile sheets. Boring B-007-0-23 was removed from the subgrade analysis since it was located outside of the proposed work zone. An average N_{60L} of 11 was calculated from the data obtained from the borings. A design CBR of 6 for pavement design is recommended based on the subgrade analysis. Subgrade soils considered to be unstable were encountered along 25 percent of the alignment. These unstable soils were observed in borings B-012-0-23, B-013-0-23, and B-018-0-23. Therefore, spot stabilization is recommended at the following locations along US 33 Mainline:

- Station 408+00 through 411+00
- Station 419+00 through 421+00

Stabilization options provided by the subgrade analysis include Item 204 Excavate and Replace to a depth of 12 inches using geotextile or Item 206 Chemical Stabilization with lime or cement to a depth of 14 inches. After discussion with the design team, it was determined that excavate and replace will be the recommended stabilization option due to size restrictions caused by narrow areas of roadway widening.

Excavations for subgrade stabilization should extend 18 inches beyond the edge of the surface of the pavement, and Item 204 Geotextile Fabric should be placed underneath the fill material. If cut and fill slopes are required, slopes should be designed with gradients of 2:1 (horizontal to vertical) or flatter.



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Of the 14 sulfate content tests completed for this project, one resulted in a sulfate content greater than 5000 ppm (5700 ppm at B-015-0-23). According to the GDM, chemical stabilization at locations with greater than 5000 ppm of sulfates should not be completed without prior consultation with the District Engineer to discuss options and risk. Stantec contacted the District Geotechnical Engineer (DGE) about this sulfate content result. The DGE recommended that this single high content sample should be considered an outlier and that chemical stabilization could still be considered a viable option for subgrade stabilization. The DGE further recommended that maintenance of traffic, schedule impact, and cost be considered in choosing between undercut and replace or chemical stabilization.

5.2.2 LIGHTING TOWER FOUNDATIONS

Lighting tower foundations are typically bolted on top of or embedded into drilled shafts. According to ODOT standard drawing HL-20.11, special foundation design is required when cohesive soils have undrained shear strengths less than 2000 pounds per square foot (psf) or when granular soils have angle of friction of less than 30 degrees and wet density greater than 120 pounds per cubic foot (pcf) along the predicted length of the drilled shaft. Borings advanced for lighting tower foundations only encountered cohesive soils with pocket penetrometer readings ranging from 3.0 to 4.5 tons per square foot (tsf). This results in undrained shear strengths greater than 2000 psf, so special foundation design will not be needed based on the boring results. The drilled shaft foundation design for lighting towers shall comply with standard drawings HL-20.21 and HL-20.11 as per ODOT Traffic Standard Construction Drawings and meet the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LRFDLTS-1). Typical drilled shaft diameters and related structural components are provided in Table 2.

Table 2. Typical Foundation Diameters

Foundation Type	Drilled Shaft Diameter (in)	Reinforcement Outside Diameter (in)	Bolt Circle Maximum Diameter (in)
I	36	31	26
II	42	37	32

The length of drilled shaft foundations is also dependent on a strength limit state check against overturning and service limit state check against excessive lateral deformation. Minimum drilled shaft lengths based on support height is provided in standard drawing HL-20.11 and listed in Table 3.

Table 3. Minimum Drilled Shaft Lengths for Support Heights

Support Height (ft)	Minimum Drilled Shaft Length (ft)
< 40	6
40 to 44	8
45 to 49	9
50 to 55	10



APPENDIX A

GEOTECHNICAL PROFILE SHEETS

PROJECT DESCRIPTION

THE OHIO DEPARTMENT OF TRANSPORTATION (ODOT) IS PLANNING TO IMPROVE THE INTERCHANGE AT I-75 AND US ROUTE 33 BY WIDENING EASTBOUND US 33 NEAR THE INTERCHANGE, ADDING A ROUNDABOUT EAST OF I-75 ALIGNED WITH THE ON AND OFF RAMPS TO NORTHBOUND I-75, ABANDONING WESTBOUND US 33, AND MAKING CURRENT EASTBOUND US 33 BOTH EASTBOUND AND WESTBOUND. THE PROJECT IS LOCATED NEAR WAPAKONETA IN AUGLAIZE COUNTY, OHIO. THE PROPOSAL ALSO INCLUDES LIGHTING IMPROVEMENTS ALONG THE NORTHWEST, SOUTHWEST AND SOUTHEAST QUADRANTS OF THE INTERCHANGE.

HISTORIC RECORDS

THE ODOT TIMS PROVIDES DOCUMENTATION FOR THREE GEOTECHNICAL EXPLORATIONS PERFORMED NEAR THE US 33 AND I-75 INTERCHANGE.

THE AUG-25-5.04 PROJECT FOR BRIDGE STRUCTURE AT SECTION AUG-33-(11.48) (16.69) CONSISTED OF TWO BOREHOLES ADVANCED ALONG THE PROPOSED US 33 ALIGNMENT IN 1957. THE OVERBURDEN SOILS PREDOMINANTLY CLASSIFIED AS COARSE AND FINE SAND (A-3A), SILT AND CLAY (A-6A), SILTY CLAY (A-6B), AND CLAY (A-7-6). BEDROCK WAS ENCOUNTERED AT APPROXIMATELY 47 TO 48 FEET AND DESCRIBED AS GRAY LIMESTONE. THE STRUCTURE FOR THIS PROJECT IS THE I-75 BRIDGE CROSSING US 33 TODAY.

THE AUG-33-(11.48) (16.62) FOR NEW ROADWAY ALIGNMENT CONSISTED OF 65 HOLES ADVANCED ALONG THE CURRENT US 33 ALIGNMENT IN 1957. THE OVERBURDEN SOILS PREDOMINANTLY CLASSIFIED AS GRAVEL FRAGMENTS WITH SAND (A-1-B), GRAVEL WITH SAND, SILT AND CLAY (A-2-6), COARSE AND FINE SAND (A-3A), SANDY SILT (A-4A), SILT AND CLAY (A-6A), SILTY CLAY (A-6B), AND CLAY (A-7-6). THE BORINGS WERE SHALLOW SUBGRADE BORINGS THUS NO BEDROCK WAS ENCOUNTERED.

THE AUG-25-4.71 CANNING FACTORY ROAD FOR NEW ROADWAY ALIGNMENT CONSISTED OF 73 BORINGS ADVANCED ALONG US 33 ABOUT 1500 FEET WEST OF THE PROJECT SITE. THE OVERBURDEN SOILS PREDOMINANTLY CONSISTED OF GRAVEL FRAGMENTS (A-1-A), GRAVEL FRAGMENTS WITH SAND (A-1-B), COARSE AND FINE SAND (A-3A), SANDY SILT (A-4A), SILT (A-4B), SILT AND CLAY (A-6A), SILTY CLAY (A-6B), AND CLAY (A-7-6). THE BORINGS WERE SHALLOW SUBGRADE BORINGS THUS NO BEDROCK WAS ENCOUNTERED.

GEOLOGY

THE PROJECT IS LOCATED WITHIN THE CENTRAL OHIO CLAYEY TILL PLAIN REGION OF THE TILL PLAINS. THE CENTRAL OHIO CLAYEY TILL PLAIN REGION IS DESCRIBED AS A SURFACE OF CLAYEY TILL CONSISTING OF WELL-DEFINED MORAINES WITH INTERVENING FLAT-LYING GROUND MORAINES AND INTERMORAINAL LAKE BASINS, NO BOULDER BELTS, AND ABOUT A DOZEN SILT, CLAY AND TILL-FILLED LAKE BASINS RANGING IN AREA FROM A FEW TO 200 SQUARE MILES. IT ALSO CONSISTS OF FEW LARGE STREAMS AND LIMITED SAND AND GRAVEL OUTWASH. THE REGION HAS MODERATE RELIEF (ABOUT 100 FEET) WITH ELEVATIONS OF 700 TO 1,150 FEET. THE PROJECT SITE IS UNDERLAIN BY CLAYEY TILL FROM LATE WISCONSINIAN ERA. THESE SOILS INCLUDE GROUND MORAINES; FLAT TO GENTLY UNDULATING. THE PROJECT SITE IS UNDERLAIN BY SEDIMENTARY BEDROCK OF THE LOCKPORT DOLOMITE GROUP FROM THE SILURIAN SYSTEM. IT IS COMPRISED OF DOLOMITE WITH MINOR LIMESTONE, CHERT, AND SHALE. THE BEDROCK IS DESCRIBED AS SHADES OF BLUSH GRAY TO GRAY; WEATHERS REDDISH GRAY TO GRAY AND RANGES IN THICKNESS FROM 20 TO 80 FEET. THE DIAGNOSTIC FEATURE OF THE BEDROCK INCLUDES THE PRESENCE OF FOSSILIFEROUS DOLOMITE AND DISTINCT PLANAR TO IRREGULAR BEDDING.

RECONNAISSANCE

STANTEC REPRESENTATIVES VISITED THE SITE ON JUNE 18, 2024, TO MAKE OBSERVATIONS OF THE SITE AND MARK BOREHOLE LOCATIONS. THE LAND SURROUNDING THE PROJECT SITE WAS DESCRIBED AS PRIMARILY RESIDENTIAL, WITH SOME BUSINESS LOCATIONS NEARBY. US 33 IS A DIVIDED 4-LANE HIGHWAY WITH TWO LANES TRAVELLING EASTBOUND AND TWO LANES TRAVELLING WEST BOUND. TWO BRIDGES FOR NORTHBOUND AND SOUTHBOUND I-75 TRAFFIC CROSSING OVER US 33 ARE PRESENT NEAR THE CENTER OF THE PROJECT SITE AND APPEAR TO BE IN GOOD CONDITION. INTERSTATE RAMPS ON AND OFF US 33 ARE IN A PARTIAL CLOVERLEAF CONFIGURATION FOR I-75 NORTHBOUND AND DIAMOND INTERCHANGES FOR I-75 SOUTHBOUND. THE US 33 AND I-75 INTERCHANGE PAVEMENT WAS OBSERVED TO BE GENERALLY IN FAIR TO POOR CONDITION, MOST LIKELY DUE TO HEAVY VEHICLE AND SEMI-TRUCK TRAFFIC. MOST AREAS WHERE WIDENING AND ROUNDABOUT ARE PLANNED ARE EITHER COVERED WITH PAVEMENT OR GRASS. EMBANKMENT FILL FOR ROADWAYS AND RAMPS WERE VEGETATED AND SHOWED NO SIGNS OF STABILITY ISSUES. ACCORDING TO ODOT TRAFFIC INFORMATION MANAGEMENT SYSTEM (TIMS) STRUCTURE MAPPING, 8 CULVERTS ARE LOCATED ALONG US 33 AND 5 CULVERTS ARE LOCATED ALONG I-75 RAMPS IN THE PROJECT AREA. CULVERTS THAT WERE OBSERVABLE WERE IN GOOD CONDITION.

SUBSURFACE EXPLORATION

EIGHTEEN BORINGS AND FOUR PAVEMENT CORES WERE ADVANCED TO OBTAIN GEOTECHNICAL DATA FOR THE PROPOSED WIDENING AND ROUNDABOUT NEAR THE US ROUTE 33 INTERCHANGE WITH I-75. SIX BORINGS WERE ADVANCED TO A DEPTH OF 25 FEET FOR LIGHTING IMPROVEMENTS ALONG THE RAMPS WITHIN THE NORTHWEST, SOUTHWEST, AND SOUTHEAST QUADRANTS. OUT OF THE SIX, TWO BORINGS WERE USED DUALLY FOR LIGHTING AS WELL AS SUBGRADE. TWELVE SUBGRADE BORINGS WERE ADVANCED TO DEPTHS OF 7.5 FEET FOR THE PROPOSED ROUNDABOUT AND ALONG WIDENINGS ACCORDING WITH THE ODOT SPECIFICATION FOR GEOTECHNICAL EXPLORATION (SGE) AT APPROXIMATE 200 TO 400-FOOT INTERVALS. THESE BORINGS WERE IN AREAS OF NEW AND EXISTING PAVEMENT AND IN AREAS WITH PROPOSED EMBANKMENT WIDENING. THE BORINGS WERE PERFORMED WITH A CME 45B TRUCK-MOUNTED DRILL RIG USING 3 1/4-INCH INSIDE DIAMETER (ID) HOLLOW STEM AUGERS TO ADVANCE THE BORINGS THROUGH SOIL. STANDARD PENETRATION TEST (SPT) SAMPLING WAS PERFORMED CONTINUOUSLY OR AT 2.5 FEET INTERVALS TO PREDETERMINED DEPTHS RANGING FROM 7 TO 25 FEET. THE ENERGY RATIO (ER) OF THE CME AUTOMATIC HAMMER AND DRILL ROD SYSTEM WAS MEASURED TO BE 79 PERCENT ON MARCH 8, 2024.

FOUR PAVEMENT CORES WERE PERFORMED NEAR BORINGS B-009-0-23, B-012-0-23, B-015-0-23, AND B-019-0-23 IN US 33 WESTBOUND LANE. A 4-INCH DIAMETER CORE BARREL WAS USED TO CUT THE ASPHALT PAVEMENT.

EXPLORATION FINDINGS

THE SOILS ENCOUNTERED IN THE BORINGS CONSISTED OF APPROXIMATELY 1 TO 1.5 FEET OF TOPSOIL OR APPROXIMATELY 1 TO 1.5 FEET OF ROADWAY MATERIALS. FINE-GRAINED SOILS WITH LOW TO MODERATE PLASTICITY WERE TYPICALLY ENCOUNTERED, WITH LESSER AMOUNTS OF COARSE-GRAINED SOILS. THE FINE-GRAINED SOILS WERE CLASSIFIED AS SANDY SILT (A-4A), SILT AND CLAY

EXPLORATION FINDINGS (CONTINUED)

(A-6A), SILTY CLAY (A-6B) AND CLAY (A-7-6). THE SOILS WERE DESCRIBED AS BROWN AND GRAY, MEDIUM STIFF TO HARD, DAMP TO WET AND HAVING LOW TO HIGH PLASTICITY. BORINGS B-001-0-23, B-002-0-23, B-003-0-23, B-011-0-23, AND B-016-0-23 CONTAINED APPROXIMATELY 1 TO 9 FEET OF COARSE-GRAINED SOILS. BORINGS B-001-0-23, B-003-0-23, AND B-011-0-23 CONTAINED 1.5 TO 5 FEET LAYER OF COARSE AND FINE SAND (A-3A). BORINGS B-001-0-23 AND B-016-0-23 CONTAINED APPROXIMATELY 3.5 TO 5.5 FEET OF GRAVEL AND STONE FRAGMENTS WITH SAND (A-1-B). SIMILARLY, BORINGS B-013-0-23 AND B-016-0-23 CONTAINED 2.5 TO 3 FEET OF STONE FRAGMENTS WITH SAND AND SILT (A-2-4) AND BORING B-002-0-23 CONTAINED 2.5 FEET OF GRAVEL WITH SAND, SILT AND CLAY (A-2-6). THESE COARSE-GRAINED SOILS WERE DESCRIBED AS BROWN TO GRAY, LOOSE TO DENSE, DRY TO MOIST AND HAVING NO PLASTICITY.

SULFATE TEST RESULTS RANGED FROM 7 TO 5700 PARTS PER MILLION (PPM). GROUNDWATER WAS ENCOUNTERED DURING DRILLING AT DEPTHS OF 13, 22, 18 AND 17 FEET FOR BORINGS B-001-0-23, B-002-0-23, B-011-0-23 AND B-016-0-23 RESPECTIVELY. GROUNDWATER WAS MEASURED AT THE END OF DRILLING AND THE GROUNDWATER WAS ENCOUNTERED AT DEPTHS OF 14, 19, 8 AND 10 FEET, RESPECTIVELY, FOR BORINGS B-001-0-23, B-002-0-23, B-011-0-23 AND B-016-0-23. PAVEMENT CORES X-009-0-23, X-012-0-23, X-015-0-23 AND X-019-0-23 WERE TAKEN FROM THE PAVED SHOULDERS OF WESTBOUND US ROUTE 33. THE ASPHALT PAVEMENT DEPTH RANGED FROM 8 TO 8.5 INCHES. THE PAVEMENT WAS IN FAIR CONDITION WITH SOME LONGITUDINAL CRACKS AND RUTTING OBSERVED IN THE VICINITY OF THE CORE LOCATION.

