
**FINAL REPORT
STRUCTURE FOUNDATION EXPLORATION
BARRIERS 1, 4 & 7
MAH-680-09.30
MAHONING COUNTY, OHIO
PID#: 110931**

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NEAS PROJECT 21-0064

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EXECUTIVE SUMMARY

The Ohio Department of Transportation (ODOT) has proposed noise abatement project (MAH-680-09.30, PID 110931) in the township of Boardman, Mahoning County, Ohio. The project begins from Tara Ct and continues along IR-680 northward to the interchange of IR-680 and E Midlothian Blvd. The proposed project consists of construction of two noise barriers: Noise Barrier 4 and Noise Barrier 7. The overall project objective is to reduce noise on IR-680 northbound and the referenced interchange.

National Engineering and Architectural Services Inc. (NEAS) has been contracted to perform geotechnical engineering services for the project. The purpose of the geotechnical engineering services was to perform geotechnical explorations within the project limits to obtain information concerning the subsurface soil and groundwater conditions relevant to the design and construction of the project. Between October 27, 2022, and November 17, 2022, NEAS performed the site reconnaissance and exploration program for the project. The subsequent document presents the results of a structure foundation exploration with respect to two noise barrier walls (Noise Barrier 4 and Noise Barrier 7).

The construction of noise walls along of the IR-680 is proposed to protect local noise-sensitive land from traffic. The proposed noise walls include the following: 1) Noise Barrier 4, an approximate 1,728 ft long, maximum 14.0 ft tall noise wall from Station 4000+00 to Station 4017+28 (Barrier 4 alignment) along the east side of IR-680; and 2) Noise Barrier 7, an approximate 3,300 ft long, maximum 16.0 ft tall noise wall from Station 700+00 to Station 733+00 (Barrier 7 alignment) along the east side of IR-680. The proposed noise wall foundations are assumed to be constructed using ODOT standard 30-inch diameter drilled shafts with a maximum length of 30 ft.

The subsurface profile at both noise wall sites consists of both fine-grained cohesive soils (A-4a, A-4b, A-6a, A-6b and A-7-6) and granular soils (A-1-a, A-1-b, A-2-4, A-3, A-3a, A-4a and A-4b) atop weathered bedrock. Bedrock elevations at the noise barrier sites were encountered from 1021.4 ft to 1062.1 ft amsl, putting bedrock at a depth of 8.5 to 23.5 ft below ground surface (bgs). Bedrock was logged as highly weathered to slightly weathered Shale and Sandstone. Interbedded Shale and Limestone was encountered at the depth of 9.0 ft (elevation of 1024.7 ft) at the boring B-024-0-21 of the Barrier 7 site. The top of bedrock decreases from south to north of the project site.

Based on the Corrected N-value, it was determined that the proposed Barrier 4 and Barrier 7 foundation soil conditions will provide adequate drilled shaft resistance assuming it is designed and constructed in accordance with the recommendations provided within this report, as well as all applicable standards and specifications (i.e., ODOT Bridge Design Manual) for noise wall design and construction.

Global stability was performed for the critical cross section at STA. 121+50 at Barrier 1 site for long-term (Effective Stress) and short-term (Total Stress) slope stability. Based on our slope stability analyses for the referenced location, the minimum slope stability safety factors for short-term (Total Stress) and long-term (Effective Stress) conditions exceeded the desired value of 1.3. It is our opinion that the subsurface conditions encountered at the project site are generally satisfactory and the site can be considered to be stable at short-term and long-term condition.

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1. INTRODUCTION

1.1. General

NEAS presents our Structure Foundation Exploration Report for the proposed construction of two noise barrier walls (Noise Barrier 1, Noise Barrier 4 and Noise Barrier 7) as part of the proposed project MAH-680-09.30 (PID 110931). The referenced project will be located along IR-680 from Tara Ct to the interchange of IR-680 and E Midlothian Blvd in Mahoning County, Ohio. The overall project objective is to reduce noise on IR-680 northbound and the referenced interchange. This report presents a summary of the encountered surficial and subsurface conditions and our recommendations for noise barrier foundation design and construction in accordance with Load and Resistance Factor Design (LRFD) method as set forth in AASHTO's Publication *LRFD Bridge Design Specifications, 9th Edition* with 2020 interim revisions (BDS) (AASHTO, 2020), *ODOT's 2020 LRFD Bridge Design Manual (BDM)* (ODOT, 2023) and *ODOT's Geotechnical Design Manual (BDM)* (ODOT, 2023).

The exploration for noise barriers was conducted in general accordance with Barr Engineering, Inc.'s DBA NEAS, Inc. proposal to IBI GROUP, dated September 2, 2021, and with the provisions of ODOT's *Specifications for Geotechnical Explorations (SGE)* (ODOT, 2021).

The scope of work performed by NEAS as part of the referenced project included: a review of published geotechnical information; performing 26 total test borings; laboratory testing of soil samples in accordance with the SGE; performing geotechnical engineering analysis to assess foundation design and construction considerations; and development of this summary report.

1.2. Proposed Construction

The construction of noise walls along IR-680 is proposed to protect local noise-sensitive land from traffic. The proposed noise walls include the following: 1) Noise Barrier 4, an approximate 1,728 ft long, maximum 14 ft tall noise wall from Station 4000+00 to Station 4017+28 (Barrier 4 alignment) along the east side of IR-680; and 2) Noise Barrier 7, an approximate 3,300 ft long, maximum 16 ft tall noise wall from Station 700+00 to Station 733+00 (Barrier 7 alignment) along the east side of IR-680.

The proposed noise wall foundations are assumed to be constructed using ODOT standard 30-inch diameter drilled shafts with a maximum length of 30 ft.

2. GEOLOGY AND OBSERVATIONS OF THE PROJECT

2.1. Geology and Physiography

The project site is located within the Killbuck-Glaciated Pittsburgh Plateau part of the Glaciated Allegheny (Southern New York Plateaus) with portions located near lake basin/deposits outside of the Huron-Erie Lake Plains. The Killbuck-Glaciated Pittsburgh Plateau region is characterized by ridges and flat uplands of moderate relief generally above 1,200 ft, covered with thin drift and dissected by steep valleys. Valley segments alternate between broad drift-filled and narrow rock-walled reaches. Elevations of the region ranges from 600 to 1,505 ft amsl, with moderate relief (200 ft). The geology within this region is described as thin to thick Wisconsinan-age clay to loam till over Mississippian- and Pennsylvanian-age shales,

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sandstones, conglomerates, and coals. The lake basin/deposits are characterized as extremely flat plains often comprised of sandy beach ridges and dunes formed along the shore of ancient lakes. (ODGS, 1998).

The geology at the project site is mapped as an average of 10 ft of Wisconsinan-age sand and gravel underlain by an average of 30 ft of Wisconsinan-age clay loamy till, all underlain by Pennsylvanian-age Shale and Limestone bedrock (ODGS, 2005). The sand and gravel is described as being intermixed and interbedded. Grains are moderately to well sorted, moderately to well rounded, finely stratified to massive, may be cross bedded and may locally contain organics. Sand and gravel in deep buried valleys is noted as potentially being older than Wisconsinan. The clay loamy till is described as having low carbonate content, contains silt, sand, and gravel lenses.

Based on the Bedrock Geologic Units Map of Ohio (USGS & ODGS, 2006), bedrock within the project area consists of shale, limestone, and coal, of the Allegheny and Pottsville Groups, Undivided. This undivided formation is comprised of Pennsylvanian-age shale, limestone, and coal. The shale in this formation is described as black, gray, and olive in color, clayey to silty, locally contains marine fossils, and is calcareous in part. The limestone is described as black to light gray in color, micritic to medium grained, locally grades into flint, thin to medium bedded, and locally nonmarine. The coal is described as banded bituminous and thin to locally as much as 12 ft thick. The bedrock appears to follow the natural topography of the site which falls gently from south to north (ODGS, 2003). Based on the ODNr bedrock topography map of Ohio, bedrock elevations at the project site can be expected to be around 975 to 1050 ft amsl, putting bedrock at a depth of about 47 to 61 ft below ground surface (bgs).

The soils at the project site have been mapped (Web Soil Survey) by the Natural Resources Conservation Service (USDA, 2015) as Chili urban land complex in the southern and northern third of the project. The soils in the central third of the project are mapped as a mix of udorthents, Sebring silt loam, and Jimtown urban land complex. Soils classified as Udorthents are soils that have been disturbed by cutting and filling/covered by building or pavement, and as such are not classified according to the AASHTO method of soil classification. Soils in the Chili series are characterized as very deep, well drained soils formed on outwash plains, terraces, kames, and beach ridges. They are formed in Wisconsinan-age outwash deposits, mainly of non-calcareous sandstone and shale with a large amount of quartz gravel. The Chili series is comprised of primarily coarse-grained soils and classifies as A-1, A-2, and A-4 type soils according to the AASHTO method of soil classification. Soils in the Sebring series are characterized as very deep, poorly drained soils formed in stratified Wisconsinan-age glaciolacustrine sediments on slackwater terraces on lake plains and some local areas on till plains. The Sebring series is comprised of primarily fine-grained soils and classifies as A-4, A-6, and A-7 type soils according to the AASHTO method of soil classification. Soils in the Jimtown series are characterized as very deep, somewhat poorly drained soils formed in outwash deposits on stream terraces, outwash terraces, outwash plains, and beach ridges. The Jimtown series is comprised of both coarse- and fine-grained soils and classifies as A-1, A-2, and A-4 type soils according to the AASHTO method of soil classification.

Chili urban in the south in center udorthents, Sebring silt loam, Jimtown urban land complex, in north chili urban land complex

2.2. Hydrology/Hydrogeology

Groundwater at the project site can be expected at an elevation consistent with that of the nearby tributary to the Mahoning River as it is the most dominant hydraulic influence in the vicinity of the project's boundaries. The water level of the Tributary to Mahoning River may be generally representative of the local groundwater table. However, it should be noted that perched groundwater systems may be existent in areas

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due to the presence of fine-grained soils making it difficult for groundwater to permeate to the phreatic surface.

A small portion of the project site between Mathews Rd. and Nova Ln. is located within a special flood hazard area (1% annual flood chance: Zone X) based on available mapping by the Federal Emergency Management Agency's (FEMA) National Flood Hazard mapping program (FEMA, 2016).

2.3. Mining and Oil/Gas Production

One abandoned underground coal mine (ID#-MG-007) located underneath the off-ramp to Everett Ln. was noted on ODNR's Mines of Ohio Locator in the vicinity of the project site (ODNR [1], 2012).

Two oil and gas wells (ID#: 3409922195) located 600 ft east and 300 ft south of the intersection between Indianola Rd. and South Ave. and (ID#: 3409922262) located just west of the Chapel for the Lake Park Cemetery were noted on ODNR's Oil and Gas Well Locator in the vicinity of the project site (ODNR [1], 2020).

2.4. Historical Records and Previous Phases of Project Exploration

The following report/plans were available for review and evaluation for this report:

- Soil Profile Sheets and Boring Logs for the Light Tower Project MAH-680-0.56 dated April 25, 1975.
- Soil Profile Sheets and Boring Logs for the Soil Profile Investigation Project MAH-680-9.32 dated November 30, 1965.

Historical soil borings associated with the above plans were reviewed. Two historical borings which both encountered top of rock are included in our report. The two historical borings are B-008-0-66 drilled in 1966 from project MAH-680-9.32, sub-batch 5993 and B-029-0-75 drilled in 1975 from project MAH-680-0.56 25, sub-batch 13493, as presented in Table 1 below.

Table 1: Historical Boring Summary

	Location (Sta/offset)	Alignment	Latitude	Longitude	Surface Elevation (ft)	Bedrock Elvation (ft)	Depth (ft)
B-008-0-66	699+66, 62' LT.	Barrier 7	41.050993	-80.629378	1065.6	1040.1	35.0
B-029-0-75	725+24, 40' LT.	Barrier 7	41.057985	-80.628724	1034.9	1022.4	13.0

2.5. Site Reconnaissance

A field reconnaissance visit for the overall project area was conducted on October 27, 2022, along the project portions of IR-680. Site conditions were noted and photographed during the visit. Photographs of notable geotechnical and drainage observations were taken and a summary of our observations by roadway segment are provided below.

2.5.1. Land Use and Cover

The land use of most of the project area consists of Residential Properties, and Woodland.

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2.5.2. *IR-680*

In general, the pavement condition along the project section of IR-680 was observed to be fair with signs of weathering and surface wear. Moderate severity longitudinal and transverse cracking was common along this section, as well as moderate severity, map cracking, rutting, patching and crack sealing deficiencies (Photograph 1). The roadway between mile markers 10.2 and 11.2 is above the surrounding land with slopes down to the surrounding land of about 3H (Horizontal):1V(Vertical). The area adjacent from Lealand Ln. was observed to be steeper than the rest of the eastern slope, roughly 2H:1V with small portions observed to be even steeper at slopes of roughly 1H:1V (Photograph 3). The roadway drained to a drainage ditch at the bottom of the eastern embankment as well as drainage basins in the median. The basins in the median drained to concrete outlets halfway up the eastern embankment (Photograph 4). Signs of erosion were observed at multiple drainage basin outlets (Photograph 5). The area is moderately to heavily vegetated, and signs of standing water such as cattails were observed at multiple points in the drainage ditch.

The roadway between mile markers 10.2 and the northern end of the project is situated in a cut below the surrounding land with slopes up to the surrounding land of about 2H (Horizontal):1V(Vertical) (Photograph 6). The slope was observed to be heavily vegetated and possible drainage channels protected with riprap were observed at intervals along the slope (Photograph 7). The roadway drained to a drainage ditch at the bottom of the eastern embankment as well as a drainage ditch in the median. Both ditches drained to drainage basins in the ditches. Signs of erosion were observed at multiple drainage basin outlets (Photograph 5). The area is heavily vegetated, and signs of standing water such as cattails were observed at multiple points in the drainage ditch.

Photograph 1: Overall Pavement Condition of IR-680 NB



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Photograph 2: Embankment Slope along IR-680 NB Shoulder



Photograph 3: Steeper Section of Eastern Slope



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Photograph 4: Drainage Basin Outlet in Eastern Embankment



Photograph 5: Signs of Erosion at Drainage Basin Outlet

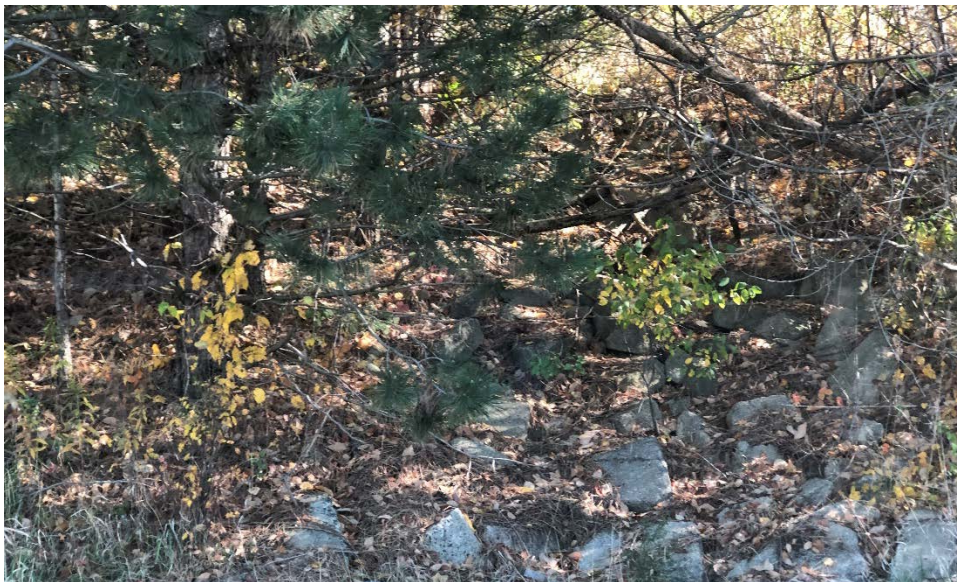


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Photograph 6: Eastern Embankment in Northern Section of Project



Photograph 7: Possible Drainage Channels Along Eastern Embankment in Northern Section of Project



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3. GEOTECHNICAL EXPLORATION

3.1. Field Exploration Program

The exploration for proposed noise walls was conducted by NEAS between November 1, 2022, and November 17, 2022, included 26 borings drilled to depths between 14.0 and 27.0 ft bgs. The boring locations were selected by NEAS in general accordance with the guidelines contained in the SGE with the intent to evaluate subsurface soil and groundwater conditions. Borings were typically located along/near the proposed wall alignments in locations that were not restricted by maintenance of traffic, underground utilities or dictated by terrain (i.e. steep embankment slopes). Each as-drilled project boring location and corresponding ground surface elevation was surveyed in the field by NEAS following completion. Each individual project boring log (included within Appendix B) includes the recorded boring latitude and longitude location (based on the surveyed Ohio State Plane North, NAD83, location) and the corresponding ground surface elevation. Stationing, offsets and elevations of the borings are shown on Table 2 below and the boring locations are shown on the boring plan provided in Appendix A. It should be noted that the borings from B-001-0-21 to B-011-0-21 were along the originally proposed noise walls near the road, which have been converted to 81” single slope barriers.

Table 2: Project Boring Summary

Boring ID	Location (Sta/offset)	Alignment	Latitude	Longitude	Surface Elevation (ft)	Depth (ft)
B-001-0-21	102+41, 26' RT	Barrier 1	41.033460	-80.630390	1080.4	25.0
B-002-0-21	105+96, 18' RT	Barrier 1	41.034400	-80.630720	1085.6	24.5
B-003-0-21	109+48, 14' RT	Barrier 1	41.035340	-80.630960	1090.1	25.0
B-004-0-21	113+56, 22' RT	Barrier 1	41.036460	-80.631090	1091.9	25.0
B-005-0-21	117+55, 1' LT	Barrier 1	41.037550	-80.631230	1095.4	25.0
B-006-0-21	121+49, 4' LT	Barrier 1	41.038620	-80.631190	1094.4	25.0
B-007-0-21	399+87, 18' RT	Barrier 4	41.041270	-80.630760	1085.5	25.0
B-008-0-21	403+45, 12' RT	Barrier 4	41.042250	-80.630620	1081.9	25.0
B-009-0-21	407+02, 15' RT	Barrier 4	41.043220	-80.630460	1077.7	25.0
B-010-0-21	411+04, 15' RT	Barrier 4	41.044320	-80.630300	1074.4	25.0
B-011-0-21	415+03, 11' RT	Barrier 4	41.045410	-80.630150	1071.1	25.0
B-012-0-21	4001+17, 3' LT.	Noise Wall 4	41.046430	-80.629910	1071.1	25.0
B-013-0-21	4005+32, 4' LT.	Noise Wall 4	41.047550	-80.629680	1071.3	25.0
B-014-0-21	4009+28, 16' LT.	Noise Wall 4	41.048630	-80.629550	1067.4	23.7
B-015-0-21	4012+46, 2' LT.	Noise Wall 4	41.049500	-80.629380	1066.7	23.6
B-016-0-21	4017+37, 12' RT.	Noise Wall 4	41.050830	-80.629140	1068.3	25.0
B-017-0-21	699+90, 12' RT.	Noise Wall 7	41.051050	-80.629120	1067.4	25.0
B-018-0-21	703+73, 10' LT.	Noise Wall 7	41.052100	-80.629090	1063.8	27.0
B-019-0-21	707+55, 12' RT.	Noise Wall 7	41.053140	-80.628970	1066.7	25.0
B-020-0-21	711+71, 7' LT.	Noise Wall 7	41.054290	-80.629010	1058.8	19.0
B-021-0-21	715+69, 16' RT.	Noise Wall 7	41.055360	-80.628980	1060.5	21.8
B-022-0-21	720+43, 10' RT.	Noise Wall 7	41.056660	-80.628830	1056.7	23.8
B-023-0-21	724+26, 27' RT.	Noise Wall 7	41.057670	-80.628590	1047.8	23.9
B-024-0-21	727+91, 14' LT.	Noise Wall 7	41.058610	-80.628150	1033.7	14.0
B-025-0-21	729+77, 17' RT.	Noise Wall 7	41.058860	-80.627550	1039.6	20.2
B-026-0-21	733+09, 10' LT.	Noise Wall 7	41.059400	-80.626580	1036.9	19.3
<i>Notes:</i>						
1. As-drilled boring location and corresponding ground surface elevation was surveyed in the field by NEAS.						

Borings were drilled using a CME 55X truck mounted drilling rig utilizing 3.25-inch diameter hollow stem augers. In general, soil samples for noise walls borings were recovered at intervals of 2.5-ft to end of boring

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(EOB) or top of rock surface (AASHTO T-206 “Standard Method for Penetration Test and Split Barrel Sampling of Soils.”). The soil samples obtained from the exploration program were visually observed in the field by the NEAS field representative and preserved for review by a Geologist and possible laboratory testing. Standard penetration tests (SPT) were conducted using a CME 55X auto hammer that has been calibrated to be 79% (indicated on the boring logs) on January 24, 2022.

Field boring logs were prepared by drilling personnel, and included lithological description, SPT results recorded as blows per 6-inch increment of penetration and estimated unconfined shear strength values on specimens exhibiting cohesion (using a hand-penetrometer). Groundwater level observations were recorded both during and after the completion of drilling. These groundwater level observations are included on the individual boring logs. After completing the borings, the boreholes were backfilled with either auger cuttings, bentonite chips, or a combination of these materials.

3.2. Laboratory Testing Program

The laboratory testing program consisted of classification testing and moisture content determinations. Data from the laboratory-testing program were incorporated onto the borings logs (Appendix B). Soil samples are retained at the laboratory for 60 days following report submittal, after which time they will be discarded.

3.2.1. Classification Testing

Representative soil samples were selected for index properties (Atterberg Limits) and gradation testing for classification purposes on approximately 33% of the samples. At each boring location, samples were selected for testing with the intent of identification and classification of all significant soil units. Soils not selected for testing were compared to laboratory tested samples/strata and classified visually. Moisture content testing was conducted on all samples. The laboratory testing was performed in general accordance with applicable AASHTO specifications.

A final classification of the soil strata was made in accordance with AASHTO M-145 “Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes,” as modified by ODOT “Classification of Soils” once laboratory test results became available. The results of the soil classification are presented on the boring logs provided in Appendix B.

3.2.2. Standard Penetration Test Results

Standard Penetration Tests (SPT) and split-barrel (commonly known as split-spoon) sampling of soils were performed at varying intervals (i.e., 2.5-ft or 5.0-ft intervals) in the project borings performed. To account for the high efficiency (automatic) hammers used during SPT sampling, field SPT N-values were converted based on the calibrated efficiency (energy ratio) of the specific drill rig's hammer. Field N-values were converted to an equivalent rod energy of 60% (N_{60}) for use in analysis or for correlation purposes. The resulting N_{60} values are presented on the boring logs provided in Appendix B.

4. GEOTECHNICAL FINDINGS

The subsurface conditions encountered during NEAS’s explorations are described in the following subsections and on each boring log presented in Appendix B. The boring logs represent NEAS’s interpretation of the subsurface conditions encountered at each boring location based on our site observations, field logs, visual review of the soil samples by NEAS's geologist, and laboratory test results. The lines designating the interfaces between various soil strata on the boring logs represent the approximate

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interface location; the actual transition between strata may be gradual and indistinct. The subsurface soil and groundwater characterizations included herein, including summary test data, are based on the subsurface findings from the geotechnical explorations performed by NEAS as part of the referenced project, and consideration of the geological history of the site.

4.1. Subsurface Conditions

The subsurface profile at all two noise wall sites consists of both fine-grained cohesive soils (A-4a, A-4b, A-6a, A-6b and A-7-6) and granular soils (A-1-a, A-1-b, A-2-4, A-3, A-3a, A-4a and A-4b) atop weathered bedrock. Bedrock elevations at the noise barrier sites were encountered range from 1021.4 ft to 1062.1 ft amsl, putting bedrock at a depth of 8.5 to 23.5 ft below ground surface (bgs). Bedrock was logged as highly weathered to slightly weathered Shale and Sandstone. Interbedded Shale and Limestone was encountered at the depth of 9.0 ft (elevation of 1024.7 ft) at the boring B-024-0-21 of the Barrier 7 site. The top of bedrock decreases from south to north of the project site.

4.1.1. Overburden Soil

1) At Barrier 4 site

Soil was generally comprised of fine-grained cohesive soils atop non-cohesive, granular soils. The exception being boring B-012-0-21 in which the granular soils were atop cohesive soils. Shale was encountered at the depth between 21.0 ft and 22.3 ft (elevation between 1044.4 ft and 1046.4 ft amsl) at the Barrier 4 site.

The natural, fine-grained cohesive soils encountered in this profile are classified on the borings logs as either sandy silt (A-4a), silt (A-4b), or silty clay (A-6b). With respect to the soil strengths, these fine-grained soils can be described as having stiff to hard consistency correlated from N_{60} values between 9 bpf and 67 bpf and unconfined compressive strengths (estimated by means of hand penetrometer) between approximately 2.0 and 4.5 tsf. Natural moisture contents of the fine-grained, cohesive material ranged from 8% to 18%.

The granular soils generally encountered within this profile were encountered between elevation 1043.3 ft and 1059.4 ft amsl and were classified as either Coarse and Fine Sand (A-3a), Fine Sand (A-3), Gravel and Stone Fragments with Sand and Silt (A-2-4), Stone Fragments with Sand (A-1-b), Silt (A-4b) or Sandy Silt (A-4a) based on laboratory testing results and a visual review of the samples. With respect to the soil strengths, the soils can be described as having a loose to very dense relative compactness correlated from N_{60} values between 5 and SPT refusal (where less than 6 inches of penetration is achieved for 50 blows). Natural moisture contents of the granular soils ranged from 6% and 28%.

The moderately to highly weathered, slightly strong Shale was encountered at the depth between 21.0 ft and 22.3 ft (elevation between 1044.4 ft and 1046.4 ft amsl) at the north end of the noise barrier 4.

