FINAL REPORT
SUBGRADE EXPLORATION REPORT
CUY-490-00.00
CUYAHOGA COUNTY, OHIO
PID: 107408

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NEAS PROJECT 21-0035

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EXECUTIVE SUMMARY

The Ohio Department of Transportation (ODOT) has proposed a roadway rehabilitation project CUY-490-00.00 (PID 107408) project along IR-490 in Cuyahoga County, Ohio. The project limits extend west to east from West 25th Street (St) to about a third of a mile west of East 55th St, but excludes the portion of IR-490 comprised of Bridge No. CUY-490-0100 which extends over various surface streets, railroads/railyards, and the Cuyahoga River. It is our understanding that the overall project objective is to rehabilitate the project portion of IR-490, which has degraded due to age and heavy traffic loading. As part of the proposed rehabilitation project, the proposed pavement replacement will maintain the existing pavement footprint (horizontal alignment) with vertical alignment changes up to about 2 ft. The associated ramps located within the project portion of I--490 will also be rehabbed with the IR-490 mainline pavement. These project ramps planned to undergo full depth pavement replacement include Lane E-S, Ramp C-7, Ramp 7-C, Ramp 7-7C, Ramp B-C, Ramp C-B, Ramp N-W, Ramp W-S, Ramp W-N, Ramp E-N and Ramp S-E.

National Engineering & 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 June 9, 2021 and July 26, 2021, NEAS performed the site reconnaissance and exploration program for the project. The subsequent document presents the results of a subgrade exploration for the project portion of IR-490 to undergo full-depth pavement replacement. As part of the rehabilitation project, NEAS advanced a total of 53 borings to be utilized for subgrade characterization purposes.

The subgrade conditions within the project limits are relatively consistent and are generally comprised of either fill soils (i.e., embankment fill) or natural soils consisting of gravel, sand and silt, or low to moderately plastic sandy silt and silt/clay combinations. The subgrade soils encountered within the project limits are generally classified as either A-1-a, A-1-b, A-2-4, A-3, A-3a, A-4a, A-4b type soils. With respect to sulfate within the subgrade soil, based on the project laboratory testing program, each subgrade soil sample tested was determined to have a sulfate content of less than 5,000 parts per million (ppm) (i.e., lower than the level which ODOT considers high and may prevent the use of chemical stabilization).

Subgrade soils designated by ODOT's GDM as both "unstable" and "unsuitable" were present at various locations throughout the project. Subgrade soils designated as "unsuitable" consisted of soils classifying as A-4b (Silt) and were encountered within subgrade depths that require remediation in seven (7) borings (B-002-0-21, B-003-0-21, B-004-0-21, B-012-0-21, B-013-0-21, B-018-0-21 and B-020-0-21) performed along IR-490 Mainline, one (1) boring (B-012-0-21) performed on Ramp 7-7C, and one (1) boring (B-033-0-21) performed on Ramp C-7. Subgrade soils designated as "unstable" via high moisture content were encountered at the various locations identified in Section 4.1.3.1 of this report. In general, it is recommended that the subgrade soil of project interstates and associated ramps be globally (chemically) stabilized to a depth of 12 inches utilizing cement as the stabilization chemical. For areas where "unsuitable" A-4b (Silt) soils were encountered, it is recommended that either Excavate and Replace with geotextile (Item 204) be performed to a depth of 36 inches below the proposed top of subgrade, or chemical stabilization be performed to a depth of 14 inches. Our minimum recommended limits for the indicated project subgrade stabilization are provided in Table 7 of this report. Although, the minimum recommended limits are presented, due to the presence of A-4b soils, NEAS recommends that chemical stabilization be performed to a depth of 14 inches for the ***whole*** project portion of IR-490.

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1. INTRODUCTION

1.1. General

National Engineering & Architectural Services, Inc. (NEAS) presents our Subgrade Exploration Report for the interstate major rehabilitation project (CUY-490-00.00, PID 107408) along Interstate Route 490 (IR-490) and associated ramps within the City of Cleveland, Cuyahoga County, Ohio. It is our understanding that the objective of the proposed project is to rehabilitate and replace the existing IR-490 pavement extending from West 25th Street (St) to about a third of a mile west of East 55th St excluding the portion of IR-490 encompassed by existing Bridge No. CUY-490-0100 which extends over various surface streets, railroads/railyards, and the Cuyahoga River. We understand that the proposed pavement replacement will maintain the existing pavement footprint (horizontal alignment) with vertical alignment changes up to about 2 ft.. The associated ramps located within the project portion of IR-490 will also be rehabbed, these project ramps planned to undergo full depth pavement replacement include Lane E-S, Ramp C-7, Ramp 7-C, Ramp 7-7C, Ramp B-C, Ramp C-B, Ramp N-W, Ramp W-S, Ramp W-N, Ramp E-N and Ramp S-E. This report presents a summary of the project encountered surficial and subsurface conditions and our recommendations for subgrade stabilization and pavement design parameters. The roadway analysis performed as part of this report has been performed in accordance with ODOT's Geotechnical Design Manual (GDM) (ODOT, 2023) and *Pavement Design Manual* (PDM) (ODOT, 2020).

The exploration was conducted in general accordance with NEAS's proposal to GPD Group (GPD), dated April 22, 2021, and with the provisions of the January 2021 (ODOT, 2021) revisions of ODOT's *Specifications for Geotechnical Explorations* (SGE).

The scope of work performed by NEAS as part of the referenced project included: a review of published geotechnical information; performing 53 total test borings; laboratory testing of soil samples in accordance with the SGE; performing geotechnical engineering analysis to assess subgrade and recommended pavement design parameters; and development of this summary report.

2. GEOLOGY AND OBSERVATIONS OF THE PROJECT

2.1. Geology and Physiography

The majority of the project site is located within the Erie Lake Plain, part of the Huron-Erie Lake Plains. This area is characterized as the edge of the very low relief (10 ft), Ice-Age Lake basin separated from the modern Lake Erie by shoreline cliffs with major streams in deep gorges being characteristic. The geology in this region is described as Pleistocene-age lacustrine sand, silt, clay, and wave-planed glacial till over Devonian- and Mississippi-age shales and sandstones (ODGS, 1998).

The geology underlying the IR-90 and IR-490 interchange portion of the project site is mapped as an average of 20 ft of Wisconsinan-age sand underlain by an average of 230 ft of silt and clay thinning to an average of 80 ft of silt and clay at the western project limits all underlain by Devonian-age shale bedrock (ODGS, 2005). The geology underlying the IR-77 and IR-490 interchange portion of the project site is mapped as an average of 40 ft of Wisconsinan-age sand and gravel underlain by an average of 290 ft of silt and clay all underlain by Devonian-age age shale bedrock (ODGS, 2005).