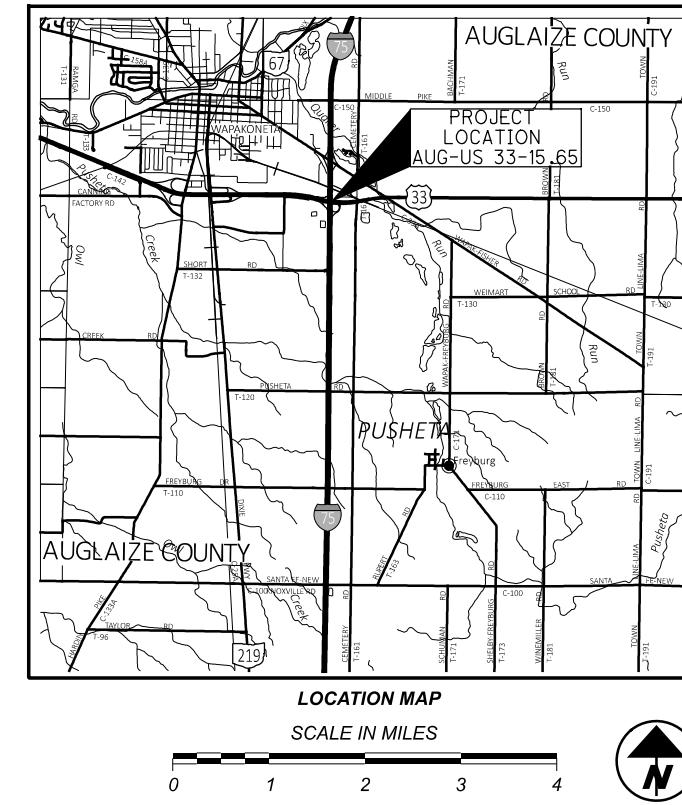
SPECIFICATIONS

THIS GEOTECHNICAL EXPLORATION WAS PERFORMED IN ACCORDANCE WITH THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, OFFICE OF GEOTECHNICAL ENGINEERING, SPECIFICATIONS FOR GEOTECHNICAL EXPLORATIONS, DATED JANUARY 2024.

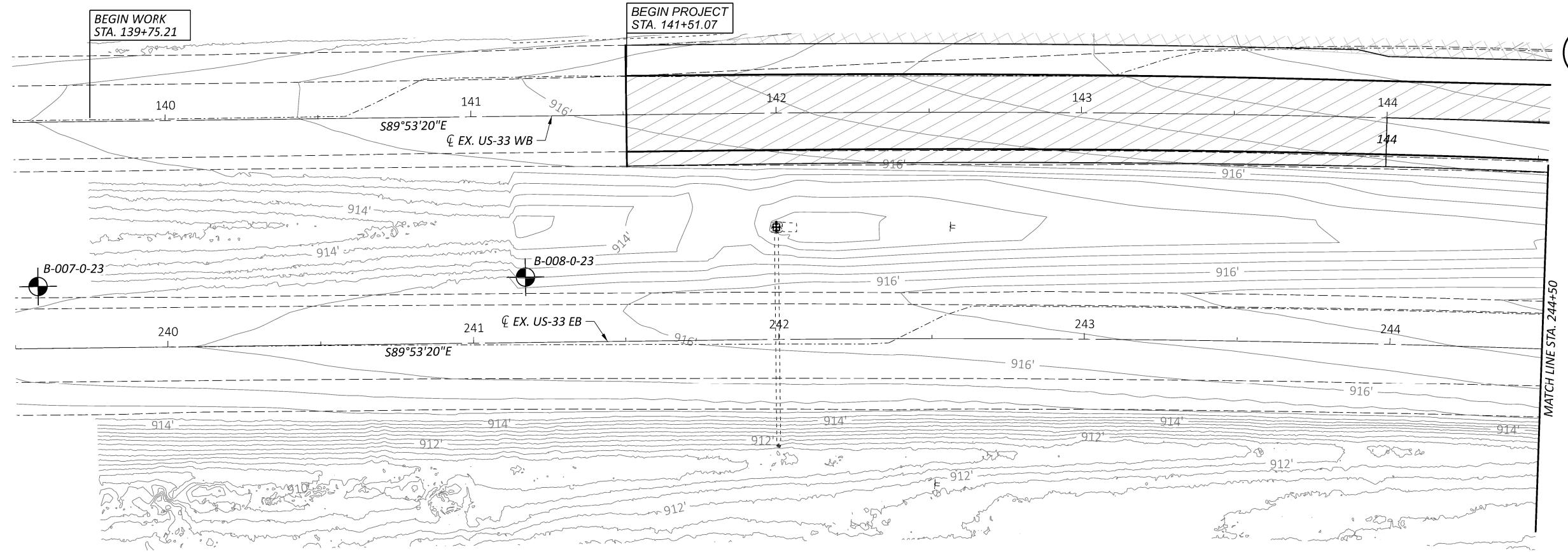
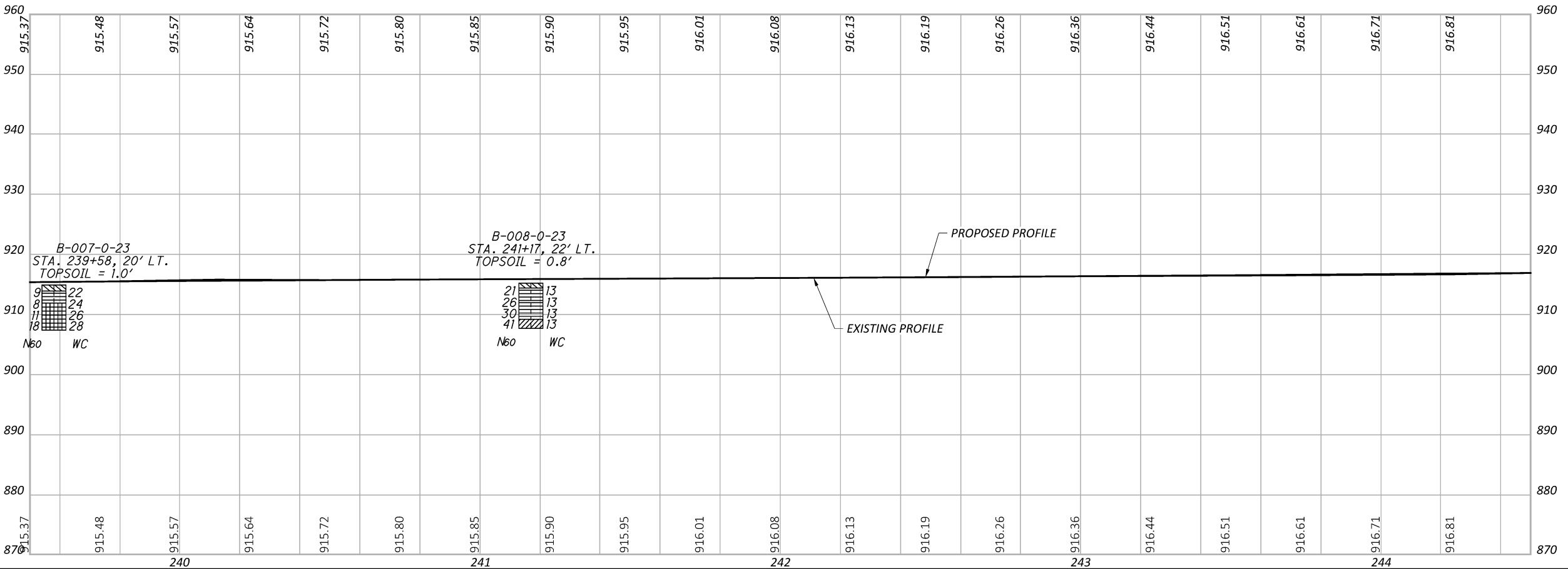
AVAILABLE INFORMATION

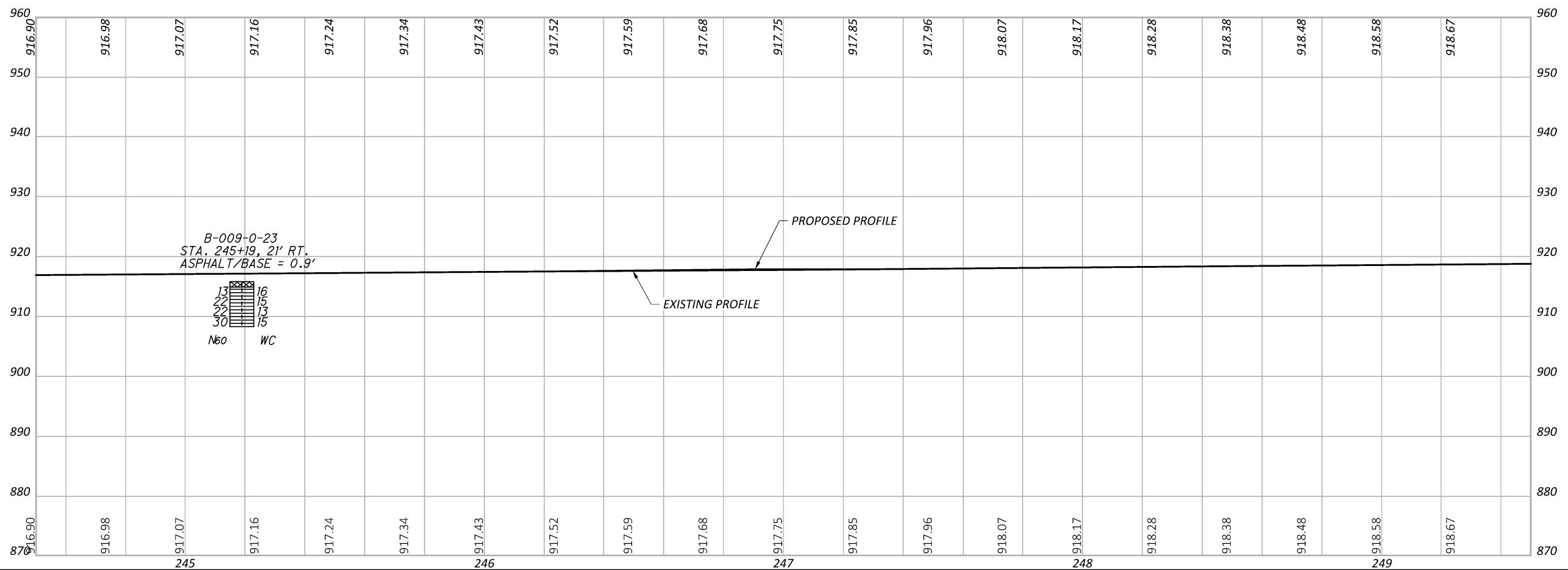
THE SOIL, BEDROCK, AND GROUNDWATER INFORMATION COLLECTED FOR THIS SUBSURFACE EXPLORATION THAT CAN BE CONVENIENTLY DISPLAYED ON THE SOIL PROFILE SHEETS HAS BEEN PRESENTED. GEOTECHNICAL REPORTS, IF PREPARED, ARE AVAILABLE FOR REVIEW ON THE OFFICE OF CONTRACT SALES WEBSITE.

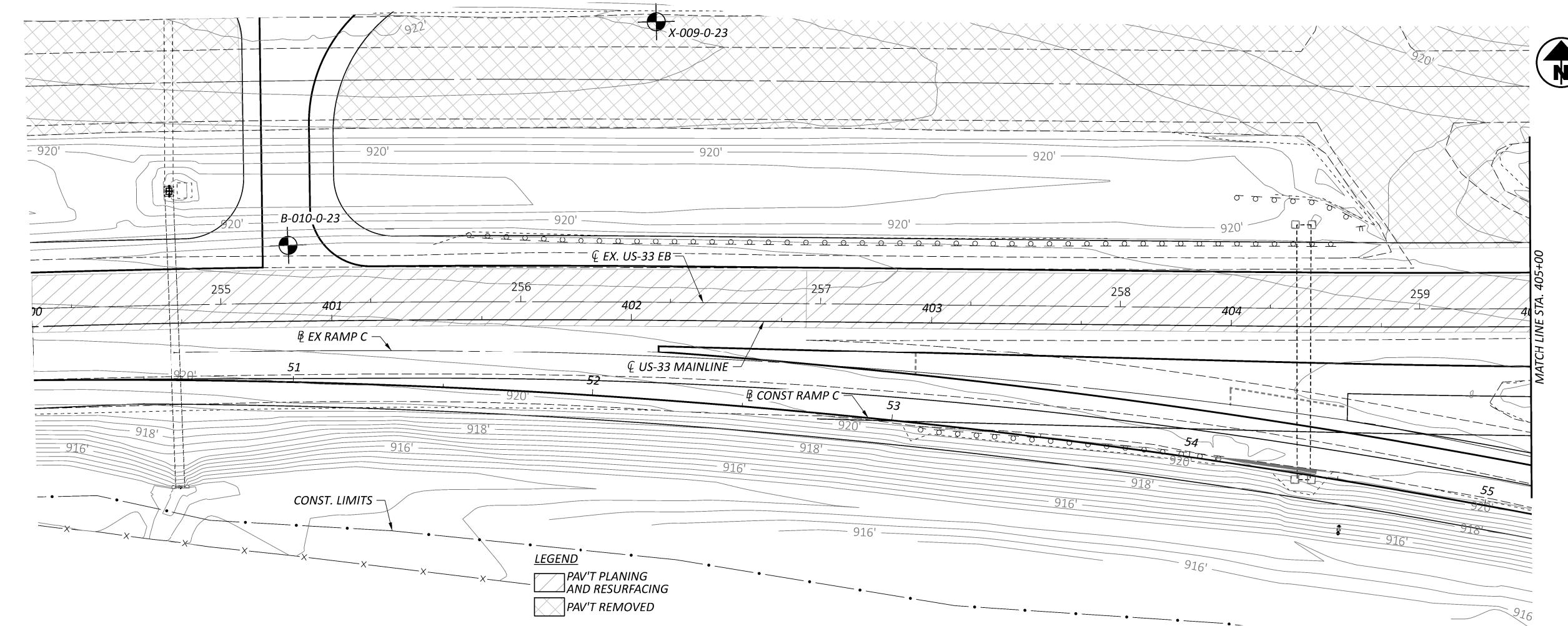
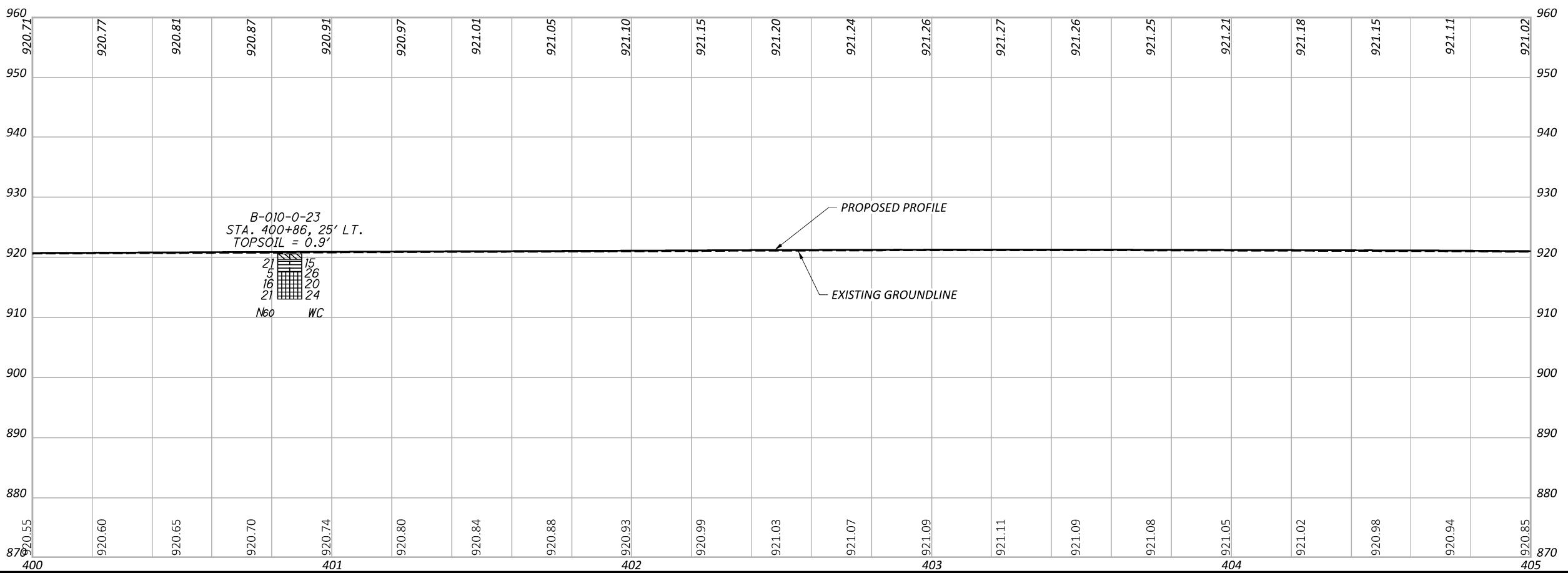
LEGEND	DESCRIPTION	ODOT CLASS	CLASSIFIED MECH./VISUAL
	GRAVEL AND STONE FRAGMENTS WITH SAND	A-1-b	2 1
	GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT	A-2-4	2 1
	GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT AND CLAY	A-2-6	0 1
	COARSE AND FINE SAND	A-3a	1 5
	SANDY SILT	A-4a	4 13
	SILT AND CLAY	A-6a	6 14
	SILTY CLAY	A-6b	20 23
	CLAY	A-7-6	9 13
	TOTAL	44	71
	TOPSOIL = X = APPROXIMATE THICKNESS	VISUAL	
	PAVEMENT = X = APPROXIMATE THICKNESS	VISUAL	
	BORING LOCATION - PLAN VIEW		
	DRIVE SAMPLE AND/OR ROCK CORE BORING PLOTTED TO VERTICAL SCALE ONLY. HORIZONTAL BAR INDICATES A CHANGE IN STRATIGRAPHY.		
	INDICATES STANDARD PENETRATION RESISTANCE NORMALIZED TO 60% DRILL ROD ENERGY RATIO.		
	INDICATES WATER CONTENT IN PERCENT.		
	NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT): X = NUMBER OF BLOWS FOR 6 INCHES (UNCORRECTED). Y/D = NUMBER OF BLOWS (UNCORRECTED) FOR D" OF PENETRATION AT REFUSAL.		
	INDICATES A SPLIT SPOON SAMPLE, STANDARD PENETRATION TEST.		
	INDICATES FREE WATER.		
	INDICATES GROUND WATER AT COMPLETION.		
	INDICATES A NON-PLASTIC MATERIAL WITH A MOISTURE CONTENT GREATER THAN 25 % OR GREATER THAN 19 % WITH A WET APPEARANCE.		
	INDICATES A PLASTIC MATERIAL WITH A MOISTURE CONTENT EQUAL TO OR GREATER THAN THE LIQUID LIMIT MINUS 3.		