2) At Barrier 7 site

Soil was generally comprised of fine-grained cohesive soils atop non-cohesive, granular soils or weathered bedrock. The exception being boring B-024-0-21 in which the granular soils were atop weathered bedrock without any cohesive soils encountered; the boring B-026-0-21 in which the granular soils were atop cohesive soils. Bedrock encountered at the Barrier 7 site include Shale, Sandstone, interbedded Shale and Sandstone, and interbedded Shale and Limestone. The encountered bedrock was at the depth between 8.5

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ft and 23.0 ft (elevation between 1019.6 ft and 1045.3 ft amsl) at the Barrier 7 site. The top of bedrock decreases from south end of Barrier 7 to north end of Barrier 7.

The natural, fine-grained cohesive soils encountered in this profile are classified on the borings logs as either sandy silt (A-4a), silt (A-4b), silt and clay (A-6a), silty clay (A-6b) or clay (A-7-6). With respect to the soil strengths, these fine-grained soils can be described as having stiff to hard consistency correlated from N_{60} values between 9 bpf and 40 bpf and unconfined compressive strengths (estimated by means of hand penetrometer) between approximately 1.25 and 4.5 tsf. Natural moisture contents of the fine-grained, cohesive material ranged from 8% to 24%.

The granular soils generally encountered within this profile were encountered were classified as either Coarse and Fine Sand (A-3a), Gravel and Stone Fragments with Sand and Silt (A-2-4), Stone Fragments with Sand (A-1-b), Stone Fragments (A-1-a), Silt (A-4b) or Sandy Silt (A-4a) based on laboratory testing results and a visual review of the samples. With respect to the soil strengths, the soils can be described as having a loose to very dense relative compactness correlated from N_{60} values between 9 bpf and refusal. Natural moisture contents of the granular soils ranged from 4% and 77%. It should be noted that the natural moisture contents of the granular soils coarse and fine sand (A-3a) and gravel with sand (A-1-b) at the north end of Barrier 7 are very high.

The weathered bedrock was encountered between elevation 1019.6 ft and 1045.3 ft amsl. The recovery of bedrock is between 58% and 93% and the RQD is between 8% and 16% at the Barrier 7 site.

4.1.2. Bedrock

Bedrock elevations at the noise barrier sites were encountered range from 1021.4 ft to 1062.1 ft amsl, putting bedrock at a depth of 8.5 to 23.5 ft below ground surface (bgs). Bedrock was logged as highly weathered to slightly weathered Shale and Sandstone. Interbedded Shale and Limestone was encountered at the depth of 9.0 ft (elevation of 1024.7 ft) at the boring B-024-0-21 of the Barrier 7 site. Rock cores were taken at the depths between 22 ft and 27 ft on both borings B-018-0-21 and B-024-0-21. Bedrock was encountered at the two historical borings at the elevation between 1022.4 ft and 1040.1 ft. A summary including bedrock elevation, recovery, and RQD is presented in Table 3 below.

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Table 3: Bedrock Summary

Boring Number	Bedrock Type	Bedrock Depth (ft)	Bedrock Elevation (ft)	Bedrock Recovery Avg (%)	Bedrock RQD Avg (%)
B-002-0-21	Sandstone	23.5	1056.9	-	-
B-014-0-21	Shale	21.0	1046.4	-	-
B-015-0-21	Shale	22.3	1044.4	-	-
B-018-0-21	Sandstone; Interbedded Sandstone and Shale	18.5	1045.3	93	16
B-020-0-21	Sandstone	17.5	1041.3	-	-
B-021-0-21	Sandstone	20.5	1040.0	-	-
B-022-0-17	Shale	23.0	1033.7	-	-
B-023-0-21	Shale	23.0	1024.8	-	-
B-024-0-21	Shale; Interbedded Shale and Limestone	8.5	1025.2	58	8
B-025-0-21	Sandstone	20.0	1019.6	-	-
B-026-0-17	Shale	15.5	1021.4	-	-
Historical Borings					
B-008-0-66	Sandstone	25.0	1040.1	92 - 100	-
B-029-0-75	-	12.5	1022.4	-	-

4.1.3. Groundwater

Groundwater measurements were taken during the boring drilling procedures and immediately following the completion of each borehole. Groundwater was encountered during drilling in 18 of the 26 borings performed at the referenced noise wall site. Based on these borings, free water was encountered between depths of 8.5 and 23.5 ft bgs (between elevations 1025.2 and 1068.4 ft amsl); static water was not encountered in any boring. It should be noted that groundwater is affected by many hydrologic characteristics in the area and may vary from those measured at the time of the exploration. The groundwater summary is presented in Table 4 below. The specific groundwater readings are included on the boring logs located within Appendix B.

Table 4: Groundwater Summary

Boring Number	Freewater Depth (ft)	Freewater Elevation (ft)
B-001-0-21	18.5	1061.9
B-002-0-21	21.0	1064.6
B-004-0-21	23.5	1068.4
B-008-0-21	21.0	1060.9
B-009-0-21	13.5	1064.2
B-010-0-21	21.0	1053.4
B-011-0-21	18.5	1052.6
B-012-0-21	13.5	1057.6
B-013-0-21	13.5	1057.8
B-014-0-21	8.5	1058.9
B-015-0-21	8.5	1058.2
B-016-0-21	14.5	1053.8
B-017-0-21	16.0	1051.4
B-018-0-21	13.5	1050.3
B-023-0-21	16.0	1031.8
B-024-0-21	8.5	1025.2
B-025-0-21	8.5	1031.1
B-026-0-21	8.5	1028.4

5. ANALYSIS AND RECOMMENDATIONS

5.1. General Noise Wall Foundation Design

This section provides information required to complete the design of drilled shaft noise wall supports. Geotechnical information has been developed in accordance with the ODOT GDM, Section 1600. ODOT design methodology requires that the N_{60} values be corrected using a factor to account for the depth of each test (overburden), and the results analyzed to determine a mean (Average N_{160}) or minimum (N_{160L}) depending on the trend of the data. Subsequently, utilizing the referenced mean or minimum corrected value (designated N_{160} herein) in addition to: 1) the broad distinction between cohesive and granular soils; 2) the proposed wall geometry; and, 3) the ODOT BDM provided look-up tables, the depth of shaft required at that boring location can be determined. The summary of Corrected N-values for each boring is presented in Table 5 to Table 10. The analysis tables indicating Corrected N-values for various design shaft depths (i.e., 4 ft, 6 ft, 8 ft, 10 ft, etc.) per boring at each noise barrier site are provided in Appendix C.

The ODOT BDM noise wall shaft design methodology for determining shaft depth is generally an iterative process before the design is to be optimized. An example of this design process is described below utilizing the information obtained in Boring B-017-0-21 and noise wall design assumptions including: 1) a post spacing of 17 ft; 2) a noise wall height of 13 ft; 3) 2:1 slope ground at the shaft location (STA. 700+00 in reference to Barrier 7); and 4) minimal cut or fill at the wall location.

The first step to select the drilled shaft length for the standard noise barrier system used by ODOT is to select the shortest possible drilled shaft length based on the geometry presented. Consulting BDM Figure 1600-2 – Cohesive Foundation Depth Table, for the conditions of a barrier height of 12.5 ft, a post spacing of 28 ft, and a 2:1 slope ground condition, the shortest possible drilled shaft length is 6.5 ft. Using this length and top of drilled shaft elevation of 1065.50 ft, the drilled shaft tip elevation is 1059.00 ft. Between these elevations, the minimum N_{160} is 12 bpf (minimum of 14, 13, 12 Corrected N-values inconsistent with depth) in cohesive soils and thus the overburden correction factor does not apply, making the design “N”-value = 12 bpf.

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However, since the design “N”-value range is 16-32 bpf for a drilled shaft length of 6.5 ft (using Figure 1600-2 – Cohesive Foundation Depth Table), a second trial is needed with a drilled shaft length of 8.0 ft, which puts the drilled shaft tip elevation at 1057.50 ft. The design “N”-value from 1065.50 to 1057.50 ft is 12 bpf (minimum of 14, 13, 12, Corrected N-values inconsistent with depth), thus a drilled shaft length of 8.0 ft is appropriate for the design “N”-value in the range of 9-15 bpf. The N₆₀ and Corrected N-Values for Barriers 4 and 7 are summarized in Tables 5 -10 below.

At the site of Barrier 7, eight out of ten borings encountered bedrock between 8.5 ft and 23 ft below ground surface, except two borings (B-017-0-21 and B-019-0-21). However, shallow bedrock (Weathered Shale and Interbedded Shale and Limestone with an unconfined compressive strength less than 7500 psi) was only encountered in the boring B-024-021 at the depth of 8.5 ft (at the elevation of 1025.2 ft amsl). It is anticipated that the drilled shafts at the location near the boring B-024-0-21 will end up into bedrock. The elevation of bedrock surface at the site of Barrier 7 was linearly interpolated at the shaft location based on the encountered bedrock elevation during our subsurface exploration presented in Appendix B. The drilled shaft lengths required by the BDM Figure 1600-1 and Figure 1600-2 were firstly adjusted to avoid frequently varying throughout the project, after that they were divided into two types of quantities: drilled shaft (linear feet) above bedrock and drilled shaft into bedrock (linear feet). The field engineer on the site should verify the range of bedrock and adjust the shaft lengths above bedrock and into bedrock as needed.

The conditions reflected at each boring in Appendix C were observed at those locations only and may not be indicative of conditions at intermediate points between borings. However, for purposes of design it is recommended that the supports be sized based on conditions at the nearest boring. Put another way, each boring may, for design purposes, be considered representative of sub-surface conditions up to half the distance to the next nearest boring.

Table 5: N₆₀ and Corrected N-Value for Borings B-013-0-21 through B-015-0-21 at Barrier 4 site

Depth of SPT	Correction Factor	B-013-0-21			B-014-0-21			B-015-0-21		
		N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value
2.5	1.6	22	Cohesive	22	18	Granular	29	20	Cohesive	20
5	1.4	25	Cohesive	25	16	Cohesive	16	28	Cohesive	28
7.5	1.2	20	Cohesive	20	11	Granular	13	18	Cohesive	18
10	1.1	17	Cohesive	17	17	Granular	19	14	Granular	15
12.5	1.1	16	Cohesive	16	47	Granular	52	18	Granular	20
15	1	5	Granular	5	62	Granular	62	21	Granular	21
17.5	0.96	8	Granular	8	40	Granular	38	21	Granular	20
20	0.91	28	Granular	25	67	Granular	61	32	Granular	29
22.5	0.88	18	Granular	16	Shale			62	Granular	55
25	0.84	29	Granular	24	Shale			Shale		

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Table 6: N_{60} and Corrected N-Value for Boring B-016-0-21-and B-012-0-21 at Barrier 4 site

Depth of SPT	Correction Factor	B-016-0-21			B-012-0-21		
		N_{60}	Soil Type	Corrected N-Value	N_{60}	Soil Type	Corrected N-Value
2.5	1.6	9	Cohesive	9	16	Granular	26
5	1.4	26	Cohesive	26	18	Granular	25
7.5	1.2	16	Cohesive	16	13	Granular	16
10	1.1	18	Cohesive	18	16	Granular	18
12.5	1.1	14	Cohesive	14	14	Granular	15
15	1	16	Cohesive	16	5	Granular	5
17.5	0.96	11	Granular	11	8	Granular	8
20	0.91	32	Granular	29	66	Granular	60
22.5	0.88	41	Granular	36	54	Granular	48
25	0.84	61	Granular	51	40	Cohesive	40

Table 7: N_{60} and Corrected N-Value for Borings B-017-0-21 through B-019-0-21 at Barrier 7 site

Depth of SPT	Correction Factor	B-017-0-21			B-018-0-21			B-019-0-21		
		N_{60}	Soil Type	Corrected N-Value	N_{60}	Soil Type	Corrected N-Value	N_{60}	Soil Type	Corrected N-Value
2.5	1.6	14	Cohesive	14	34	Cohesive	34	26	Cohesive	26
5	1.4	13	Cohesive	13	34	Granular	48	17	Granular	24
7.5	1.2	12	Cohesive	12	16	Cohesive	16	28	Granular	34
10	1.1	13	Cohesive	13	28	Granular	31	29	Granular	32
12.5	1.1	14	Cohesive	14	18	Granular	20	29	Granular	32
15	1	13	Cohesive	13	14	Granular	14	33	Granular	33
17.5	0.96	11	Granular	11	38	Granular	36	22	Granular	21
20	0.91	32	Granular	29	Sandstone			26	Granular	24
22.5	0.88	49	Granular	43				41	Granular	36
25	0.84	53	Granular	45				51	Granular	43

Table 8: N_{60} and Corrected N-Value for Borings B-020-0-21 through B-022-0-21 at Barrier 7 site

Depth of SPT	Correction Factor	B-020-0-21			B-021-0-21			B-022-0-21		
		N_{60}	Soil Type	Corrected N-Value	N_{60}	Soil Type	Corrected N-Value	N_{60}	Soil Type	Corrected N-Value
2.5	1.6	16	Cohesive	16	28	Cohesive	28	21	Cohesive	21
5	1.4	14	Granular	20	40	Cohesive	40	26	Cohesive	26
7.5	1.2	20	Granular	24	14	Cohesive	14	29	Cohesive	29
10	1.1	28	Granular	31	11	Cohesive	11	24	Cohesive	24
12.5	1.1	25	Granular	28	18	Granular	20	18	Cohesive	18
15	1	84	Granular	84	18	Granular	18	20	Cohesive	20
17.5	0.96	75	Granular	72	21	Granular	20	9	Granular	9
20	0.91	Sandstone			66	Granular	60	55	Granular	50
22.5	0.88				Sandstone			41	Granular	36
25	0.84							Shale		

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Table 9: N_{60} and Corrected N-Value for Borings B-023-0-21 through B-025-0-21 at Barrier 7 site

Depth of SPT	Correction Factor	B-023-0-21			B-024-0-21			B-025-0-21		
		N_{60}	Soil Type	Corrected N-Value	N_{60}	Soil Type	Corrected N-Value	N_{60}	Soil Type	Corrected N-Value
2.5	1.6	16	Cohesive	16	14	Cohesive	14	12	Cohesive	12
5	1.4	12	Cohesive	12	12	Granular	17	26	Cohesive	26
7.5	1.2	9	Cohesive	9	34	Granular	41	13	Cohesive	13
10	1.1	25	Cohesive	25	Shale			14	Granular	15
12.5	1.1	11	Cohesive	11				12	Granular	13
15	1	12	Cohesive	12				9	Granular	9
17.5	0.96	24	Granular	23				50	Granular	48
20	0.91	70	Granular	64				36	Granular	33
22.5	0.88	84	Granular	74				Sandstone		
25	0.84	Shale								

Table 10: N_{60} and Corrected N-Value for Boring B-026-0-21 at Barrier 7 site

Depth of SPT	Correction Factor	B-026-0-21			B-008-0-66			B-029-0-75		
		N_{60}	Soil Type	Corrected N-Value	N_{60}	Soil Type	Corrected N-Value	N_{60}	Soil Type	Corrected N-Value
2.5	1.6	36	Granular	58	9	Granular	14	13	Granular	21
5	1.4	18	Granular	25	9	Granular	13	22	Granular	31
7.5	1.2	21	Granular	25	9	Granular	11	44	Granular	53
10	1.1	14	Granular	15	19	Granular	21	39	Granular	43
12.5	1.1	28	Cohesive	28	19	Granular	21	100	Granular	110
15	1	90	Granular	90	19	Granular	19	Shale		
17.5	0.96	Shale			33	Granular	32			
20	0.91				47	Granular	43			
22.5	0.88				50	Granular	44			
25	0.84				Shale					

5.2. Drilled Shaft Depth Recommendations

Utilizing the design methodology presented in Section 5.1 of this report and in accordance with Section 1600 "Noise Barrier Foundation" of the ODOT GDM the drilled shaft design depths for Barrier 4 and Barrier 7 were determined based on: 1) the soil and rock encountered at each boring location; 2) the developed Corrected N-value provided in Section 5.1 of this report; and, 3) noise wall design information including post spacing, post location, noise wall height, and traverse ground slope provided by IBI GROUP via email dated as November 9, 2023. Our recommendations for depth of drilled shaft foundations for each wall are presented in Table 11 through 12 below. According to Section 1600 of 2023 ODOT GDM, frequently varying plan specified shaft lengths throughout the project should be avoided, and the minimum increment of plan specified shaft length should be 2-ft. It should be noted that the "Shaft Length used in Plan" in the summary Tables 11-12 below has been adjusted to avoid frequently varying shaft lengths. The noise wall drilled shaft length analysis and design parameters for each wall can be found in Appendix D.

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Table 11: Noise Barrier 4 Drilled Shaft Design Lengths

Noise Barrier 4						Noise Barrier 4 (Continue)					
Drilled Shaft Number	Station	Nearby Boring Utilized	Shaft Length Used in Plan (ft)	Shaft Length Above Bedrock (ft)	Shaft Length Into Bedrock (ft)	Drilled Shaft Number	Station	Nearby Boring Utilized	Shaft Length Used in Plan (ft)	Shaft Length Above Bedrock (ft)	Shaft Length Into Bedrock (ft)
1	4000+00	B-012-0-21	10.5	10.5	-	38	4008+88	B-014-0-21	11.0	11.0	-
2	4000+24	B-012-0-21	10.5	10.5	-	39	4009+12	B-014-0-21	11.0	11.0	-
3	4000+48	B-012-0-21	10.5	10.5	-	40	4009+36	B-014-0-21	11.0	11.0	-
4	4000+72	B-012-0-21	10.5	10.5	-	41	4009+60	B-014-0-21	11.0	11.0	-
5	4000+96	B-012-0-21	10.5	10.5	-	42	4009+84	B-014-0-21	11.0	11.0	-
6	4001+20	B-012-0-21	10.5	10.5	-	43	4010+08	B-014-0-21	11.0	11.0	-
7	4001+44	B-012-0-21	10.5	10.5	-	44	4010+32	B-014-0-21	11.0	11.0	-
8	4001+68	B-012-0-21	10.5	10.5	-	45	4010+56	B-014-0-21	11.0	11.0	-
9	4001+92	B-012-0-21	10.5	10.5	-	46	4010+80	B-014-0-21	11.0	11.0	-
10	4002+16	B-012-0-21	10.5	10.5	-	47	4011+04	B-015-0-21	8.0	8.0	-
11	4002+40	B-012-0-21	10.5	10.5	-	48	4011+28	B-015-0-21	8.0	8.0	-
12	4002+64	B-012-0-21	10.5	10.5	-	49	4011+52	B-015-0-21	8.0	8.0	-
13	4002+88	B-012-0-21	10.5	10.5	-	50	4011+76	B-015-0-21	8.0	8.0	-
14	4003+12	B-012-0-21	10.5	10.5	-	51	4012+00	B-015-0-21	8.0	8.0	-
15	4003+36	B-013-0-21	6.5	6.5	-	52	4012+24	B-015-0-21	8.0	8.0	-
16	4003+60	B-013-0-21	6.5	6.5	-	53	4012+48	B-015-0-21	8.0	8.0	-
17	4003+84	B-013-0-21	6.5	6.5	-	54	4012+72	B-015-0-21	8.0	8.0	-
18	4004+08	B-013-0-21	6.5	6.5	-	55	4012+96	B-015-0-21	8.0	8.0	-
19	4004+32	B-013-0-21	6.5	6.5	-	56	4013+20	B-015-0-21	8.0	8.0	-
20	4004+56	B-013-0-21	6.5	6.5	-	57	4013+44	B-015-0-21	8.0	8.0	-
21	4004+80	B-013-0-21	6.5	6.5	-	58	4013+68	B-015-0-21	8.0	8.0	-
22	4005+04	B-013-0-21	6.5	6.5	-	59	4013+92	B-015-0-21	8.0	8.0	-
23	4005+28	B-013-0-21	6.5	6.5	-	60	4014+16	B-015-0-21	8.0	8.0	-
24	4005+52	B-013-0-21	6.5	6.5	-	61	4014+40	B-015-0-21	8.0	8.0	-
25	4005+76	B-013-0-21	6.5	6.5	-	62	4014+64	B-015-0-21	8.0	8.0	-
26	4006+00	B-013-0-21	6.5	6.5	-	63	4014+88	B-015-0-21	8.0	8.0	-
27	4006+24	B-013-0-21	6.5	6.5	-	64	4015+12	B-016-0-21	8.0	8.0	-
28	4006+48	B-013-0-21	6.5	6.5	-	65	4015+36	B-016-0-21	8.0	8.0	-
29	4006+72	B-013-0-21	6.5	6.5	-	66	4015+60	B-016-0-21	8.0	8.0	-
30	4006+96	B-013-0-21	6.5	6.5	-	67	4015+84	B-016-0-21	8.0	8.0	-
31	4007+20	B-013-0-21	6.5	6.5	-	68	4016+08	B-016-0-21	8.0	8.0	-
32	4007+44	B-014-0-21	11.0	11.0	-	69	4016+32	B-016-0-21	8.0	8.0	-
33	4007+68	B-014-0-21	11.0	11.0	-	70	4016+56	B-016-0-21	8.0	8.0	-
34	4007+92	B-014-0-21	11.0	11.0	-	71	4016+80	B-016-0-21	8.0	8.0	-
35	4008+16	B-014-0-21	11.0	11.0	-	72	4017+04	B-016-0-21	8.0	8.0	-
36	4008+40	B-014-0-21	11.0	11.0	-	73	4017+28	B-016-0-21	8.0	8.0	-
37	4008+64	B-014-0-21	11.0	11.0	-						

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Mahoning County, Ohio
PID: 110931**