The sands contain minor amounts of disseminated gravel or thin lenses of silt and is described as well to moderately sorted, moderately to well rounded, finely stratified to massive, may be cross bedded and may locally contain organics. Sand in deep buried valleys are noted as potentially being older than Wisconsinan. The sand and gravel soils are described as interbedded sand and gravel commonly containing thin, discontinuous layer of silt and clay and may locally contain organics. These sands and gravels are comprised of material that is moderately to well sorted, moderately to well-rounded and finely stratified to massive. Sand and gravel in buried valleys are noted as potentially being older than Wisconsinan. The silt and clay in this region can be found as thick lacustrine valley-fill deposits of high, proglacial predecessors of Lake Erie and is described as laminated to interbedded soils that may contain thin fine sand or gravel layers.

Based on the Bedrock Geologic Units Map of Ohio (USGS & ODGS, 2006), bedrock within the project area consists of shale of the Ohio Shale formation. This unit is comprised of Devonian-age shale with carbonate and/or siderite concretions in the lowermost 50 ft. This brownish black to greenish gray shale is carbonaceous to clayey, laminated to thin bedded and can have a petroliferous odor. The bedrock is anticipated to generally follow the natural topography of the site, sloping downward from west to east then increasing elevation moving east of the Cuyahoga River (ODGS, 2003). Based on the ODNR bedrock topography map of Ohio, bedrock elevations at the project site can be expected to be between elevations of 400 and 600 ft above sea level (amsl), putting bedrock at a depth ranging from about 50 ft to about 290 ft below ground surface (bgs).

The majority of soils directly underlying the project site have been mapped (Web Soil Survey) by the Natural Resources Conservation Service as being Udorthents and urban land complex. Udorthents are soils that have been disturbed by cutting or filling and are not rated for local roads. These soils as units are not classified according to the AASHTO method of soil classification, but it can be expected that these soils will largely consist of fill soils and often vary in composition. The exceptions to this are portions of the project near the West 7th St overpass where the soils are mapped as Ellsworth urban land complex, and near the Broadway Avenue (Ave) overpass where the soils are mapped as Elnora urban land complex. Soils in the Ellsworth series are characterized as very deep, moderately well drained soils formed in till on till plains. The Ellsworth series is comprised of primarily fine-grained soils and classifies as A-4, A-6 and A-7-6 type soils according to the AASHTO method of soil classification. Soils in the Elnora series are characterized as a very deep, moderately well drained soils formed in sandy glacial lake, eolian and deltaic sediments. The Elnora series is comprised of both coarse- and fine-grained soils and classifies as A-2 and A-4 type soils according to the AASHTO method of soil classification (USDA, 2015).

2.2. Hydrology/Hydrogeology

Groundwater at the project site can be expected at an elevation consistent with that of the Cuyahoga River as it is the most dominant hydraulic influence in the vicinity of the project's boundaries. The water level of the Cuyahoga River may be generally representative of the local groundwater table. However, it should be noted that perched groundwater systems may be existent in areas due to the presence of fine-grained soils making it difficult for groundwater to permeate to the phreatic surface.

The project site is not located within a special flood hazard area 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

No abandoned mines are noted on ODNR's Abandoned Underground Mine Locator within the immediate vicinity of the project's boundaries (ODNR [1], 2016).

No oil or gas wells are noted on ODNR's Ohio Oil & Gas Locator within the immediate vicinity of the project's boundaries (ODNR [2], 2016).

2.4. Historical Records and Previous Phases of Project Exploration

A historic record search was performed through ODOT's Geotechnical Data Management System (GeoMS), and the following report/plans were available for review and evaluation for this report:

- Soil Profile Sheets as part of ODOT project CUY-490-0.27 pages 1-11, prepared by the Ohio State Highway Testing and Research Laboratory, dated May 6, 1998;
- Soil Profile Sheets as part of ODOT project CUY-21-254-(14.12-18.69), prepared by the State of Ohio Department of Highways Testing Laboratory, dated September 13, 1962;
- Project Boring Logs for CUY-71-19.25 prepared by the Ohio State Soil Testing Laboratory, dated April 17, 1964; and,
- Project Boring Logs for CUY-90-6.83 (PID 76779) and associated Subgrade Exploration Report prepared by S&ME, Inc., dated December 11, 2020.

Four historical soil borings (B-109-0-20, B-110-0-20, B-111-0-20, and B-112-0-20) that were drilled as part of the 2020 Subgrade Exploration for ODOT project CUY-90-6.83 were reviewed and are utilized in our report and analysis. A summary of the historic boring information (location, elevation, etc.) is provided in Table 1, and their locations are depicted on the Boring Location Plan provided in Appendix A. The historic boring logs of the borings utilized within this report are provided in Appendix B.

Table 1: Historic Boring Summary

Boring Number	Historical Location (Sta/Offset)[1]	Latitude[2]	Longitude[2]	Elevation[2] (NAVD 88) (ft)	Depth (ft)
B-109-0-20	930+69, 5' LT	41.474054	81.698962	656.0	7.5
B-110-0-20	931+91, 38' LT	41.474197	81.697498	648.1	7.5
B-111-0-20	935+97, 5' RT	41.474104	81.696012	639.8	7.5
B-112-0-20	937+90, 5' LT	41.474142	81.695311	635.8	7.5

Notes:
1. *Station and Offsets reference IR-90 alignment assoicated with ODOT Project CUY-90-6.83 (PID 76779).*
2. *Location information based on data provided on refferenced boring logs assoicated with ODOT Project CUY-90-6.83 (PID 76779).*

Additional historical soil borings associated with the above historical records, not listed in the table above, were reviewed, however, were not utilized for our analysis as historical borings are generally not representative of existing subgrade conditions. Therefore, are not referenced or presented within this report.

2.5. Field Reconnaissance

A field reconnaissance visit for the overall project area was conducted on June 9, 2021. The reconnaissance was performed along the project portions of IR-490 mainline and associated ramps (Lane E-S, Ramp C-7, Ramp 7-7C, Ramp B-C, Ramp C-B, Ramp N-W, Ramp W-N, Ramp E-N, and Ramp S-E). Site conditions, including the existing pavement conditions, were noted and photographed during the visit. Photographs of notable pavement distress and a summary of our observations by roadway segment are provided below.

2.5.1. Land Use and Cover

The land use of the project area consists of a combination of residential, commercial, industrial, and railroad properties as well as ODOT Right of Way (ROW).

2.5.2. IR-490 from West 25th St to West 11th St

In general, the pavement condition along this section of IR-490 was observed to be fair. Moderate severity longitudinal and transverse cracking was observed along this section as well as edge cracking and crack sealing deficiencies (Photograph 1). The roadway in this section is situated in a cut (i.e., at a lower grade than the surrounding area) with the observed cut slopes at an approximate 3 horizontal to 1 vertical (3H:1V) grade. The roadway was observed to be relatively well-drained along this segment though some signs of standing water were observed at the low point along this segment located near the center of the interchange. The area appeared to be stable with no signs of geotechnical instability observed during our visit.