SUMMARY OF SOIL TEST DATA																		
ATH-33-15.65																		
EXISTING US-33 EB																		
EXPLOR. ID	STATION	FROM-TO	SAMPLE ID	N60	REC	tsf	%	%	%	%	%	ODOT	ppm					
B-007-0-23	239+58	1.5-3	SS-1	9	60	4.5	10	8	18	31	33	17	16	22	A-6b (8)	7		
STA. 239+58, 20' Lt.	239+58	3-4.5	SS-2	8	72	2.75	5	5	13	37	40	44	22	22	A-7-6 (14)	-		
Latitude=40.555726	239+58	4.5-6	SS-3	11	93	2.25									26	A-7-6 (VISUAL)	-	
Longitude=-84.178984	239+58	6-7.5	SS-4	18	100	2.5									28	A-7-6 (VISUAL)	-	
B-008-0-23	241+17	1.5-3	SS-1	21	67	4.5	10	8	13	31	38	34	18	16	13	A-6b (9)	27	
STA. 241+17, 22' Lt.	241+17	3-4.5	SS-2	26	80	4.5									13	A-6b (VISUAL)	-	
Latitude=40.555736	241+17	4.5-6	SS-3	30	53	4.5									13	A-6b (VISUAL)	-	
Longitude=-84.178410	241+17	6-7.5	SS-4	41	72	4.5	11	10	13	31	35	29	17	12	13	A-6a (7)	-	
B-009-0-23	245+19	1.5-3	SS-1	13	80	4.5	12	8	11	30	39	38	19	19	16	A-6b (10)	40	
STA. 245+19, 21' Rt.	245+19	3-4.5	SS-2	22	93	4.5	8	9	13	33	37	33	17	16	15	A-6b (9)	-	
Latitude=40.555612	245+19	4.5-6	SS-3	22	80	4.5									13	A-6b (VISUAL)	-	
Longitude=-84.176965	245+19	6-7.5	SS-4	30	100	4.5									15	A-6b (VISUAL)	-	
US-33 MAINLINE																		
B-010-0-23	400+86	1.5-3	SS-1	21	72	4.5	5	7	14	33	41	37	18	19	15	A-6b (11)	27	
STA. 400+86, 25' Lt.	400+86	3-4.5	SS-2	5	47	2.25	1	4	12	37	46	48	22	26	26	A-7-6 (16)	-	
Latitude=40.555363	400+86	4.5-6	SS-3	16	67	3									20	A-7-6 (VISUAL)	-	
Longitude=-84.173371	400+86	6-7.5	SS-4	21	100	4.25									24	A-7-6 (VISUAL)	-	
B-011-0-23	406+05	1.5-3	SS-1	24	72	4.5	13	4	12	36	35	37	17	20	14	A-6b (11)	20	
STA. 406+05, 23' Rt.	406+05	3-4.5	SS-2	12	67	4.25									30	A-6b (VISUAL)	-	
Latitude=40.554903	406+05	4.5-6	SS-3	21	87	4									15	A-6b (VISUAL)	-	
Longitude=-84.171589	406+05	6-7.5	SS-4	28	87	4.5									17	A-6b (VISUAL)	-	
406+05	8.5-10	SS-5	20	67	4.5										20	A-6b (VISUAL)		
406+05	11-12.5	SS-6	13	100	4.5	18	0	16	46	20	21	13	8	10	A-4a (6)			
406+05	13.5-15	SS-7	18	80	3.75										12	A-4a (VISUAL)		
406+05	16-17.5	SS-8	16	100	3.25										15	A-4a (VISUAL)		
406+05	18.5-20	SS-9	13	67	2.5										12	A-4a (VISUAL)		
406+05	21-22	SS-10A	13	100	-										38	A-3a (VISUAL)		
406+05	22-22.5	SS-10B	1												16	A-6a (VISUAL)		
406+05	23.5-25	SS-11	13	72	3.5	12	10	13	33	32	27	16	11	14	A-6a (6)			
B-012-0-23	408+91	1.5-3	SS-1	11	67	2.25	5	10	21	34	30	36	17	19	19	A-6b (9)	107	
STA. 408+91, 29' Lt.	408+91	3-4.5	SS-2	7	72	3.5	2	3	18	40	37	42	21	21	24	A-7-6 (13)	-	
Latitude=40.554900	408+91	4.5-6	SS-3	11	72	3.5									25	A-7-6 (VISUAL)	-	
Longitude=-84.170543	408+91	6-7.5	SS-4	18	100	2.75									24	A-7-6 (VISUAL)	-	
B-013-0-23	410+65	1.5-3	SS-1	9	27	-									7	A-2-4 (VISUAL)	47	
STA. 410+65, 25' Lt.	410+65	3-4.5	SS-2	7	33	-	38	19	13	20	10	22	16	6	11	A-2-4 (0)	-	
Latitude=40.554821	410+65	4.5-6	SS-3	20	53	-	5	7	33	39	16	0	0	0	19	A-4a (4)	-	
Longitude=-84.169930	410+65	6-7.0	SS-4A	18	80	-									15	A-4a (VISUAL)	-	
410+65	7.0-7.5	SS-4B	1												14	A-3a (VISUAL)		
B-014-0-23	413+03	1.5-3	SS-1	9	67	1.5	1	3	25	37	34	39	19	20	22	A-6b (11)	67	
STA. 413+03, 26' Lt.	413+03	3-4.5	SS-2	7	80	1.5	2	3	23	38	34	36	18	18	24	A-6b (11)	-	
Latitude=40.554750	413+03	4.5-6	SS-3	8	72	2									19	A-6b (VISUAL)	-	
Longitude=-84.169079	413+03	6-7.5	SS-4	14	72	-									21	A-4a (VISUAL)	-	
B-015-0-23	415+48	1.5-3	SS-1	17	87	4	10	8	22	28	32	33	17	16	14	A-6b (7)	5700	
STA. 415+48, 49' Lt.	415+48	3-4.5	SS-2	17	53	3.25									17	A-6b (VISUAL)	-	
Latitude=40.554717	415+48	4.5-6	SS-3	11	53	1.25	0	2	19	39	40	46	23	23	26	A-7-6 (14)	-	
Longitude=-84.168212	415+48	6-7.5	SS-4	18	72	1.5									17	A-7-6 (VISUAL)	-	
B-016-0-23	416+59	1.5-3	SS-1	22	47	4.5	6	8	22</td									







HORIZONTAL SCALE IN FEET

0 10 20 30 40

GEOTECHNICAL PROFILE - ROADWAY
US-33 MAINLINE - STA. 400+00 TO STA. 405+00.00

DESIGN AGENCY
Stantec
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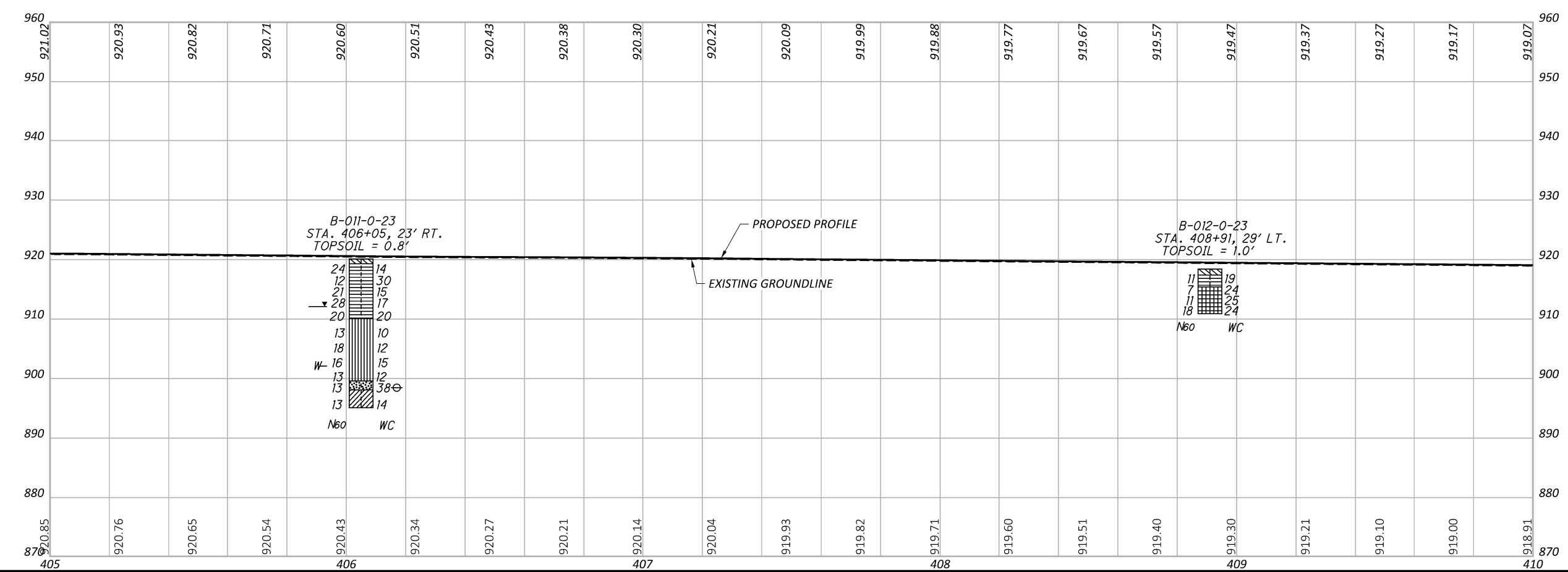
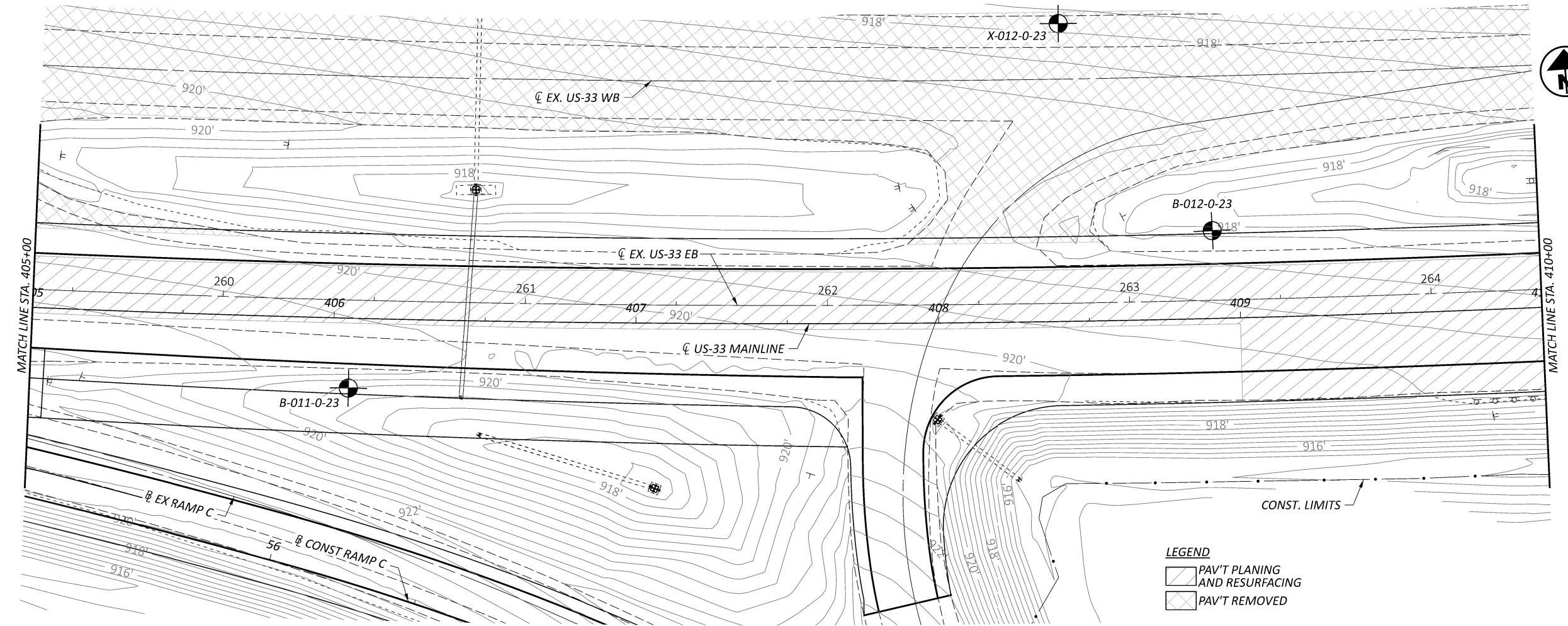
DESIGNER
MSJ

REVIEWER
EMK 10-31-24

PROJECT ID
118055

SUBSET TOTAL
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SHEET TOTAL
P.229 243



HORIZONTAL
SCALE IN FEET

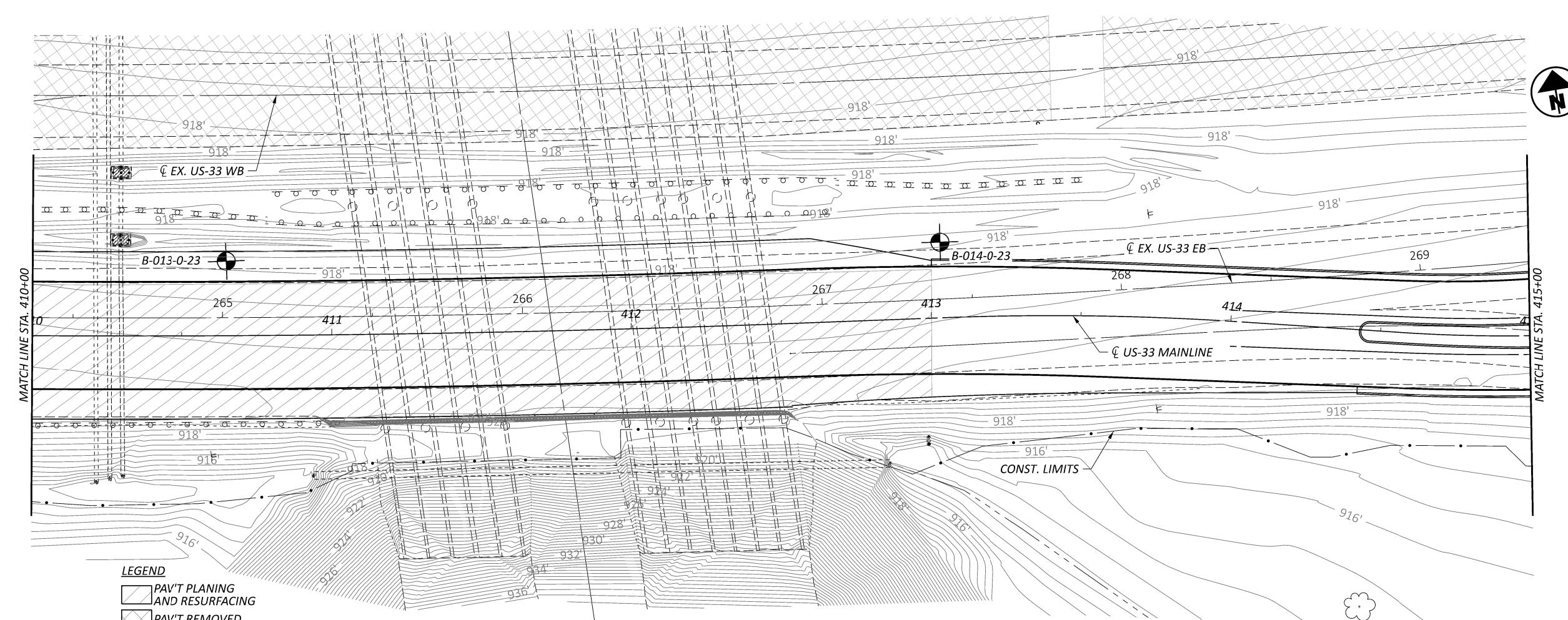
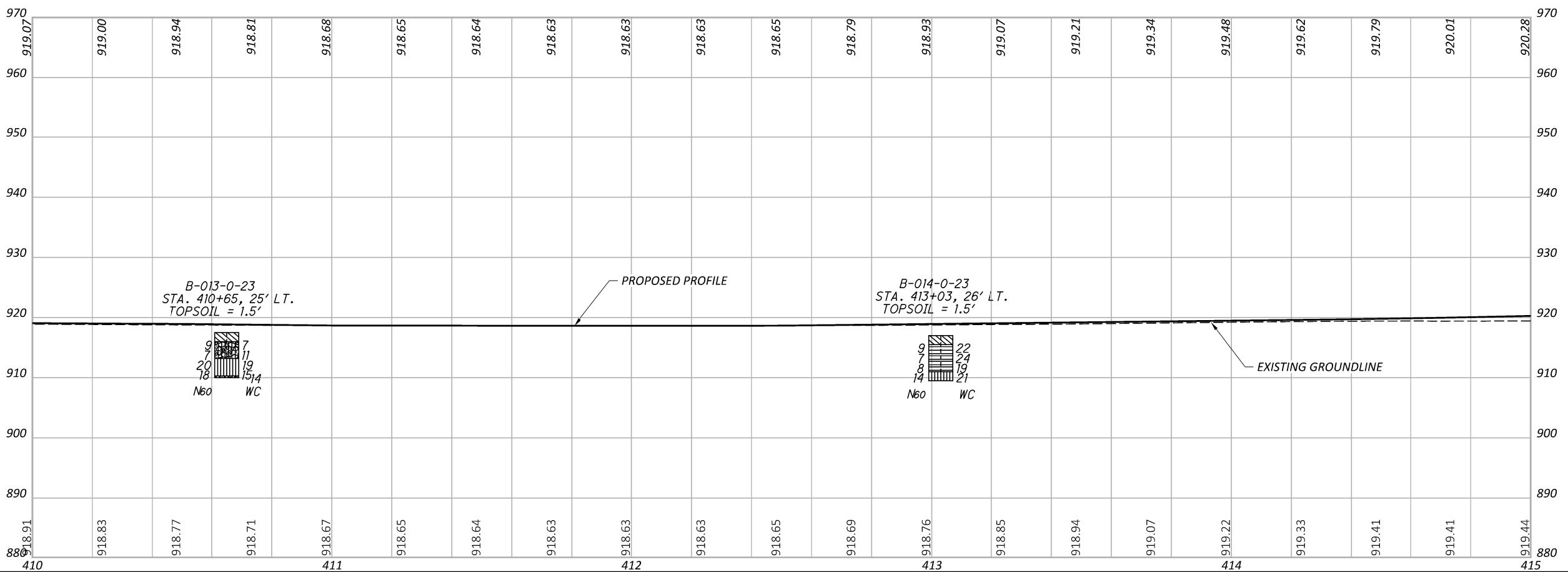