Table 12: Noise Barrier 7 Drilled Shaft Design Lengths

Noise Barrier 7						Noise Barrier 7 (Continue)					
Drilled Shaft Number	Station	Nearby Boring Utilized	Shaft Length Used in Plan (ft)	Shaft Length Above Bedrock (ft)	Shaft Length Into Bedrock (ft)	Drilled Shaft Number	Station	Nearby Boring Utilized	Shaft Length Used in Plan (ft)	Shaft Length Above Bedrock (ft)	Shaft Length Into Bedrock (ft)
1	700+00	B-017-0-21	8.0	8.0	-	76	717+16	B-021-0-21	8.0	8.0	-
2	700+18	B-017-0-21	8.0	8.0	-	77	717+40	B-021-0-21	8.0	8.0	-
3	700+36	B-017-0-21	8.0	8.0	-	78	717+64	B-021-0-21	8.0	8.0	-
4	700+54	B-017-0-21	8.0	8.0	-	79	717+88	B-021-0-21	8.0	8.0	-
5	700+78	B-017-0-21	8.0	8.0	-	80	718+12	B-022-0-21	8.0	8.0	-
6	701+02	B-017-0-21	8.0	8.0	-	81	718+36	B-022-0-21	8.0	8.0	-
7	701+22	B-017-0-21	8.0	8.0	-	82	718+60	B-022-0-21	8.0	8.0	-
8	701+46	B-017-0-21	8.0	8.0	-	83	718+84	B-022-0-21	8.0	8.0	-
9	701+56	B-017-0-21	8.0	8.0	-	84	719+08	B-022-0-21	8.0	8.0	-
10	701+80	B-017-0-21	8.0	8.0	-	85	719+32	B-022-0-21	8.0	8.0	-
11	702+04	B-018-0-21	12.5	12.5	-	86	719+56	B-022-0-21	8.0	8.0	-
12	702+28	B-018-0-21	12.5	12.5	-	87	719+80	B-022-0-21	8.0	8.0	-
13	702+52	B-018-0-21	12.5	12.5	-	88	720+04	B-022-0-21	8.0	8.0	-
14	702+76	B-018-0-21	12.5	12.5	-	89	720+28	B-022-0-21	8.0	8.0	-
15	703+00	B-018-0-21	12.5	12.5	-	90	720+52	B-022-0-21	8.0	8.0	-
16	703+24	B-018-0-21	12.5	12.5	-	91	720+76	B-022-0-21	8.0	8.0	-
17	703+48	B-018-0-21	12.5	12.5	-	92	721+00	B-022-0-21	8.0	8.0	-
18	703+72	B-018-0-21	12.5	12.5	-	93	721+24	B-022-0-21	8.0	8.0	-
19	703+96	B-018-0-21	12.5	12.5	-	94	721+48	B-022-0-21	8.0	8.0	-
20	704+20	B-018-0-21	12.5	12.5	-	95	721+72	B-022-0-21	8.0	8.0	-
21	704+44	B-018-0-21	12.5	12.5	-	96	721+96	B-022-0-21	8.0	8.0	-
22	704+62	B-018-0-21	12.5	12.5	-	97	722+20	B-022-0-21	8.0	8.0	-
23	704+74	B-018-0-21	12.5	12.5	-	98	722+44	B-023-0-21	8.0	8.0	-
24	704+98	B-018-0-21	12.5	12.5	-	99	722+68	B-023-0-21	8.0	8.0	-
25	705+10	B-018-0-21	12.5	12.5	-	100	722+92	B-023-0-21	8.0	8.0	-
26	705+34	B-018-0-21	12.5	12.5	-	101	723+16	B-023-0-21	8.0	8.0	-
27	705+58	B-018-0-21	12.5	12.5	-	102	723+40	B-023-0-21	8.0	8.0	-
28	705+82	B-019-0-21	12.5	12.5	-	103	723+64	B-023-0-21	8.0	8.0	-
29	706+06	B-019-0-21	12.5	12.5	-	104	723+88	B-023-0-21	8.0	8.0	-
30	706+30	B-019-0-21	12.5	12.5	-	105	724+12	B-023-0-21	8.0	8.0	-
31	706+54	B-019-0-21	12.5	12.5	-	106	724+36	B-023-0-21	8.0	8.0	-
32	706+78	B-019-0-21	12.5	12.5	-	107	724+60	B-023-0-21	8.0	8.0	-
33	707+02	B-019-0-21	12.5	12.5	-	108	724+84	B-023-0-21	8.0	8.0	-
34	707+26	B-019-0-21	12.5	12.5	-	109	725+08	B-023-0-21	8.0	8.0	-
35	707+50	B-019-0-21	12.5	12.5	-	110	725+20	B-023-0-21	8.0	8.0	-
36	707+74	B-019-0-21	12.5	12.5	-	111	725+32	B-023-0-21	8.0	8.0	-
37	707+98	B-019-0-21	12.5	12.5	-	112	725+44	B-023-0-21	8.0	8.0	-
38	708+22	B-019-0-21	12.5	12.5	-	113	725+56	B-023-0-21	8.0	8.0	-
39	708+46	B-019-0-21	12.5	12.5	-	114	725+64	B-023-0-21	8.0	8.0	-
40	708+70	B-019-0-21	12.5	12.5	-	115	725+72	B-023-0-21	8.0	8.0	-
41	708+94	B-019-0-21	12.5	12.5	-	116	725+80	B-023-0-21	8.0	8.0	-
42	709+18	B-019-0-21	12.5	12.5	-	117	725+88	B-023-0-21	8.0	8.0	-
43	709+42	B-019-0-21	12.5	12.5	-	118	725+96	B-023-0-21	8.0	8.0	-
44	709+66	B-020-0-21	12.5	12.5	-	119	726+04	B-023-0-21	8.0	8.0	-
45	709+90	B-020-0-21	12.5	12.5	-	120	726+16	B-024-0-21	12.5	11.5	1.0
46	710+14	B-020-0-21	12.5	12.5	-	121	726+28	B-024-0-21	12.5	10.0	2.5
47	710+38	B-020-0-21	12.5	12.5	-	122	726+52	B-024-0-21	12.5	10.0	2.5
48	710+62	B-020-0-21	14.5	14.5	-	123	726+76	B-024-0-21	12.5	9.5	3.0
49	710+86	B-020-0-21	11.5	11.5	-	124	727+00	B-024-0-21	12.5	9.5	3.0
50	711+10	B-020-0-21	11.5	11.5	-	125	727+20	B-024-0-21	12.5	9.5	3.0
51	711+34	B-020-0-21	11.5	11.5	-	126	727+40	B-024-0-21	12.5	9.0	3.5
52	711+58	B-020-0-21	11.5	11.5	-	127	727+60	B-024-0-21	12.5	9.0	3.5
53	711+82	B-020-0-21	11.5	11.5	-	128	727+80	B-024-0-21	12.5	9.5	3.0
54	712+06	B-020-0-21	14.5	14.5	-	129	728+04	B-024-0-21	12.5	10.0	2.5
55	712+30	B-020-0-21	14.5	14.5	-	130	728+28	B-024-0-21	12.5	10.5	2.0
56	712+54	B-020-0-21	14.5	14.5	-	131	728+52	B-024-0-21	12.5	12.5	-
57	712+78	B-020-0-21	11.5	11.5	-	132	728+76	B-024-0-21	12.5	12.5	-
58	713+02	B-020-0-21	11.5	11.5	-	133	729+00	B-025-0-21	8.0	8.0	-
59	713+26	B-020-0-21	11.5	11.5	-	134	729+24	B-025-0-21	8.0	8.0	-
60	713+38	B-020-0-21	11.5	11.5	-	135	729+48	B-025-0-21	8.0	8.0	-
61	713+60	B-020-0-21	11.5	11.5	-	136	729+72	B-025-0-21	8.0	8.0	-
62	713+82	B-021-0-21	8.0	8.0	-	137	729+96	B-025-0-21	8.0	8.0	-
63	714+04	B-021-0-21	8.0	8.0	-	138	730+20	B-025-0-21	8.0	8.0	-
64	714+28	B-021-0-21	8.0	8.0	-	139	730+44	B-025-0-21	8.0	8.0	-
65	714+52	B-021-0-21	8.0	8.0	-	140	730+68	B-025-0-21	8.0	8.0	-
66	714+76	B-021-0-21	8.0	8.0	-	141	730+92	B-025-0-21	8.0	8.0	-
67	715+00	B-021-0-21	8.0	8.0	-	142	731+16	B-025-0-21	8.0	8.0	-
68	715+24	B-021-0-21	8.0	8.0	-	143	731+40	B-025-0-21	8.0	8.0	-
69	715+48	B-021-0-21	8.0	8.0	-	144	731+64	B-026-0-21	11.0	11.0	-
70	715+72	B-021-0-21	8.0	8.0	-	145	731+88	B-026-0-21	11.0	11.0	-
71	715+96	B-021-0-21	8.0	8.0	-	146	732+12	B-026-0-21	11.0	11.0	-
72	716+20	B-021-0-21	8.0	8.0	-	147	732+36	B-026-0-21	11.0	11.0	-
73	716+44	B-021-0-21	8.0	8.0	-	148	732+56	B-026-0-21	11.0	11.0	-
74	716+68	B-021-0-21	8.0	8.0	-	149	732+76	B-026-0-21	11.0	11.0	-
75	716+92	B-021-0-21	8.0	8.0	-	150	733+00	B-026-0-21	11.0	11.0	-

**Structure Foundation Exploration – Final
Barrier 1, Noise Barrier 4, Noise Barrier 7
MAH-680-09.30
Mahoning County, Ohio
PID: 110931**

5.3. Global Stability Analysis for Barrier 1 Site

Per the plan, 81” high concrete single slope barrier was proposed along the Barrier 1 site. For purposes of evaluating the stability of the embankment slope supporting the proposed 81” Barrier Noise Wall, NEAS reviewed the cross-section and project boring logs to determine the subsurface soil conditions that posed the greatest potential for slope instability. Based on our review, NEAS developed a representative cross-sectional model at STA. 121+50 in reference to Barrier 1 to use as the basis for global stability analyses. The models were developed from NEAS’s interpretation of the available information which included: 1) the cross section prepared by Arcadis; and 2) test borings and laboratory data developed as part of this report.

For analysis purposes, the nearby boring log B-006-0-21 was reviewed, and a generalized material profile was developed for analysis. Utilizing the generalized soil profile, engineering properties for each soil strata were estimated based on their field (i.e., SPT N_{60} Values, hand penetrometer values, etc.) and laboratory (i.e., Atterberg Limits, grain size, etc.) test results using correlations provided in published engineering manuals, research reports and guidance documents. The developed soil profile and estimated engineering soil properties (with cited correlation/reference material) used in our evaluation is summarized per boring within Table 13 below.

Table 13: Soil Properties B-006-0-21

MAH-680-9.30 Barrier 1: Soil Profile B-006-0-21							
Soil Description	Unit Weight ⁽¹⁾ (pcf)	Moist Unit Weight ⁽¹⁾ (pcf)	Saturated Unit Weight ⁽¹⁾ (pcf)	Undrained Shear Strength ⁽²⁾ (psf)	Effective Cohesion ⁽³⁾ (psf)	Effective Friction Angle ⁽³⁾ (degrees)	Setup Factor (f_{su})
Sandy Silt Depth (1094.4 ft - 1083.9 ft)	115	115	125	2750	250	26	1.50
Gravel with Sand Depth (1083.9 ft - 1078.9 ft)	118	118	128	-	-	36	1.00
Sandy Silt Depth (1078.9 ft - 1073.9 ft)	115	115	125	2600	250	26	1.50
Coarse and Fine Sand Depth (1073.9 ft - 1071.4 ft)	115	115	125	-	-	33	1.00
Sandy Silt Depth (1071.4 ft - 1069.4 ft)	112	112	122	2000	200	25	1.50

Notes:
1. Values interpreted from ODOT Geotechnical Design Manual (GDM) Section 405.
2. Values calculated from Terzaghi and Peck (1967) if $N_{160}<52$, else Stroud and Butler (1975) was used.
3. Values interpreted from LRFD BDS Table 10.4.6.2.4-1 and ODOT GDM Table 400-3.

The above referenced slope stability model was analyzed for long-term (Effective Stress) and short-term (Total Stress) slope stability utilizing the software entitled Slide 7.0 by Rocscience, Inc. Specifically, the Bishop, Spencer and GLE analysis methods were used to calculate a factor of safety (FOS) for circular type slope failures. The FOS is the ratio of the resisting forces and the driving forces, with the desired safety factor being more than about 1.3 which equates to an AASHTO resistance factor less than 0.75 (per AASHTO, 2020 - the specified resistance factors are essentially the inverse of the FOS that should be targeted in slope stability programs). For this analysis, a resistance factor of 0.75 or lower is targeted as the slope does not contain or support a structural element.

Based on our slope stability analyses for the referenced STA. 121+50, the minimum slope stability safety factors for short-term (Total Stress) and long-term (Effective Stress) conditions exceeded the desired value of 1.3. In other words, the Capacity to Demand Ratio (CDR) is larger than 1.0, where CDR is equal to the ratio of the calculated FOS to the minimum required FOS of 1.3. It is our opinion that the subsurface conditions encountered at Barrier 1 site are generally satisfactory and the site can be considered to be stable at short-term and long-term condition. The results of the analyses are summarized in Table 14. The graphical output of the slope stability program (cross-sectional model, calculated safety factor, and critical failure plane) is presented in Appendix E.

**Structure Foundation Exploration – Final
Barrier 1, Noise Barrier 4, Noise Barrier 7
MAH-680-09.30
Mahoning County, Ohio
PID: 110931**

Table 14: Global Stability Analysis

Barrier 1 Global Stability Summary							
Location	Boring No.	Description	Minimum Factor of Safety	Equivalent Resistance Factor	Minimum Required Factor of Safety	Capacity to Demand Ratio	Status (OK/NG)
STA. 121+50	B-006-0-21	Short Term	4.40	0.23	1.30	3.38	OK
		Long Term	1.82	0.55	1.30	1.40	OK

6. QUALIFICATIONS

This investigation was performed in accordance with accepted geotechnical engineering practice for the purpose of characterizing the subsurface conditions at the site of Noise Barrier 4 and Noise Barrier 7 for the MAH-680-03.90 project. This report has been prepared for IBI Group, ODOT and their design consultants to be used solely in evaluating the soils underlying the noise barrier site and presenting geotechnical engineering recommendations specific to this project. The assessment of general site environmental conditions or the presence of pollutants in the soil, rock and groundwater of the site was beyond the scope of this geotechnical exploration. Our recommendations are based on the results of our field explorations, laboratory tests results from representative soil samples, and geotechnical engineering analyses. The results of the field explorations and laboratory tests, which form the basis of our recommendations, are presented in the appendices as noted. This report does not reflect any variations that may occur between the borings or elsewhere on the site, or variations whose nature and extent may not become evident until a later stage of construction. In the event that any changes in the nature, design or location of the proposed retaining wall is made, the conclusions and recommendations contained in this report should not be considered valid until they are reviewed and have been modified or verified in writing by a geotechnical engineer.

It has been a pleasure to be of service to IBI Group in performing this geotechnical exploration for the MAH-680-03.90 project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

National Engineering and Architectural Services Inc.

Chunmei (Melinda) He, Ph.D., P.E.
Project Manager

Zhao Mankoci, Ph.D., P.E.
Geotechnical Engineer

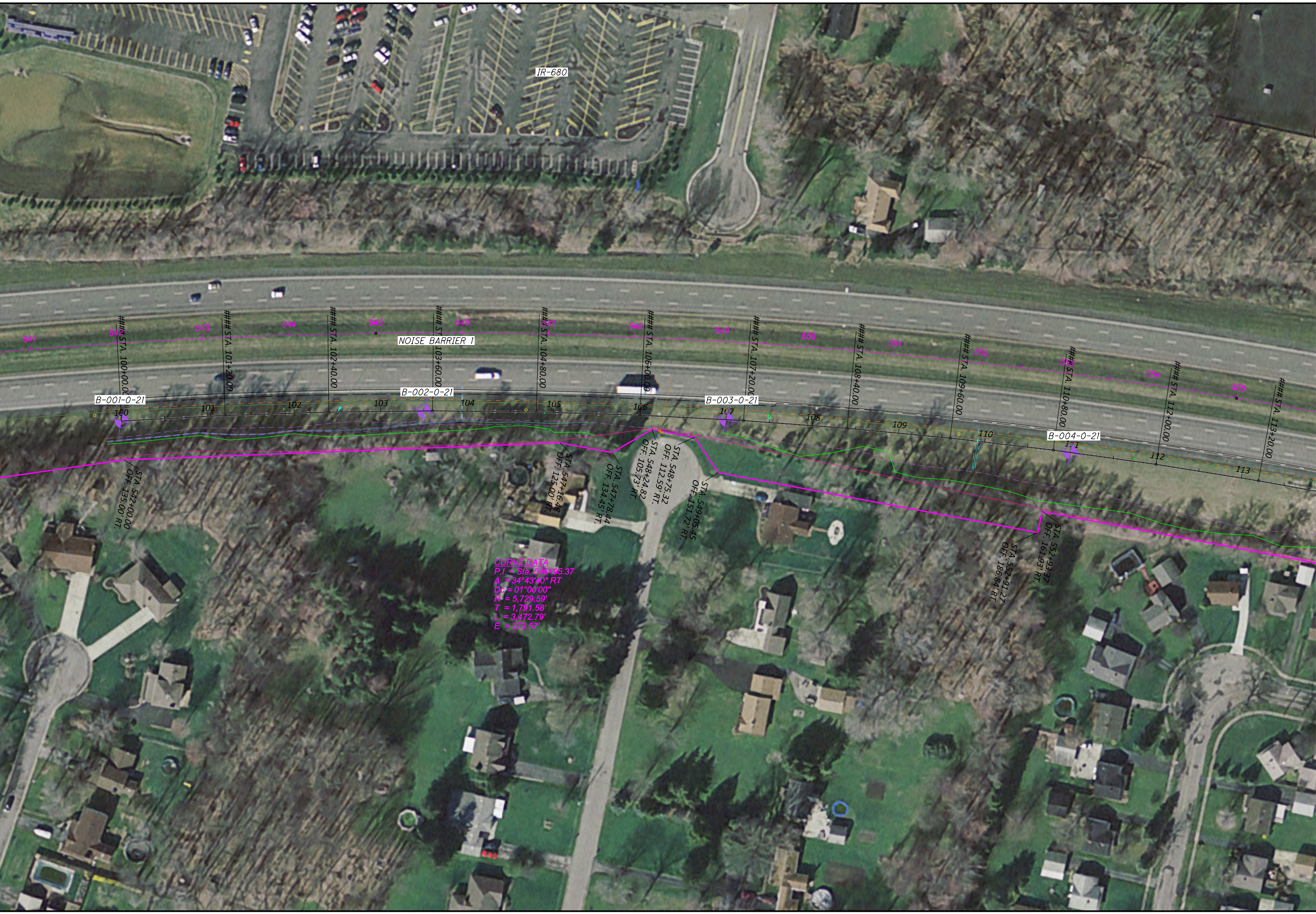
**Structure Foundation Exploration – Final
Barrier 1, Noise Barrier 4, Noise Barrier 7
MAH-680-09.30
Mahoning County, Ohio
PID: 110931**

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APPENDIX A

SOIL BORING LOCATION PLAN



CURVE DATA
 P.I. = Sta. 546+95.37
 $\Delta = 34^{\circ}43'40''$ RT
 $D_s = 01^{\circ}00'00''$
 $R = 5,729.59'$
 $T = 1,791.58'$
 $L = 3,472.79'$
 $E = 273.57'$

STA. 542+00.00
 OFF. 135.00' RT.

STA. 547+16.48
 OFF. 125.00' RT.

STA. 547+78.44
 OFF. 134.45' RT.

STA. 548+24.82
 OFF. 105.73' RT.

STA. 548+75.32
 OFF. 112.59' RT.

STA. 549+05.45
 OFF. 151.72' RT.

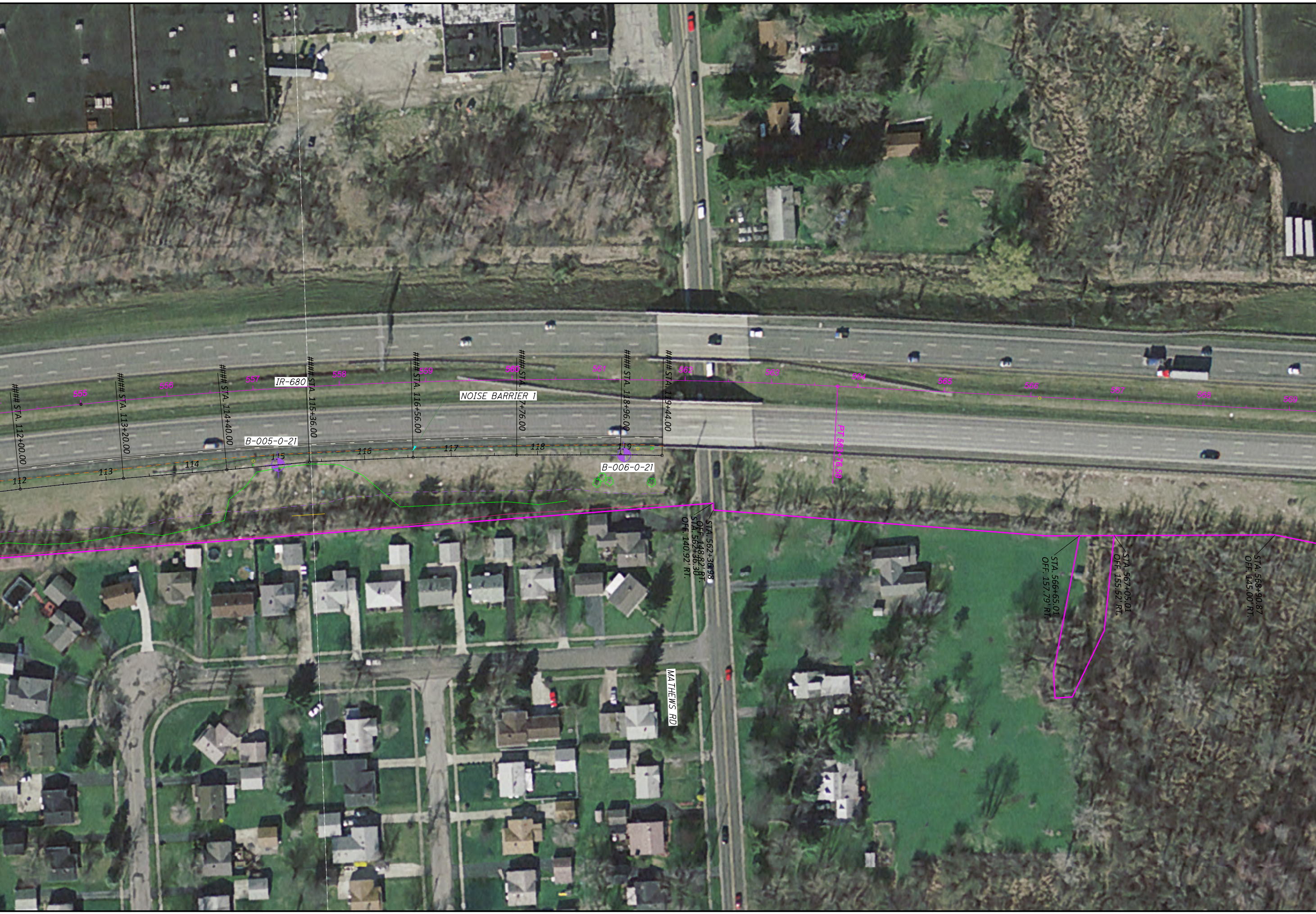
STA. 552+91.27
 OFF. 186.84' RT.

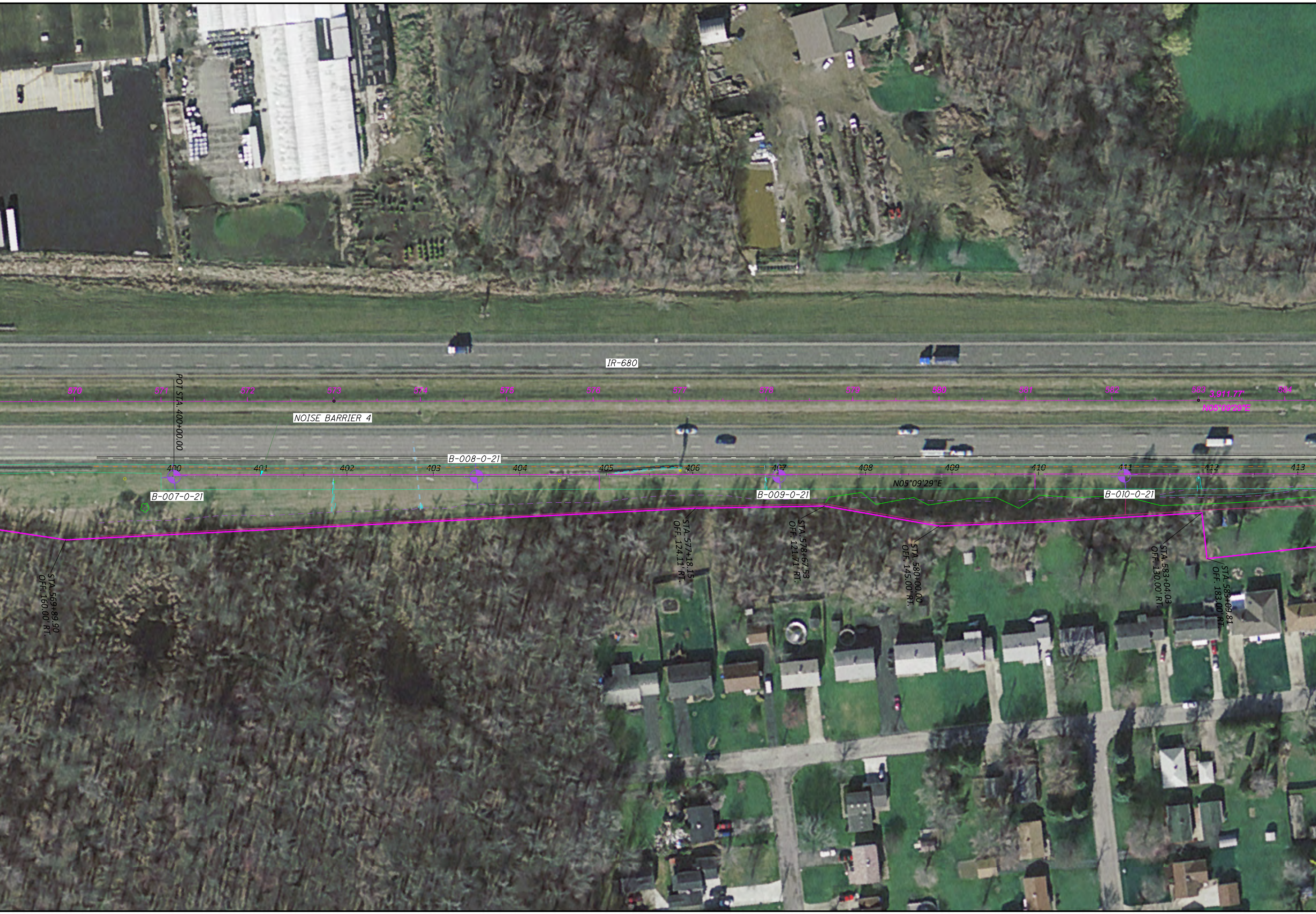
STA. 552+93.37
 OFF. 161.93' RT.

DRAWN	ZM	CHECKED	JS
HORIZONTAL SCALE IN FEET			

**MAH-680-9.23 NOISE BARRIER 1
 TARGET BORING PLAN**

MAH-680-9.23





STA. 569+89.90
OFF. 160.00' RT.

B-007-0-21

POT STA. 400+00.00

NOISE BARRIER 4

B-008-0-21

400

401

402

403

404

405

406

407

408

409

410

411

412

413

STA. 577+18.15
OFF. 124.11' RT.

STA. 578+67.53
OFF. 121.71' RT.

STA. 580+00.00
OFF. 145.00' RT.

STA. 583+04.03
OFF. 130.00' RT.

STA. 583+09.81
OFF. 183.00' RT.