Photograph 1: Pavement Condition of IR-490 from West 25th St to West 11th St

2.5.3. IR-490 from West 11th St to Bridge No. CUY-490-0100

In general, the pavement condition along this section of the project was observed to be poor. High severity joint cracking, D-cracking, and settlement was observed along this section as well as moderate severity patching and crack sealing deficiencies (Photograph 2). The adjacent grading along this portion of IR-490 generally consists of slopes with the land to the south extending downslope of IR-490 and the land to the north extending upslope from IR-490. The referenced slopes on either side of the interstate were observed to be approximately 2H:1V. The roadway appeared to be well drained with no signs of standing water observed. The area appeared to be stable with no signs of geotechnical instability observed during our visit.

Photograph 2: Pavement condition of IR-490 between West 11th St and Bridge No. CUY-490-0100.

2.5.4. IR-490 from Bridge No. CUY-490-0100 to the Eastern Project Limits

In general, the pavement condition along this section of the project was observed to be poor. High severity joint cracking, D-cracking, and patching was observed along this section as well as moderate severity crack sealing deficiencies (Photograph 3). The interstate along this segment is situated in a cut (i.e., at a lower grade than surrounding area) with the adjacent cut slopes observed to be approximately 2H:1V. With respect to drainage, the roadway was observed to be relatively well-drained with signs of standing water such as cattails observed at the lowest point located near the IR-490 and IR-77 interchange (Photograph 4). The area appeared to be stable with no signs of geotechnical instability observed during our visit.

Photograph 3: Pavement Condition of IR-490 from Bridge No. CUY-490-0100 to the Eastern Project Limits

Photograph 4: Signs of standing water along IR-490

2.5.5. Ramp from IR-490 WB to IR-71 SB (Lane E-S)

In general, the pavement condition along Lane E-S was observed to be fair. Moderate severity transverse and longitudinal cracking was observed in addition to light severity settlement, map cracking and crack sealing deficiencies (Photograph 6). The deck of the bridge carrying this ramp over IR-490 appeared to be in excellent condition with very few signs of surface wear. On the northeast portion of Lane E-S, before the bridge, the ramp is constructed part way up an embankment east of IR-71 (north of IR-490). On the southwest portion of Lane E-S, following the bridge, the roadway is located downslope of IR-71's embankment and above IR-490 at grades approximately level with the surrounding property. The embankment slopes are roughly 2H:1V in the northeast and roughly 3H:1V in the southwest. The roadway drains to drainage ditches on the sides of the roadway while the bridge carrying the ramp over IR-490 drains to scuppers near the eastern end of the bridge. The area is moderately vegetated for the most part with no signs of standing water observed.

Photograph 5: Overall Pavement Condition of Lane E-S

2.5.6. Ramp from West 7th St to IR-490 EB (Ramp 7-7C)

In general, the pavement condition along Ramp 7-7C was observed to be fair . High severity longitudinal joint cracking, D-cracking, and patching was observed as well as moderate crack sealing deficiencies (Photograph 6). Ramp 7-7C is a partial clover leaf ramp constructed atop an embankment above the surrounding land with the embankment slopes observed to be about 2H:1V. With respect to drainage, the roadway drains to the inside of the ramp towards two inlets spaced near the center of the ramp near where the ramp meets IR-490. The area is lightly vegetated for the most part with no signs of standing water observed. The area appeared to be stable with no signs of geotechnical instability during our visit.

Photograph 6: Overall Pavement Condition of Ramp 7-7C

2.5.7. Ramp from IR-490 WB to West 7th St (Ramp C-7)

In general, the pavement condition along Ramp C-7 was observed to be poor. High severity longitudinal and transverse joint cracking, D-cracking, and patching was observed as well as moderate crack sealing deficiencies and bleeding of the asphalt patching (Photograph 7). The ramp extends downslope from West 7th St to IR-490 grades where the ramp appears to abut Bridge No. CUY-490-0100. The embankment slopes below the western portion of Ramp C-7 are roughly 2H:1V and in good condition. Ramp C-7 appears to drain west to east towards inlets located north of the ramp just prior to Bridge No. CUY-490-0100. The area is lightly vegetated for the most part with no signs of standing water observed. The area appeared to be stable with no signs of geotechnical instability during our visit.

Photograph 7: Overall Pavement Condition of Ramp C-7

2.5.8. Ramp from Rockefeller Ave to IR-490 WB (Ramp B-C)

In general, the pavement condition along Ramp B-C was observed to be fair. Moderate severity longitudinal and transverse joint cracking, D-cracking, and patching was observed as well as moderate crack sealing deficiencies (Photograph 8). The ramp extends downslope from Rockefeller Ave to IR-490 grades where the ramp appears to abut Bridge No. CUY-490-0100. The embankment slopes below the eastern portion of Ramp B-C are roughly 2H:1V and in good condition. Similar to Ramp C-7, Ramp B-C appears to drain towards inlets located north of the ramp just prior to Bridge No. CUY-490-0100. The area is lightly vegetated for the most part with no signs of standing water observed. The area appeared to be stable with no signs of geotechnical instability during our visit.

Photograph 8: Overall Pavement Condition of Ramp B-C

2.5.9. Ramp from IR-490 EB to Broadway Ave (Ramp C-B)

In general, the pavement condition along Ramp C-B was observed to be fair. Moderate severity longitudinal and transverse joint cracking and patching was observed as well as moderate crack sealing deficiencies and asphalt bleeding in the right turn lane (Photograph 9). This ramp generally consist of bridge deck with the exception of the eastern most approximate 250 ft of roadway located just west of Broadway Ave. The

portion of ramp supported by soil is constructed atop an embankment above the surrounding land roughly equal in grade with Broadway Ave. The roadway drains towards an inlet on the south side of the roadway. The area is lightly vegetated for the most part with no signs of standing water observed. The area appeared to be stable with no signs of geotechnical instability during our visit.

Photograph 9: Overall Pavement Condition of Ramp C-B

2.5.10. Ramp from IR-490 EB to IR-77 NB (Ramp S-E)

In general, the pavement condition along this section of the project was observed to be fair to poor. Moderate severity longitudinal and transverse joint cracking, D-cracking, joint spalling, and potholing was observed along this section as well as moderate crack sealing deficiencies and surface deterioration (Photograph 10). The roadway in this section is relatively level with the surrounding land. The embankment slope down to IR-490 is roughly 3H:1V to 4H:1V. The roadway slopes gradually upwards from west to east in this section. The roadway drains towards the north side of the road and off the shoulder as well as to a pair of inlets on the north side of the roadway just past where the ramp to IR-77 SB splits off. The area is lightly vegetated for the most part with no signs of standing water observed. The area appeared to be stable with no signs of geotechnical instability during our visit.

Photograph 10: Overall Pavement Condition of Ramp S-E

2.5.11. Ramp from IR-77 SB to IR-490 WB (Ramp N-W)

In general, the pavement condition along Ramp N-W was observed to be good to fair. Moderate severity longitudinal joint cracking, and patching was observed as well as light crack sealing deficiencies. The roadway in this section is situated in a cut below the surrounding land with the embankment slope up to the surrounding land observed to be about 2H:1V while the slope down to IR-490 was about 3H:1V. The roadway drains towards the north side of the road into a drainage ditch with several inlets spaced along the drainage ditch. The area is lightly vegetated for the most part with no signs of standing water observed. The area appeared to be stable with no signs of geotechnical instability during our visit.