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GEOTECHNICAL PROFILE - ROADWAY
US-33 MAINLINE - STA. 405+00.00 TO STA. 410+00.00

DESIGN AGENCY

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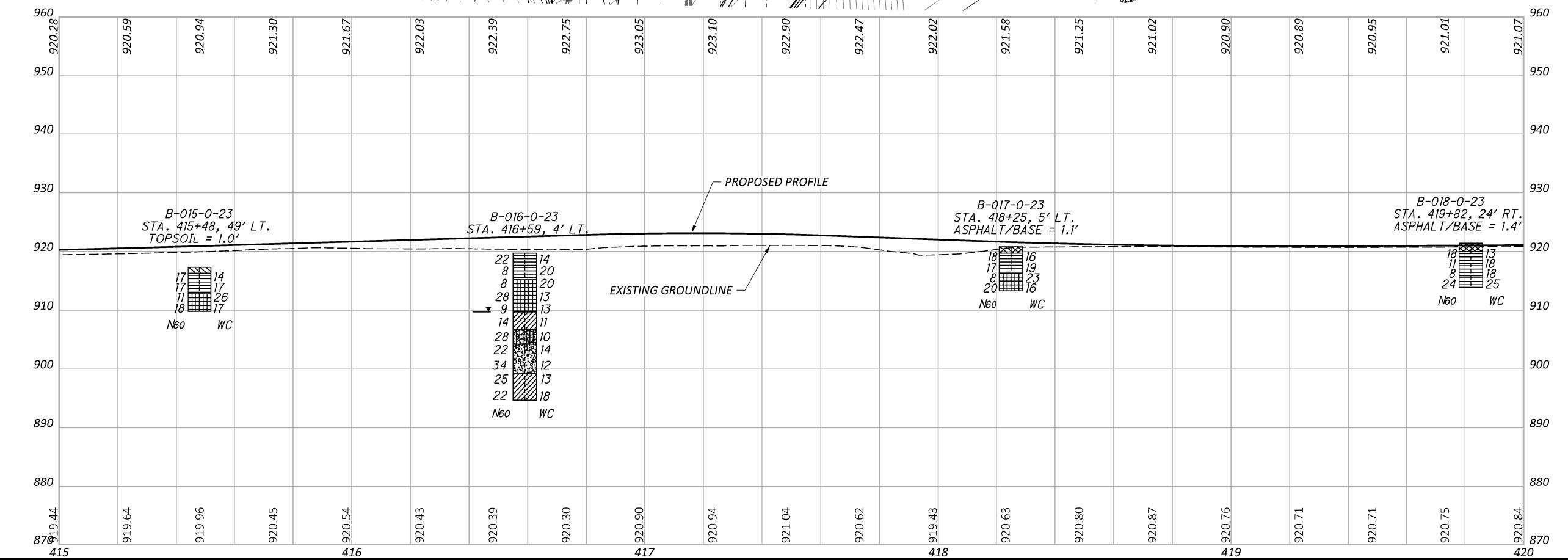
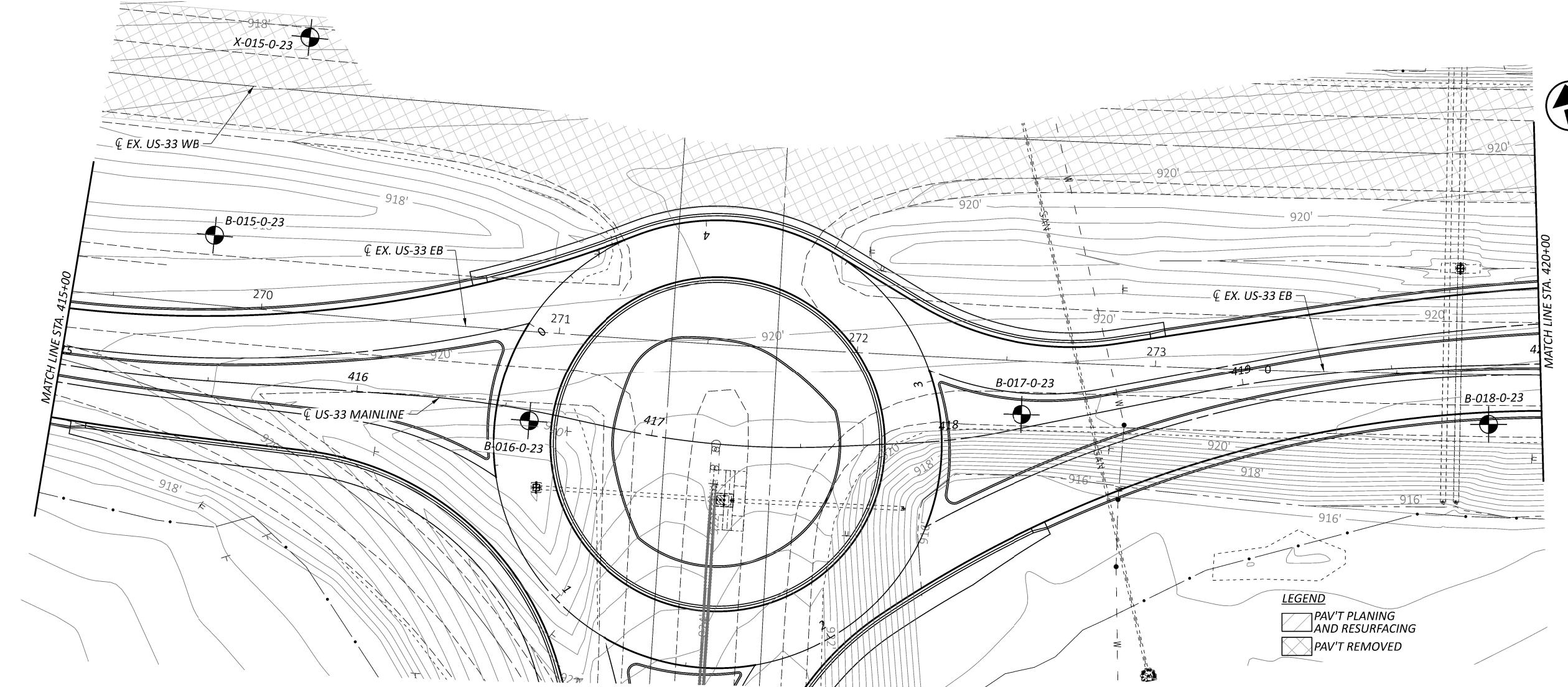
REVIEWER
EMK 10-31-24

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SUBSET TOTAL
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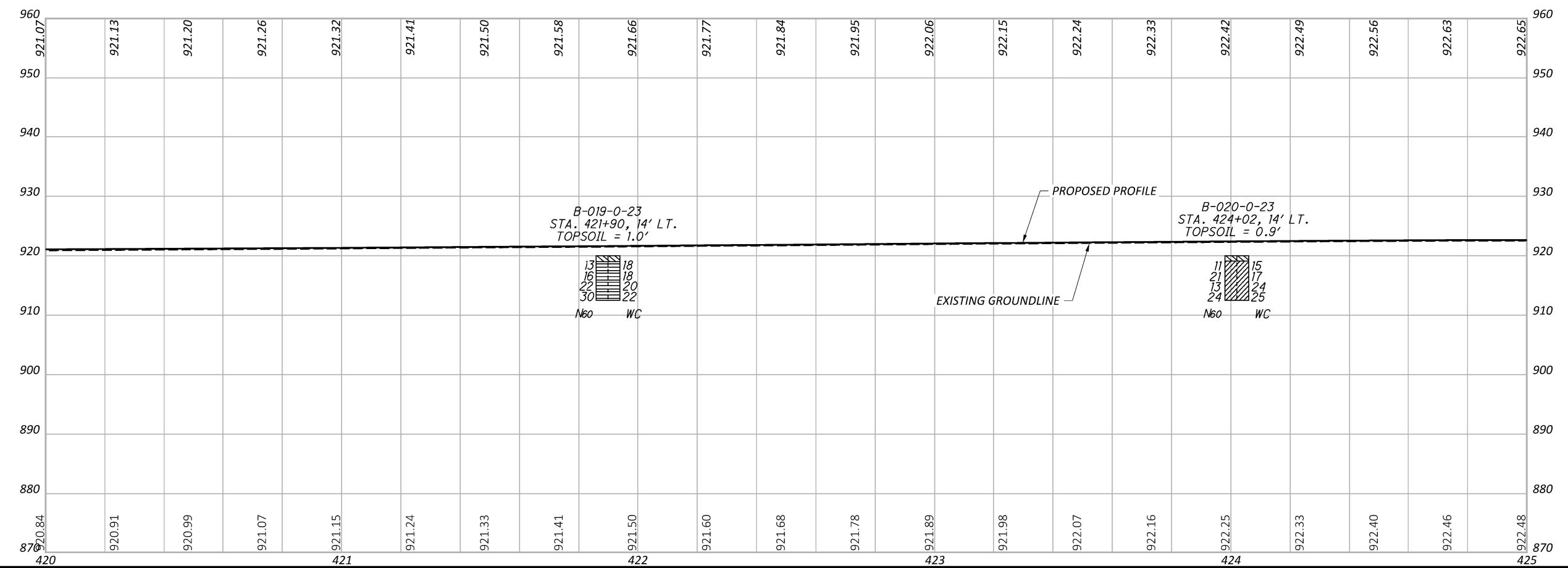
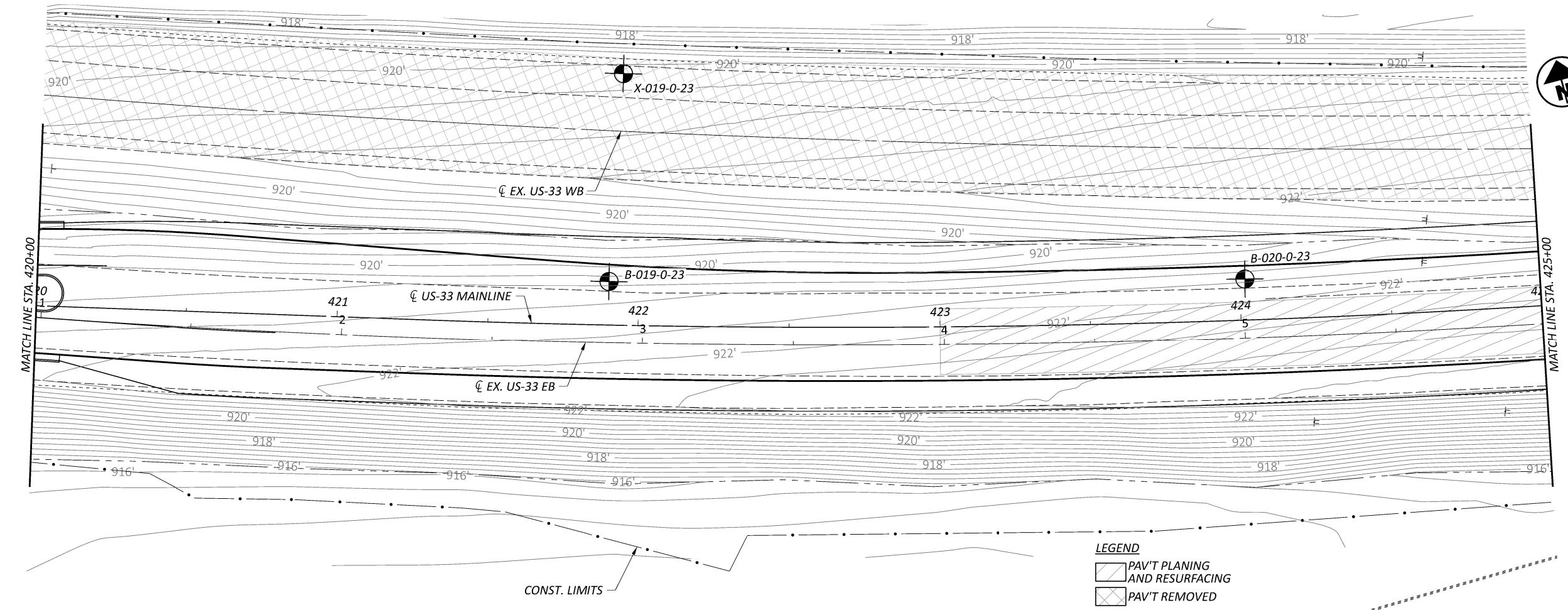
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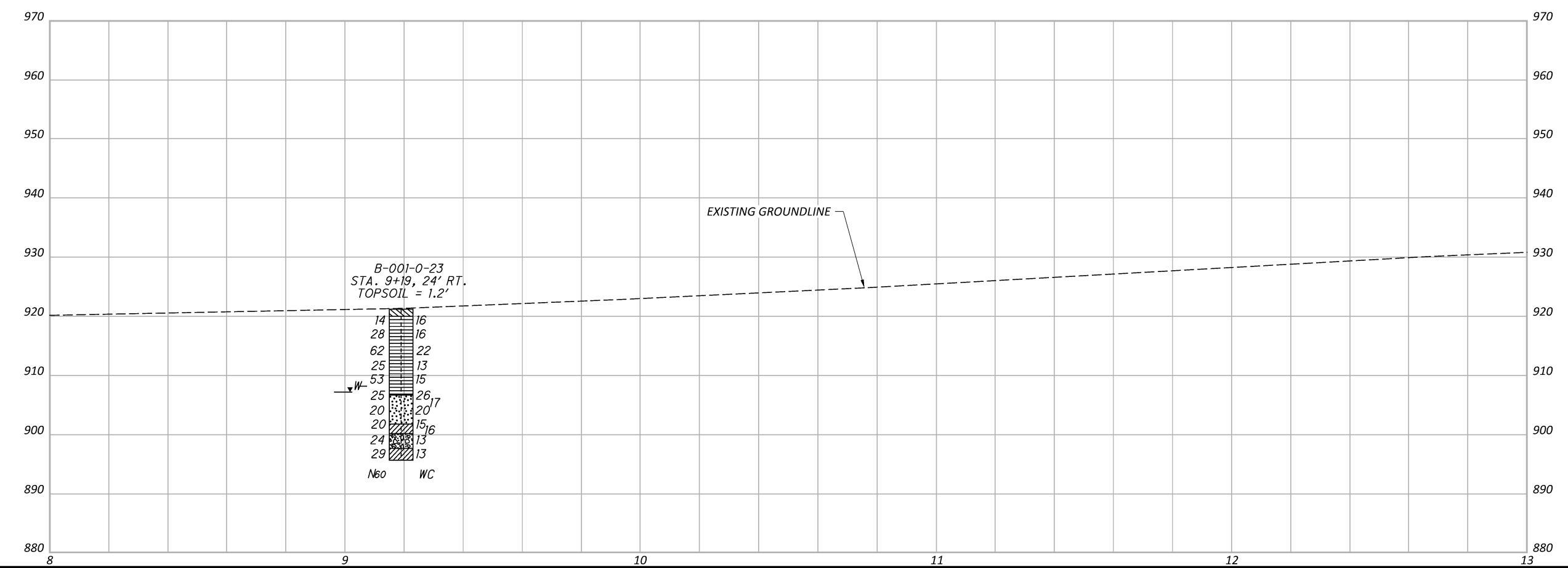
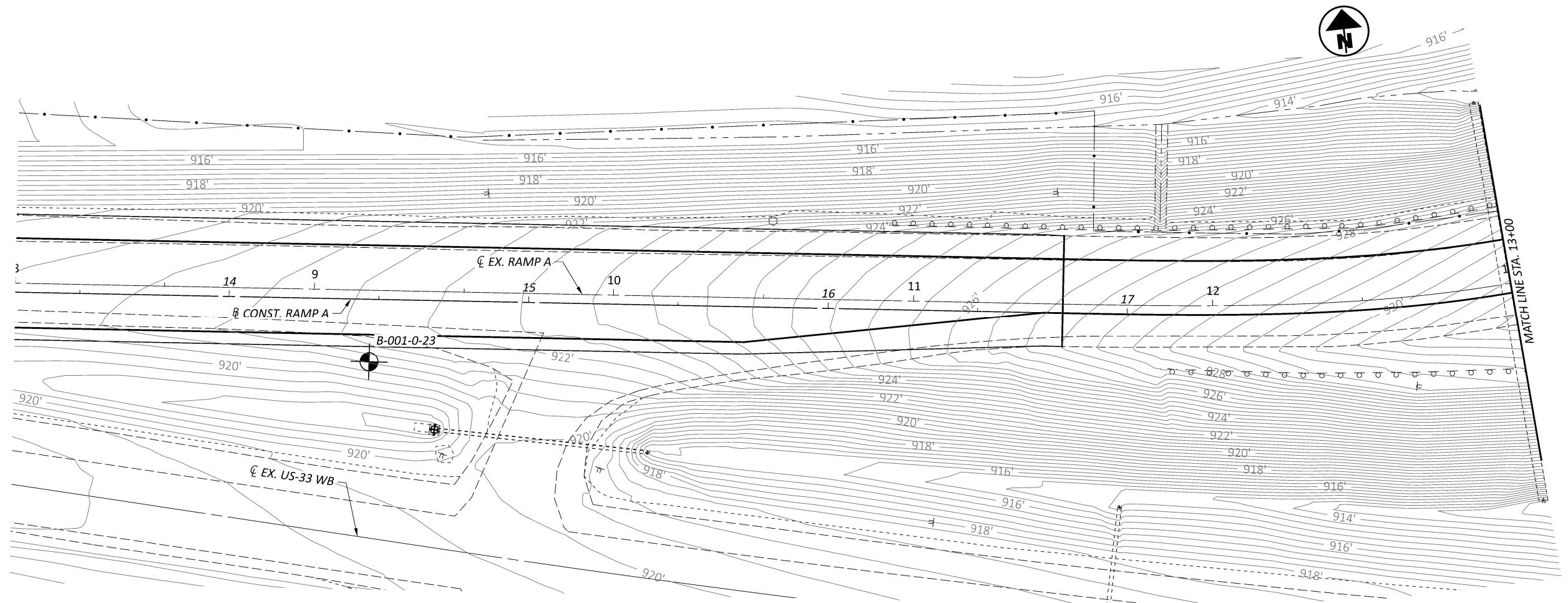
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GEOTECHNICAL PROFILE - ROADWAY
US-33 MAINLINE - STA. 415+00 TO STA. 420+00.00