IR-680

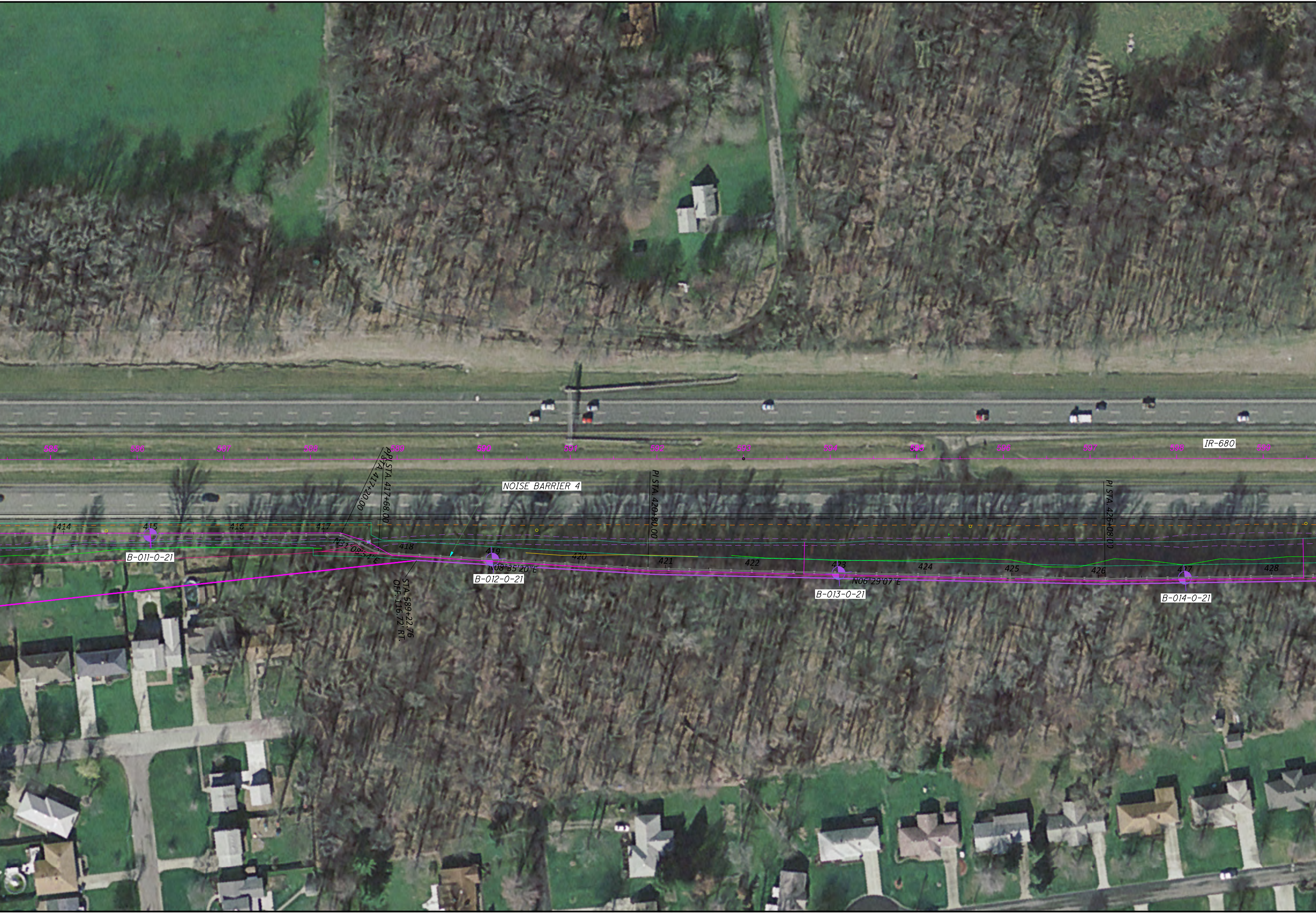
3,911.77'
N05°09'29\"/>

DRAWN	ZM
CHECKED	JS

0 50 100
HORIZONTAL SCALE IN FEET

MAH-680-9.23 NOISE BARRIER 4 TARGET BORING PLAN

MAH-680-9.23

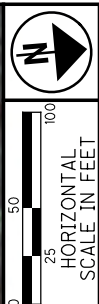


DRAWN	ZM	CHECKED	JS
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**MAH-680-9.23 NOISE BARRIER 4
TARGET BORING PLAN**

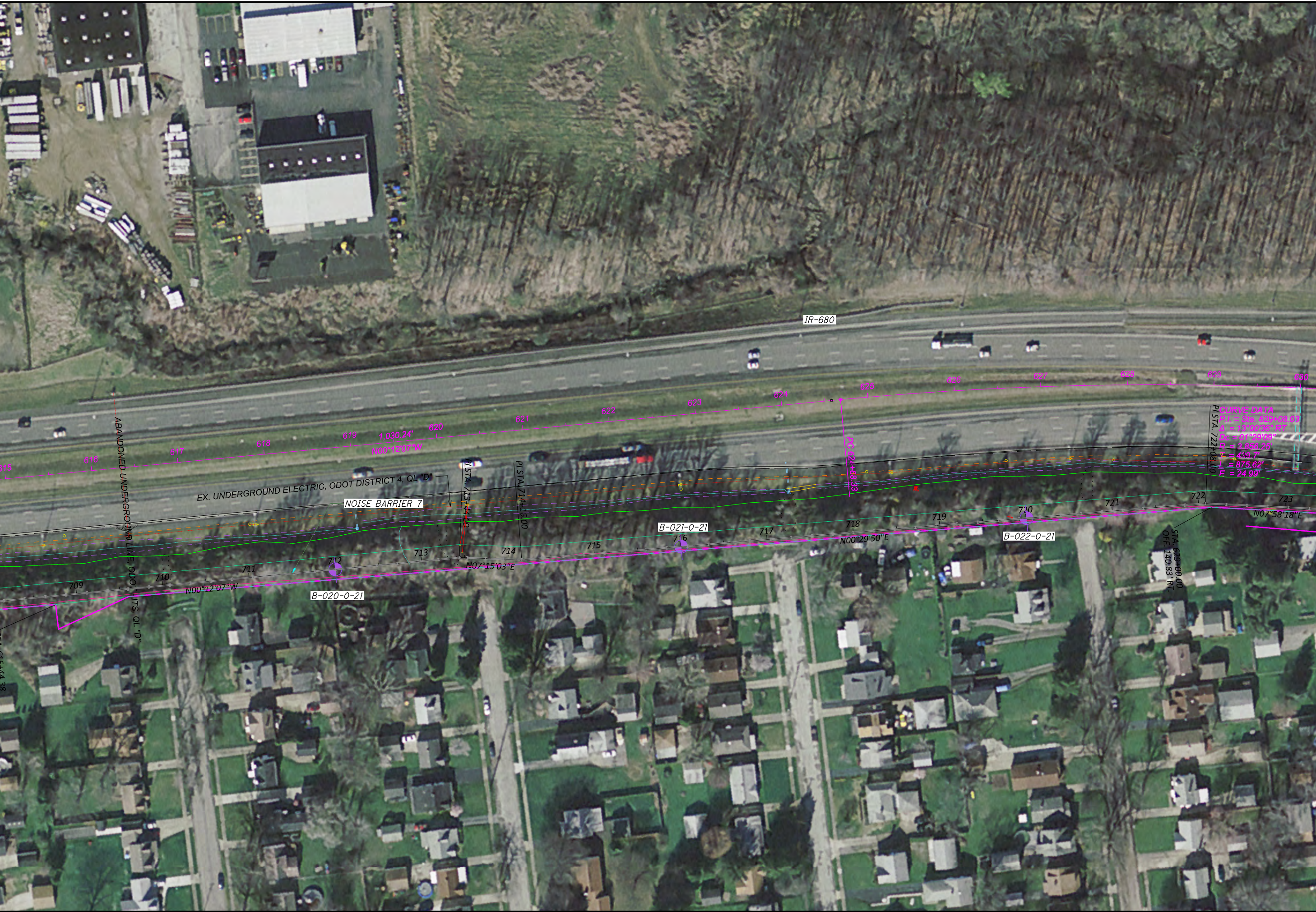
MAH-680-9.23

4
7





		MAH-680-9.23 NOISE BARRIER 4 & 7 TARGET BORING PLAN
	DRAWN ZM CHECKED JS	
		



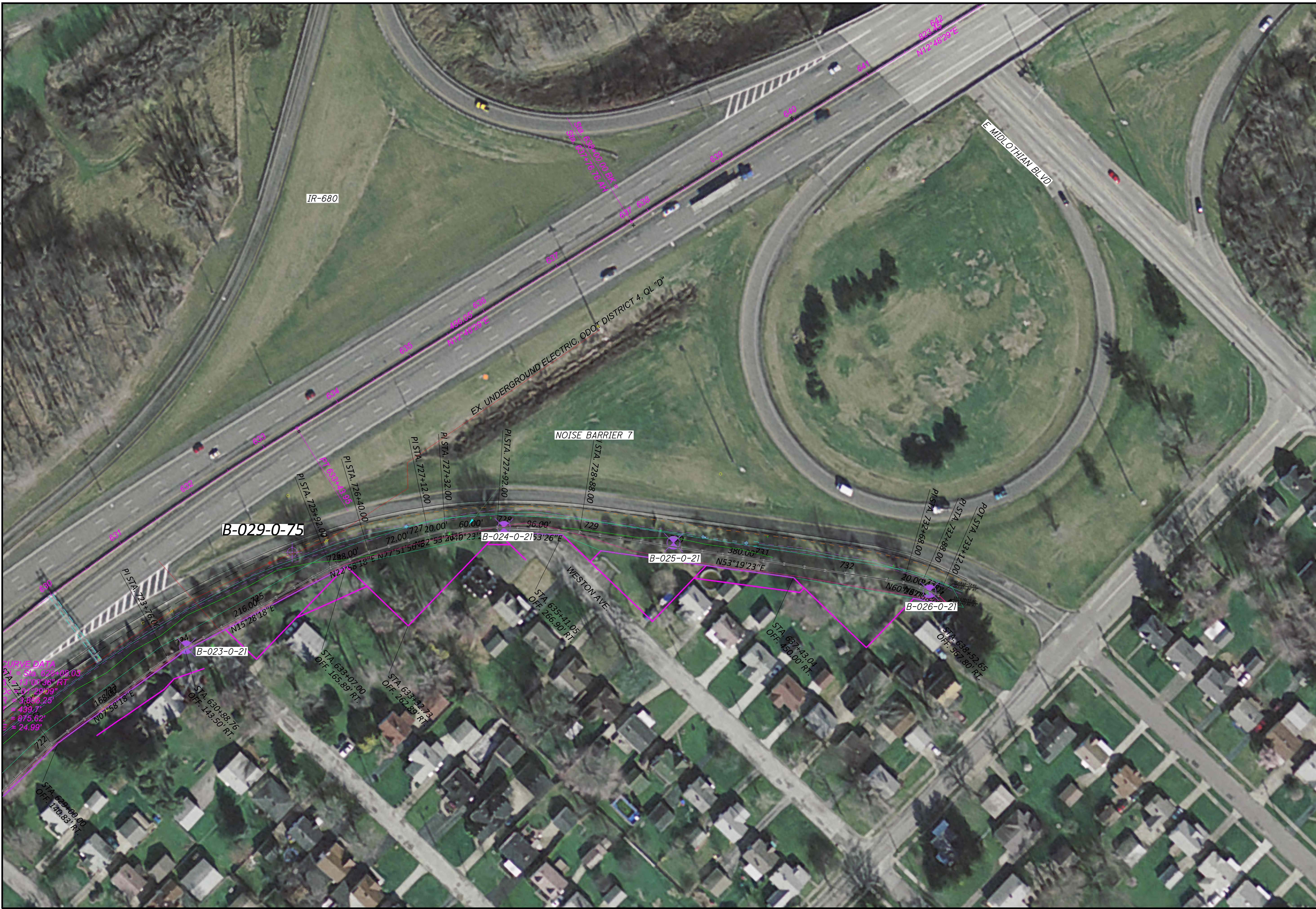
DRAWN ZM
CHECKED JS

0 50 100
HORIZONTAL SCALE IN FEET

MAH-680-9.23 NOISE BARRIER 7
TARGET BORING PLAN

MAH-680-9.23

6
7

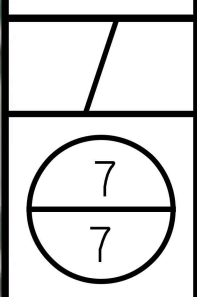


DRAWN: ZM
CHECKED: JS

0 25 50 100
HORIZONTAL SCALE IN FEET

MAH-680-9.23 NOISE BARRIER 7
TARGET BORING PLAN

MAH-680-9.23



APPENDIX B

SOIL BORING LOGS

STRENGTH TEST REPORTS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BASEMAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 102+41, 26' RT.	EXPLORATION ID: B-001-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER 1	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1080.4 (MSL) EOB: 25.0 ft.	PAGE: 1 OF 1
START: 11/1/22 END: 11/1/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.033460, -80.630390	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			ODOT CLASS (GI)	BACK FILL			
								GR	CS	FS	SI	CL	LL	PL	PI			WC		
VERY STIFF TO HARD, BROWN, SANDY SILT, LITTLE CLAY, TRACE TO LITTLE GRAVEL, DAMP	1080.4	1	3																	
		2	6	7	17	100	SS-1	4.50	7	10	22	42	19	24	16	8	14	A-4a (5)		
		3																		
		4	3	4	5	12	100	SS-2	2.50	-	-	-	-	-	-	-	-	15	A-4a (V)	
		5																		
		6	3	3	4	9	100	SS-3	2.75	7	11	20	45	17	23	17	6	17	A-4a (5)	
		7																		
	1072.4	8																		
HARD, GRAY, SANDY SILT, SOME CLAY, LITTLE GRAVEL, IRON STAINING, DAMP	1072.4	9	3	6	8	18	100	SS-4	4.50	11	13	17	33	26	27	18	9	13	A-4a (5)	
	1069.9	10																		
MEDIUM DENSE, GRAY, COARSE AND FINE SAND, SOME SILT, TRACE STONE FRAGMENTS, TRACE CLAY, MOIST	1069.9	11	4	8	11	25	100	SS-5	-	-	-	-	-	-	-	-	-	13	A-3a (V)	
	1067.9	12																		
VERY STIFF TO HARD, GRAY, SANDY SILT, LITTLE CLAY, TRACE TO LITTLE GRAVEL, DAMP	1067.9	13																		
		14	5	5	6	14	100	SS-6	4.50	6	12	19	46	17	19	14	5	12	A-4a (6)	
		15																		
		16	2	2	4	8	100	SS-7	3.25	-	-	-	-	-	-	-	-	14	A-4a (V)	
		17																		
	1061.9	18																		
		19	3	3	4	9	100	SS-8	3.75	-	-	-	-	-	-	-	-	14	A-4a (V)	
		20																		
		21	3	5	10	20	100	SS-9	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)	
		22																		
		23																		
		24	3	7	12	25	100	SS-10	4.50	-	-	-	-	-	-	-	-	11	A-4a (V)	
	1055.4	25																		
		EOB																		

NOTES: GROUNDWATER ENCOUNTERED AT 18.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\B\SEMAP\SIGINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 105+96, 18' RT.	EXPLORATION ID B-002-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER 1	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1085.6 (MSL) EOB: 24.5 ft.	PAGE 1 OF 1
START: 11/1/22 END: 11/1/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.034400, -80.630720	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			ODOT CLASS (GI)	BACK FILL		
								GR	CS	FS	SI	CL	LL	PL	PI			WC	
VERY STIFF TO HARD, BROWN, SANDY SILT , LITTLE CLAY, TRACE TO LITTLE GRAVEL, IRON STAINING, DAMP	1085.6	1	4																
		2	8	25	100	SS-1	4.50	8	12	26	37	17	24	16	8	12	A-4a (4)		
		3																	
		4	3	6	21	100	SS-2	3.00	-	-	-	-	-	-	-	-	14	A-4a (V)	
		5	10																
MEDIUM DENSE, BROWN, GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT , LITTLE CLAY, MOIST	1080.1	6	3																
		7	3	11	100	SS-3	-	-	-	-	-	-	-	-	-	14	A-2-4 (V)		
		8																	
		9	3	4	13	100	SS-4	-	-	-	-	-	-	-	-	-	15	A-2-4 (V)	
VERY STIFF TO HARD, BROWNISH GRAY, SANDY SILT , SOME CLAY, TRACE TO LITTLE GRAVEL, DAMP	1075.1	10	6																
		11	3	5	21	100	SS-5	4.50	10	14	17	34	25	29	19	10	13	A-4a (5)	
		12	11																
MEDIUM DENSE, GRAY, FINE SAND , TRACE SILT, TRACE COARSE SAND, TRACE GRAVEL, TRACE CLAY, WET	1070.1	14	3	10	37	22	SS-6	3.75	-	-	-	-	-	-	-	-	14	A-4a (V)	
		15	18																
MEDIUM DENSE, GRAY, FINE SAND , TRACE SILT, TRACE COARSE SAND, TRACE GRAVEL, TRACE CLAY, WET	1067.6	16	4	9	28	100	SS-7	-	-	-	-	-	-	-	-	-	19	A-3 (V)	
		17	12																
HARD, GRAY, SANDY SILT , SOME STONE FRAGMENTS, LITTLE CLAY, DAMP	1065.1	18	3	8	22	72	SS-8	4.25	34	11	16	27	12	21	15	6	8	A-4a (1)	
		19	9																
DENSE, GRAY, STONE FRAGMENTS WITH SAND AND SILT , LITTLE CLAY, WET	1062.1	20																	
		21	6	14	47	83	SS-9	-	-	-	-	-	-	-	-	-	14	A-2-4 (V)	
SANDSTONE , GRAY, MODERATELY WEATHERED, STRONG, FINE TO MEDIUM GRAINED, FRIABLE.	1061.1	22	22																
		23																	
		TR																	
		EOB	15	50	-	42	SS-10	-	-	-	-	-	-	-	-	-	7	Rock (V)	

NOTES: GROUNDWATER ENCOUNTERED AT 21.0' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BASEMAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 109+48, 14' RT.	EXPLORATION ID B-003-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER 1	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1090.1 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 11/2/22 END: 11/2/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.035340, -80.630960	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI			WC
VERY STIFF, BROWN AND BROWNISH GRAY, SANDY SILT, LITTLE CLAY, TRACE GRAVEL, DAMP	1090.1	1	4															
		2	4	11	100	SS-1	2.50	4	12	26	41	17	22	16	6	13	A-4a (5)	
		3																
		4	2	3	9	100	SS-2	2.50	-	-	-	-	-	-	-	-	14	A-4a (V)
STIFF TO VERY STIFF, ORANGISH BROWN MOTTLED WITH GRAY, SANDY SILT, LITTLE CLAY, TRACE GRAVEL, IRON STAINING, DAMP	1084.6	5																
		6	5	14	100	SS-3	3.75	-	-	-	-	-	-	-	-	16	A-4a (V)	
		7																
		8	4	6	16	100	SS-4	1.50	7	12	22	41	18	24	17	7	16	A-4a (5)
HARD, GRAY, SANDY SILT, LITTLE TO SOME GRAVEL, LITTLE CLAY, DAMP	1079.6	9																
		10	4	6	16	100	SS-4	1.50	7	12	22	41	18	24	17	7	16	A-4a (5)
		11																
		12	3	6	29	100	SS-5	4.50	21	14	15	32	18	26	18	8	12	A-4a (3)
DENSE, LIGHT GRAY, STONE FRAGMENTS WITH SAND, LITTLE SILT, TRACE CLAY, DAMP	1072.1	13																
		14	8	9	26	100	SS-6	4.50	-	-	-	-	-	-	-	10	A-4a (V)	
		15																
		16	5	6	18	100	SS-7	4.50	-	-	-	-	-	-	-	-	11	A-4a (V)
DENSE, LIGHT GRAY, STONE FRAGMENTS WITH SAND, LITTLE SILT, TRACE CLAY, DAMP	1069.6	17																
		18	7	12	42	44	SS-8	-	-	-	-	-	-	-	-	5	A-1-b (V)	
DENSE, GRAY AND LIGHT GRAY, STONE FRAGMENTS WITH SAND AND SILT, LITTLE CLAY, DAMP	1067.1	19																
		20	14	19	47	39	SS-9	-	-	-	-	-	-	-	-	8	A-2-4 (V)	
HARD, GRAY, SANDY SILT, LITTLE CLAY, TRACE GRAVEL, DAMP	1065.1	21																
		22	9	13	30	33	SS-10	4.50	9	12	22	40	17	26	17	9	10	A-4a (4)
		23																
		24																
		25																
		EOB																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BASEMAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 113+56, 22' RT.	EXPLORATION ID B-004-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER 1	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1091.9 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 11/2/22 END: 11/2/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.036460, -80.631090	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI				
HARD, BROWN AND GRAY, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, DAMP	1091.9	1	6															<< < > >>	
		2	9	25	100	SS-1	4.50	9	11	28	36	16	21	15	6	11	A-4a (3)	<< < > >>	
		3																<< < > >>	
		4	5	6	20	100	SS-2	4.50	-	-	-	-	-	-	-	9	A-4a (V)	<< < > >>	
		5																<< < > >>	
		6	2	5	34	56	SS-3	4.50	-	-	-	-	-	-	-	7	A-4a (V)	<< < > >>	
		7																<< < > >>	
		8																<< < > >>	
		9	3	12	26	100	SS-4	4.50	-	-	-	-	-	-	-	15	A-4a (V)	<< < > >>	
		10																<< < > >>	
LOOSE TO MEDIUM DENSE, ORANGISH BROWN AND GRAY, SANDY SILT , LITTLE CLAY, TRACE TO LITTLE GRAVEL, IRON STAINING, MOIST TO DAMP	1081.4	11	2	4	12	100	SS-5	-	-	-	-	-	-	-	-	16	A-4a (V)	<< < > >>	
		12																<< < > >>	
		13																<< < > >>	
		14	2	5	24	100	SS-6	-	-	-	-	-	-	-	-	14	A-4a (V)	<< < > >>	
		15																<< < > >>	
		16																<< < > >>	
		17	2	3	9	100	SS-7	-	13	16	24	35	12	NP	NP	NP	13	A-4a (2)	<< < > >>
		18																<< < > >>	
VERY STIFF, GRAY, SANDY SILT , SOME CLAY, LITTLE TO SOME GRAVEL, DAMP	1071.4	19	3	6	14	100	SS-8	-	-	-	-	-	-	-	-	13	A-4a (V)	<< < > >>	
		20																<< < > >>	
		21	3	3	11	67	SS-9	3.50	-	-	-	-	-	-	-	10	A-4a (V)	<< < > >>	
		22																<< < > >>	
		23																<< < > >>	
		24	5	3	9	89	SS-10	3.00	-	-	-	-	-	-	-	12	A-4a (V)	<< < > >>	
	1066.9	25	4														<< < > >>		

NOTES: GROUNDWATER ENCOUNTERED AT 23.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\O\H\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECH\B\BASEMAP\SIGINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 117+55, 1' LT.	EXPLORATION ID B-005-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER 1	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1095.4 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 11/16/22 END: 11/16/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.037550, -80.631230	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI			WC
5.0" ASPHALT AND 5.0" BASE (DRILLERS DESCRIPTION)	1095.4																	
VERY STIFF, GREENISH GRAY, SANDY SILT , LITTLE CLAY, LITTLE GRAVEL, SLIGHTLY ORGANIC, DAMP	1094.6	1	4			SS-1	2.75	15	9	21	36	19	28	19	9	14	A-4a (4)	
	1092.4	2	5	12	83													
HARD, BROWN AND GRAY, SANDY SILT , LITTLE CLAY, LITTLE GRAVEL, DAMP		3																
		4	8	20	67	SS-2	4.50	13	11	28	34	14	20	15	5	10	A-4a (3)	
		5	7															
		6	6															
	1087.4	7	5	16	67	SS-3	4.25	-	-	-	-	-	-	-	-	15	A-4a (V)	
		8																
MEDIUM DENSE, BROWN, GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT , TRACE CLAY, DAMP	1084.9	9	7	14	83	SS-4	-	-	-	-	-	-	-	-	-	10	A-2-4 (V)	
		10	5	6														
VERY STIFF TO HARD, BROWN AND GRAY, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, SS-5 CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP		11	6	17	72	SS-5	-	8	13	26	38	15	21	16	5	9	A-4a (4)	
		12	6	7														
		13																
		14	5	16	78	SS-6	4.50	-	-	-	-	-	-	-	-	10	A-4a (V)	
	1079.9	15	7	5														
MEDIUM DENSE, BROWN, COARSE AND FINE SAND , SOME SILT, LITTLE GRAVEL, TRACE CLAY, DAMP		16	6	13	67	SS-7	-	-	-	-	-	-	-	-	-	12	A-3a (V)	
		17	5	5														
VERY STIFF TO HARD, GRAYISH BROWN AND GRAY, SANDY SILT , LITTLE TO SOME CLAY, TRACE GRAVEL, DAMP	1077.4	18	5	12	100	SS-8	3.25	-	-	-	-	-	-	-	-	15	A-4a (V)	
		19	4	5														
		20																
		21	5	13	89	SS-9	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)	
		22	5	5														
		23																
	1070.4	24	6	16	100	SS-10	4.50	6	10	18	45	21	24	16	8	14	A-4a (6)	
		25	5	7														

EOB

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BASEMAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 121+49, 4' LT.	EXPLORATION ID: B-006-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER 1	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1094.4 (MSL) EOB: 25.0 ft.	PAGE: 1 OF 1
START: 11/16/22 END: 11/16/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.038620, -80.631190	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI			WC
4.0" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION) HARD, BROWNISH GRAY BECOMING GRAY, SANDY SILT, LITTLE TO SOME GRAVEL, LITTLE CLAY, DAMP	1094.4																	
	1093.6	1	4															
		2	3	11	56	SS-1	4.50	16	18	21	31	14	20	15	5	7	A-4a (2)	
		3																
		4	7	11	25	83	SS-2	4.50	-	-	-	-	-	-	-	9	A-4a (V)	
		5																
		6	6	6	17	78	SS-3	4.50	16	11	21	38	14	21	16	5	9	A-4a (3)
		7																
		8	7	17	36	56	SS-4	4.50	-	-	-	-	-	-	-	9	A-4a (V)	
		9																
MEDIUM DENSE, BROWNISH GRAY, STONE FRAGMENTS WITH SAND, TRACE SILT, TRACE CLAY, DAMP SS-5 CONTAINS NO RECOVERY	1083.9	10																
		11	8	8	25	0	SS-5	-	-	-	-	-	-	-	-			
		12																
		13	7	10	29	22	SS-6	-	-	-	-	-	-	-	-	8	A-1-b (V)	
HARD, GRAY, SANDY SILT, SOME GRAVEL, LITTLE CLAY, DAMP	1078.9	14																
		15	8	8	20	56	SS-7	4.50	22	11	19	35	13	21	14	7	7	A-4a (3)
		16																
		17	7	8	22	61	SS-8	4.50	-	-	-	-	-	-	-	9	A-4a (V)	
MEDIUM DENSE, BROWN, COARSE AND FINE SAND, LITTLE GRAVEL, LITTLE SILT, TRACE CLAY, DAMP	1073.9	18																
		19	7	6	17	39	SS-9	-	-	-	-	-	-	-	-	13	A-3a (V)	
VERY STIFF, BROWN AND GRAY, SANDY SILT, LITTLE CLAY, TRACE GRAVEL, DAMP	1071.4	20																
		21	5	6	16	89	SS-10	3.75	9	11	19	41	20	24	17	7	13	A-4a (5)
	1069.4	22																
		23																
		24																
		25																