2.5.12. Ramp from IR-490 WB to IR-77 NB (Ramp E-N)

In general, the pavement condition along Ramp E-N was observed to be fair in the northern portion and excellent in the southern portion. During our visit the northern portion of the ramp (about 500 ft) consisted of an asphalt pavement surface while the remaining southern portion consisted of a concrete surface. The asphalt portion was observed to show signs of surface wear such as moderate severity longitudinal and transverse cracking as well as moderate crack sealing deficiencies (Photograph 11). The concrete portion showed very little signs of wear at the surface. Ramp E-N is located upslope of IR-490 and downslope of an adjacent CSX railway. The embankment slopes which extended up to the adjacent CSX railway to the east are roughly 2H:1V while the slope down to IR-490 is roughly 3H:1V. With respect to drainage, the roadway drains towards the north/northeast side of the ramp into a ditches with several inlets spaced along the ditch. Standing water was observed near the location where the ramp passes underneath the CSX railroad bridge. The area appeared to be stable with no signs of geotechnical instability during our visit.

Photograph 11: Overall Pavement Condition of Ramp E-N

2.5.13. Ramp from IR-77 NB to IR-490 EB (Ramp W-N)

In general, the pavement condition along Ramp W-N was observed to be excellent at the entrance and exit portions of the ramp and fair in the central part of the ramp. The ramp has an asphalt surface at the entrance and through the central portion of the ramp with a concrete surface at the exit of the ramp. The asphalt in the central portion of the ramp was observed to show signs of surface wear consisting of moderate severity longitudinal and transverse cracking while the entrance portion appeared to be recently paved (Photograph 12). This ramp is situated above IR-490 grades and below IR-77 grades and the surrounding property in the area. The slopes up to the surrounding land to the south are roughly 2H:1V while the slope

down to IR-490 is about 3H:1V to 4H:1V. With respect to drainage, the roadway drains towards the south side of the road into drainage ditches. The area is moderately vegetated for the most part and signs of standing water were not observed. The area appeared to be stable with no signs of geotechnical instability during our visit.

Photograph 12: Pavement Condition Transition of Ramp W-N

GEOTECHNICAL EXPLORATION

2.6. Exploration Program

The subsurface exploration for the project was conducted by NEAS between July 13, 2021 and July 26, 2021 and included 53 borings each drilled to a depth of 7.5 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 either within existing pavement areas that are planned to undergo full-depth replacement or within areas where widening and/or realignment is planned. Target boring locations were located in the field by NEAS prior to drilling utilizing handheld GPS equipment and the boring locations were drilled in areas that were not restricted by 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 following drilling. 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. The boring locations are depicted within the boring location plan provided in Appendix A.

Borings were drilled using a CME 45B truck-mounted drilling rig utilizing 3.25-inch (inner diameter) hollow stem augers. Soil samples were typically recovered continuously to a depth of 7.5 ft bgs, using an 18-inch split spoon sampler (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 for possible laboratory testing. Standard penetration tests (SPT) were conducted using a CME auto hammer that has been calibrated on December 5, 2019 to be 81.7% efficient as indicated on the boring logs (Appendix B).

An exploration was performed to support a retaining wall which was subsequently removed from this project. This retaining wall exploration was conducted by NEAS on October 19, 2022 and included 4

borings (B-001-1-21, B-001-2-21, B-002-1-21 and B-002-2-21) each drilled to a depth of 16.5 ft bgs. The noted boring logs are included in Appendix B.

Field boring logs were prepared by drilling personnel and included pavement description (where present), 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 (provided in Appendix B). After completing the borings, the boreholes were backfilled with either auger cuttings, bentonite chips, or a combination of these materials and patched accordingly with cold patch asphalt and/or cement when drilled through the roadway.

2.7. Laboratory Testing Program

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

2.7.1. Classification Testing

Representative soil samples were selected for index property (Atterberg Limits) and gradation testing for classification purposes on approximately forty percent (40%) of the samples. At each subgrade boring location, the upper two samples obtained below the proposed top of subgrade elevation were generally tested while additional samples were selected for testing with the intent of properly classifying the subsurface soil and groundwater conditions within the planned project limits. 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 and ODOT Supplements.

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

2.7.2. Standard Penetration Test Results

Standard Penetration Tests (SPT) and split-barrel (commonly known as split-spoon) sampling of soils were performed continuously 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 shown on the boring logs provided in Appendix B.

2.7.3. Sulfate Testing

Sulfate testing was generally performed on one sample from each subgrade/roadway boring performed for pavement/subgrade design purposes. The selected samples were tested in accordance with ODOT Supplement 1122, “Determining Sulfate Content in Soils” dated July 17, 2015. In general, the upper most sample (within 3 ft of the proposed subgrade elevation) from each boring was tested when feasible. Testing

results are summarized in Table 2 below, provided in Appendix C and presented on the boring logs within Appendix B.

Table 2: Sulfate Test Summary by Boring

Boring ID	Sample	Depth (ft)	Dilution Ratio	Average Sulfate Content (ppm)	Boring ID	Sample	Depth (ft)	Dilution Ratio	Average Sulfate Content (ppm)
B-001-0-21	SS-1	1.5-3.0	20	1433	B-028-0-21	SS-1	1.5-3.0	20	93
B-002-0-21	SS-1	1.5-3.0	20	227	B-029-0-21	SS-1	1.5-3.0	20	300
B-003-0-21	SS-1A	1.5-2.2	20	647	B-030-0-21	SS-1	1.5-3.0	20	873
B-004-0-21	SS-1	1.5-3.0	20	693	B-031-0-21	SS-1	1.5-3.0	20	100
B-005-0-21	SS-1	1.5-3.0	20	487	B-032-0-21	SS-1	1.5-3.0	20	960
B-006-0-21	SS-1	1.5-3.0	40	1187	B-033-0-21	SS-1	1.5-3.0	20	733
B-007-0-21	SS-1	1.5-3.0	20	193	B-034-0-21	SS-1	1.5-3.0	20	1413
B-008-0-21	SS-1	1.5-3.0	40	1280	B-035-0-21	SS-1	1.5-3.0	20	153
B-009-0-21	SS-1	1.5-3.0	20	313	B-036-0-21	SS-1	1.5-3.0	20	367
B-010-0-21	SS-1	1.5-3.0	20	553	B-037-0-21	SS-1	1.5-3.0	20	860
B-011-0-21	SS-1	1.5-3.0	40	2120	B-038-0-21	SS-1	1.5-3.0	20	340
B-012-0-21	SS-1	1.5-3.0	20	733	B-039-0-21	SS-1	1.5-3.0	20	793
B-013-0-21	SS-1	1.5-3.0	20	900	B-040-0-21	SS-1	1.5-3.0	20	413
B-014-0-21	SS-1	1.5-3.0	40	2133	B-041-0-21	SS-1	1.5-3.0	100	2800
B-015-0-21	SS-1	1.5-3.0	100	2367	B-042-0-21	SS-1	1.5-3.0	20	1300
B-016-0-21	SS-1	1.5-3.0	20	973	B-043-0-21	SS-1	1.5-3.0	20	933
B-017-0-21	SS-1	1.5-3.0	20	0	B-044-0-21	SS-1	1.5-3.0	20	1080
B-018-0-21	SS-1	1.5-3.0	20	627	B-045-0-21	SS-1	1.5-3.0	20	340
B-019-0-21	SS-1	1.5-3.0	20	820	B-046-0-21	SS-1	1.5-3.0	20	253
B-020-0-21	SS-1A	1.5-2.7	40	2600	B-047-0-21	SS-1	1.5-3.0	20	67
B-021-0-21	SS-1	1.5-3.0	40	1400	B-048-0-21	SS-1	1.5-3.0	40	2387
B-022-0-21	SS-1	1.5-3.0	20	400	B-049-0-21	SS-1	1.5-3.0	20	20
B-023-0-21	SS-1	1.5-3.0	40	1573	B-050-0-21	SS-1	1.5-3.0	20	1100
B-024-0-21	SS-1	1.5-3.0	20	133	B-051-0-21	SS-1	1.5-3.0	100	3000
B-025-0-21	SS-1	1.5-3.0	20	560	B-052-0-21	SS-1	1.5-3.0	20	40
B-026-0-21	SS-1	1.5-3.0	20	73	B-053-0-21	SS-1	1.5-3.0	20	347
B-027-0-21	SS-1	1.5-3.0	20	240					