HORIZONTAL SCALE IN FEET
0 20 40





UG-US 33-15.65

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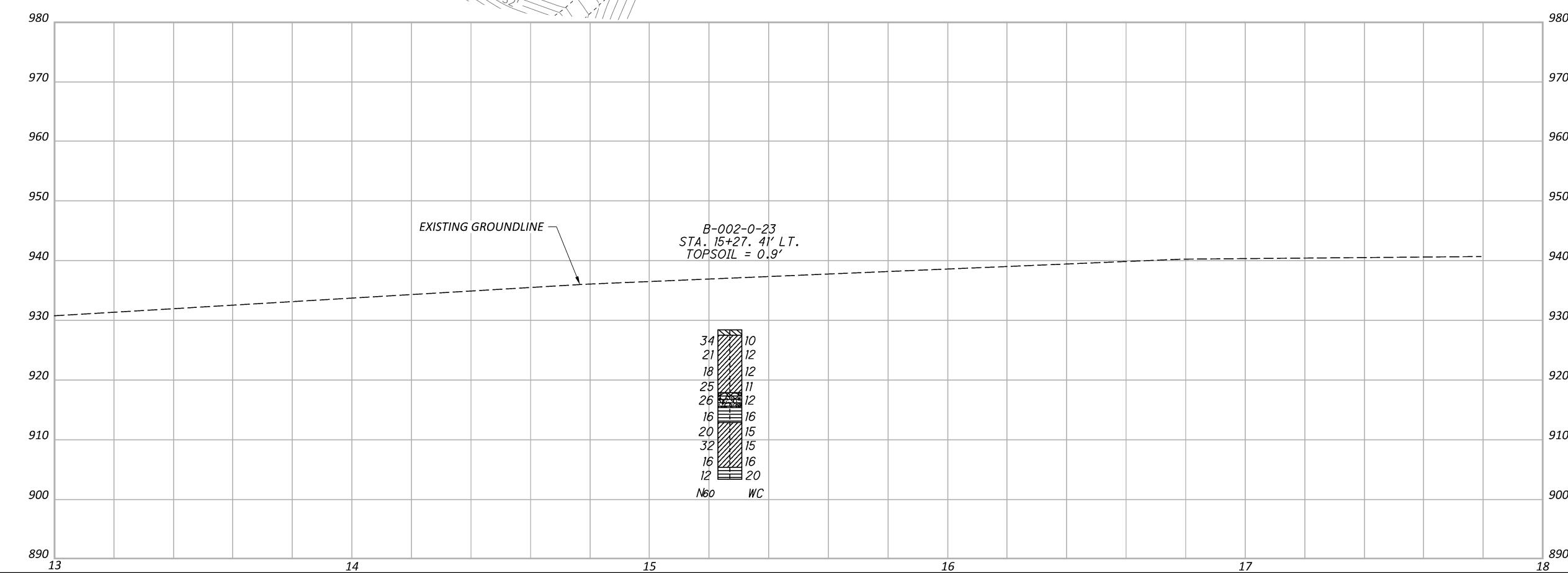
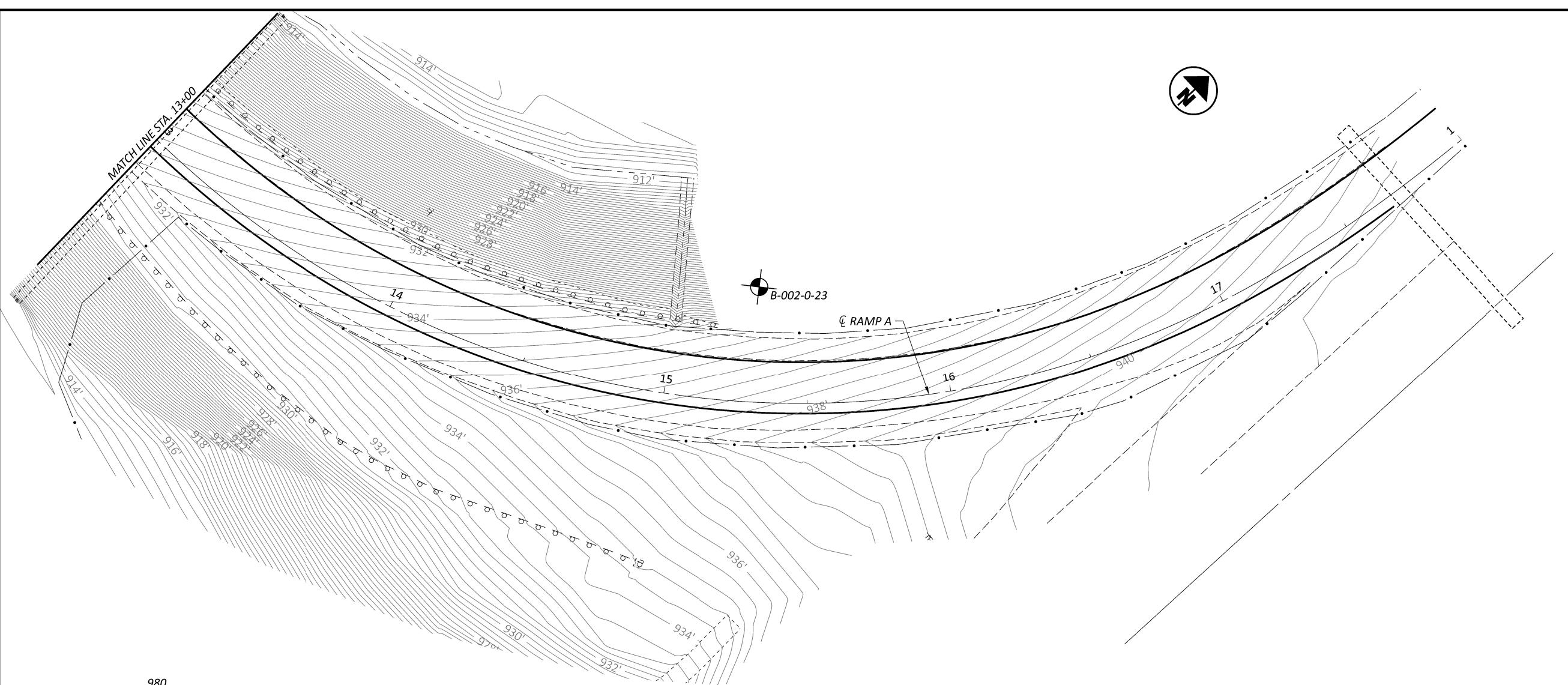
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US-33 - RAMPA - STA. 8+00.00 TO STA. 13+00.00

DESIGN AGENCY	
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DESIGNER	MSJ
REVIEWER	
IMK 10-31-24	
PROJECT ID	
118055	
SUBSET	TOTAL
10	19
SHEET TOTAL	
P.234 243	

AUG-US 33-15.65

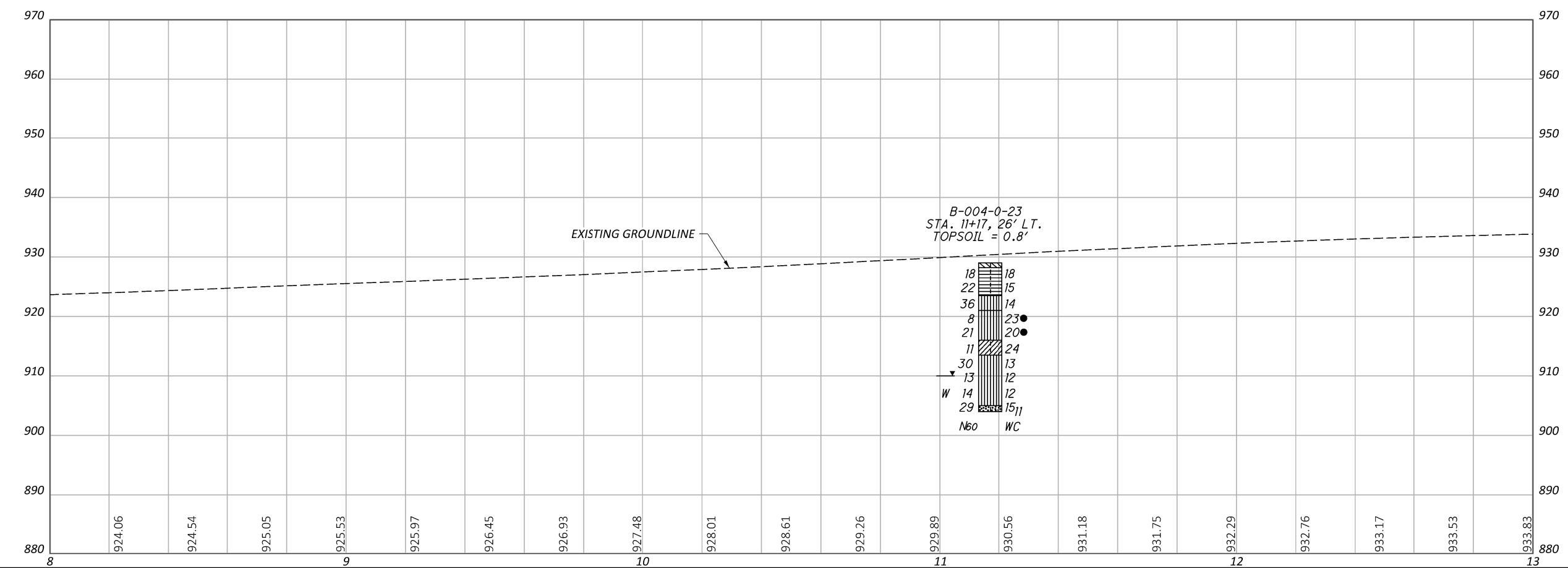
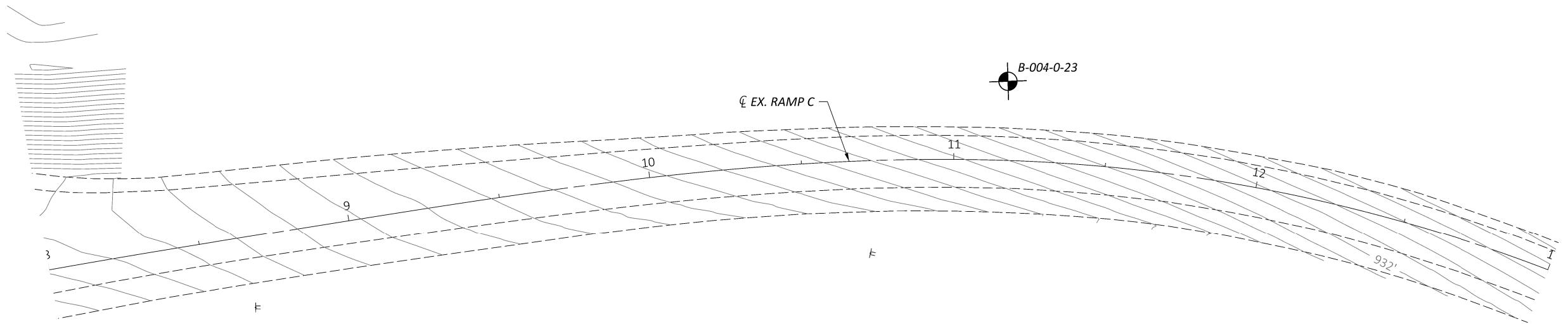
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GEOTECHNICAL PROFILE - ROADWAY
US-33 RAMP A - STA. 13+00.00 TO STA. 18+00.00

HORIZONTAL SCALE IN FEET
0 10 20 40

DESIGN AGENCY
Stantec
10200, Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-8200
DESIGNER
MSJ
REVIEWER
EMK 10-31-24
PROJECT ID
118055
SUBSET TOTAL
11 19
SHEET TOTAL
P.235 243