EOB

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BASEMAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 399+87, 18' RT.	EXPLORATION ID B-007-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER4	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1085.5 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 11/2/22 END: 11/2/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.041270, -80.630760	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI				
HARD, BROWN AND GRAY BECOMING GRAY, SANDY SILT, LITTLE TO SOME CLAY, TRACE TO SOME GRAVEL, SS-9 CONTAINS IRON STAINING, DAMP TO MOIST	1085.5																		
		1	3																
		2	6	7	17	100	SS-1	4.50	10	11	22	37	20	24	16	8	12	A-4a (4)	
		3																	
		4	4																
		5	5	8	17	100	SS-2	4.50	-	-	-	-	-	-	-	-	-	14	A-4a (V)
		6																	
		7	4																
		8																	
		9	5																
	10																		
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	12	4																	
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	16																		
	17	3																	
	18																		
	19	4																	
	20																		
	21																		
	22	2																	
	23																		
	24	5																	
	1060.5																		
		EOB																	
		25																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OHDPOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECH\B\SEM\B\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 403+45, 12' RT.	EXPLORATION ID B-008-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER4	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1081.9 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 11/3/22 END: 11/3/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.042250, -80.630620	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
MEDIUM DENSE, BROWN AND GRAY, STONE FRAGMENTS WITH SAND , LITTLE SILT, TRACE CLAY, DAMP	1081.9	1	5															
	1078.9	2	4	11	33	SS-1	-	-	-	-	-	-	-	-	17	A-1-b (V)		
		3	4	11	44	SS-2	3.00	27	12	19	29	13	22	17	5	11	A-4a (1)	
VERY STIFF, BROWN, SANDY SILT , SOME GRAVEL AND STONE FRAGMENTS, LITTLE CLAY, DAMP	1076.4	4	3															
		5	4	11	44	SS-2	3.00	27	12	19	29	13	22	17	5	11	A-4a (1)	
	6	2	1	4	100	SS-3	3.50	-	-	-	-	-	-	-	15	A-4a (V)		
VERY STIFF TO HARD, BROWNISH GRAY AND ORANGISH BROWN, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, IRON STAINING, DAMP	1068.9	7	2															
		8	3	5	16	100	SS-4	4.50	-	-	-	-	-	-	14	A-4a (V)		
	9	3	5	13	100	SS-5	4.25	-	-	-	-	-	-	15	A-4a (V)			
MEDIUM DENSE, BROWNISH GRAY, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, MOIST	1066.4	10	5															
		11	3	5	13	100	SS-5	4.25	-	-	-	-	-	-	15	A-4a (V)		
	12	5	5	13	100	SS-6	-	-	-	-	-	-	-	14	A-4a (V)			
VERY STIFF, BROWN AND GRAY, SANDY SILT , SOME CLAY, LITTLE GRAVEL, DAMP	1061.4	13	5															
		14	5	5	13	100	SS-6	-	-	-	-	-	-	-	14	A-4a (V)		
	15	2	4	12	100	SS-7	3.50	-	-	-	-	-	-	15	A-4a (V)			
DENSE, GRAY, STONE FRAGMENTS WITH SAND AND SILT , TRACE CLAY, MOIST	1058.9	16	2															
		17	4	5	12	100	SS-7	3.50	-	-	-	-	-	-	15	A-4a (V)		
	18	2	2	8	100	SS-8	3.50	-	-	-	-	-	-	14	A-4a (V)			
MEDIUM DENSE, GRAY, SANDY SILT , LITTLE CLAY, LITTLE GRAVEL, DAMP	1056.9	19	2	4														
		20	4	8	100	SS-8	3.50	-	-	-	-	-	-	14	A-4a (V)			
	21	8	14	34	100	SS-9	-	-	-	-	-	-	-	14	A-2-4 (V)			
EOB	25	5	7	22	100	SS-10	-	12	10	21	41	16	NP	NP	NP	11	A-4a (4)	

NOTES: GROUNDWATER ENCOUNTERED AT 21.0' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BASEMAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 407+02, 15' RT.	EXPLORATION ID B-009-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER4	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1077.7 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 11/3/22 END: 11/3/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.043220, -80.630460	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
VERY STIFF, DARK GRAY, SILT AND CLAY , SOME SAND, TRACE GRAVEL, SLIGHTLY ORGANIC, MOIST	1077.7	1	4															<< << <<
		2	4	12	100	SS-1	2.50	3	6	19	44	28	35	21	14	21	A-6a (9)	<< << <<
	1074.7	3	5															<< << <<
VERY STIFF TO HARD, BROWN AND GRAY, SANDY SILT , LITTLE TO SOME CLAY, TRACE TO LITTLE GRAVEL, DAMP TO WET		4	3	18	83	SS-2	4.50	7	10	23	41	19	27	18	9	14	A-4a (5)	<< << <<
		5	6	8														<< << <<
		6	5															<< << <<
	1069.7	7	6	14	100	SS-3	3.75	-	-	-	-	-	-	-	-	26	A-4a (V)	<< << <<
		8	5															<< << <<
MEDIUM DENSE, ORANGISH BROWN, COARSE AND FINE SAND , SOME SILT, TRACE GRAVEL, TRACE CLAY, IRON STAINING, MOIST	1067.2	9	10	25	100	SS-4	-	-	-	-	-	-	-	-	-	15	A-3a (V)	<< << <<
		10	11	8														<< << <<
VERY STIFF, BROWN, SANDY SILT , SOME CLAY, TRACE GRAVEL, MOIST	1064.7	11	2	9	100	SS-5	2.50	4	10	19	42	25	26	16	10	17	A-4a (6)	<< << <<
		12	3	4														<< << <<
MEDIUM DENSE, GRAY, SILT , SOME SAND, TRACE CLAY, TRACE GRAVEL, MOIST	1064.2	13	2															<< << <<
		14	3	14	100	SS-6	-	7	11	22	50	10	NP	NP	NP	17	A-4b (5)	<< << <<
	1062.2	15	8															<< << <<
HARD, GRAY, SANDY SILT , LITTLE CLAY, TRACE TO LITTLE GRAVEL, DAMP		16	3	12	100	SS-7	4.25	8	11	24	42	15	19	15	4	12	A-4a (4)	<< << <<
		17	4	5														<< << <<
		18	5															<< << <<
		19	8	25	100	SS-8	4.50	-	-	-	-	-	-	-	-	11	A-4a (V)	<< << <<
		20	11															<< << <<
		21	4	21	100	SS-9	4.50	-	-	-	-	-	-	-	-	11	A-4a (V)	<< << <<
		22	7	9														<< << <<
		23	9															<< << <<
	1052.7	24	3	18	100	SS-10	4.50	-	-	-	-	-	-	-	-	13	A-4a (V)	<< << <<
		25	5	9														<< << <<

NOTES: GROUNDWATER ENCOUNTERED AT 13.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BASEMAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 411+04, 15' RT.	EXPLORATION ID B-010-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER4	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1074.4 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 11/3/22 END: 11/3/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.044320, -80.630300	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI				
MEDIUM DENSE, BROWN, STONE FRAGMENTS WITH SAND AND SILT , TRACE CLAY, DAMP	1074.4	1	15															<< < <	
	1071.4	2	6	14	72	SS-1	-	-	-	-	-	-	-	-	12	A-2-4 (V)	<< < <		
		3	5															<< < <	
MEDIUM STIFF TO VERY STIFF, BLACK WITH ORANGISH BROWN AND GRAY BECOMING ORANGISH BROWN MOTTLED WITH GRAY, CLAY , "AND" SILT, TRACE SAND, TRACE GRAVEL, IRON STAINING, SS-2 IS MODERATELY ORGANIC, MOIST TO DAMP	1064.9	4	2	9	100	SS-2	1.00	3	2	7	43	45	54	24	30	33	A-7-6 (19)	<< < <	
		5	3	4														<< < <	
		6	2																<< < <
		7	4	11	100	SS-3	2.25	-	-	-	-	-	-	-	-	28	A-7-6 (V)	<< < <	
		8																	<< < <
		9	3	4	22	100	SS-4A	2.00	-	-	-	-	-	-	-	21	A-7-6 (V)	<< < <	
MEDIUM DENSE, ORANGISH BROWN, COARSE AND FINE SAND , TRACE SILT, TRACE CLAY, TRACE GRAVEL, MOIST	1063.9	10	4	13		SS-4B	-	-	-	-	-	-	-	-	17	A-3a (V)	<< < <		
	1053.2	11	7	21	100	SS-5	4.50	9	9	18	47	17	22	16	6	13	A-4a (6)	<< < <	
12		7	9															<< < <	
13																		<< < <	
14		5	21	100	SS-6	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)	<< < <		
15		6	10															<< < <	
16																		<< < <	
17		4	17	100	SS-7	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)	<< < <		
18		6	7															<< < <	
19		4	13	100	SS-8	4.00	-	-	-	-	-	-	-	-	14	A-4a (V)	<< < <		
20		4	6															<< < <	
MEDIUM DENSE, GRAY, COARSE AND FINE SAND , SOME SILT, LITTLE GRAVEL, TRACE CLAY, MOIST TO WET	1053.2	21	4	16	100	SS-9	-	-	-	-	-	-	-	-	14	A-3a (V)	<< < <		
	1049.4	22	6	6														<< < <	
		23																<< < <	
	1049.4	24	2	11	100	SS-10	-	-	-	-	-	-	-	-	23	A-3a (V)	<< < <		
		25	4														<< < <		

NOTES: GROUNDWATER ENCOUNTERED AT 21.0' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BASEMAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 415+03, 11' RT.	EXPLORATION ID B-011-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP BARRIER4	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1071.1 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 11/4/22 END: 11/4/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.045410, -80.630150	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI				
HARD, ORANGISH BROWN MOTTLED WITH GRAY, SILT AND CLAY , SOME SAND, TRACE GRAVEL, IRON STAINING, DAMP	1071.1	1	6																
	1068.1	2	7	22	100	SS-1	4.50	6	7	19	44	24	29	17	12	14	A-6a (7)		
		3	10																
VERY STIFF TO HARD, ORANGISH BROWN MOTTLED WITH GRAY BECOMING BROWN, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, IRON STAINING, DAMP	1066.6	4	2	4	13	56	SS-2	4.50	10	9	19	43	19	24	17	7	14	A-4a (5)	
		5	6																
	1058.1	6	1	3	8	100	SS-3	3.25	-	-	-	-	-	-	-	-	15	A-4a (V)	
		7	3																
		8	2																
		9	2	9	100	SS-4	4.25	-	-	-	-	-	-	-	-	-	17	A-4a (V)	
10	5																		
DENSE, BROWN, STONE FRAGMENTS WITH SAND , TRACE SILT, TRACE CLAY, DAMP	1053.1	11	32	46	33	SS-5	-	-	-	-	-	-	-	-	-	10	A-1-b (V)		
VERY STIFF TO HARD, GRAY, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, DAMP	1053.1	12	24																
		13	11																
MEDIUM DENSE, GRAY, COARSE AND FINE SAND , SOME SILT, LITTLE GRAVEL, LITTLE CLAY, WET	1050.6	14	2	4	12	100	SS-6	4.50	10	11	18	42	19	19	14	5	11	A-4a (5)	
		15	5																
		16	2	3	11	100	SS-7	4.00	-	-	-	-	-	-	-	-	13	A-4a (V)	
MEDIUM DENSE TO DENSE, GRAY, GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT , LITTLE CLAY, MOIST	1050.6	17	3	5															
		18	3	4	13	83	SS-8	-	-	-	-	-	-	-	-	-	19	A-3a (V)	
MEDIUM DENSE TO DENSE, GRAY, GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT , LITTLE CLAY, MOIST	1046.1	19	4	6															
		20	6																
		21	3	8	25	100	SS-9	-	-	-	-	-	-	-	-	-	14	A-2-4 (V)	
		22	11																
		23	17	14	43	100	SS-10	-	-	-	-	-	-	-	-	11	A-2-4 (V)		
		24	19																
		25	19																

NOTES: GROUNDWATER ENCOUNTERED AT 18.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BSEM\MAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 4001+17, 3' LT.	EXPLORATION ID B-012-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL4	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1071.1 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 11/4/22 END: 11/4/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.046430, -80.629910	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	BACK FILL		
								GR	CS	FS	SI	CL	LL	PL	PI	WC				
STIFF TO HARD, BROWN AND BROWNISH GRAY BECOMING GRAY, SANDY SILT , LITTLE TO SOME CLAY, TRACE TO LITTLE GRAVEL, SS-1 AND SS-2 CONTAIN IRON STAINING, DAMP	1071.1	1	3																	
		2	5	16	100	SS-1	4.25	4	20	34	29	13	24	18	6	12	A-4a (1)			
		3																		
		4	3	6	18	78	SS-2	4.50	-	-	-	-	-	-	-	-	14	A-4a (V)		
		5																		
		6	3	5	13	100	SS-3	3.50	-	-	-	-	-	-	-	-	14	A-4a (V)		
		7																		
		8																		
		9	5	5	16	100	SS-4	3.50	-	-	-	-	-	-	-	-	13	A-4a (V)		
		10																		
		11	3	6	14	100	SS-5	2.00	-	-	-	-	-	-	-	-	13	A-4a (V)		
	LOOSE, GRAY, FINE SAND , TRACE COARSE SAND, TRACE SILT, TRACE CLAY, TRACE GRAVEL,, WET	1058.6	12	1	5	28	SS-6	-	-	-	-	-	-	-	-	-	18	A-3 (V)		
		13																		
		14	2	3	8	61	SS-7	-	-	-	-	-	-	-	-	24	A-3 (V)			
		15																		
VERY DENSE, GRAY, STONE FRAGMENTS WITH SAND AND SILT , TRACE CLAY, WET TO MOIST	1053.1	16	6		80	SS-8	-	-	-	-	-	-	-	-	-	15	A-2-4 (V)			
		17	16																	
		18	50/3"																	
		19	17	22	54	100	SS-9	-	-	-	-	-	-	-	-	9	A-2-4 (V)			
HARD, GRAY, SANDY SILT , LITTLE STONE FRAGMENTS, LITTLE CLAY, DAMP	1048.1	20																		
		21	14	14	40	100	SS-10	4.50	19	14	16	35	16	23	16	7	10	A-4a (3)		
	1046.1	22																		
		23																		
		24																		
		25																		
EOB																				

NOTES: GROUNDWATER ENCOUNTERED AT 13.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECH\LAB\SEMAP\SIGINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 4005+32, 4' LT.	EXPLORATION ID B-013-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL4	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1071.3 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 11/8/22 END: 11/8/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.047550, -80.629680	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL		
								GR	CS	FS	SI	CL	LL	PL	PI					
HARD, BROWN MOTTLED WITH ORANGISH BROWN, SILTY CLAY , SOME SAND, TRACE GRAVEL, IRON STAINING, DAMP	1071.3	1	5															<< < <		
	1068.3	2	7 10	22	100	SS-1	4.50	5	5	18	46	26	33	17	16	14	A-6b (10)	<< < <		
		3																	<< < <	
HARD, BROWN MOTTLED WITH ORANGISH BROWN AND GRAY BECOMING GRAY, SANDY SILT , LITTLE TO SOME CLAY, TRACE GRAVEL, SS-2 CONTAINS IRON STAINING, DAMP	1058.3	4	5 10	25	100	SS-2	4.50	-	-	-	-	-	-	-	-	10	A-4a (V)	<< < <		
		5																	<< < <	
		6	3																<< < <	
		7	7 8	20	100	SS-3	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)	<< < <		
		8																	<< < <	
		9	6 8	17	100	SS-4	4.50	-	-	-	-	-	-	-	-	11	A-4a (V)	<< < <		
		10																	<< < <	
		11	4 5	16	100	SS-5	4.50	-	-	-	-	-	-	-	-	14	A-4a (V)	<< < <		
		12																		<< < <
		13																		<< < <
LOOSE, GRAY, FINE SAND , TRACE SILT, TRACE COARSE SAND, TRACE CLAY, TRACE GRAVEL, WET	1058.3	14	1 2	5	50	SS-6	-	-	-	-	-	-	-	-	24	A-3 (V)	<< < <			
		15																	<< < <	
MEDIUM DENSE, GRAY, SANDY SILT , TRACE TO LITTLE CLAY, TRACE TO LITTLE GRAVEL AND STONE FRAGMENTS, DAMP	1053.3	16	1 2	8	100	SS-7	-	-	-	-	-	-	-	-	27	A-3 (V)	<< < <			
		17																	<< < <	
		18	7 9	28	100	SS-8	-	6	12	38	34	10	NP	NP	NP	13	A-4a (2)	<< < <		
		19																	<< < <	
		20																	<< < <	
		21	5 7	18	100	SS-9	-	-	-	-	-	-	-	-	-	10	A-4a (V)	<< < <		
		22																		<< < <
EOB	1046.3	23																<< < <		
		24	5 8	29	100	SS-10	-	-	-	-	-	-	-	-	11	A-4a (V)	<< < <			
		25																	<< < <	

NOTES: GROUNDWATER ENCOUNTERED AT 13.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECH\B\SEM\B\GINT FILES\MAH-680-9.30.GP

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 4009+28, 16' LT.	EXPLORATION ID B-014-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL4	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1067.4 (MSL) EOB: 23.7 ft.	PAGE 1 OF 1
START: 11/8/22 END: 11/8/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.048630, -80.629550	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
MEDIUM DENSE, BROWN, GRAVEL AND STONE FRAGMENTS WITH SAND , LITTLE SILT, TRACE CLAY, DAMP	1067.4	1	6															<< < <
		2	7	18	100	SS-1	-	-	-	-	-	-	-	-	10	A-1-b (V)		<< < <
	1064.4	3																<< < <
HARD, BROWN, SANDY SILT , SOME CLAY, TRACE GRAVEL, DAMP		4	3															<< < <
		5	5	16	100	SS-2	4.50	7	11	16	43	23	25	17	8	14	A-4a (6)	<< < <
	1061.9	6																<< < <
MEDIUM DENSE, GRAY, SANDY SILT , LITTLE GRAVEL, TRACE CLAY, MOIST		7	2															<< < <
	1059.4	8	3	11	100	SS-3	-	-	-	-	-	-	-	-	12	A-4a (V)		<< < <
	1059.4	9	5															<< < <
MEDIUM DENSE, GRAY, COARSE AND FINE SAND , LITTLE SILT, TRACE GRAVEL, TRACE CLAY, WET		10	6	17	100	SS-4	-	-	-	-	-	-	-	-	24	A-3a (V)		<< < <
	1056.9	11																<< < <
DENSE TO VERY DENSE, GRAY, STONE FRAGMENTS WITH SAND AND SILT , TRACE CLAY, DAMP TO MOIST		12	2	47	33	SS-5	-	-	-	-	-	-	-	-	9	A-2-4 (V)		<< < <
		13	10															<< < <
		14	9															<< < <
	1051.9	15	12		29	SS-6	-	-	-	-	-	-	-	-	11	A-2-4 (V)		<< < <
		16	50/2"															<< < <
HARD, GRAY, SANDY SILT , LITTLE CLAY, LITTLE STONE FRAGMENTS, DAMP		17	9	40	100	SS-7	4.50	15	13	22	35	15	20	15	5	8	A-4a (3)	<< < <
	1049.4	18	13															<< < <
		19	5	67	100	SS-8	4.50	-	-	-	-	-	-	-	9	A-4a (V)		<< < <
HARD, DARK GRAY, SANDY SILT , SOME CLAY, LITTLE STONE FRAGMENTS, RELIC ROCK STRUCTURE, DAMP		20	22															<< < <
	1046.4	21	29															<< < <
SHALE , DARK GRAY, HIGHLY WEATHERED, SLIGHTLY STRONG, FISSILE.		TR	50/4"		75	SS-9	-	-	-	-	-	-	-	-	9	Rock (V)		<< < <
	1043.7	EOB	50/2"		100	SS-10	-	-	-	-	-	-	-	-	8	Rock (V)		<< < <

NOTES: GROUNDWATER ENCOUNTERED AT 8.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BASEMAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 4012+46, 2' LT.	EXPLORATION ID B-015-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL4	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1066.7 (MSL) EOB: 23.6 ft.	PAGE 1 OF 1
START: 11/9/22 END: 11/9/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.049500, -80.629380	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI				
HARD, BROWN, SANDY SILT, SOME CLAY, TRACE GRAVEL, DAMP TO MOIST	1066.7																		
		1	2																
		2	5	20	100	SS-1	4.50	6	9	20	44	21	24	16	8	10	A-4a (6)		
		3																	
		4	9	28	100	SS-2	4.50	-	-	-	-	-	-	-	-	17	A-4a (V)		
		5	10																
MEDIUM DENSE, GRAY, SILT, TRACE CLAY, TRACE SAND, TRACE GRAVEL, WET	1058.7																		
		6	6	18	100	SS-3	4.50	-	-	-	-	-	-	-	-	14	A-4a (V)		
		7	6	8															
		8																	
		9	4	14	100	SS-4	-	0	0	4	91	5	NP	NP	NP	26	A-4b (8)		
		10	5	6															
MEDIUM DENSE TO VERY DENSE, GRAY, SANDY SILT, LITTLE CLAY, TRACE TO SOME STONE FRAGMENTS, DAMP	1053.7																		
		11	7	18	100	SS-5	-	-	-	-	-	-	-	-	-	28	A-4b (V)		
		12	6	8															
		13																	
		14	6	21	100	SS-6	-	10	12	25	38	15	NP	NP	NP	11	A-4a (4)		
		15	8	8															
SHALE, DARK GRAY, MODERATELY WEATHERED, SLIGHTLY STRONG, FISSILE.	1044.4																		
		16	5	21	100	SS-7	-	-	-	-	-	-	-	-	-	10	A-4a (V)		
		17	7	9															
		18																	
		19	5	32	100	SS-8	-	-	-	-	-	-	-	-	-	10	A-4a (V)		
		20	11	13															
SHALE, DARK GRAY, MODERATELY WEATHERED, SLIGHTLY STRONG, FISSILE.	1043.1																		
		21	4	-	87	SS-9	-	-	-	-	-	-	-	-	-	6	A-4a (V)		
		22	12	50/3"															
		23	60/1"	-	100	SS-10	-	-	-	-	-	-	-	-	-	12	Rock (V)		

NOTES: GROUNDWATER ENCOUNTERED AT 8.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECH\B\SEMAP\SIGINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 4017+37, 12' RT.	EXPLORATION ID: B-016-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL4	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1068.3 (MSL) EOB: 25.0 ft.	PAGE: 1 OF 1
START: 11/17/22 END: 11/17/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.050830, -80.629140	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI			WC
VERY STIFF, BROWN MOTTLED WITH ORANGISH BROWN, SILTY CLAY, SOME SAND, TRACE GRAVEL, IRON STAINING, MOIST	1068.3	1																
	1066.3	2	4	9	100	SS-1A	3.00	3	7	24	39	27	33	17	16	18	A-6b (9)	<<<<<<
LOOSE, BROWN, SILT, SOME SAND, LITTLE CLAY, TRACE GRAVEL, DAMP	1065.3	3																
	1065.3	4	3															
VERY STIFF TO HARD, ORANGISH BROWN AND BROWN, SANDY SILT, LITTLE TO SOME CLAY, TRACE GRAVEL, DAMP		5																
		6	3	26	100	SS-2	4.25	-	-	-	-	-	-	-	-	12	A-4a (V)	<<<<<<
		7	2	16	100	SS-3	4.00	-	-	-	-	-	-	-	-	14	A-4a (V)	<<<<<<
		8																
		9	3	18	100	SS-4	4.50	4	10	22	47	17	23	16	7	13	A-4a (6)	<<<<<<
		10																
		11	4	14	44	SS-5	3.00	-	-	-	-	-	-	-	-	15	A-4a (V)	<<<<<<
		12	5															
		13	6															
		14	4	16	33	SS-6	2.25	-	-	-	-	-	-	-	-	16	A-4a (V)	<<<<<<
MEDIUM DENSE, GRAY, SILT, LITTLE SAND, TRACE CLAY, TRACE GRAVEL, WET	1052.8	15																
	1050.3	16	3	11	100	SS-7	-	3	4	16	70	7	NP	NP	NP	21	A-4b (8)	<<<<<<
DENSE, GRAY, STONE FRAGMENTS WITH SAND AND SILT, TRACE CLAY, STONE FRAGMENTS ARE WEAK BLACK SHALE, MOIST TO DAMP		17	4															
		18																
		19	8	32	33	SS-8	-	-	-	-	-	-	-	-	-	17	A-2-4 (V)	<<<<<<
		20	12															
VERY DENSE, BLACK AND GRAY, STONE FRAGMENTS WITH SAND, LITTLE SILT, TRACE CLAY, STONE FRAGMENTS ARE WEAK BLACK SHALE, DAMP	1045.3	21	8	41	28	SS-9	-	-	-	-	-	-	-	-	-	10	A-2-4 (V)	<<<<<<
		22	11															
	1043.3	23	10	61	39	SS-10	-	-	-	-	-	-	-	-	-	11	A-1-b (V)	<<<<<<
	24	18																
	25	28																