3. FINDINGS

The subsurface conditions encountered during NEAS's explorations are described in the following subsections and/or 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 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. It should be noted that for the purposes of this report and our analysis the term 'subgrade' has been assumed to represent soils and/or soil conditions from 1.5 ft below proposed final pavement grades to a depth of 7.5 ft below the proposed pavement grades.

3.1. Existing Pavement

The pavement section thicknesses in terms of asphalt, concrete and granular base were measured at representative project subgrade borings during the subsurface exploration for the project and are recorded

on the test boring logs provided in Appendix B. A summary of these measurements is provided in Table 3 below.

Table 3: Measured Pavement Thickness at Boring Locations

Boring ID	Proposed Alignment	Drilled Depth (ft)	Asphalt Thickness (in)	Concrete Thickness (in)	Base Thickness (in)	Total Thickness (in)	Boring ID	Proposed Alignment	Drilled Depth (ft)	Asphalt Thickness (in)	Concrete Thickness (in)	Base Thickness (in)	Total Thickness (in)
B-001-0-21	IR-490	7.5	4.0	8.0	6.0	18.0	B-026-0-21	Lane E-S	7.5	6.0	7.0	0.0	13.0
B-002-0-21	IR-490	7.5	4.0	8.0	6.0	18.0	B-027-0-21	Lane E-S	7.5	4.0	6.0	0.0	10.0
B-003-0-21	IR-490	7.5	4.0	8.0	6.0	18.0	B-028-0-21	Lane E-S	7.5	8.0	4.0	0.0	12.0
B-004-0-21	IR-490	7.5	5.0	9.0	6.5	20.5	B-029-0-21	Ramp 7-7C	7.5	0.0	10.0	7.0	17.0
B-005-0-21	IR-490	7.5	4.0	8.0	6.0	18.0	B-030-0-21	Ramp 7-7C	7.5	0.0	10.0	7.0	17.0
B-006-0-21	IR-490	7.5	0.0	10.0	7.0	17.0	B-033-0-21	Ramp C-7	7.5	0.0	10.0	8.0	18.0
B-007-0-21	IR-490	7.5	6.0	6.0	0.0	12.0	B-034-0-21	Ramp C-7	7.5	0.0	8.0	9.0	17.0
B-008-0-21	IR-490	7.5	0.0	10.0	7.0	17.0	B-035-0-21	Ramp B-C	7.5	0.0	8.0	8.0	16.0
B-009-0-21	IR-490	7.5	8.0	5.0	0.0	13.0	B-036-0-21	Ramp B-C	7.5	0.0	6.0	8.0	14.0
B-010-0-21	IR-490	7.5	0.0	8.0	8.0	16.0	B-037-0-21	Ramp N-W	7.5	0.0	8.0	8.0	16.0
B-011-0-21	IR-490	7.5	7.5	6.5	0.0	14.0	B-038-0-21	Ramp N-W	7.5	0.0	8.0	8.0	16.0
B-012-0-21	IR-490	7.5	0.0	8.0	10.0	18.0	B-039-0-21	Ramp N-W	7.5	0.0	8.0	9.0	17.0
B-013-0-21	IR-490	7.5	8.0	6.0	0.0	14.0	B-040-0-21	Ramp N-W	7.5	0.0	6.0	8.0	14.0
B-014-0-21	IR-490	7.5	0.0	8.0	9.0	17.0	B-042-0-21	Ramp W-N	7.5	0.0	8.0	9.0	17.0
B-015-0-21	IR-490	7.5	0.0	8.0	9.0	17.0	B-043-0-21	Ramp W-N	7.5	0.0	8.0	8.0	16.0
B-016-0-21	IR-490	7.5	0.0	8.0	8.0	16.0	B-044-0-21	Ramp C-B	7.5	0.0	8.0	7.5	15.5
B-017-0-21	IR-490	7.5	0.0	8.0	8.0	16.0	B-045-0-21	Ramp C-B	7.5	0.0	8.0	7.5	15.5
B-018-0-21	IR-490	7.5	0.0	8.0	6.0	14.0	B-046-0-21	Ramp S-E	7.5	4.0	6.0	6.0	16.0
B-019-0-21	IR-490	7.5	0.0	8.0	8.0	16.0	B-047-0-21	Ramp S-E	7.5	4.0	8.0	6.0	18.0
B-020-0-21	IR-490	7.5	0.0	8.0	6.0	14.0	B-048-0-21	Ramp S-E	7.5	0.0	8.0	8.0	16.0
B-021-0-21	IR-490	7.5	0.0	8.0	8.0	16.0	B-049-0-21	Ramp S-E	7.5	0.0	8.0	7.5	15.5
B-022-0-21	IR-490	7.5	4.0	8.0	0.0	12.0	B-050-0-21	Ramp E-N	7.5	0.0	8.0	7.5	15.5
B-023-0-21	Lane E-S	7.5	4.0	8.0	0.0	12.0	B-051-0-21	Ramp E-N	7.5	0.0	10.0	7.0	17.0
B-024-0-21	Lane E-S	7.5	4.0	7.0	0.0	11.0	B-052-0-21	Ramp E-N	7.5	4.0	8.0	6.0	18.0
B-025-0-21	Lane E-S	7.5	4.0	8.0	0.0	12.0	B-053-0-21	Ramp E-N	7.5	4.0	8.0	6.0	18.0

3.2. Subgrade Conditions

The subgrade conditions within the project limits are relatively consistent and are generally comprised of either fill soils (i.e., embankment fill) or natural soils consisting of gravel, sand and silt, or low to moderately plastic sandy silt and silt/clay combinations. The subgrade soils encountered within the project limits are generally classified as either A-1-a, A-1-b, A-2-4, A-3, A-3a, A-4a, A-4b type soils. With respect to sulfate within the subgrade soil, based on the project laboratory testing program, each subgrade soil sample tested was determined to have a sulfate content of less than 5,000 parts per million (ppm) (i.e., lower than the level which ODOT considers high and may prevent the use of chemical stabilization).