113

HORIZONTAL
SCALE IN FEET

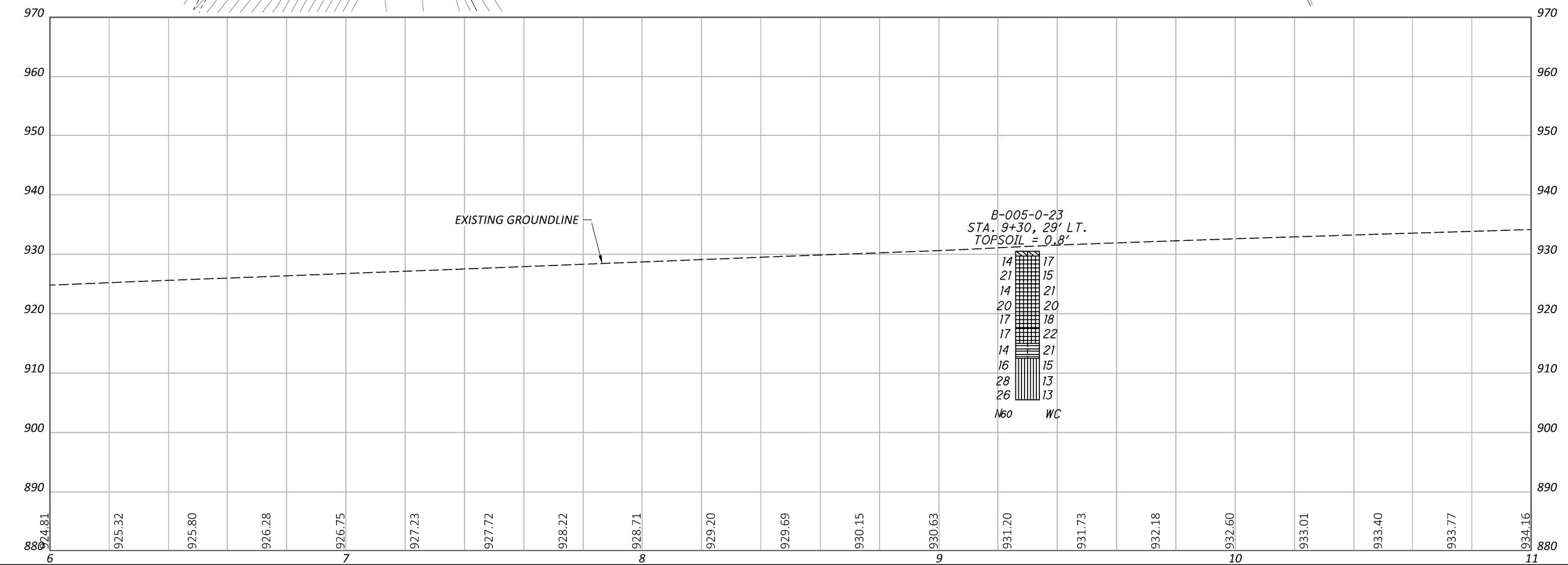
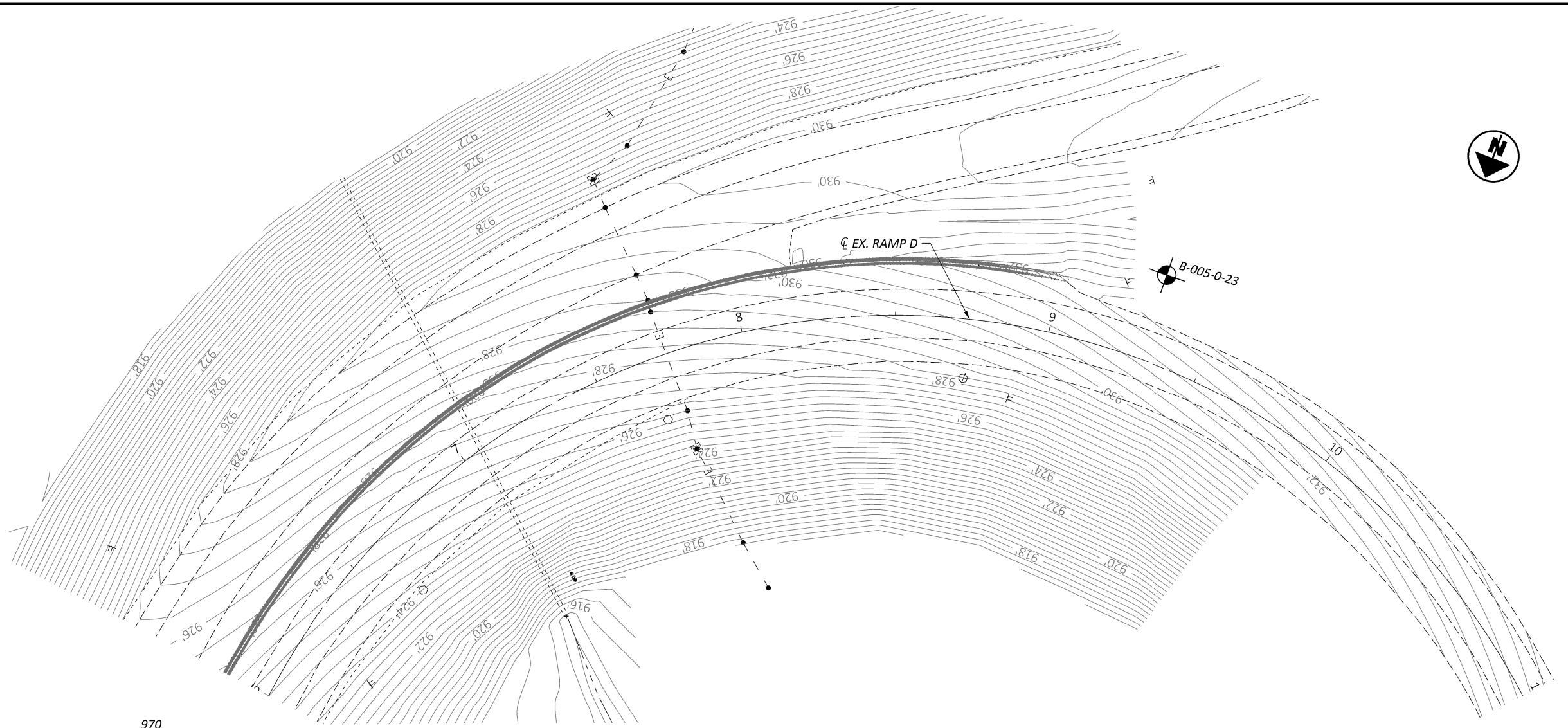


0 20 30

**GEOTECHNICAL PROFILE - ROADWAY
US-33 RAMP C - STA. 8+00.00 TO STA. 13+00.00**

DESIGN AGENCY

Stanted
10200 Alliance Road
Suite 300
Cincinnati, OH 45244
(513) 842-8200
DESIGNER
MSJ
REVIEWER
JKM 10-31-
PROJECT ID
118055
UBSET TOTAL
12 **19**
SHEET TOTAL
P.236 **243**



DESIGN AGENCY
Stantec
10200 Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER
MSJ
REVIEWER
EMK 10-31-24

PROJECT ID
118055
SUBSET TOTAL
13 19
SHEET TOTAL
P.237 243

GEOTECHNICAL PROFILE - ROADWAY
US 33 RAMP D - STA. 6+00.00 TO STA. 11+00.00

HORIZONTAL SCALE IN FEET
0 20 40

PROJECT:	AUG-US 33-15.65	DRILLING FIRM / OPERATOR:	NEAS / RW	DRILL RIG:	CME 45B	STATION / OFFSET:	9+19, 24' RT.	EXPLORATION ID:	US 33
TYPE:	LIGHT TOWER	SAMPLING FIRM / LOGGER:	STANTEC / GK	HAMMER:	CME AUTOMATIC	ALIGNMENT:	B-001-0-23		
PID:	118055	SFN:	N/A	CALIBRATION DATE:	3/8/24	ELEVATION:	921.2 (MSL)	EOB:	25.5 ft.
START:	6/24/24	END:	6/24/24	ENERGY RATIO (%):	79	LAT / LONG:	40.555469, -84.117220		1 OF 1
MATERIAL DESCRIPTION AND NOTES		ELEV.	DEPTH	SPT / RQD	REC SAMPLE ID	HP (tsf)	GR (%) CS (%) FS (%) SI (%) CL (%) LL (%) PL (%) PI (%) WC (%) <th>ODOT CLASS (G)</th> <th>BACK FILL</th>	ODOT CLASS (G)	BACK FILL
14.4" TOPSOIL (DRILLERS DESCRIPTION)		921.2							
STIFF TO HARD, BROWN AND GRAY, SILTY CLAY, LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST		920.0							
		- 1							
		- 2	2 3 14 87	SS-1	4.50	-	-	-	16 A-6b (V)
		- 3							
		- 4	8 12 9	SS-2	4.50	5 6 11 35 43 39 19 20 16	A-6b (V)		
		- 5							
		- 6							
		- 7	8 16 31	SS-3	4.50	-	-	-	22 A-6b (V)
		- 8							
		- 9							
		- 10	16 8 11	SS-4	4.50	-	-	-	13 A-6b (V)
		- 11							
		- 12	8 11 29	SS-5	4.50	-	-	-	15 A-6b (V)
		- 13							
		▼ 1.5 hrs							
		- 14							
MEDIUM DENSE, BROWN AND GRAY, COARSE AND FINE SAND, LITTLE GRAVEL, LITTLE SILT, TRACE CLAY, WET		906.7							
		- 15	9 10	SS-6A	1.50	-	-	-	26 A-6b (V)
		- 16							
		- 17	5 8 7	SS-7	-	12 36 33 11 8	NP NP NP NP	20 A-3a (0)	
		- 18							
		- 19							15 A-3a (V)
		- 20	4 6 9	SS-8A	-	-	-	-	16 A-6a (V)
		- 21							
		- 22	5 8 10	SS-8B	0.75	-	-	-	
		- 23							
		- 24	4 8 14	SS-9	-	39 21 30 8 2	NP NP NP	13 A-1-b (0)	
		- 25							
HARD GRAY, SILT AND CLAY, LITTLE SAND, TRACE GRAVEL, DAMP		897.7							
		- 26							
		- 27	4 8 14	SS-10	4.50	-	-	-	13 A-6a (V)
		- 28							
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PROJECT:	AUG-US 33-15.65	DRILLING FIRM / OPERATOR:	NEAS / RW	DRILL RIG:	CME 45B	STATION / OFFSET:	15+27.41' LT.	EXPLORATION ID
TYPE:	LIGHT TOWER	SAMPLING FIRM / LOGGER:	STANTEC / GK	HAMMER:	CME AUTOMATIC	ALIGNMENT:	US 33	B-002-0-23
PID:	118055	SFN:	N/A	DRILLING METHOD:	2.25" HSA	CALIBRATION DATE:	3/8/24	ELEVATION:
START:	6/24/24	END:	6/24/24	SAMPLING METHOD:	SPT	ENERGY RATIO (%):	79	LAT / LONG:
MATERIAL DESCRIPTION	AND NOTES	ELEV	DEPTH	SPT / RQD	N ₆₀ (%)	REC SAMPLE ID	HP (tsf)	GRADATION (%)
11.0" TOPSOIL (DRILLERS DESCRIPTION)		928.4						
HARD, BROWN AND BROWNISH GRAY, SILT AND CLAY, SOME SAND, TRACE GRAVEL, DAMP		927.5						
		1						
		2	10	34	100	SS-1	4.50	-
		3						
		4	5	7	9	SS-2	4.50	9
		5						11
		6						12
		7	5	7	18	SS-3	4.50	32
		8						31
		9	4	9	25	SS-4	4.50	16
		10						15
MEDIUM DENSE, BROWN, GRAVEL WITH SAND, SILT, AND CLAY, DAMP		917.9						
		11						
		12	5	12	8	SS-5	-	
		13						
VERY STIFF, BROWN AND GRAY, SILTY CLAY, SOME SAND, TRACE GRAVEL, DAMP		915.4						
		14						
		15						
VERY STIFF TO HARD, BROWN, SILT AND CLAY, SOME SAND, TRACE GRAVEL, DAMP		912.9						
		16						
		17	6	6	20	SS-7	4.00	9
		18						13
		19						33
VERY STIFF, BROWN MOTTLED WITH YELLOWISH BROWN, SILTY CLAY, SOME SAND, LITTLE GRAVEL, MOIST		905.4						36
		20						19
		21						17
		22	3	5	16	SS-9	4.50	14
		23						15
		24	1	4	12	SS-10	3.00	16
		25						20

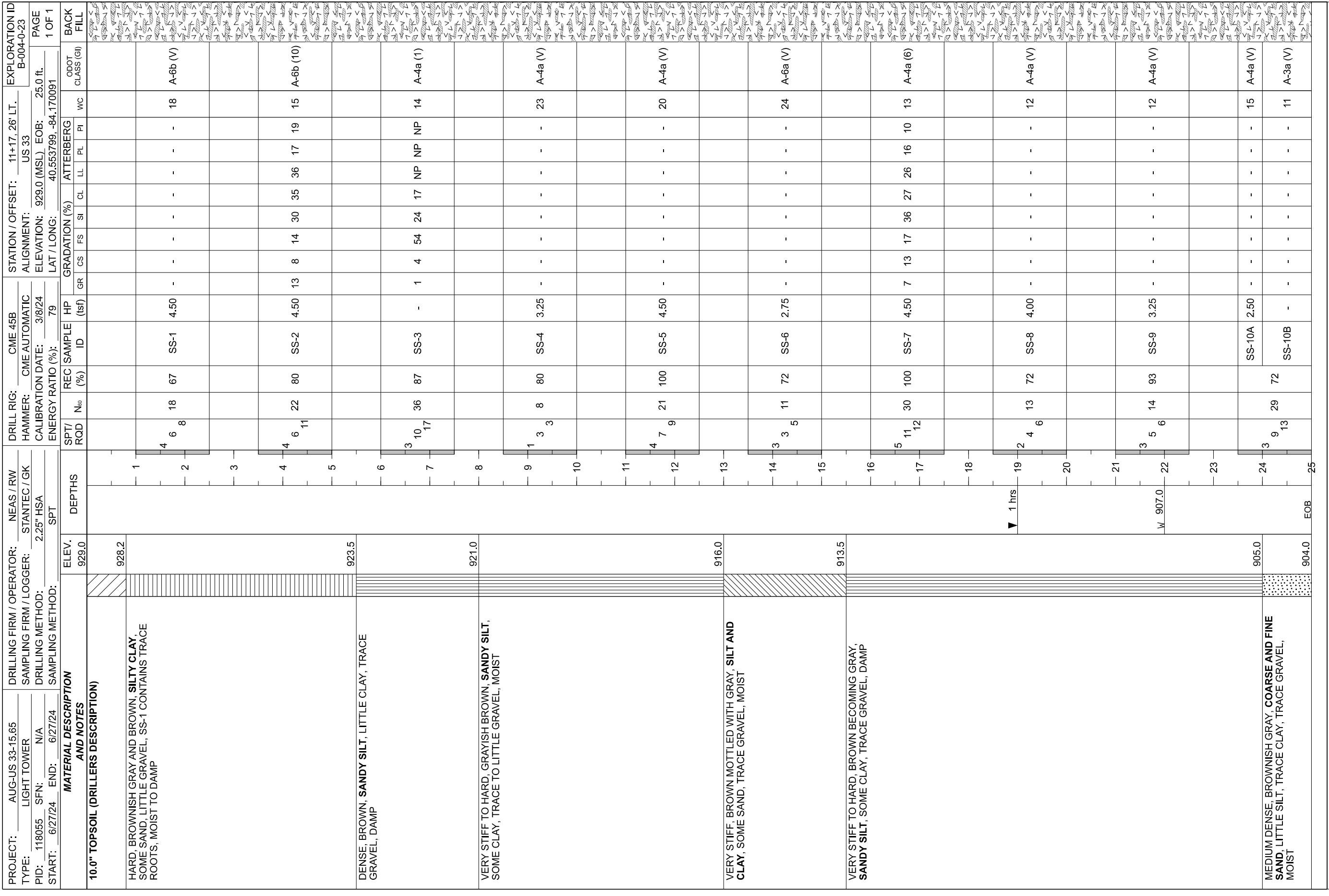
NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 1 BAG HOLE PLUG; SHOVEL ED SOIL CUTTINGS

GEOTECHNICAL PROFILE - ROADWAY (LIGHT TOWER)

BORING LOG B-002-0-23

DESIGN AGENCY	Stantec
10200 Alliance Road,	
Suite 300	
Cincinnati, OH 45242	
(513) 842-8200	
DESIGNER	MSJ
REVIEWER	EMK
PROJECT ID	10-31-24
SUBSET	118055
SHEET	15
TOTAL	19
SHEET	239
TOTAL	243



GEOTECHNICAL PROFILE - ROADWAY (LIGHT TOWER)
BORING LOG B-004-0-23

DESIGN AGENCY	Stantec
10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-8200	
DESIGNER	MSJ
REVIEWER	EMK
PROJECT ID	10-31-24
SUBSET	118055
SHEET	16
TOTAL	19
SHEET	P.240
TOTAL	243

PROJECT:	AUG-US 33-15.65	DRILLING FIRM / OPERATOR:	NEAS / RW	DRILL RIG:	CME 45B	STATION / OFFSET:	9+30, 29' LT.	EXPLORATION ID
TYPE:	LIGHT TOWER	SAMPLING FIRM / LOGGER:	STANTEC / GK	HAMMER:	CME AUTOMATIC	ALIGNMENT:	US 33	B-005-0-23
PID:	118055	SFN:	N/A	DRILLING METHOD:	2.25" HSA	CALIBRATION DATE:	3/8/24	ELEVATION:
START:	6/27/24	END:	6/27/24	SAMPLING METHOD:	SPT	ENERGY RATIO (%):	79	LAT / LONG:
MATERIAL DESCRIPTION AND NOTES		ELEV	DEPTH	SPT / RQD	N ₆₀ (%)	REC SAMPLE ID	HP (tsf)	GRADATION (%)
10.0" TOPSOIL (DRILLERS DESCRIPTION)		930.5						ATTERBERG
HARD, BROWN AND GRAYISH BROWN, CLAY , SOME SILT, SOME SAND, TRACE GRAVEL, SS-1 CONTAINS TRACE ROOTS, DAMP		929.7						ODOT CLASS (G)
VERY STIFF, BROWN MOTTLED WITH GRAY AND ORANGISH BROWN, CLAY , SOME SILT, LITTLE SAND, TRACE GRAVEL, IRON STAINING, MOIST TO DAMP		925.0						BACK FILL
VERY STIFF, DARK GRAYISH BROWN, CLAY , "AND" SILT, LITTLE SAND, TRACE GRAVEL, MOIST		917.5						
VERY STIFF, BROWN MOTTLED WITH GRAY AND ORANGISH BROWN, SILTY CLAY , LITTLE SAND, TRACE GRAVEL, IRON STAINING, MOIST		915.0						
HARD, BROWN AND GRAYISH BROWN, SANDY SILT , SOME CLAY, TRACE TO LITTLE GRAVEL, TRACE IRON STAINING, DAMP		912.5						
NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 1 BAG HOLE PLUG; SHOVELLED SOIL CUTTINGS		905.5		EOB	25			