NOTES: GROUNDWATER ENCOUNTERED AT 14.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OHDPOT_V2\WORKSETS\110931\400-ENGINEERING\GEOTECHNICAL\BAMAP\SIGNIT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 699+90, 12' RT.	EXPLORATION ID: B-017-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL 7	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1067.4 (MSL) EOB: 25.0 ft.	PAGE: 1 OF 1
START: 11/17/22 END: 11/17/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.051050, -80.629120	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
STIFF, BROWN MOTTLED WITH ORANGISH BROWN AND GRAY, CLAY , "AND" SILT, LITTLE SAND, TRACE GRAVEL, IRON STAINING, MOIST	1067.4	1	3															
		2	5	14	100	SS-1	1.75	1	3	9	51	36	45	20	25	24	A-7-6 (15)	
		3	6															
VERY STIFF, BROWN AND BROWNISH GRAY, SILT AND CLAY , SOME SAND, TRACE GRAVEL, MOIST	1063.7	4	2															
		5	4	13	100	SS-2	4.00	4	5	16	49	26	33	20	13	21	A-6a (9)	
STIFF TO VERY STIFF, BROWN AND GRAY, SILTY CLAY , LITTLE TO SOME SAND, TRACE GRAVEL, DAMP TO MOIST	1061.9	6	3															
		7	4	12	100	SS-3	3.00	-	-	-	-	-	-	-	-	18	A-6b (V)	
		8	5															
		9	4															
		10	4	13	100	SS-4	1.25	3	6	14	46	31	36	19	17	22	A-6b (11)	
		11	5															
		12	4	14	100	SS-5	3.25	-	-	-	-	-	-	-	-	-	17	A-6b (V)
		13	7															
		14	4															
		15	5	13	33	SS-6	2.00	-	-	-	-	-	-	-	-	-	15	A-6b (V)
MEDIUM DENSE, GRAY, COARSE AND FINE SAND , "AND" SILT, TRACE CLAY, TRACE GRAVEL, WET	1051.9	16	2															
		17	3	11	78	SS-7	-	-	-	-	-	-	-	-	-	-	19	A-3a (V)
DENSE, GRAY, STONE FRAGMENTS WITH SAND AND SILT , TRACE CLAY, STONE FRAGMENTS ARE WEAK BLACK SHALE, DAMP	1049.4	18	6															
		19	9	32	28	SS-8	-	-	-	-	-	-	-	-	-	11	A-2-4 (V)	
		20	15															
		21	7															
		22	15	49	39	SS-9	-	-	-	-	-	-	-	-	-	9	A-2-4 (V)	
		23	22															
VERY DENSE, BLACK AND GRAY, STONE FRAGMENTS WITH SAND , LITTLE SILT, TRACE CLAY, STONE FRAGMENTS ARE WEAK BLACK SHALE, DAMP	1044.4	24	9															
	1042.4	25	16	53	39	SS-10	-	-	-	-	-	-	-	-	-	11	A-1-b (V)	
		EOB	24															

NOTES: GROUNDWATER ENCOUNTERED AT 16.0' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECH\B\B\SEMAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 703+73, 10' LT.	EXPLORATION ID B-018-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL 7	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 1/24/22	ELEVATION: 1063.8 (MSL) EOB: 27.0 ft.	PAGE 1 OF 1
START: 11/9/22 END: 11/9/22	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 79	LAT / LONG: 41.052100, -80.629090	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI	WC		
HARD, BROWN, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	1063.8	1	7															
		2	9	34	100	SS-1	-	9	15	25	35	16	26	18	8	8	A-4a (3)	
DENSE, BROWN, STONE FRAGMENTS WITH SAND , TRACE SILT, TRACE CLAY, DAMP	1060.8	3																
		4	12	34	89	SS-2	-	-	-	-	-	-	-	-	-	7	A-1-b (V)	
	1058.3	5	14															
VERY STIFF, BROWN, SILT , SOME CLAY, SOME SAND, TRACE GRAVEL, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	1058.3	6	5															
		7	6	16	100	SS-3	-	2	6	15	51	26	27	17	10	12	A-4b (8)	
	1055.8	8																
MEDIUM DENSE, GRAY, STONE FRAGMENTS , LITTLE SAND, TRACE SILT, TRACE CLAY, DAMP	1055.8	9	5															
		10	10	28	22	SS-4	-	-	-	-	-	-	-	-	-	6	A-1-a (V)	
	1053.3	11																
VERY STIFF, BROWN AND GRAY, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, DAMP	1053.3	12	3															
		13	5	18	100	SS-5	4.00	7	9	19	45	20	22	16	6	13	A-4a (6)	
	1050.8	14																
MEDIUM DENSE, GRAY, COARSE AND FINE SAND , LITTLE GRAVEL, TRACE SILT, TRACE CLAY, WET	1050.8	14	2															
		15	4	14	100	SS-6	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
	1048.3	16																
DENSE, GRAY, STONE FRAGMENTS WITH SAND AND SILT , TRACE CLAY, MOIST	1048.3	16	6															
		17	14	38	100	SS-7	-	-	-	-	-	-	-	-	-	12	A-2-4 (V)	
	1045.3	18																
SANDSTONE , GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE GRAINED.	1045.3	18																
		19	50/5"	-	80	SS-8	-	-	-	-	-	-	-	-	-	-	Rock (V)	
	1041.8	21																
		22	9															
INTERBEDDED SANDSTONE (85%) AND SHALE (15%) , CROSS BEDDED, BEDDING DISCONTINUITIES: LOW ANGLE, JOINT DISCONTINUITIES: HIGH ANGLE FROM 22.2'-22.7', 22.8'-23.9', HIGHLY FRACTURED TO MODERATELY FRACTURED, OPEN TO NARROW, SLIGHTLY ROUGH TO VERY ROUGH, BLOCKY/DISTURBED/SEAMY, GOOD SURFACE CONDITION, RQD 16%, REC. 93%;	1041.8	22	50/4"	-	70	SS-9	-	-	-	-	-	-	-	-	-	-	Rock (V)	
SANDSTONE , GRAY, SLIGHTLY WEATHERED, STRONG, VERY FINE TO MEDIUM GRAINED, LAMINATED TO THIN BEDDED, MICACEOUS;		23																
SHALE , DARK GRAY, SLIGHTLY WEATHERED, WEAK, FISSILE, MICACEOUS, CONTAINS INTERBEDDED COAL LENSES.		24																
		25	16		93	NQ2-1												CORE
	1036.8	26																
		27																

NOTES: GROUNDWATER ENCOUNTERED AT 13.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 50 GAL. BENTONITE GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECH\LIB\SEM\MAPS\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 707+55, 12' RT.	EXPLORATION ID: B-019-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL 7	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1066.7 (MSL) EOB: 25.0 ft.	PAGE: 1 OF 1
START: 11/10/22 END: 11/10/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.053140, -80.628970	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	BACK FILL			
								GR	CS	FS	SI	CL	LL	PL	PI	WC					
HARD, BROWN, SILT AND CLAY, "AND" SAND, TRACE GRAVEL, DAMP	1066.7	1	3																		
	1063.7	2	8	26	100	SS-1	4.50	3	9	33	35	20	26	15	11	12	A-6a (4)				
		3	12																		
MEDIUM DENSE, BROWN, SANDY SILT, LITTLE CLAY, LITTLE GRAVEL, DAMP	1061.2	4	7	17	100	SS-2	-	14	11	23	38	14	21	16	5	11	A-4a (3)				
		5	6																		
HARD, BROWN BECOMING GRAY, SANDY SILT, LITTLE CLAY, TRACE TO LITTLE GRAVEL, DAMP	1048.7	6	7	28	100	SS-3	4.25	-	-	-	-	-	-	-	-	-	12	A-4a (V)			
		7	8	13																	
		8																			
		9	5	9	29	100	SS-4	4.50	-	-	-	-	-	-	-	-	-	12	A-4a (V)		
		10	13																		
		11	5	7	29	100	SS-5	4.50	17	12	22	34	15	22	16	6	11	A-4a (3)			
		12	15																		
		13																			
		14	4	8	33	100	SS-6	4.50	-	-	-	-	-	-	-	-	-	12	A-4a (V)		
		15	17																		
MEDIUM DENSE, GRAY, SILT, SOME CLAY, TRACE SAND, TRACE GRAVEL, DAMP	1046.2	16	5	7	22	44	SS-7	4.50	-	-	-	-	-	-	-	-	15	A-4a (V)			
		17	10																		
DENSE TO VERY DENSE, GRAY, STONE FRAGMENTS WITH SAND AND SILT, TRACE CLAY, DAMP	1041.7	18	5	9	26	33	SS-8	-	2	4	5	61	28	25	20	5	19	A-4b (8)			
		19	11																		
		20																			
		21	7	12	41	33	SS-9	-	-	-	-	-	-	-	-	-	16	A-2-4 (V)			
		22	19																		
		23																			
		24	5	16	51	39	SS-10	-	-	-	-	-	-	-	-	-	10	A-2-4 (V)			
		25	23																		

EOB

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECH\B\SEM\B\G\INT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 711+71, 7' LT.	EXPLORATION ID B-020-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP WALL 7	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1058.8 (MSL) EOB: 19.0 ft.	PAGE 1 OF 1
START: 11/10/22 END: 11/10/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.054290, -80.629010	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI			WC
VERY STIFF, ORANGISH BROWN AND BROWN, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, IRON STAINING, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	1058.8	1	4															
		2	5	16	100	SS-1	-	8	8	28	38	18	27	19	8	13	A-4a (4)	<< << <<
MEDIUM DENSE, ORANGISH BROWN AND BROWNISH GRAY, COARSE AND FINE SAND , TRACE TO SOME SILT, TRACE TO LITTLE GRAVEL, TRACE CLAY, IRON STAINING, DAMP TO MOIST	1050.8	3																
		4	4	14	100	SS-2	-	-	-	-	-	-	-	-	-	13	A-3a (V)	<< << <<
MEDIUM DENSE, BROWNISH GRAY, STONE FRAGMENTS WITH SAND , TRACE SILT, TRACE CLAY, WET	1050.8	5																
		6	5	20	100	SS-3	-	-	-	-	-	-	-	-	-	15	A-3a (V)	<< << <<
MEDIUM DENSE, BROWNISH GRAY, SANDY SILT , LITTLE CLAY, LITTLE GRAVEL, DAMP	1048.3	7	6	9														
		8	7	28	100	SS-4	-	-	-	-	-	-	-	-	-	17	A-1-b (V)	<< << <<
MEDIUM DENSE, BROWNISH GRAY, SANDY SILT , LITTLE CLAY, LITTLE GRAVEL, DAMP	1045.8	9																
		10	5	25	100	SS-5	-	12	14	28	33	13	NP	NP	NP	14	A-4a (2)	<< << <<
VERY DENSE, DARK GRAY, STONE FRAGMENTS WITH SAND , TRACE SILT, TRACE CLAY, RELIC ROCK STRUCTURE, DAMP	1041.3	11																
		12	9	10														
MEDIUM DENSE, BROWNISH GRAY, SANDY SILT , LITTLE CLAY, LITTLE GRAVEL, DAMP	1045.8	13																
		14	13	84	33	SS-6	-	-	-	-	-	-	-	-	-	7	A-1-b (V)	<< << <<
MEDIUM DENSE, BROWNISH GRAY, SANDY SILT , LITTLE CLAY, LITTLE GRAVEL, DAMP	1041.3	15																
		16	18	-	86	SS-7	-	-	-	-	-	-	-	-	-	11	A-1-b (V)	<< << <<
MEDIUM DENSE, BROWNISH GRAY, SANDY SILT , LITTLE CLAY, LITTLE GRAVEL, DAMP	1041.3	17																
		18	25	50/2"														
MEDIUM DENSE, BROWNISH GRAY, SANDY SILT , LITTLE CLAY, LITTLE GRAVEL, DAMP	1039.8	19																
		EOB	50	-	83	SS-8	-	-	-	-	-	-	-	-	-	4	Rock (V)	<< << <<

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECH\LIB\SEM\MAPS\GINT FILES\MAH-680-9.30.GP

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 715+69, 16' LT.	EXPLORATION ID B-021-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL 7	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1060.5 (MSL) EOB: 21.8 ft.	PAGE 1 OF 1
START: 11/10/22 END: 11/10/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.055360, -80.628980	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI	WC			
HARD, BROWN, SILTY CLAY , LITTLE SAND, TRACE GRAVEL, DAMP	1060.5	1	5																
	1057.5	2	9 12	28	100	SS-1	4.50	3	5	12	46	34	40	22	18	14	A-6b (11)		
		3																	
VERY STIFF TO HARD, BROWN, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, DAMP	1050.0	4	6 13 17	40	100	SS-2	4.50	-	-	-	-	-	-	-	-	15	A-4a (V)		
		5																	
		6	5																
		7	5 6	14	100	SS-3	4.50	4	9	22	46	19	24	17	7	14	A-4a (6)		
		8																	
		9	3 4	11	56	SS-4	3.25	-	-	-	-	-	-	-	-	-	14	A-4a (V)	
MEDIUM DENSE, BROWN, COARSE AND FINE SAND , LITTLE SILT, TRACE GRAVEL, TRACE CLAY, DAMP	1047.5	10																	
		11	7 6	18	39	SS-5	-	-	-	-	-	-	-	-	-	14	A-3a (V)		
VERY STIFF, BROWN, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, DAMP	1045.0	12																	
		13	5 7	18	33	SS-6	3.50	6	9	28	41	16	21	16	5	15	A-4a (4)		
MEDIUM DENSE, BROWN, COARSE AND FINE SAND , LITTLE STONE FRAGMENTS, TRACE SILT, TRACE CLAY, MOIST	1042.5	14																	
		15	6 7	21	100	SS-7	-	-	-	-	-	-	-	-	-	20	A-3a (V)		
HARD, GRAY, SANDY SILT , LITTLE STONE FRAGMENTS, LITTLE CLAY, DAMP	1040.0	16																	
		17	7 18 32	66	61	SS-8	4.50	19	17	20	32	12	24	19	5	9	A-4a (2)		
SANDSTONE , GRAY, HIGHLY WEATHERED, SLIGHTLY STRONG, VERY FINE TO MEDIUM GRAINED.	1038.7	18																	
		19	13 50/4"	-	30	SS-9	-	-	-	-	-	-	-	-	-	3	Rock (V)		
		20																	
		21																	
		TR																	
		EOB																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\B\SEMAP\SIGINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 720+43, 10' RT.	EXPLORATION ID: B-022-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL 7	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1056.7 (MSL) EOB: 23.8 ft.	PAGE: 1 OF 1
START: 11/15/22 END: 11/15/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.056660, -80.628830	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI				
6.0" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION) HARD, ORANGISH BROWN BECOMING BROWN, SANDY SILT , LITTLE TO SOME CLAY, TRACE TO LITTLE GRAVEL, IRON STAINING, DAMP	1056.7																		
	1055.7	1	4																
		2	7	21	33	SS-1	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)		
		3																	
		4	4	8	26	100	SS-2	4.50	4	10	17	44	25	28	18	10	10	A-4a (7)	
		5																	
		6	5	10	29	28	SS-3	4.50	-	-	-	-	-	-	-	8	A-4a (V)		
		7																	
		8																	
		9	5	7	24	89	SS-4	4.50	-	-	-	-	-	-	-	11	A-4a (V)		
		10																	
		11	3	4	18	100	SS-5	4.50	-	-	-	-	-	-	-	11	A-4a (V)		
		12																	
		13																	
	14	4	6	20	22	SS-6	4.50	-	-	-	-	-	-	-	11	A-4a (V)			
	15																		
VERY STIFF, GRAY, SANDY SILT , LITTLE CLAY, TRACE GRAVEL, DAMP	1041.2	16	2	3	9	100	SS-7	3.25	10	12	25	38	15	18	14	4	11	A-4a (4)	
	1038.7	17																	
DENSE TO VERY DENSE, GRAY, STONE FRAGMENTS WITH SAND AND SILT , TRACE CLAY, RELIC ROCK STRUCTURE, DAMP		18	9	19	55	100	SS-8	-	-	-	-	-	-	-	-	4	A-2-4 (V)		
		19																	
		20																	
		21	8	10	41	100	SS-9	-	-	-	-	-	-	-	-	8	A-2-4 (V)		
		22																	
	1033.7	TR																	
SHALE , GRAY, MODERATELY WEATHERED, STRONG, ARENACEOUS.	1032.9	EOB	50/4"	-	100	SS-10	-	-	-	-	-	-	-	-	-	-	-	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\BASEMAPS\GINT FILES\MAH-680-9.30.GP

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 724+26, 27' RT.	EXPLORATION ID: B-023-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL 7	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1047.8 (MSL) EOB: 23.9 ft.	PAGE: 1 OF 1
START: 11/15/22 END: 11/15/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.057670, -80.628590	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL		
								GR	CS	FS	SI	CL	LL	PL	PI					
3.0" ASPHALT AND 9.0" BASE (DRILLERS DESCRIPTION) VERY STIFF TO HARD, BROWN BECOMING GRAY, SANDY SILT , LITTLE TO SOME CLAY, TRACE TO LITTLE GRAVEL, DAMP	1047.8																			
	1046.8																			
			1	5																
			2	6	16	39	SS-1	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)		
			3																	
			4	3	4	12	100	SS-2	4.25	-	-	-	-	-	-	-	14	A-4a (V)		
			5		5															
			6	2																
			7	3	4	9	100	SS-3	4.25	6	10	21	43	20	24	17	7	14	A-4a (6)	
			8																	
			9	6	9	25	100	SS-4	4.50	-	-	-	-	-	-	-	-	13	A-4a (V)	
			10		10															
			11	2	3	11	100	SS-5	4.50	-	-	-	-	-	-	-	-	11	A-4a (V)	
			12		5															
			13																	
		14	2	2	12	72	SS-6	3.25	-	-	-	-	-	-	-	-	11	A-4a (V)		
	1032.3	15		7																
MEDIUM DENSE, GRAY, SILT , SOME SAND, TRACE CLAY, TRACE GRAVEL, WET		16	4	7	24	100	SS-7	-	0	1	22	70	7	NP	NP	NP	25	A-4b (8)		
	1029.8	17		11																
VERY DENSE, GRAY, STONE FRAGMENTS WITH SAND AND SILT , TRACE CLAY, DAMP		18																		
	1027.3	19	11	26	70	56	SS-8	-	-	-	-	-	-	-	-	-	8	A-2-4 (V)		
		20		27																
HARD, GRAY, SANDY SILT , LITTLE CLAY, LITTLE STONE FRAGMENTS, DAMP		21	10	16	84	100	SS-9	4.50	15	20	13	35	17	26	20	6	9	A-4a (3)		
	1024.8	22		48																
SHALE , GRAY, MODERATELY WEATHERED, WEAK TO SLIGHTLY STRONG, FISSILE.	1023.9	23	50/5"	-	40		SS-10	-	-	-	-	-	-	-	-	-	-	Rock (V)		
		TR																		
		EOB																		

NOTES: GROUNDWATER ENCOUNTERED AT 16.0' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECH\LAB\SEM\BSP\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 727+91, 14' LT.	EXPLORATION ID B-024-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL 7	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 1/24/22	ELEVATION: 1033.7 (MSL) EOB: 14.0 ft.	PAGE 1 OF 1
START: 11/14/22 END: 11/14/22	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 79	LAT / LONG: 41.058610, -80.628150	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	HOLE SEALED	
								GR	CS	FS	SI	CL	LL	PL	PI				
VERY STIFF, BROWN AND DARK BROWN, SANDY SILT , LITTLE CLAY, TRACE TO LITTLE GRAVEL, SS-1 IS SLIGHTLY ORGANIC, MOIST TO DAMP	1033.7	1	5																
		2	5	14	22	SS-1	3.25	-	-	-	-	-	-	-	-	20	A-4a (V)		
		3																	
		4	2	4	12	44	SS-2	3.00	3	10	33	42	12	21	17	4	14	A-4a (4)	
DENSE, GRAY, STONE FRAGMENTS WITH SAND , LITTLE SILT, TRACE CLAY, DAMP	1028.2	5																	
		6	6	12	34	100	SS-3	-	-	-	-	-	-	-	-	9	A-1-b (V)		
SHALE , GRAY, SEVERELY WEATHERED, WEAK TO SLIGHTLY STRONG, FISSILE.	1025.2	7																	
	1024.7	8																	
INTERBEDDED SHALE (62%) AND LIMESTONE (38%) , BEDDING DISCONTINUITIES: LOW ANGLE, JOINT DISCONTINUITIES: HIGH ANGLE FROM 22.0'-22.5', 22.9'-23.4', HIGHLY FRACTURED TO MODERATELY FRACTURED, OPEN TO NARROW, SLIGHTLY ROUGH TO VERY ROUGH, BLOCKY/DISTURBED/SEAMY, GOOD TO FAIR SURFACE CONDITION, RQD 8%, REC. 58%;	1025.2	9	50/5"		60	SS-4	-	-	-	-	-	-	-	-	-	-	-	Rock (V)	
	1019.7	10																	
SHALE , DARK GRAY, SEVERELY TO HIGHLY WEATHERED, VERY WEAK TO WEAK, LAMINATED TO THIN BEDDED, FISSILE; LIMESTONE , DARK GRAY, SLIGHTLY WEATHERED, STRONG, VERY FINE TO MEDIUM GRAINED, FOSSILIFEROUS, ARGILLACEOUS.		11																	
		12	8		58	NQ2-1												CORE	
		13																	
		14																	

NOTES: GROUNDWATER ENCOUNTERED AT 8.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 30 GAL. BENTONITE GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OHDOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\B\SEM\B\GINT FILES\MAH-680-9.30.GPJ

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 729+77, 17' RT.	EXPLORATION ID B-025-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL 7	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1039.6 (MSL) EOB: 20.2 ft.	PAGE 1 OF 1
START: 11/15/22 END: 11/15/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.058860, -80.627550	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	BACK FILL		
								GR	CS	FS	SI	CL	LL	PL	PI	WC				
VERY STIFF TO HARD, BROWN, SANDY SILT , SOME CLAY, TRACE TO LITTLE GRAVEL, IRON STAINING, CONTAINS CONCRETE FRAGMENTS, DAMP TO MOIST	1039.6	1	4																	
		2	4	12	100	SS-1	4.50	3	9	18	46	24	29	20	9	15	A-4a (7)			
		3																		
		4	5	8	26	28	SS-2	4.25	-	-	-	-	-	-	-	-	14	A-4a (V)		
		5																		
		6	4																	
		7	4	6	13	100	SS-3	3.00	-	-	-	-	-	-	-	-	19	A-4a (V)		
LOOSE TO MEDIUM DENSE, BROWN, COARSE AND FINE SAND , LITTLE SILT, TRACE GRAVEL, TRACE CLAY, WET	1031.6	8																		
		9	3	5	14	100	SS-4	-	-	-	-	-	-	-	-	26	A-3a (V)			
		10																		
		11	2	4	12	56	SS-5	-	-	-	-	-	-	-	-	29	A-3a (V)			
		12																		
		13	2	3	9	100	SS-6	-	-	-	-	-	-	-	-	27	A-3a (V)			
DENSE, GRAY, STONE FRAGMENTS WITH SAND , SOME SILT, TRACE CLAY, DAMP TO MOIST	1024.1	14																		
		15																		
		16	6	8	50	100	SS-7	-	-	-	-	-	-	-	-	13	A-1-b (V)			
		17																		
SANDSTONE , GRAY, MODERATELY WEATHERED, STRONG, FINE TO MEDIUM GRAINED.	1019.6	18	10	11	36	100	SS-8	-	-	-	-	-	-	-	-	12	A-1-b (V)			
	1019.4	19																		
		20	60/2"			100	SS-9	-	-	-	-	-	-	-	-	-	Rock (V)			

NOTES: GROUNDWATER ENCOUNTERED AT 8.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

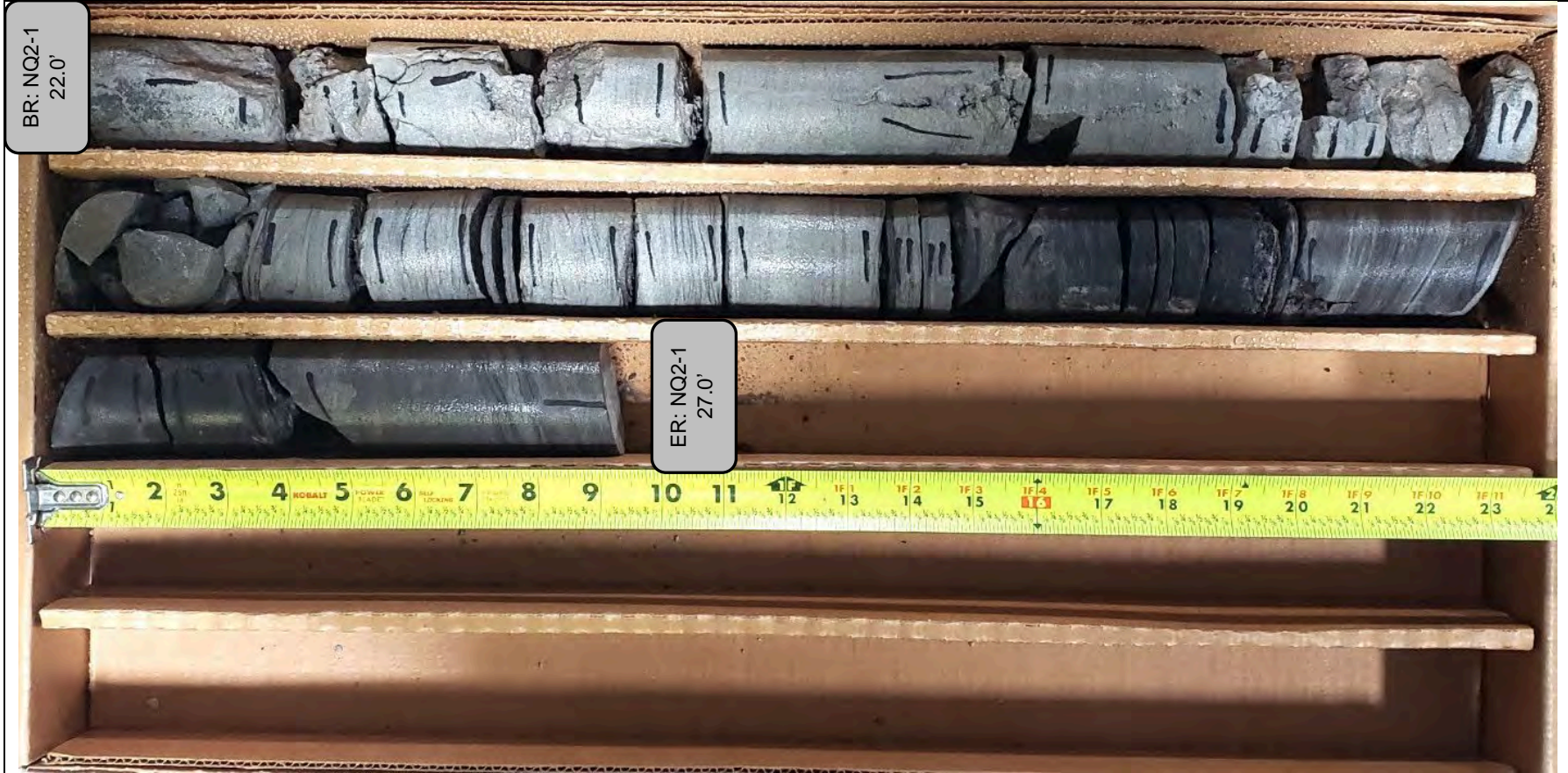
STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 11/14/23 13:51 - P:\OH\DOT_V2\WORKSETS\110931\400-ENGINEERING\GEO\TECHNICAL\B\SEM\B\GINT FILES\MAH-680-9.30.GP