The following subsections present a brief summary of the subsurface conditions by ramp/roadway segment with problem areas highlighted where present.

3.2.1. IR-490 Mainline

The project portions of IR-490 are planned to undergo full depth pavement replacement. The borings performed along this portion of roadway included historical borings B-109-0-20 through B-112-0-20 as well as project borings B-001-0-21 through B-022-0-21.

Along IR-490, nineteen percent (19%) of the soil samples were identified as fine-grained soils and were comprised of cohesive Sandy Silt (A-4a, 11% of samples) and Silt (A-4b, 8% of samples). With respect to the consistency of the fine-grained soils, the descriptions varied from stiff to hard correlating to converted

SPT-N values (N_{60}) between 15 and 42 blows per foot (bpf). Natural moisture contents ranged from 10 to 19 percent. Based on Atterberg Limit tests performed on representative samples of the fine-grained subgrade soils obtained along the project portions of IR-490, the liquid and plastic limits ranged from 21 to 27 percent and from 16 to 21 percent, respectively.

Eighty-one percent (81%) of the samples taken along the proposed roadway were classified as coarse-grained, non-cohesive soils and were comprised of: 1) Gravel (A-1-a, 6% of samples); 2) Gravel with Sand (A-1-b, 8% of samples); 3) Gravel and Stone Fragments with Sand and Silt (A-2-4, 9% of samples); 4) Fine Sand (A-3, 4% of samples); 5) Coarse and fine sand (A-3a, 27% of samples); 6) non-cohesive Sandy Silt (A-4a, 12% of samples); and, 7) non-cohesive Silt (A-4b, 14% of samples). With respect to the relative density of the coarse-grained soils, the descriptions varied from medium dense to dense correlating to N_{60} values between 12 and 50 bpf. Natural moisture contents ranged from 4 to 26 percent.

3.2.2. Lane E-S

Lane E-S is the exit ramp from the IR-490 WB to IR-71 SB which is planned for full depth pavement replacement. The borings performed along lane E-S included borings B-023-0-21 through B-028-0-21.

Along Lane E-S, ninety-two percent (92%) of the soil samples were identified as coarse-grained, non-cohesive soils and were comprised of Gravel with Sand (A-1-b, 38% of samples) and Coarse and Fine Sand (A-3a, 54% of samples). With respect to the relative density of the coarse-grained soils, the descriptions varied from medium dense to very dense correlating to N_{60} values between 12 and 52 bpf. Natural moisture contents ranged from 5 to 17 percent.

Eight percent (8%) of the samples taken along the proposed roadway were classified as fine-grained soils and were comprised of Silt (A-4b, 2 samples). With respect to the consistency of the fine-grained soils, the soil can be described as very stiff correlating to N_{60} values between 18 and 29 bpf. Natural moisture contents ranged from 14 to 20 percent.

3.2.3. Ramp 7-7C

Ramp 7-7C is the exit ramp from West 7th St to IR-490 EB which is planned for full depth pavement replacement. The borings performed along Ramp 7-7C included boring B-012-0-21 as well as borings B-029-0-21 through B-032-0-21.

Sixty percent (60%) of the samples taken along the ramp were classified as coarse-grained, non-cohesive soils and were comprised of Gravel and Stone Fragments with Sand and Silt (A-2-4, 20% of samples), Coarse and Fine Sand (A-3a, 20% of samples) and non-cohesive Silt (A-4b, 20% of samples). With respect to the relative density of the coarse-grained soils, the descriptions varied from medium dense to very dense correlating to N_{60} values of 15 and 63 bpf. Natural moisture contents ranged from 6 to 15 percent.

Forty percent (40%) of the soil samples taken along the proposed ramps were identified as fine-grained soils and were comprised of cohesive Sandy Silt (A-4a, 40% of samples). With respect to the consistency of the fine-grained soils, the descriptions varied from very stiff to hard correlating to N_{60} values between 23 and 56 bpf. Natural moisture contents ranged from 11 to 13 percent. Based on Atterberg Limit tests performed on representative samples of the fine-grained subgrade soils obtained along Ramps 7-7C, the liquid and plastic limits ranged from 23 to 29 percent and from 16 to 22 percent, respectively.

3.2.4. Ramp C-7

Ramp C-7 is the entrance ramp for West 7th St to IR-490 WB which is planned for full depth pavement replacement. The borings performed along Ramp C-7 included borings B-033-0-21 and B-034-0-21.

Sixty-three percent (63%) of the soil samples taken along the proposed ramps were identified as fine-grained soils and were comprised of cohesive Sandy Silt (A-4a, 13% of samples) and Silt (A-4b, 50% of samples). With respect to the consistency of the fine-grained soils, the descriptions varied from stiff to very stiff correlating to N_{60} values between 14 and 18 bpf. Natural moisture contents ranged from 15 to 21 percent. Based on Atterberg Limit tests performed a representative sample of the fine-grained subgrade soils obtained along Ramp C-7, the liquid and plastic limits are 29 percent and 22 percent, respectively.

Thirty-seven percent (37%) of the samples taken along the ramp were classified as coarse-grained, non-cohesive soils and were comprised of Gravel with Sand (A-1-b, 12% of sample) and Gravel with Stone Fragments (A-1-a, 25% of samples). With respect to the relative density of the coarse-grained soils, the soils can be described as medium dense correlating to N_{60} values between 20 and 25 bpf. Natural moisture contents of the non-cohesive samples ranged from 7 to 9 percent.

3.2.5. Ramp B-C

Ramp B-C is the entrance ramp from Rockefeller Ave to IR-490 WB which is planned for full depth pavement replacement. The borings performed along Ramp B-C included borings B-035-0-21 and B-036-0-21.

One hundred percent (100%) of the samples taken along the ramp were classified as coarse-grained, non-cohesive soils and were comprised of Coarse and Fine Sand (A-3a, 63% of samples) and non-cohesive Sandy Silt (A-4a, 37% of samples). With respect to the relative density of the coarse-grained soils, the soil can be described as medium dense to dense correlating to N_{60} values between 11 and 31 bpf. Natural moisture contents of the non-cohesive samples ranged from 9 to 15 percent.

3.2.6. Ramp N-W

Ramp N-W is the IR-490 WB exit ramp from IR-71 SB which is planned for full depth pavement replacement. The borings performed along Ramps M and N included borings B-037-0-21 through B-040-0-21.