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 1 BAG HOLE PLUG; SHOVELLED SOIL CUTTINGS

GEOTECHNICAL PROFILE - ROADWAY (LIGHT TOWER)

BORING LOG B-005-0-23

DESIGN AGENCY	Stantec
10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-8200	
DESIGNER	MSJ
REVIEWER	EMK
PROJECT ID	10-31-24
SUBSET	118055
TOTAL	17 19
SHEET	P.241
TOTAL	243

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NOTES: GROUNDWATER ENCOUNTERED AT 18.0' DURING DRILLING, 8.0' AFTER DRILLING.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: REQUIRED 1 BAG HOLE BBL (G: SHOVEL

ABANDONMENT | METHODS | MATERIALS, QUANTITIES, FOUNDED | BAG HOLE FLUX, SHOVELLED SOIL CUMMINGS

DE
DE
DE
PR

GEOTECHNICAL PROFILE - ROADWAY (L)
BORING LOG B-011-0-23

DESIGN AGENCY
**Stantec**
10200 Alliance Road
Suite 300
Cincinnati, OH 45244
(513) 642-8200

DESIGNER
MSJ

REVIEWER
JKM 10-31

PROJECT ID
118055

SUBSET	TOTAL
18	1

SPREAD SHEET TOTAL
232 33

GEOTECHNICAL PROFILE - ROADWAY (IGHT TOWER)

BORING LOG B-011-0-23

APPENDIX B

BORING AND PAVEMENT CORE LOGS

PROJECT: AUG-33-15.65	DRILLING FIRM / OPERATOR: NEAS / RW	DRILL RIG: CME 45B	STATION / OFFSET: 11+17, 26' LT.	EXPLORATION ID: B-004-0-23																				
TYPE: LIGHT TOWER	SAMPLING FIRM / LOGGER: STANTEC / GK	HAMMER: CME AUTOMATIC	ALIGNMENT: US 33																					
PID: 118055 SFN: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 929.0 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1																				
START: 6/27/24 END: 6/27/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 40.553799, -84.170091																					
MATERIAL DESCRIPTION AND NOTES		ELEV. 929.0	DEPTHs	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL				
10.0" TOPSOIL (DRILLERS DESCRIPTION)		928.2			1	4			GR	CS	FS	SI	CL	LL	PL	PI								
HARD, BROWNISH GRAY AND BROWN, SILTY CLAY , SOME SAND, LITTLE GRAVEL, SS-1 CONTAINS TRACE ROOTS, MOIST TO DAMP		923.5			2	6	8	18	67	SS-1	4.50	-	-	-	-	-	-	18	A-6b (V)	-				
DENSE, BROWN, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, DAMP		921.0			4	6	11	22	80	SS-2	4.50	13	8	14	30	35	36	17	19	15	A-6b (10)	-		
VERY STIFF TO HARD, GRAYISH BROWN, SANDY SILT , SOME CLAY, TRACE TO LITTLE GRAVEL, MOIST		916.0			6	3	10	36	87	SS-3	-	1	4	54	24	17	NP	NP	NP	14	A-4a (1)	-		
VERY STIFF, BROWN MOTTLED WITH GRAY, SILT AND CLAY , SOME SAND, TRACE GRAVEL, MOIST		913.5			7	17																		
VERY STIFF TO HARD, BROWN BECOMING GRAY, SANDY SILT , SOME CLAY, TRACE GRAVEL, DAMP		905.0			9	3	3	8	80	SS-4	3.25	-	-	-	-	-	-	-	-	23	A-4a (V)	-		
MEDIUM DENSE, BROWNISH GRAY, COARSE AND FINE SAND , LITTLE SILT, TRACE CLAY, TRACE GRAVEL, MOIST		904.0			10																			
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PROJECT: AUG-33-15.65	DRILLING FIRM / OPERATOR: NEAS / RW	DRILL RIG: CME 45B	STATION / OFFSET: 239+58, 20' LT.	EXPLORATION ID																
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: STANTEC / GK	HAMMER: CME AUTOMATIC	ALIGNMENT: US 33	B-007-0-23																
PID: 118055 SFN: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 914.8 (MSL) EOB: 7.5 ft.	PAGE																
START: 6/26/24 END: 6/26/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 40.555726, -84.178984	1 OF 1																
MATERIAL DESCRIPTION AND NOTES	ELEV. 914.8	DEPTHs	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI					
12.0" TOPSOIL (DRILLERS DESCRIPTION)	913.8																			
HARD, BROWN, SILTY CLAY, SOME SAND, TRACE GRAVEL, MOIST	911.8			1																
VERY STIFF, DARK BROWN AND GRAY, CLAY, "AND" SILT, LITTLE SAND, TRACE GRAVEL, SLIGHTLY ORGANIC, TRACE IRON STAINING, MOIST	907.3			2	4	9	60	SS-1	4.50	10	8	18	31	33	33	17	16	22	A-6b (8)	<100
				3	3	4														
				4	1	5	8	SS-2	2.75	5	5	13	37	40	44	22	22	24	A-7-6 (14)	-
				5	3	5	11	SS-3	2.25	-	-	-	-	-	-	-	-	26	A-7-6 (V)	-
				6	5	6	18	SS-4	2.50	-	-	-	-	-	-	-	-	28	A-7-6 (V)	-
				7	8															
		EOB																		
NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.																				
ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELLED SOIL CUTTINGS																				

PROJECT: AUG-33-15.65	DRILLING FIRM / OPERATOR: NEAS / RW	DRILL RIG: CME 45B	STATION / OFFSET: 241+17, 22' LT.	EXPLORATION ID B-008-0-23
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: STANTEC / GK	HAMMER: CME AUTOMATIC	ALIGNMENT: US 33	
PID: 118055 SFN: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 915.2 (MSL) EOB: 7.5 ft.	PAGE
START: 6/26/24 END: 6/26/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 40.555736, -84.178410	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 915.2	DEPTH(S)	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
10.0" TOPSOIL (DRILLERS DESCRIPTION)	914.4			1															
HARD, BROWN MOTTLED WITH GRAY, SILTY CLAY , SOME SAND, TRACE GRAVEL, TRACE IRON STAINING, DAMP				2	4	6	21	67	SS-1	4.50	10	8	13	31	38	34	18	16	13
				3	5	8	26	80	SS-2	4.50	-	-	-	-	-	-	-	-	13
				4	5	10	30	53	SS-3	4.50	-	-	-	-	-	-	-	-	13
				5	10	13	41	72	SS-4	4.50	11	10	13	31	35	29	17	12	13
HARD, BROWN, SILT AND CLAY , SOME SAND, LITTLE GRAVEL, DAMP	907.7	EOB		6	10	13	18												

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: AUG-33-15.65	DRILLING FIRM / OPERATOR: NEAS / RW	DRILL RIG: CME 45B	STATION / OFFSET: 400+86, 25' LT.	EXPLORATION ID: B-010-0-23															
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: STANTEC / GK	HAMMER: CME AUTOMATIC	ALIGNMENT: US 33																
PID: 118055 SFN: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 920.6 (MSL) EOB: 7.5 ft.	PAGE: 1 OF 1															
START: 6/27/24 END: 6/27/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 40.555363, -84.173371																
MATERIAL DESCRIPTION AND NOTES	ELEV. 920.6	DEPTHs	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
11.0" TOPSOIL (DRILLERS DESCRIPTION)	919.7																		
HARD, BROWN, SILTY CLAY, SOME SAND, TRACE GRAVEL, DAMP	917.6	1																	
VERY STIFF TO HARD, DARK BROWN AND GRAY, CLAY, "AND" SILT, LITTLE SAND, TRACE GRAVEL, SLIGHTLY ORGANIC, MOIST TO DAMP	913.1	2	5 7 9	21	72	SS-1	4.50	5	7	14	33	41	37	18	19	15	A-6b (11)	<100	
		3	2 1 3	5	47	SS-2	2.25	1	4	12	37	46	48	22	26	26	A-7-6 (16)	-	
		4	1 3 9	16	67	SS-3	3.00	-	-	-	-	-	-	-	-	20	A-7-6 (V)	-	
		5	6 7 9	21	100	SS-4	4.25	-	-	-	-	-	-	-	-	24	A-7-6 (V)	-	
		6																	
		7																	
		EOB																	
NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.																			
ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELLED SOIL CUTTINGS																			

PROJECT: AUG-33-15.65	DRILLING FIRM / OPERATOR: NEAS / RW	DRILL RIG: CME 45B	STATION / OFFSET: 410+65, 25' LT.	EXPLORATION ID B-013-0-23															
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: STANTEC / GK	HAMMER: CME AUTOMATIC	ALIGNMENT: US 33																
PID: 118055 SFN: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 917.5 (MSL) EOB: 7.5 ft.	PAGE															
START: 6/25/24 END: 6/25/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 40.554821, -84.169930	1 OF 1															
MATERIAL DESCRIPTION AND NOTES	ELEV. 917.5	DEPTHs	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				

18.0" TOPSOIL (DRILLERS DESCRIPTION)

LOOSE, BROWNISH GRAY, **STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, RESEMBLES GRANULAR BASE, DAMP (FILL)

MEDIUM DENSE, BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, WET TO MOIST

MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, WET

916.0

913.2

910.3

910.0 EOB

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: AUG-33-15.65		DRILLING FIRM / OPERATOR: NEAS / RW				DRILL RIG: CME 45B				STATION / OFFSET: 413+03, 26' LT.				EXPLORATION ID B-014-0-23				
TYPE: SUBGRADE		SAMPLING FIRM / LOGGER: STANTEC / GK				HAMMER: CME AUTOMATIC				ALIGNMENT: US 33								
PID: 118055 SFN: N/A		DRILLING METHOD: 2.25" HSA				CALIBRATION DATE: 3/8/24				ELEVATION: 917.0 (MSL) EOB: 7.5 ft.				PAGE 1 OF 1				
START: 6/26/24 END: 6/26/24		SAMPLING METHOD: SPT				ENERGY RATIO (%): 79				LAT / LONG: 40.554750, -84.169079								
MATERIAL DESCRIPTION AND NOTES			ELEV.	DEPTHs		SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)				ATTERBERG			
18.0" TOPSOIL (DRILLERS DESCRIPTION)			917.0								GR	CS	FS	SI	CL	LL	PL	PI
STIFF, DARK BROWN AND BROWN, SILTY CLAY , SOME SAND, TRACE GRAVEL, SLIGHTLY ORGANIC, CONTAINS TRACE ROOTS, MOIST			915.5			1												
STIFF TO VERY STIFF, BROWN MOTTLED WITH GRAY AND ORANGISH BROWN, SILTY CLAY , SOME SAND, TRACE GRAVEL, TRACE IRON STAINING, MOIST			914.0			2	1	2	SS-1	1.50	1	3	25	37	34	39	19	20
MEDIUM DENSE, BROWN, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, WET			911.0			3	1	2	SS-2	1.50	2	3	23	38	34	36	18	18
			909.5			4	1	2	SS-3	2.00	-	-	-	-	-	-	-	19
						5	3	3	SS-4	-	-	-	-	-	-	-	-	21
						6	3	3										
						7	3	8										

PROJECT: AUG-33-15.65	DRILLING FIRM / OPERATOR: NEAS / RW	DRILL RIG: CME 45B	STATION / OFFSET: 418+25, 5' LT.	EXPLORATION ID B-017-0-23
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: STANTEC / GK	HAMMER: CME AUTOMATIC	ALIGNMENT: US 33	
PID: 118055 SFN: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 920.7 (MSL) EOB: 7.5 ft.	PAGE
START: 6/26/24 END: 6/26/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 40.554586, -84.167231	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 920.7	DEPTH(S)	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL		
								GR	CS	FS	SI	CL	LL	PL	PI						
10.0" ASPHALT AND 3.0" BASE (DRILLERS DESCRIPTION)	919.6			1																	
HARD, BROWN AND GRAY, SILTY CLAY, SOME SAND, TRACE GRAVEL, SS-2 CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP TO MOIST				2	6	18	100	SS-1	4.50	6	7	14	37	36	37	18	19	16	A-6b (11)	190	
				3	2																
				4	6	7	27	SS-2	-	-	-	-	-	-	-	-	-	19	A-6b (V)	-	
STIFF TO VERY STIFF, BROWNISH GRAY, CLAY, "AND" SILT, LITTLE SAND, TRACE GRAVEL, MOIST TO DAMP	916.2			5	1	2	8	60	SS-3	1.50	2	4	13	41	40	43	18	25	23	A-7-6 (15)	-
				6	4																
				7	6	9	20	87	SS-4	3.00	-	-	-	-	-	-	-	16	A-7-6 (V)	-	
		EOB																			

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: AUG-33-15.65	DRILLING FIRM / OPERATOR: NEAS / RW	DRILL RIG: CME 45B	STATION / OFFSET: 424+02, 14' LT.	EXPLORATION ID															
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: STANTEC / GK	HAMMER: CME AUTOMATIC	ALIGNMENT: US 33	B-020-0-23															
PID: 118055 SFN: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 920.0 (MSL) EOB: 7.5 ft.	PAGE															
START: 6/26/24 END: 6/26/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 40.554798, -84.165177	1 OF 1															
MATERIAL DESCRIPTION AND NOTES	ELEV. 920.0	DEPTHs	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
11.0" TOPSOIL (DRILLERS DESCRIPTION)	919.1			1															
STIFF TO VERY STIFF, BROWN AND GRAY, SILT AND CLAY, SOME SAND, TRACE TO LITTLE GRAVEL, SS-1 CONTAINS WOOD FRAGMENTS, DAMP TO MOIST				2	3	SS-1	4.00	16	11	17	30	26	30	16	14	15	A-6a (6)	180	
				3	2	6	11	67											
				4	10	8	21	93	SS-2	2.00	6	8	18	37	31	31	18	A-6a (8)	-
				5	3	4	13	80	SS-3	3.50	-	-	-	-	-	-	24	A-6a (V)	-
				6	5	6	24	100	SS-4	3.00	-	-	-	-	-	-	25	A-6a (V)	-
				7	6	12													
		EOB																	
NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.																			
ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS																			

X-9 CORE LOG

Core Location: US-33 West Right Lane Shoulder

156+64, 19.3' Lt.

Project: AUG-33-15.65 Date: 6/24/2024

Location: Auglaize County, Ohio Core Type / Alignment: Pavement / Vertical

Client: TranSystems Coring Crew: NEAS

Core Barrel Size (O.D.): 4" Hole Patched w/: Cold Patch Asphalt

Photograph and Core Depth	Description and Noted Features of Core Sample
	<p>Note: Due to the angle at which the photographs were taken, the description to the right of the above core may appear to be slightly above or below the actual feature being described.</p> <p>ASPHALT PAVEMENT FROM 0.0 – 8.5"</p> <p>PAVEMENT CORE DIAMETER = 3.75"</p> <p>LONGITUDINAL CRACKS AND TIRE RUTTING WERE OBSERVED ON THE PAVEMENT SURFACE IN THE VICINITY OF THE CORE LOCATION.</p> <p>ASPHALT PAVEMENT APPEARS TO BE IN FAIR CONDITION.</p> <p>BOTTOM OF CORE MATERIAL: GRANULAR BASE</p> <p>PAVEMENT HOLE DEPTH = 8.5"</p>

Location Photos

Core Vicinity	After Coring
	

X-12 CORE LOG

Core Location: US-33 West Right Lane Shoulder

162+92, 18.4' Lt.

Project: AUG-33-15.65 Date: 6/24/2024

Location: Auglaize County, Ohio Core Type / Alignment: Pavement / Vertical

Client: TranSystems Coring Crew: NEAS

Core Barrel Size (O.D.): 4" Hole Patched w/: Cold Patch Asphalt

Photograph and Core Depth	Description and Noted Features of Core Sample
	<p>Note: Due to the angle at which the photographs were taken, the description to the right of the above core may appear to be slightly above or below the actual feature being described.</p> <p>ASPHALT PAVEMENT FROM 0.0 – 8.5"</p> <p>PAVEMENT CORE DIAMETER = 3.75"</p> <p>LONGITUDINAL CRACKS AND TIRE RUTTING WERE OBSERVED ON THE PAVEMENT SURFACE IN THE VICINITY OF THE CORE LOCATION.</p> <p>ASPHALT PAVEMENT APPEARS TO BE IN FAIR CONDITION.</p> <p>BOTTOM OF CORE MATERIAL: GRANULAR BASE</p> <p>PAVEMENT HOLE DEPTH = 8.5"</p>

Location Photos

Core Vicinity	After Coring
	

X-15 CORE LOG

Core Location: US-33 West Right Lane Shoulder
170+13, 17.9' Lt.