PROJECT: MAH-680-9.30	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 733+09, 10' LT.	EXPLORATION ID B-026-0-21
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CLP_WALL 7	
PID: 110931 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 1036.9 (MSL) EOB: 19.3 ft.	PAGE 1 OF 1
START: 11/14/22 END: 11/14/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 79	LAT / LONG: 41.059400, -80.626580	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
MEDIUM DENSE TO DENSE, GRAY, GRAVEL WITH SAND , LITTLE SILT, TRACE CLAY, RESEMBLES STABILIZED MATERIAL, LIKELY CONTAINS HIGH SULFATE CONTENT, WC RESULTS DO NOT REFLECT TRUE WC DUE TO STABILIZATION ADDITIVES, DAMP TO MOIST	1036.9																	
		1	12															
		2	12 15	36	100	SS-1	-	-	-	-	-	-	-	-	51	A-1-b (V)		
		3																
		4	7	18	100	SS-2	-	-	-	-	-	-	-	-	73	A-1-b (V)		
		5	7															
		6	5															
		7	7 9	21	100	SS-3	-	-	-	-	-	-	-	-	77	A-1-b (V)		
		8																
		9	6	14	100	SS-4	-	-	-	-	-	-	-	-	72	A-1-b (V)		
	1026.4	10	4															
HARD, BROWN, SANDY SILT , LITTLE CLAY, LITTLE GRAVEL, TRACE IRON STAINING, DAMP	1023.9	11	4	28	100	SS-5	4.50	11	20	13	39	17	32	24	8	16	A-4a (4)	
	1023.9	12	9 12															
VERY DENSE, DARK GRAY, STONE FRAGMENTS WITH SAND AND SILT , LITTLE CLAY, RELIC ROCK STRUCTURE, DAMP	1021.4	13	10	90	44	SS-6	-	-	-	-	-	-	-	-	-	13	A-2-4 (V)	
	1021.4	14	27 41															
SHALE , GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG.	1017.6	15																
		16	12															
		17	34 50/5"	-	53	SS-7	-	-	-	-	-	-	-	-	-	-	-	Rock (V)
		18																
	1017.6	19	42 50/3"	-	44	SS-8	-	-	-	-	-	-	-	-	-	-	Rock (V)	

NOTES: GROUNDWATER ENCOUNTERED AT 8.5' DURING DRILLING. HOLE DID NOT CAVE.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

B-018-0-21



Run #:	Depth		Recovery		RQD	
NQ2-1	22.0'	27.0'	56.0"	93%	9.5"	16%
MAH-680-9.30 / PID: 110931						

B-024-0-21



Run #:	Depth		Recovery		RQD	
NQ2-1	22.0'	27.0'	35.0"	58%	4.5"	8%
MAH-680-9.30 / PID: 110931						

LOG OF BORING

Date Started 1-5-66
 Date Completed 1-7-66
 Boring No. B-8

Sampler Type SS Dia. 1 1/8"
 Casing: Length 20' Dia. 3 1/2"
 Station & Offset 20+82, 20' Lt. (Forward Pier)

Water Elev. _____
 Surface Elev. 1065.6'

Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	Physical Characteristics							SHTL Class.					
							% Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.		W.C.				
1065.6	0																		
	2																		
	4																		
1060.6	6	4/5			Brown Sandy Silt	1	14	8	19	40	19	19	3	18				A-4a	
	8																		
1055.6	10	6/13			Brown Gravelly Sandy Silt	2	22	5	27	37	9	NP	NP	19				A-4a	
	12																		
	14																		
1050.6	16	13/20			Brown and Gray Sandy Gravelly Silt	3	25	6	10	41	18	20	2	16				A-4a	
1048.1	18	22/25			Gray Silty Sandy Gravel	4	40	11	11	19	19	20	2	12				A-4a	
1045.6	20	50* (0.7)			Gray Silty Sandy Gravel	5	53	22	8	6	11	26	7	8				A-2-4	
1043.1	22	50* (0.4)			Gray Sandy Silt with Shale Fragments	6	20	19	6	28	27	30	10	10				A-4a	
1040.1	24				TOP OF ROCK														
	26																		
	28		4.6	0.4	Sandstone, gray, fine-grained, argillaceous, slightly micaceous, firm, slightly jointed. Core loss 4%.														
	30																		
	32																		
	34		7.9	6.0															
1030.6																			

← BOTTOM OF BORING *REFUSAL

State of Ohio
Department of Transportation
Division of Highways
Testing Laboratory

34
38

HOLLOW STEM

LOG OF BORING

Date Started 9/4/75 Sampler: Type AUGER Dia. _____ Water Elev. 1031.9'
Date Completed 9/4/75 Casing: Length _____ Dia. _____ STATIC WATER 1026.9'

Project Identification: MAHONING

MHI - 680-0,56

LIGHT TOWERS

Boring No. B-29 Station & Offset 632+45, 110'RT Surface Elev. 1034.9'

Elev.	Depth	Std. Pen. (N)	Description	Field No.	Lab. Nos. So.	Physical Characteristics						SHTL Class						
						% Agg.	% C.S.	% F.S.	% Silt	% Clay	L.L.		PI.	W.C.				
1034.9	0																	
	2																	
1032.4	4	5/7/6	GRAY STONE FRAGMENTS WITH SAND AND SILT AND BOULDERS	1	93162	44	4	12	28	12	NP	NP	11					A-4a
1029.9	6	3/11/11	GRAY CLAYEY SANDY SILT WITH STONE FRAGMENTS	2	93163	11	6	41	28	14	NP	NP	20					A-4a
1027.4	8	14/30	GRAY STONE FRAGMENTS WITH SAND AND SILT	3	93164	36	7	12	31	14	NP	NP	9					A-4a
1024.9	10																	
1022.4	12	6/17/22	GRAY SANDY CLAYEY SILT WITH STONE FRAGMENTS	4	93165	22	5	9	41	23	24	5	10					A-4a
	14	65(0.5')	GRAY WEATHERED CLAY SHALE TOP OF ROCK	5	93166	61	6	6	21	6	NP	NP	9					VISUAL
1021.9	16		BOTTOM OF BORING															
	18																	
	20																	
	22																	
	24																	
	26																	
	28																	
	30																	
	32																	
	34																	
	36																	

APPENDIX C

**CORRECTED N-VALUES BASE ON
DRILLED SHAFT LENGTH**

MAH-680-0068_Noise Barrier 4 Foundation Design Corrected N-Values

Noise Barrier 4

Depth of SPT	Correction Factor	B-013-0-21			B-014-0-21			B-015-0-21		
		N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value
2.5	1.6	22	Cohesive	22	18	Granular	29	20	Cohesive	20
5	1.4	25	Cohesive	25	16	Cohesive	16	28	Cohesive	28
7.5	1.2	20	Cohesive	20	11	Granular	13	18	Cohesive	18
10	1.1	17	Cohesive	17	17	Granular	19	14	Granular	15
12.5	1.1	16	Cohesive	16	47	Granular	52	18	Granular	20
15	1	5	Granular	5	62	Granular	62	21	Granular	21
17.5	0.96	8	Granular	8	40	Granular	38	21	Granular	20
20	0.91	28	Granular	25	67	Granular	61	32	Granular	29
22.5	0.88	18	Granular	16	Shale			62	Granular	55
25	0.84	29	Granular	24	Shale			Shale		

Noise Barrier 4

Depth of SPT	Correction Factor	B-016-0-21			B-012-0-21		
		N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value
2.5	1.6	9	Cohesive	9	16	Granular	26
5	1.4	26	Cohesive	26	18	Granular	25
7.5	1.2	16	Cohesive	16	13	Granular	16
10	1.1	18	Cohesive	18	16	Granular	18
12.5	1.1	14	Cohesive	14	14	Granular	15
15	1	16	Cohesive	16	5	Granular	5
17.5	0.96	11	Granular	11	8	Granular	8
20	0.91	32	Granular	29	66	Granular	60
22.5	0.88	41	Granular	36	54	Granular	48
25	0.84	61	Granular	51	40	Cohesive	40

MAH-680-0068_Noise Barrier 4 Foundation Design. Mean/Min Corrected

Noise Barrier 4

Depth of Shaft	B-013-0-21		B-014-0-21		B-015-0-21	
	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type
4	24	Cohesive	16	Granular	24	Cohesive
6	20	Cohesive	13	Granular	18	Cohesive
8	20	Cohesive	13	Granular	18	Cohesive
10	17	Cohesive	13	Granular	15	Cohesive
12	16	Cohesive	13	Granular	15	Cohesive
14	5	Cohesive	13	Granular	15	Cohesive
16	5	Cohesive	13	Granular	15	Granular
18	5	Cohesive	36	Granular	15	Granular
20	5	Cohesive	36	Granular	15	Granular
22	5	Cohesive	36	Granular	15	Granular
24	5	Cohesive	36	Granular	15	Granular

Noise Barrier 4

Depth of Shaft	B-016-0-21		B-012-0-21	
	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type
4	18	Cohesive	25	Granular
6	9	Cohesive	16	Granular
8	9	Cohesive	16	Granular
10	9	Cohesive	16	Granular
12	9	Cohesive	15	Granular
14	9	Cohesive	5	Granular
16	9	Cohesive	5	Granular
18	9	Cohesive	5	Granular
20	9	Cohesive	5	Granular
22	9	Cohesive	5	Granular
24	9	Cohesive	5	Granular

MAH-680-0068_Noise Barrier 7 Foundation Design Corrected N-Values

Noise Barrier 7

Depth of SPT	Correction Factor	B-017-0-21			B-018-0-21			B-019-0-21		
		N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value
2.5	1.6	14	Cohesive	14	34	Cohesive	34	26	Cohesive	26
5	1.4	13	Cohesive	13	34	Granular	48	17	Granular	24
7.5	1.2	12	Cohesive	12	16	Cohesive	16	28	Granular	34
10	1.1	13	Cohesive	13	28	Granular	31	29	Granular	32
12.5	1.1	14	Cohesive	14	18	Granular	20	29	Granular	32
15	1	13	Cohesive	13	14	Granular	14	33	Granular	33
17.5	0.96	11	Granular	11	38	Granular	36	22	Granular	21
20	0.91	32	Granular	29	Sandstone			26	Granular	24
22.5	0.88	49	Granular	43				41	Granular	36
25	0.84	53	Granular	45				51	Granular	43

Noise Barrier 7

Depth of SPT	Correction Factor	B-020-0-21			B-021-0-21			B-022-0-21		
		N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value
2.5	1.6	16	Cohesive	16	28	Cohesive	28	21	Cohesive	21
5	1.4	14	Granular	20	40	Cohesive	40	26	Cohesive	26
7.5	1.2	20	Granular	24	14	Cohesive	14	29	Cohesive	29
10	1.1	28	Granular	31	11	Cohesive	11	24	Cohesive	24
12.5	1.1	25	Granular	28	18	Granular	20	18	Cohesive	18
15	1	84	Granular	84	18	Granular	18	20	Cohesive	20
17.5	0.96	75	Granular	72	21	Granular	20	9	Granular	9
20	0.91	Sandstone			66	Granular	60	55	Granular	50
22.5	0.88				Sandstone			41	Granular	36
25	0.84							Shale		

Noise Barrier 7

Depth of SPT	Correction Factor	B-023-0-21			B-024-0-21			B-025-0-21		
		N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value
2.5	1.6	16	Cohesive	16	14	Cohesive	14	12	Cohesive	12
5	1.4	12	Cohesive	12	12	Granular	17	26	Cohesive	26
7.5	1.2	9	Cohesive	9	34	Granular	41	13	Cohesive	13
10	1.1	25	Cohesive	25	Shale			14	Granular	15
12.5	1.1	11	Cohesive	11				12	Granular	13
15	1	12	Cohesive	12				9	Granular	9
17.5	0.96	24	Granular	23				50	Granular	48
20	0.91	70	Granular	64				36	Granular	33
22.5	0.88	84	Granular	74				Sandstone		
25	0.84	Shale								

Noise Barrier 7

Depth of SPT	Correction Factor	B-026-0-21			B-008-0-66			B-029-0-75		
		N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value	N ₆₀	Soil Type	Corrected N-Value
2.5	1.6	36	Granular	58	9	Granular	14	13	Granular	21
5	1.4	18	Granular	25	9	Granular	13	22	Granular	31
7.5	1.2	21	Granular	25	9	Granular	11	44	Granular	53
10	1.1	14	Granular	15	19	Granular	21	39	Granular	43

MAH-680-0068_Noise Barrier 7 Foundation Design. Mean/Min Corrected

Noise Barrier 7

Depth of Shaft	B-017-0-21		B-018-0-21		B-019-0-21	
	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type
4	13	Cohesive	41	Cohesive	24	Cohesive
6	12	Cohesive	16	Cohesive	24	Granular
8	12	Cohesive	16	Cohesive	24	Granular
10	12	Cohesive	16	Granular	29	Granular
12	12	Cohesive	16	Granular	24	Granular
14	12	Cohesive	14	Granular	30	Granular
16	11	Cohesive	14	Granular	21	Granular
18	11	Cohesive	14	Granular	21	Granular
20	11	Cohesive	Sandstone		21	Granular
22	11	Cohesive			21	Granular
24	21	Cohesive			21	Granular

Noise Barrier 7

Depth of Shaft	B-020-0-21		B-021-0-21		B-022-0-21	
	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type
4	18	Granular	34	Cohesive	24	Cohesive
6	20	Granular	14	Cohesive	25	Cohesive
8	20	Granular	14	Cohesive	25	Cohesive
10	23	Granular	11	Cohesive	21	Cohesive
12	24	Granular	11	Cohesive	18	Cohesive
14	34	Granular	11	Cohesive	18	Cohesive
16	39	Granular	11	Cohesive	9	Cohesive
18	39	Granular	11	Cohesive	9	Cohesive
20	39	Granular	11	Cohesive	9	Cohesive
22	39	Granular	Sandstone		9	Cohesive
24	39	Granular			Shale	

Noise Barrier 7

Depth of Shaft	B-023-0-21		B-024-0-21		B-025-0-21	
	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type
4	12	Cohesive	15	Cohesive	19	Cohesive
6	9	Cohesive	24	Granular	12	Cohesive
8	9	Cohesive	24	Granular	12	Cohesive
10	9	Cohesive	Shale		12	Cohesive
12	9	Cohesive			12	Cohesive
14	9	Cohesive			9	Cohesive
16	9	Cohesive			9	Granular
18	9	Cohesive			9	Granular
20	9	Cohesive			9	Granular
22	27	Cohesive			Sandstone	
24	Shale					

Noise Barrier 7

Depth of Shaft	B-026-0-21		B-008-0-66		B-029-0-75	
	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type	Min or Ave N160	Soil Type
4	25	Granular	13	Granular	26	Granular
6	25	Granular	11	Granular	35	Granular
8	25	Granular	11	Granular	35	Granular
10	15	Granular	11	Granular	37	Granular

12.5	1.1	28	Cohesive	28	19	Granular	21	100	Granular	110
15	1	90	Granular	90	19	Granular	19	Shale		
17.5	0.96	Shale			33	Granular	32			
20	0.91				47	Granular	43			
22.5	0.88				50	Granular	44			
25	0.84				Shale					

12	15	Granular	11	Granular	51	Granular
14	15	Granular	11	Granular	Shale	
16	Shale		19	Granular		
18			22	Granular		
20			22	Granular		
22			24	Granular		
24			24	Granular		

APPENDIX D

**NOISE WALL DRILLED SHAFT LENGTH
ANALYSIS**

MAH-680-03.92 Noise Barrier 4 Drilled Shaft Length Analysis										
Shaft No.	Station	Top of Shaft Elevation (ft)	Barrier Height (ft)	Post Spacing (ft)	Boring ID	Soil Type	Corrected N-value	Slope	Total Shaft Length based on BDM 802 (ft)	Shaft Length used in the Plans (ft)
1	4000+00	1069.3	13	24	B-012-0-21	Granular	16	5:1	10.0	10.5
2	4000+24	1069.2	14	24	B-012-0-21	Granular	16	5:1	10.0	10.5
3	4000+48	1069.7	13	24	B-012-0-21	Granular	16	5:1	10.0	10.5
4	4000+72	1069.7	14	24	B-012-0-21	Granular	16	5:1	10.0	10.5
5	4000+96	1070.2	13	24	B-012-0-21	Granular	16	5:1	10.0	10.5
6	4001+20	1070.2	13	24	B-012-0-21	Granular	16	5:1	10.0	10.5
7	4001+44	1070.2	13	24	B-012-0-21	Granular	16	5:1	10.0	10.5
8	4001+68	1070.2	14	24	B-012-0-21	Granular	16	5:1	10.0	10.5
9	4001+92	1070.7	13	24	B-012-0-21	Granular	16	5:1	10.0	10.5
10	4002+16	1070.7	14	24	B-012-0-21	Granular	16	5:1	10.0	10.5
11	4002+40	1071.2	13	24	B-012-0-21	Granular	15	4:1	10.5	10.5
12	4002+64	1071.2	13	24	B-012-0-21	Granular	15	4:1	10.5	10.5
13	4002+88	1071.2	13	24	B-012-0-21	Granular	15	4:1	10.5	10.5
14	4003+12	1071.2	13	24	B-012-0-21	Granular	15	4:1	10.5	10.5
15	4003+36	1071.2	13	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
16	4003+60	1070.7	14	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
17	4003+84	1070.7	13	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
18	4004+08	1070.7	13	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
19	4004+32	1070.7	13	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
20	4004+56	1070.7	13	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
21	4004+80	1070.7	13	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
22	4005+04	1070.7	13	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
23	4005+28	1070.7	13	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
24	4005+52	1070.7	13	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
25	4005+76	1070.7	13	24	B-013-0-21	Cohesive	20	4:1	6.5	6.5
26	4006+00	1070.7	14	24	B-013-0-21	Cohesive	20	3:1	6.5	6.5
27	4006+24	1071.2	13	24	B-013-0-21	Cohesive	20	3:1	6.5	6.5
28	4006+48	1071.2	13	24	B-013-0-21	Cohesive	20	3:1	6.5	6.5
29	4006+72	1071.2	14	24	B-013-0-21	Cohesive	20	3:1	6.5	6.5
30	4006+96	1071.7	13	24	B-013-0-21	Cohesive	20	3:1	6.5	6.5
31	4007+20	1071.7	13	24	B-013-0-21	Cohesive	20	3:1	6.5	6.5
32	4007+44	1071.7	13	24	B-014-0-21	Granular	13	3:1	11.0	11.0
33	4007+68	1071.7	13	24	B-014-0-21	Granular	13	3:1	11.0	11.0
34	4007+92	1071.2	14	24	B-014-0-21	Granular	13	3:1	11.0	11.0
35	4008+16	1071.2	13	24	B-014-0-21	Granular	13	3:1	11.0	11.0
36	4008+40	1070.7	14	24	B-014-0-21	Granular	13	3:1	11.0	11.0
37	4008+64	1070.7	13	24	B-014-0-21	Granular	13	3:1	11.0	11.0
38	4008+88	1070.2	14	24	B-014-0-21	Granular	13	3:1	11.0	11.0
39	4009+12	1070.2	13	24	B-014-0-21	Granular	13	3:1	11.0	11.0
40	4009+36	1069.2	14	24	B-014-0-21	Granular	13	3:1	11.0	11.0
41	4009+60	1068.7	14	24	B-014-0-21	Granular	13	3:1	11.0	11.0
42	4009+84	1068.7	13	24	B-014-0-21	Granular	13	3:1	11.0	11.0

43	4010+08	1068.2	14	24	B-014-0-21	Granular	13	3:1	11.0	11.0
44	4010+32	1067.7	14	24	B-014-0-21	Granular	13	3:1	11.0	11.0
45	4010+56	1067.7	13	24	B-014-0-21	Granular	13	3:1	11.0	11.0
46	4010+80	1067.2	14	24	B-014-0-21	Granular	13	3:1	11.0	11.0
47	4011+04	1066.7	14	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
48	4011+28	1066.7	13	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
49	4011+52	1066.7	13	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
50	4011+76	1066.2	14	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
51	4012+00	1066.2	13	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
52	4012+24	1065.7	14	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
53	4012+48	1065.2	14	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
54	4012+72	1064.7	14	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
55	4012+96	1064.2	14	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
56	4013+20	1063.7	14	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
57	4013+44	1062.7	14	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
58	4013+68	1062.7	13	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
59	4013+92	1062.7	13	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
60	4014+16	1062.7	13	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
61	4014+40	1062.7	13	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
62	4014+64	1062.7	13	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
63	4014+88	1062.7	14	24	B-015-0-21	Cohesive	18	3:1	6.5	8.0
64	4015+12	1063.2	13	24	B-016-0-21	Cohesive	9	3:1	8.0	8.0
65	4015+36	1063.2	13	24	B-016-0-21	Cohesive	9	3:1	8.0	8.0
66	4015+60	1063.2	13	24	B-016-0-21	Cohesive	9	3:1	8.0	8.0
67	4015+84	1063.2	13	24	B-016-0-21	Cohesive	9	3:1	8.0	8.0
68	4016+08	1063.2	13	24	B-016-0-21	Cohesive	9	3:1	8.0	8.0
69	4016+32	1063.2	13	24	B-016-0-21	Cohesive	9	3:1	8.0	8.0
70	4016+56	1063.2	13	24	B-016-0-21	Cohesive	9	3:1	8.0	8.0
71	4016+80	1063.2	14	24	B-016-0-21	Cohesive	9	3:1	8.0	8.0
72	4017+04	1063.7	14	24	B-016-0-21	Cohesive	9	3:1	8.0	8.0
73	4017+28	1064.3	13	24	B-016-0-21	Cohesive	9	2:1	8.0	8.0

MAH-680-03.92 Noise Barrier 7 Drilled Shaft Length Analysis

Shaft No.	Station	Top of Shaft Elevation (ft)	Estimated Rock Elevation (ft)	Barrier Height	Post Spacing	Boring ID	Soil Type	Corrected N-value	Slope	Foundation Depth (5ft below Bedrock)	Total Shaft Length (ft)	Shaft Length used in the Plans (ft)	Drilled Shaft above Bedrock (ft)	Drilled Shaft into Bedrock (ft)
1	700+00	1065.3	1040.5	13	17	B-017-0-21	Cohesive	12	2:1	29.5	8.0	8.0	8.0	0.0
2	700+17	1064.7	1040.8	14	18	B-017-0-21	Cohesive	12	2:1	29.0	8.0	8.0	8.0	0.0
3	700+35	1064.7	1041.0	13	18	B-017-0-21	Cohesive	12	2:1	28.5	8.0	8.0	8.0	0.0
4	700+53	1064.2	1041.2	14	24	B-017-0-21	Cohesive	12	2:1	28.0	8.0	8.0	8.0	0.0
5	700+77	1063.2	1041.5	14	24	B-017-0-21	Cohesive	12	2:1	26.5	8.0	8.0	8.0	0.0
6	701+01	1062.7	1041.8	14	24	B-017-0-21	Cohesive	12	3:1	26.0	8.0	8.0	8.0	0.0
7	701+21	1061.7	1042.1	14	24	B-017-0-21	Cohesive	12	3:1	24.5	8.0	8.0	8.0	0.0
8	701+45	1061.7	1042.4	14	24	B-017-0-21	Cohesive	12	3:1	24.5	8.0	8.0	8.0	0.0
9	701+55	1061.7	1042.5	14	24	B-017-0-21	Cohesive	12	3:1	24.0	8.0	8.0	8.0	0.0
10	701+79	1062.7	1042.8	13	24	B-017-0-21	Cohesive	12	2:1	25.0	8.0	8.0	8.0	0.0
11	702+03	1062.7	1043.0	13	24	B-018-0-21	Granular	16	3:1	24.5	11.0	12.5	12.5	0.0
12	702+27	1062.7	1043.3	14	24	B-018-0-21	Granular	16	3:1	24.5	11.0	12.5	12.5	0.0
13	702+51	1064.2	1043.6	12	24	B-018-0-21	Granular	16	3:1	25.5	11.0	12.5	12.5	0.0
14	702+75	1063.2	1044.0	13	24	B-018-0-21	Granular	16	3:1	24.0	11.0	12.5	12.5	0.0
15	702+99	1063.2	1044.3	13	24	B-018-0-21	Granular	16	3:1	24.0	11.0	12.5	12.5	0.0
16	703+23	1064.2	1044.6	12	24	B-018-0-21	Granular	16	3:1	24.5	11.0	12.5	12.5	0.0
17	703+47	1064.2	1044.9	12	24	B-018-0-21	Granular	14	2:1	24.0	12.5	12.5	12.5	0.0
18	703+71	1063.7	1045.3	13	24	B-018-0-21	Granular	14	2:1	23.5	12.5	12.5	12.5	0.0
19	703+95	1063.7	1045.1	13	24	B-018-0-21	Granular	14	2:1	23.5	12.5	12.5	12.5	0.0
20	704+19	1063.7	1044.9	14	24	B-018-0-21	Granular	14	2:1	24.0	12.5	12.5	12.5	0.0
21	704+43	1064.2	1044.6	14	24	B-018-0-21	Granular	14	2:1	24.5	12.5	12.5	12.5	0.0
22	704+61	1065.2	1044.5	14	18	B-018-0-21	Granular	14	2:1	25.5	12.5	12.5	12.5	0.0
23	704+73	1066.2	1044.4	13	24	B-018-0-21	Granular	14	2:1	27.0	12.5	12.5	12.5	0.0
24	704+97	1066.2	1044.1	14	24	B-018-0-21	Granular	14	2:1	27.0	12.5	12.5	12.5	0.0
25	705+09	1066.7	1044.0	13	24	B-018-0-21	Granular	14	2:1	27.5	12.5	12.5	12.5	0.0
26	705+33	1066.7	1043.8	13	24	B-018-0-21	Granular	14	2:1	28.0	12.5	12.5	12.5	0.0
27	705+57	1066.2	1043.6	14	24	B-018-0-21	Granular	14	2:1	27.5	12.5	12.5	12.5	0.0
28	705+81	1065.7	1043.3	14	24	B-019-0-21	Granular	24	2:1	27.5	11.5	12.5	12.5	0.0
29	706+05	1065.7	1043.1	13	24	B-019-0-21	Granular	24	2:1	27.5	11.5	12.5	12.5	0.0
30	706+29	1065.7	1042.9	13	24	B-019-0-21	Granular	24	2:1	28.0	11.5	12.5	12.5	0.0
31	706+53	1065.7	1042.6	13	24	B-019-0-21	Granular	24	2:1	28.0	11.5	12.5	12.5	0.0
32	706+77	1065.2	1042.4	14	24	B-019-0-21	Granular	24	2:1	28.0	11.5	12.5	12.5	0.0
33	707+01	1065.2	1042.2	13	24	B-019-0-21	Granular	24	2:1	28.0	11.5	12.5	12.5	0.0
34	707+25	1064.2	1042.0	13	24	B-019-0-21	Granular	24	2:1	27.0	11.5	12.5	12.5	0.0
35	707+49	1064.2	1041.7	13	24	B-019-0-21	Granular	24	2:1	27.5	11.5	12.5	12.5	0.0
36	707+73	1064.2	1041.7	14	24	B-019-0-21	Granular	24	2:1	27.5	11.5	12.5	12.5	0.0
37	707+97	1064.7	1041.6	13	24	B-019-0-21	Granular	24	2:1	28.0	11.5	12.5	12.5	0.0
38	708+21	1064.7	1041.6	13	24	B-019-0-21	Granular	24	2:1	28.0	11.5	12.5	12.5	0.0
39	708+45	1064.7	1041.6	13	24	B-019-0-21	Granular	24	2:1	28.0	11.5	12.5	12.5	0.0