One hundred percent (100%) of the soil samples were identified as coarse-grained soils and were comprised of: 1) Gravel with Sand (A-1-b, 25% of sample); 2) Coarse and Fine Sand (A-3a, 50% of samples); and, 3) Fine Sand (A-3, 25% of samples). With respect to the consistency of the coarse-grained soils, the soils can be described as medium dense to dense correlating to N_{60} values between 11 and 41 bpf. Natural moisture contents ranged from 4 to 11 percent.

3.2.7. Ramps W-N

Ramps W-N is the IR-490 EB to IR-71 NB ramp which is planned for full depth pavement replacement. The borings performed along Ramp W-N included borings B-041-0-21 through B-043-0-21.

One hundred percent (100%) of the samples taken along the proposed ramps were classified as coarse-grained, non-cohesive soils and were comprised of Gravel with Sand (A-1-b, 42% of samples) and Coarse and Fine Sand (A-3a, 58% of samples). With respect to the relative density of the coarse-grained soils, descriptions ranged from medium dense to dense correlating to N_{60} values between 23 and 50 bpf. Natural moisture contents ranged from 4 to 30 percent.

3.2.8. Ramp C-B

Ramp C-B is the IR-490 EB exist ramp to Broadway Ave which is planned for full depth pavement replacement. The borings performed along Ramp C-B included borings B-044-0-21 and B-045-0-21.

One hundred percent (100%) of the samples taken along the ramp were classified as coarse-grained, non-cohesive soils and were comprised of: 1) Gravel with Sand (A-1-b, 50% of samples); 2) Coarse and Fine Sand (A-3a, 38% of samples); and, 3) Gravel with stone fragments (A-1-a, 12% of samples). With respect to the relative density of the coarse-grained soils can be described as medium dense correlating to N_{60} values between 11 and 18 bpf. Natural moisture contents ranged from 4 to 14 percent.

3.2.9. Ramp S-E

Ramp S-E is the IR-71 NB to IR-490 EB which is planned for full depth pavement replacement. The borings performed along Ramp S-E included borings B-046-0-21 through B-049-0-21.

Eighty-seven percent (87%) of the samples taken along the ramp were classified as coarse-grained, non-cohesive soils and were comprised of Gravel with Sand (A-1-b, 25% of samples) and Coarse and Fine Sand (A-3a, 62% of samples). With respect to the relative density of the coarse-grained soils, descriptions ranged from loose to dense correlating to N_{60} values between 10 and 38 bpf. Natural moisture contents ranged from 6 to 27 percent.

Thirteen percent (13%) of the soil samples taken along the proposed ramps were identified as fine-grained soils and were comprised of Silt (A-4b, 2 samples). With respect to the consistency of the fine-grained soils, the soil can be described as very stiff correlating to N_{60} values between 25 and 26 bpf. Natural moisture contents ranged from 15 to 16 percent. Based on Atterberg Limit tests performed on a representative sample of the fine-grained subgrade soils obtained along Ramp S-E, the liquid and plastic limits are 25 percent and 19 percent, respectively. Natural moisture contents ranged from 15 to 16 percent.

3.2.10. Ramp E-N

Ramp E-N is the IR-490 WB to IR-71 NB ramp from which is planned for full depth pavement replacement. The borings performed along Ramp E-N included borings B-050-0-21 through B-053-0-21.

Eighty-eight percent (88%) of the samples taken along the ramp were classified as coarse-grained, non-cohesive soils and were comprised of: 1) Gravel with Sand (A-1-b, 31% of samples); 2) Coarse and Fine Sand (A-3a, 38% of samples); and, 3) Sandy Silt (A-4a, 19% of samples). With respect to the relative density of the coarse-grained soils, descriptions ranged from medium dense to very dense correlating to N_{60} values between 14 and 56 bpf. Natural moisture contents ranged from 6 to 45 percent.

Twelve percent (12%) of the soil samples taken along the ramp were identified as fine-grained soils and were comprised of cohesive Sandy Silt (A-4a, 2 samples). With respect to the consistency of the fine-grained soils, the soil can be described as very stiff correlating to N_{60} values between 20 and 22 bpf. Natural moisture contents ranged from 10 to 12 percent. Based on Atterberg Limit tests performed on representative samples of the fine-grained subgrade soils obtained along Ramp E-N, the liquid and plastic limits are between 19 to 25 percent and 14 to 15 percent, respectively.

3.2.11. Groundwater

Groundwater was observed within proposed subgrade depths during drilling in four (4) of the borings (B-002-0-21, B-006-0-21, B-011-0-21, and B-024-0-21) performed as part of the exploration. Based on measurements at each boring location, groundwater was encountered at depths ranging from 3 ft to 5.5 ft

(elevations ranging from 620.7 ft amsl to 647.3 ft amsl). 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 specific groundwater readings are included on the individual test boring logs located within Appendix B.

4. ANALYSES AND RECOMMENDATIONS

We understand that reconstruction of a portion of IR-490 mainline freeway as well as the reconstruction of various adjacent ramps are planned as part of the major rehabilitation project (CUY-490-0.00, PID 107408). In addition to the mainline freeway segment, full depth pavement replacement of the associated entrance/exit ramps (Lane E-S, Ramp C-7, Ramp 7-C, Ramp 7-7C, Ramp B-C, Ramp C-B, Ramp N-W, Ramp W-S, Ramp W-N, Ramp E-N and Ramp S-E) is also planned. For this purpose, a subgrade exploration and subsequent analysis was completed for the referenced project. The analysis completed for the proposed reconstruction included a subgrade analysis performed in accordance with ODOT's GDM criteria utilizing the ODOT provided *GB1: Subgrade Analysis Spreadsheet* (GB1_SubgradeAnalysis.xls, Version 14.5 dated January 18, 2019). Input information for the spreadsheet was based on the soil characteristics gathered during both historical explorations and NEAS's subgrade exploration (i.e., SPT results, laboratory test results, etc.). A subgrade analysis was performed for the entire project as well as for each of the referenced mainline and ramp segments individually.

Based on our evaluation of the subsurface conditions and our geotechnical engineering analyses of the proposed reconstruction, it is our opinion that subgrade conditions are generally satisfactory, and pavement can be supported by the underlying subsurface material utilizing 12-inches of chemical stabilization (global stabilization) per ODOT's GDM, though certain segments of mainline IR-490 Ramp 7-7C and Ramp C-7 where unsuitable soils were encountered, may require additional stabilization beyond the recommended 12-inches. Further detail regarding our subgrade analysis and the recommended remediation are provided in Section 5.1 and Section 5.2 of this report, respectively.

4.1. Subgrade Analysis

A subgrade analysis was performed to identify the method, location, and dimensions (including depth) of required subgrade stabilization for the project. In addition to identifying stabilization recommendations, pavement design parameters are also determined to aid in pavement section design. The subsections below present the results of our subgrade analysis including pavement design parameters and unsuitable subgrade conditions identified within the project limits. Subgrade analysis spreadsheets are provided in Appendix D.