Project: Aug-33-15.65 Date: 6/28/2024
Location: Auglaize County, Ohio Core Type / Alignment: Pavement / Vertical
Client: TranSystems Coring Crew: NEAS
Core Barrel Size (O.D.): 4" Hole Patched w/: Cold Patch Asphalt

Photograph and Core Depth	Description and Noted Features of Core Sample
	<p>Note: Due to the angle at which the photographs were taken, the description to the right of the above core may appear to be slightly above or below the actual feature being described.</p> <p>ASPHALT PAVEMENT FROM 0.0 – 8.5"</p> <p>PAVEMENT CORE DIAMETER = 3.75"</p> <p>LONGITUDINAL CRACKS AND TIRE RUTTING WERE OBSERVED ON THE PAVEMENT SURFACE IN THE VICINITY OF THE CORE LOCATION.</p> <p>ASPHALT PAVEMENT APPEARS TO BE IN FAIR CONDITION.</p> <p>BOTTOM OF CORE MATERIAL: GRANULAR BASE</p> <p>PAVEMENT HOLE DEPTH = 8.5"</p>

Location Photos

Core Vicinity	After Coring
	

X-19 CORE LOG

Core Location: US-33 West Right Lane Shoulder

176+17.1, 19.1' Lt.

Project: Aug-33-15.65

Date: 6/28/2024

Location: Auglaize County, Ohio

Core Type / Alignment: Pavement / Vertical

Client: TranSystems

Coring Crew: NEAS

Core Barrel Size (O.D.): 4"

Hole Patched w/: Cold Patch Asphalt

Photograph and Core Depth	Description and Noted Features of Core Sample
 A photograph of a cylindrical asphalt core sample. The sample is dark grey with visible aggregate pieces. It is placed next to a yellow tape measure for scale. The tape measure shows markings from 0 to 12 inches.	<p>Note: Due to the angle at which the photographs were taken, the description to the right of the above core may appear to be slightly above or below the actual feature being described.</p> <p>ASPHALT PAVEMENT FROM 0.0 – 8.00"</p> <p>PAVEMENT CORE DIAMETER = 3.75"</p> <p>LONGITUDINAL CRACKS AND TIRE RUTTING WERE OBSERVED ON THE PAVEMENT SURFACE IN THE VICINITY OF THE CORE LOCATION.</p> <p>ASPHALT PAVEMENT APPEARS TO BE IN FAIR CONDITION.</p> <p>BOTTOM OF CORE MATERIAL: GRANULAR BASE</p> <p>PAVEMENT HOLE DEPTH = 8.00"</p>

Location Photos

Core Vicinity	After Coring
 A photograph showing a worker in a bright yellow safety vest standing next to a core drilling rig. The rig is connected to a hose. The background shows a paved road and some utility poles under a clear sky.	 A close-up photograph of a circular hole in the asphalt surface. The hole is deep and appears to be a coring sample.

APPENDIX C

SUBGRADE ANALYSIS

OHIO DEPARTMENT OF TRANSPORTATION**OFFICE OF GEOTECHNICAL ENGINEERING****PLAN SUBGRADES**
Geotechnical Design Manual Section 600

Instructions: Enter data in the shaded cells only.

(Enter state route number, project description, county, consultant's name, prepared by name, and date prepared. This information will be transferred to all other sheets. The date prepared must be entered in the appropriate cell on this sheet to remove these instructions prior to printing.)

AUG-33-15.65**118055**

**Roadway widening and roundabout construction at the IR 75 and US 33 exchange in
Auglaize County**

Stantec

Prepared By: James Samples

Date prepared: Friday, February 21, 2025

Stantec Consulting Services
10200 Alliance Rd.
Suite 300
Cincinnati, OH 45242
513-842-8204
james.samples@stantec.com

NO. OF BORINGS:**13**

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-008-0-23	US 33	241+17	22	Lt	CME 45B	79	915.2	914.9	0.3 C
2	B-009-0-23	US 33	245+19	21	Rt	CME 45B	79	915.8	917.1	1.3 F
3	B-010-0-23	US 33	400+86	25	Lt	CME 45B	79	920.6	920.8	0.2 F
4	B-011-0-23	US 33	406+05	23	Rt	CME 45B	79	920.1	919.6	0.5 C
5	B-012-0-23	US 33	408+91	29	Lt	CME 45B	79	918.3	918.5	0.2 F
6	B-013-0-23	US 33	410+65	25	LT	CME 45B	79	917.5	917.9	0.4 F
7	B-014-0-23	US 33	413+03	26	Lt	CME 45B	79	917.0	917.9	0.9 F
8	B-015-0-23	US 33	415+48	49	Lt	CME 45B	79	917.3	919.9	2.6 F
9	B-016-0-23	US 33	416+59	4	Lt	CME 45B	79	919.7	921.4	1.7 F
10	B-017-0-23	US 33	418+25	5	Lt	CME 45B	79	920.7	920.6	0.1 C
11	B-018-0-23	US 33	419+82	24	Rt	CME 45B	79	921.4	920.0	1.4 C
12	B-019-0-23	US 33	421+90	14	Lt	CME 45B	79	920.0	920.6	0.6 F
13	B-020-0-23	US 33	424+02	14	Lt	CME 45B	79	920.0	921.4	1.4 F



#	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		
			From	To	From	To																				
1	B 008-0 23	SS1	1.5	3.0	1.2	2.7	21	21	4.5	34	18	16	31	38	69	13	16	A-6b	9	27						
		SS2	3.0	4.5	2.7	4.2	26		4.5										13	16	A-6b	16				
		SS3	4.5	6.0	4.2	5.7	30		4.5	29	17	12	31	35	66	13	16	A-6b	7							
		SS4	6.0	7.5	5.7	7.2	41		4.5										13	14	A-6a					
2	B 009-0 23	SS1	1.5	3.0	2.8	4.3	13	13	3	38	19	19	30	39	69	16	16	A-6b	10	40						
		SS2	3.0	4.5	4.3	5.8	22		4.5	33	17	16	33	37	70	15	16	A-6b	9							
		SS3	4.5	6.0	5.8	7.3	22		4.5										13	16	A-6b					
		SS4	6.0	7.5	7.3	8.8	30		4.5										15	16	A-6b					
3	B 010-0 23	SS1	1.5	3.0	1.7	3.2	21	5	4.5	37	18	19	33	41	74	15	16	A-6b	11	27						
		SS2	3.0	4.5	3.2	4.7	5		2	48	22	26	37	46	83	26	19	A-7-6	16							
		SS3	4.5	6.0	4.7	6.2	16		3										20	18	A-7-6	16				
		SS4	6.0	7.5	6.2	7.7	21		2.5										24	18	A-7-6					
4	B 011-0 23	SS1	1.5	3.0	1.0	2.5	24	12	4.5	37	17	20	36	35	71	14	16	A-6b	11	20						
		SS2	3.0	4.5	2.5	4.0	12		3										30	16	A-6b	16				
		SS3	4.5	6.0	4.0	5.5	21		3										15	16	A-6b	16				
		SS4	6.0	7.5	5.5	7.0	28		4.5										17	16	A-6b					
5	B 012-0 23	SS1	1.5	3.0	1.7	3.2	11	7	2	36	17	19	34	30	64	19	16	A-6b	9	107						
		SS2	3.0	4.5	3.2	4.7	7		1.75	42	21	21	40	37	77	24	18	A-7-6	13							
		SS3	4.5	6.0	4.7	6.2	11		1.5										25	18	A-7-6	16				
		SS4	6.0	7.5	6.2	7.7	18		1.5										24	18	A-7-6					
6	B 013-0 23	SS1	1.5	3.0	1.9	3.4	9	7										7	10	A-2-4	0	47				
		SS2	3.0	4.5	3.4	4.9	7			22	16	6	20	10	30	11	10	A-2-4	0							
		SS3	4.5	6.0	4.9	6.4	20		2	0	0	NP	39	16	55	19	11	A-4a	4							
		SS4	6.0	7.5	6.4	7.9	18		2.5										15	10	A-4a					
7	B 014-0 23	SS1	1.5	3.0	2.4	3.9	9	7	1	39	19	20	37	34	71	22	16	A-6b	11	67						
		SS2	3.0	4.5	3.9	5.4	7		0.75	36	18	18	38	34	72	24	16	A-6b	11							
		SS3	4.5	6.0	5.4	6.9	8		1										19	16	A-6b					
		SS4	6.0	7.5	6.9	8.4	14												21	10	A-4a					
8	B 015-0 23	SS1	1.5	3.0	4.1	5.6	17	17	3.5	33	17	16	28	32	60	14	16	A-6b	7	5700						
		SS2	3.0	4.5	5.6	7.1	17		2.5										17	16	A-6b					
		SS3	4.5	6.0	7.1	8.6	11		1.25	46	23	23	39	40	79	26	20	A-7-6								
		SS4	6.0	7.5	8.6	10.1	18		1.5										17	18	A-7-6					
9	B 016-0 23	SS1	1.5	3.0	3.2	4.7	22	8		35	18	17	34	30	64	14	16	A-6b	9	120						
		SS2	3.0	4.5	4.7	6.2	8		1.25	37	20	17	39	34	73	20	16	A-6b	10							
		SS3	4.5	6.0	6.2	7.7	8		1.25	42	19	23	31	37	68	20	18	A-7-6								
		SS4	6.0	7.5	7.7	9.2	28		3.5										13	18	A-7-6					



#	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		
			From	To	From	To																				
10	B 017-0 23	SS1	1.5	3.0	1.4	2.9	18	8	3	37	18	19	37	16	53	16	16	A-6b	7	193						
		SS2	3.0	4.5	2.9	4.4	17										19	16	A-6b	16						
		SS3	4.5	6.0	4.4	5.9	8		1.5	43	18	25	41	40	81	23	18	A-7-6	15							
		SS4	6.0	7.5	5.9	7.4	20		3								16	18	A-7-6							
11	B 018-0 23	SS1	1.5	3.0	0.1	1.6	18	8	4	33	16	17	33	31	64	13	16	A-6b	9	500						
		SS2	3.0	4.5	1.6	3.1	11		2								18	16	A-6b	16						
		SS3	4.5	6.0	3.1	4.6	8		2	36	17	19	34	32	66	18	16	A-6b	10							
		SS4	6.0	7.5	4.6	6.1	24		4								25	16	A-6b	16						
12	B 019-0 23	SS1	1.5	3.0	2.1	3.6	13	13	3	39	18	21	35	33	68	18	16	A-6b	11	173						
		SS2	3.0	4.5	3.6	5.1	16		4.5	38	17	21	31	29	60	18	16	A-6b	9							
		SS3	4.5	6.0	5.1	6.6	22		4								20	16	A-6b							
		SS4	6.0	7.5	6.6	8.1	30		2								22	16	A-6b							
13	B 020-0 23	SS1	1.5	3.0	2.9	4.4	11	11	4	30	16	14	30	26	56	15	14	A-6a	6	180						
		SS2	3.0	4.5	4.4	5.9	21		2	31	18	13	37	31	68	17	14	A-6a	8							
		SS3	4.5	6.0	5.9	7.4	13		3.5								24	14	A-6a							
		SS4	6.0	7.5	7.4	8.9	24		3								25	14	A-6a							

PID: 118055

County-Route-Section: AUG-33-15.65

No. of Borings: 13

Geotechnical Consultant: Stantec

Prepared By: James Samples

Date prepared: 2/21/2025

Chemical Stabilization Options		
320	Rubblize & Roll	No
206	Cement Stabilization	Option
	Lime Stabilization	Option
206	Depth	14"

Excavate and Replace Stabilization Options		
Global Geotextile	Average(N60L):	12"
Average(HP):	0"	
Global Geogrid	Average(N60L):	0"
Average(HP):	0"	

Design CBR	6
------------	---

% Samples within 3 feet of subgrade			
N ₆₀ ≤ 5	0%	HP ≤ 0.5	0%
N ₆₀ < 12	12%	0.5 < HP ≤ 1	2%
12 ≤ N ₆₀ < 15	7%	1 < HP ≤ 2	5%
N ₆₀ ≥ 20	10%	HP > 2	24%
M+	2%		
Rock	0%		
Unstable Soil	0%		

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

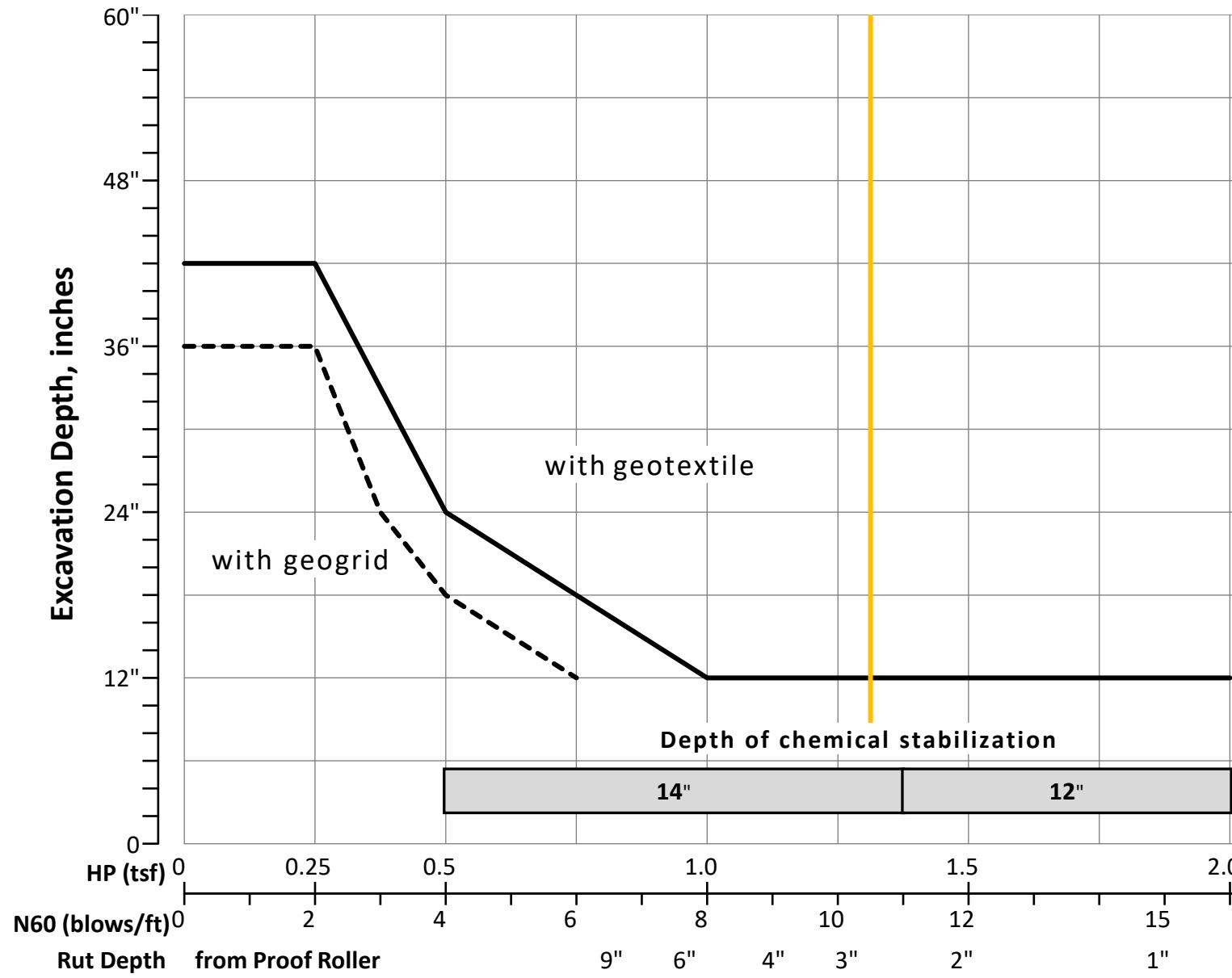
% Proposed Subgrade Surface	
Unstable & Unsuitable	25%
Unstable	25%
Unsuitable (Soil & Rock)	0%

	N ₆₀	N _{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M _c	M _{opt}	GI
Average	17	11	2.89	35	17	18	34	32	67	18	16	11
Maximum	41	21	4.50	48	23	26	41	46	83	30	20	16
Minimum	5	5	0.75	0	0	6	20	10	30	7	10	0

Classification Counts by Sample																				
ODOT Class	UCF	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	0	0	0	0	2	0	0	0	0	0	3	0	0	5	30	0	12	0	0	52
Percent	0%	0%	0%	0%	4%	0%	0%	0%	0%	0%	6%	0%	0%	10%	58%	0%	23%	0%	0%	100%
% Rock Granular Cohesive	0%	0%																		100%
Surface Class Count	0	0	0	0	1	0	0	0	0	0	0	0	0	0	11	0	0	0	0	12
Surface Class Percent	0%	0%	0%	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	92%	0%	0%	0%	0%	100%



Fig. 600-1 – Subgrade Stabilization

OVERIDE TABLE

Calculated Average	New Values	Check to Override
2.89	2.00	<input type="checkbox"/> HP
10.54	6.00	<input type="checkbox"/> N _{60L}

Average HP

Average N_{60L}