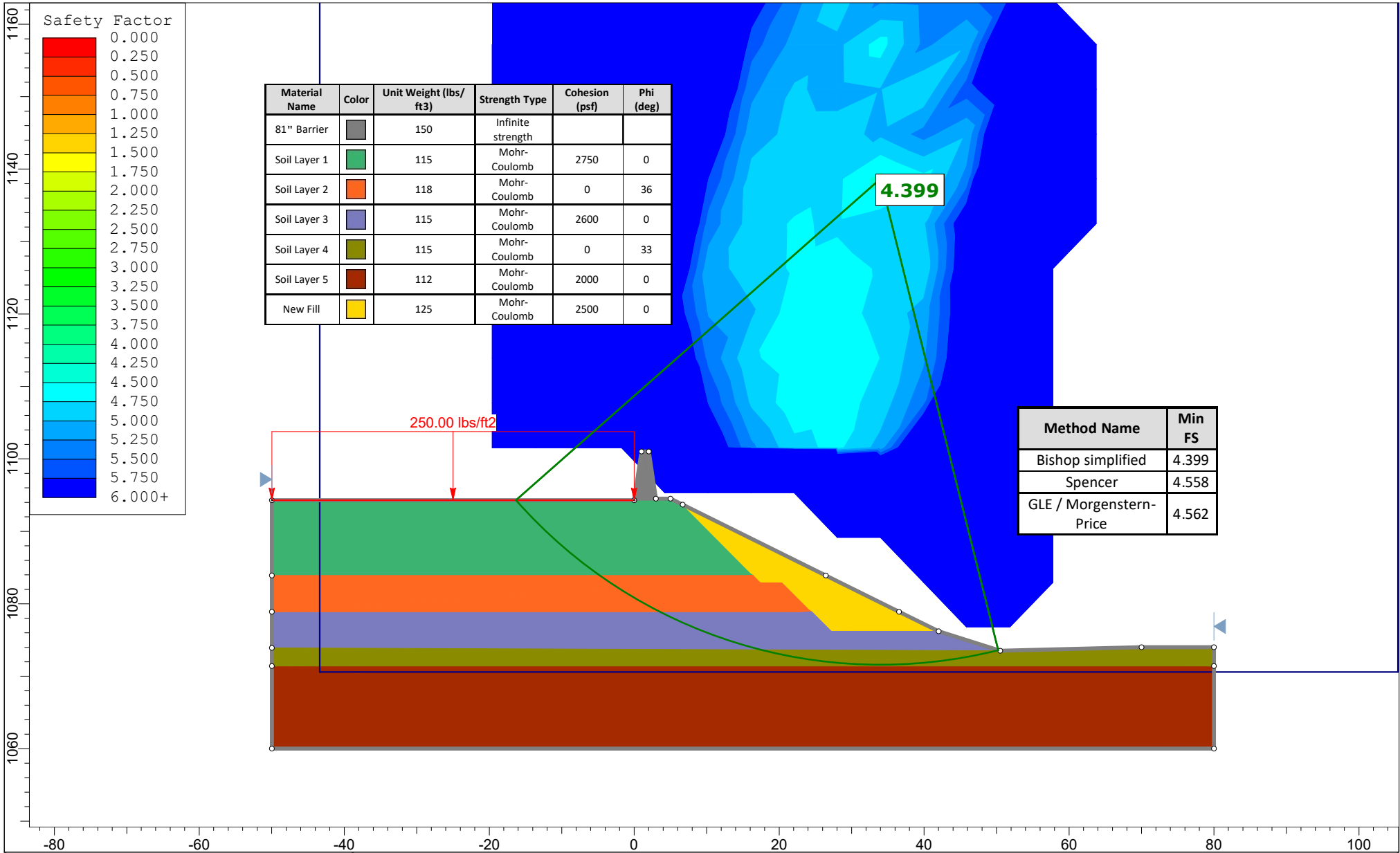
40	708+69	1064.2	1041.6	14	24	B-019-0-21	Granular	24	2:1	27.5	11.5	12.5	12.5	0.0
41	708+93	1063.7	1041.6	14	24	B-019-0-21	Granular	24	2:1	27.0	11.5	12.5	12.5	0.0
42	709+17	1063.7	1041.5	13	24	B-019-0-21	Granular	24	2:1	27.0	11.5	12.5	12.5	0.0
43	709+41	1063.7	1041.5	13	24	B-019-0-21	Granular	24	2:1	27.0	11.5	12.5	12.5	0.0
44	709+65	1063.7	1041.5	13	24	B-020-0-21	Granular	24	2:1	27.0	11.5	12.5	12.5	0.0
45	709+89	1064.7	1041.5	12	24	B-020-0-21	Granular	24	2:1	28.0	11.5	12.5	12.5	0.0
46	710+13	1063.2	1041.5	14	24	B-020-0-21	Granular	24	2:1	26.5	11.5	12.5	12.5	0.0
47	710+37	1062.2	1041.4	14	24	B-020-0-21	Granular	24	2:1	26.0	11.5	12.5	12.5	0.0
48	710+61	1060.7	1041.4	15	24	B-020-0-21	Granular	24	2:1	24.5	14.5	14.5	14.5	0.0
49	710+85	1060.2	1041.4	14	24	B-020-0-21	Granular	24	2:1	24.0	11.5	11.5	11.5	0.0
50	711+09	1059.7	1041.4	14	24	B-020-0-21	Granular	24	2:1	23.5	11.5	11.5	11.5	0.0
51	711+33	1059.2	1041.3	14	24	B-020-0-21	Granular	24	2:1	23.0	11.5	11.5	11.5	0.0
52	711+57	1058.2	1041.3	14	24	B-020-0-21	Granular	24	2:1	22.0	11.5	11.5	11.5	0.0
53	711+81	1057.2	1041.3	14	24	B-020-0-21	Granular	24	2:1	21.0	11.5	11.5	11.5	0.0
54	712+05	1056.2	1041.2	15	24	B-020-0-21	Granular	24	2:1	20.0	14.5	14.5	14.5	0.0
55	712+29	1056.2	1041.1	15	24	B-020-0-21	Granular	24	3:1	20.0	13.0	14.5	14.5	0.0
56	712+53	1056.2	1041.0	15	24	B-020-0-21	Granular	24	3:1	20.0	13.0	14.5	14.5	0.0
57	712+77	1057.2	1041.0	14	24	B-020-0-21	Granular	24	3:1	21.0	10.5	11.5	11.5	0.0
58	713+01	1057.2	1040.9	14	24	B-020-0-21	Granular	24	2:1	21.5	11.5	11.5	11.5	0.0
59	713+25	1058.3	1040.8	13	24	B-020-0-21	Granular	24	3:1	22.5	10.5	11.5	11.5	0.0
60	713+37	1060.3	1040.8	13	22	B-020-0-21	Granular	24	3:1	24.5	10.5	11.5	11.5	0.0
61	713+59	1060.2	1040.7	13	22	B-020-0-21	Granular	24	2:1	24.5	11.5	11.5	11.5	0.0
62	713+81	1060.2	1040.6	13	22	B-021-0-21	Cohesive	14	2:1	24.5	8.0	8.0	8.0	0.0
63	714+03	1060.2	1040.5	14	24	B-021-0-21	Cohesive	14	2:1	24.5	8.0	8.0	8.0	0.0
64	714+27	1060.7	1040.5	13	24	B-021-0-21	Cohesive	14	2:1	25.0	8.0	8.0	8.0	0.0
65	714+51	1060.7	1040.4	13	24	B-021-0-21	Cohesive	14	2:1	25.5	8.0	8.0	8.0	0.0
66	714+75	1060.2	1040.3	14	24	B-021-0-21	Cohesive	14	2:1	25.0	8.0	8.0	8.0	0.0
67	714+99	1059.2	1040.2	14	24	B-021-0-21	Cohesive	14	2:1	24.0	8.0	8.0	8.0	0.0
68	715+23	1059.2	1040.2	14	24	B-021-0-21	Cohesive	14	3:1	24.0	8.0	8.0	8.0	0.0
69	715+47	1059.2	1040.1	14	24	B-021-0-21	Cohesive	14	3:1	24.0	8.0	8.0	8.0	0.0
70	715+71	1060.2	1040.0	13	24	B-021-0-21	Cohesive	14	2:1	25.0	8.0	8.0	8.0	0.0
71	715+95	1060.2	1039.7	13	24	B-021-0-21	Cohesive	14	2:1	25.5	8.0	8.0	8.0	0.0
72	716+19	1060.2	1039.3	13	24	B-021-0-21	Cohesive	14	2:1	26.0	8.0	8.0	8.0	0.0
73	716+43	1060.2	1039.0	13	24	B-021-0-21	Cohesive	14	2:1	26.0	8.0	8.0	8.0	0.0
74	716+67	1060.2	1038.7	13	24	B-021-0-21	Cohesive	14	2:1	26.5	8.0	8.0	8.0	0.0
75	716+91	1060.2	1038.4	13	24	B-021-0-21	Cohesive	14	2:1	27.0	8.0	8.0	8.0	0.0
76	717+15	1060.2	1038.1	13	24	B-021-0-21	Cohesive	14	2:1	27.0	8.0	8.0	8.0	0.0
77	717+39	1060.2	1037.8	13	24	B-021-0-21	Cohesive	14	2:1	27.5	8.0	8.0	8.0	0.0
78	717+63	1060.2	1037.4	13	24	B-021-0-21	Cohesive	14	2:1	28.0	8.0	8.0	8.0	0.0
79	717+87	1059.7	1037.1	14	24	B-021-0-21	Cohesive	14	2:1	27.5	8.0	8.0	8.0	0.0
80	718+11	1059.7	1036.8	13	24	B-022-0-21	Cohesive	25	2:1	28.0	6.5	8.0	8.0	0.0
81	718+35	1059.2	1036.5	14	24	B-022-0-21	Cohesive	25	2:1	27.5	6.5	8.0	8.0	0.0
82	718+59	1059.2	1036.2	13	24	B-022-0-21	Cohesive	25	2:1	28.0	6.5	8.0	8.0	0.0
83	718+83	1058.2	1035.8	14	24	B-022-0-21	Cohesive	25	2:1	27.5	6.5	8.0	8.0	0.0
84	719+07	1057.7	1035.5	14	24	B-022-0-21	Cohesive	25	2:1	27.0	6.5	8.0	8.0	0.0
85	719+31	1057.2	1035.2	14	24	B-022-0-21	Cohesive	25	2:1	27.0	6.5	8.0	8.0	0.0
86	719+55	1056.7	1034.9	14	24	B-022-0-21	Cohesive	25	2:1	27.0	6.5	8.0	8.0	0.0

87	719+79	1056.2	1034.6	14	24	B-022-0-21	Cohesive	25	2:1	26.5	6.5	8.0	8.0	0.0
88	720+03	1055.7	1034.3	14	24	B-022-0-21	Cohesive	25	2:1	26.5	6.5	8.0	8.0	0.0
89	720+27	1055.2	1033.9	14	24	B-022-0-21	Cohesive	25	2:1	26.0	6.5	8.0	8.0	0.0
90	720+51	1055.2	1033.5	13	24	B-022-0-21	Cohesive	25	2:1	26.5	6.5	8.0	8.0	0.0
91	720+75	1054.2	1033.0	14	24	B-022-0-21	Cohesive	25	2:1	26.0	6.5	8.0	8.0	0.0
92	720+99	1053.7	1032.4	14	24	B-022-0-21	Cohesive	25	2:1	26.5	6.5	8.0	8.0	0.0
93	721+23	1053.2	1031.9	14	24	B-022-0-21	Cohesive	25	2:1	26.5	6.5	8.0	8.0	0.0
94	721+47	1053.2	1031.3	13	24	B-022-0-21	Cohesive	25	2:1	27.0	6.5	8.0	8.0	0.0
95	721+71	1052.7	1030.7	14	24	B-022-0-21	Cohesive	25	2:1	27.0	6.5	8.0	8.0	0.0
96	721+95	1052.2	1030.2	14	24	B-022-0-21	Cohesive	25	2:1	27.0	6.5	8.0	8.0	0.0
97	722+19	1052.2	1029.6	13	24	B-022-0-21	Cohesive	25	2:1	27.5	6.5	8.0	8.0	0.0
98	722+43	1051.7	1029.1	14	24	B-023-0-21	Cohesive	9	2:1	27.5	8.0	8.0	8.0	0.0
99	722+67	1051.2	1028.5	14	24	B-023-0-21	Cohesive	9	2:1	27.5	8.0	8.0	8.0	0.0
100	722+91	1050.7	1027.9	14	24	B-023-0-21	Cohesive	9	2:1	28.0	8.0	8.0	8.0	0.0
101	723+15	1050.2	1027.4	14	24	B-023-0-21	Cohesive	9	2:1	28.0	8.0	8.0	8.0	0.0
102	723+39	1049.7	1026.8	14	24	B-023-0-21	Cohesive	9	2:1	28.0	8.0	8.0	8.0	0.0
103	723+63	1049.2	1026.3	14	24	B-023-0-21	Cohesive	9	2:1	28.0	8.0	8.0	8.0	0.0
104	723+87	1049.2	1025.7	13	24	B-023-0-21	Cohesive	9	2:1	28.5	8.0	8.0	8.0	0.0
105	724+11	1048.2	1025.1	14	24	B-023-0-21	Cohesive	9	2:1	28.0	8.0	8.0	8.0	0.0
106	724+35	1047.2	1024.6	14	24	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	27.5	8.0	8.0	8.0	0.0
107	724+59	1046.2	1024.0	14	24	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	27.0	8.0	8.0	8.0	0.0
108	724+83	1045.7	1023.4	14	24	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	27.5	8.0	8.0	8.0	0.0
109	725+07	1045.7	1022.8	13	24	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	28.0	8.0	8.0	8.0	0.0
110	725+19	1044.2	1022.5	15	12	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	26.5	8.0	8.0	8.0	0.0
111	725+31	1043.2	1022.5	15	12	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	25.5	8.0	8.0	8.0	0.0
112	725+43	1042.2	1022.6	15	12	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	24.5	8.0	8.0	8.0	0.0
113	725+55	1041.2	1022.7	15	12	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	23.5	8.0	8.0	8.0	0.0
114	725+63	1040.2	1022.8	15	8	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	22.5	6.5	8.0	8.0	0.0
115	725+71	1039.2	1022.9	15	8	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	21.5	6.5	8.0	8.0	0.0
116	725+79	1038.2	1023.0	15	8	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	20.0	6.5	8.0	8.0	0.0
117	725+87	1037.2	1023.1	15	8	B-023-0-21 /B-029-0-75	Cohesive	9	2:1	19.0	6.5	8.0	8.0	0.0
118	725+95	1036.2	1023.1	15	8	B-023-0-21 /B-029-0-75	Cohesive	9	3:1	18.0	6.5	8.0	8.0	0.0
119	726+03	1035.7	1023.2	15	12	B-023-0-21 /B-029-0-75	Cohesive	9	3:1	17.5	8.0	8.0	8.0	0.0

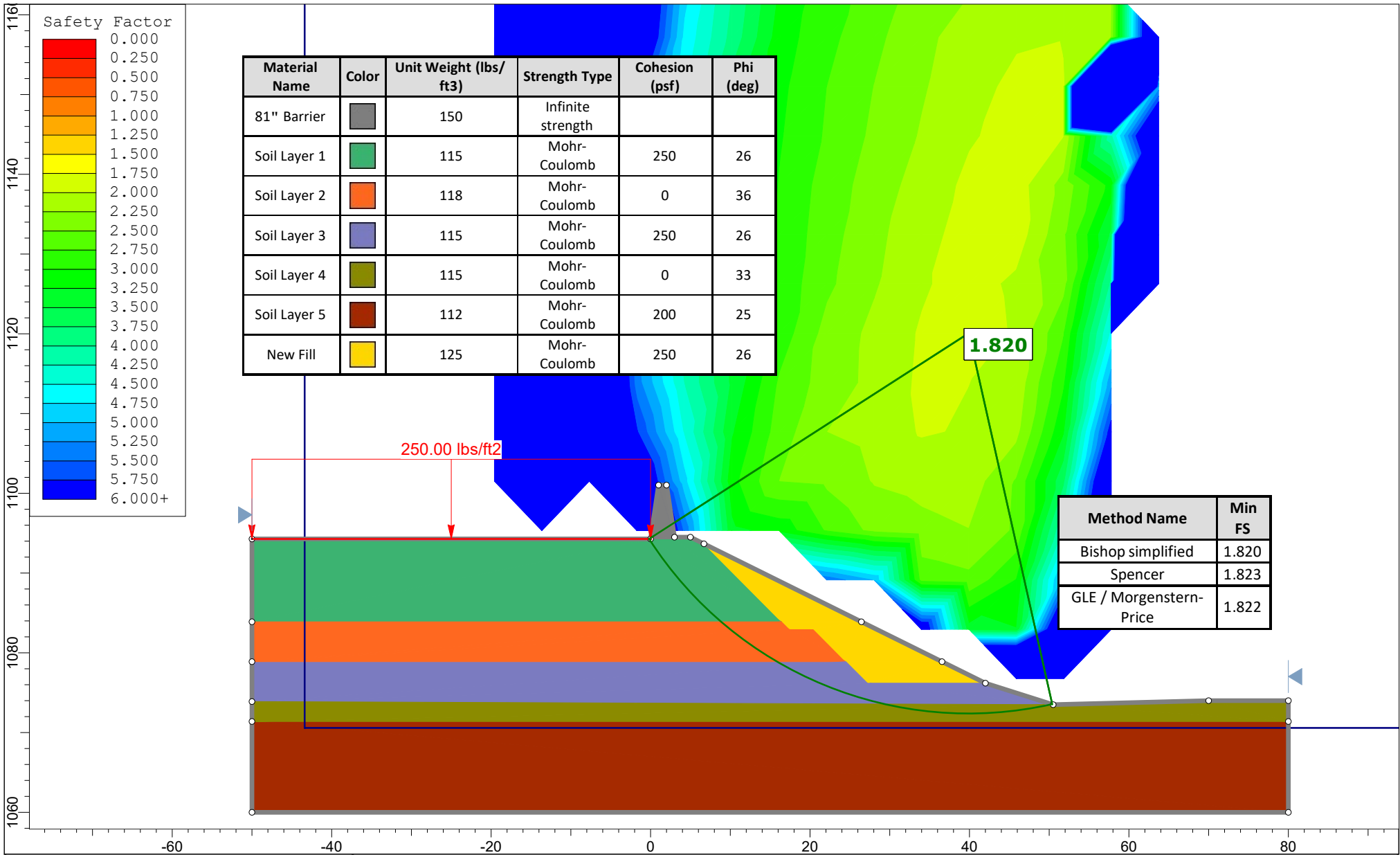
120	726+15	1034.7	1023.3	15	12	B-024-0-21 /B-029-0-75	Granular	24	3:1	16.5	10.5	12.5	11.5	1.0
121	726+27	1033.7	1023.5	16	24	B-024-0-21 /B-029-0-75	Granular	24	4:1	15.0	12.5	12.5	10.0	2.5
122	726+51	1033.7	1023.7	16	24	B-024-0-21 /B-029-0-75	Granular	24	5:1	15.0	12.0	12.5	10.0	2.5
123	726+75	1033.7	1024.0	16	24	B-024-0-21 /B-029-0-75	Granular	24	4:1	14.5	12.5	12.5	9.5	3.0
124	726+99	1033.7	1024.2	16	24	B-024-0-21 /B-029-0-75	Granular	24	5:1	14.5	12.0	12.5	9.5	3.0
125	727+16	1033.7	1024.4	16	24	B-024-0-21 /B-029-0-75	Granular	24	5:1	14.5	12.0	12.5	9.5	3.0
126	727+40	1033.7	1024.6	16	24	B-024-0-21 /B-029-0-75	Granular	24	5:1	14.0	12.0	12.5	9.0	3.5
127	727+64	1033.7	1024.9	16	24	B-024-0-21 /B-029-0-75	Granular	24	5:1	14.0	12.0	12.5	9.0	3.5
128	727+88	1034.7	1025.1	15	24	B-024-0-21 /B-029-0-75	Granular	24	5:1	14.5	12.0	12.5	9.5	3.0
129	728+08	1034.7	1024.7	15	20	B-024-0-21	Granular	24	5:1	15.0	12.0	12.5	10.0	2.5
130	728+28	1034.7	1024.1	15	24	B-024-0-21	Granular	24	4:1	15.5	12.5	12.5	10.5	2.0
131	728+52	1035.7	1023.3	14	24	B-024-0-21	Granular	24	2:1	17.5	11.5	12.5	12.5	0.0
132	728+76	1036.7	1022.6	13	24	B-024-0-21	Granular	24	2:1	19.0	11.5	12.5	12.5	0.0
133	729+00	1036.7	1021.9	13	24	B-025-0-21	Cohesive	12	2:1	20.0	8.0	8.0	8.0	0.0
134	729+24	1036.7	1021.2	13	24	B-025-0-21	Cohesive	12	2:1	20.5	8.0	8.0	8.0	0.0
135	729+48	1036.7	1020.5	13	24	B-025-0-21	Cohesive	12	2:1	21.0	8.0	8.0	8.0	0.0
136	729+72	1036.7	1019.7	13	24	B-025-0-21	Cohesive	12	2:1	22.0	8.0	8.0	8.0	0.0
137	729+96	1036.7	1019.7	13	24	B-025-0-21	Cohesive	12	2:1	22.0	8.0	8.0	8.0	0.0
138	730+20	1036.7	1019.8	13	24	B-025-0-21	Cohesive	12	2:1	22.0	8.0	8.0	8.0	0.0
139	730+44	1036.7	1020.0	13	24	B-025-0-21	Cohesive	12	2:1	21.5	8.0	8.0	8.0	0.0
140	730+68	1036.7	1020.1	13	24	B-025-0-21	Cohesive	12	2:1	21.5	8.0	8.0	8.0	0.0
141	730+92	1036.7	1020.2	13	24	B-025-0-21	Cohesive	12	2:1	21.5	8.0	8.0	8.0	0.0
142	731+16	1036.7	1020.4	13	24	B-025-0-21	Cohesive	12	2:1	21.5	8.0	8.0	8.0	0.0
143	731+40	1036.2	1020.5	14	24	B-025-0-21	Cohesive	12	2:1	20.5	8.0	8.0	8.0	0.0
144	731+64	1035.2	1020.6	14	24	B-026-0-21	Granular	15	3:1	19.5	11.0	11.0	11.0	0.0
145	731+88	1035.2	1020.7	13	24	B-026-0-21	Granular	15	3:1	19.5	11.0	11.0	11.0	0.0
146	732+12	1035.2	1020.9	13	24	B-026-0-21	Granular	15	4:1	19.5	10.5	11.0	11.0	0.0
147	732+36	1035.2	1021.0	13	24	B-026-0-21	Granular	15	4:1	19.0	10.5	11.0	11.0	0.0
148	732+56	1035.2	1021.1	13	20	B-026-0-21	Granular	15	3:1	19.0	11.0	11.0	11.0	0.0
149	732+76	1035.2	1021.2	13	24	B-026-0-21	Granular	15	3:1	19.0	11.0	11.0	11.0	0.0
150	733+00	1035.3	1021.3	13	24	B-026-0-21	Granular	15	4:1	19.0	10.5	11.0	11.0	0.0

APPENDIX E

GLOBAL STABILITY ANALYSIS



	Project		MAH-680-09.30	
	Group		Group 1	Scenario
	Drawn By		ZM	Company
	Date		02/08/24	File Name
				MAH-680_Barrier 1_STA. 121+50_B-06_Total.slm
			Master Scenario	NEAS, Inc.



	Project	MAH-680-09.30		
	Group	Group 1	Scenario	Master Scenario
	Drawn By	ZM	Company	NEAS, Inc.
	Date	02/08/24	File Name	MAH-680_Barrier 1_STA. 121+50_B-06.slmd