Again, it should be noted that for the purposes of this report and our analysis, the term 'proposed subgrade' has been assumed to represent soils and/or soil conditions from 1.5 ft below proposed final pavement grades to a depth of 7.5 ft below the proposed pavement grades.

4.1.1. Pavement Design Recommendations

It is our understanding that pavement analysis and design is to be performed to determine the proposed pavement sections for the segments within the project limits to undergo full depth replacement. A subgrade analysis was performed using the subgrade soil data obtained during our field exploration program to evaluate the soil characteristics and develop pavement parameters for use in pavement design. The subgrade parameters recommended for use in pavement design are presented in Table 4 below. Provided in the table are ranges of maximum, minimum and average N_{60L} values for the indicated segments as well as the design CBR value recommended for use in pavement design.

Table 4: Pavement Design Values

Segment	Maximum N_{60L}	Minimum N_{60L}	Average N_{60L}	Average PI Values	Design CBR
Mainline I-490	30	14	22	7	9
Lane E-S (WB-490 to SB-71)	27	12	20	NP	13
Ramp 7-7C (NB 7th St to EB-490)	30	15	25	7	8
Ramp C-7 (WB-490 to 7th St)	18	14	16	7	7
Ramp B-C (Rockefeller Ave to WB-490)	19	11	15	NP	9
Ramp N-W (SB-77 to WB-490)	22	11	16	NP	13
Ramp W-N (EB-490 to NB-77)	27	23	25	NP	13
Ramp C-B (EB-490 to Broadway Ave)	12	11	12	NP	13
Ramp S-E (NB-77 to EB-490)	25	10	15	6	12
Ramp E-N (WB-490 to NB-77)	25	14	21	6	11
Entire Project	**30**	**10**	**20**	**7**	**10**

4.1.2. Unsuitable Subgrade

Per ODOT's GDM, the presence of select subgrade conditions (i.e., unsuitable) are prohibited within the subgrade zone for new pavement construction. These unsuitable subgrade conditions generally include the presence of rock and specific soil types. With respect to the proposed pavement construction and realignment project these subgrade conditions are further discussed in the following subsections.

4.1.2.1. Unsuitable Soils

Unsuitable soil types per the GDM, which include A-4b, A-2-5, A-5, A-7-5, A-8a, A-8b, and soils with liquid limits greater than 65, were encountered within the subgrade of the referenced project roadway segments. Soil Type A-4b (Silt) was encountered within eight (8) borings performed along the project portion of IR-490 mainline, Ramp 7-7C, and Ramp C-7. A summary of the prohibited soils encountered and the associated GDM recommended remediation depths are shown in Table 5 below.

Table 5: Prohibited Soils Location Summary

Boring ID	Prohibited Soil Type	Depth Below Subgrade (ft)	Remediation Depth (inches)	
			Excavate and Replace (Item 204 w/ Geotextile)	Chemical Stabilization (Item 206)
MainLine IR-490				
B-002-0-21	A-4b	2.0 - 2.5	36	14
B-003-0-21	A-4b	1.8 - 2.6	36	14
B-004-0-21	A-4b	1.5 - 3.5	36	14
B-012-0-21	A-4b	1.5 - 4.1	36	14
B-013-0-21	A-4b	3.0 - 9.0	36	14
B-018-0-21	A-4b	1.1 - 5.6	36	14
B-020-0-21	A-4b	1.2 - 2.2	36	14
Ramp 7-7C				
B-012-0-21	A-4b	0.0-5.7	36	14
Ramp C-7				
B-033-0-21	A-4b	0.0 - 6.4	36	14

4.1.3. Unstable Soils

The GDM recommends subgrade stabilization for soils considered unstable in which the N_{60} value of a particular soil sample (SS) at a referenced boring location is less than 12 bpf and in some cases less than 15 bpf (i.e., where moisture content is greater than optimum plus 3 percent). Based on the specific N_{60} value

at the subject boring, *Figure B - Subgrade Stabilization* within the GDM recommends a depth of subgrade stabilization for ODOT standard stabilization methods. It should be noted that *Figure B - Subgrade Stabilization* does not apply to soil types A-1-a, A-1-b, A-3, or A-3a, nor to soils with N_{60L} values of 15 or more. Per GDM guidance, *these soils should be reworked to stabilize the subgrade.* It should be noted that although a soil sample's N_{60} value may meet the criteria to be considered an unstable soil, the depth in which the unstable soil is encountered in relation to the proposed subgrade is considered when each individual subgrade boring is analyzed. For example, if the GDM recommends an excavate and replace of 12 inches within a weak soil underlying 18 inches of stable material, it would be unreasonable to recommend the removal of both the stable and unstable material for a total of 30 inches of excavate and replace.

Within the subject project roadway no soil samples collected during our exploration met the N_{60} value criteria to be considered unstable with the exception of samples classified as soil types A-1-a, A-1-b, A-3, or A-3a for which *Figure B - Subgrade Stabilization* does not apply.

4.1.3.1. High Moisture Content Soils

High moisture content soils are defined by the GDM as soils that exceed the estimated optimum moisture content (per *Table 600-1: Optimum Moisture Content* within the GDM) for a given classification by 3 percent or more. Per the GDM, soils determined to be above the identified moisture content levels are a likely indication of the presence of an unstable subgrade and may require some form of subgrade stabilization. Similar to our analysis of unstable soils, although a soil sample's moisture content may meet the criteria to be considered high, the depth in which the high moisture soil is encountered in relation to the proposed subgrade is considered when each individual subgrade boring is analyzed for stabilization recommendations. Summaries of the boring locations where high moisture content conditions were encountered in the top 3 ft of subgrade within the limits of each proposed roadway segment are shown in Table 6 below.

Table 6: High Moisture Content Soils Location Summary

Boring ID	Moisture Content (%)	Optimum Moisture Content (%)	Depth Below Subgrade (ft)
MainLine IR-490			
B-109-0-20	21	10	0.0 - 2.9
B-004-0-21	14	10	1.5 - 2.0
B-012-0-21	14/15	10	0.0 - 2.6
B-013-0-21	17	10	3.0 - 9.0
B-018-0-21	14/20	10	0.0 - 2.6
B-019-0-21	16/19	10	0.0 - 2.7
B-020-0-21	14/19	10	1.2 - 2.2
Ramp 7-7C			
B-012-0-21	14/15	10	0.0 - 2.7

4.2. Stabilization Recommendations

4.2.1. Subgrade Stabilization

Based on the results of our analysis, subgrade soils designated by ODOT's GDM as both "unstable" and "unsuitable" were present at various locations throughout the project. Subgrade soils designated as "unsuitable" consisted of soils classifying as A-4b (Silt) and were encountered within subgrade depths that require remediation in seven (7) borings (B-002-0-21, B-003-0-21, B-004-0-21, B-012-0-21, B-013-0-21, B-018-0-21 and B-020-0-21) performed along IR-490 Mainline, one (1) boring (B-012-0-21) performed on

Ramp 7-7C, and one (1) boring (B-033-0-21) performed on Ramp C-7. Subgrade soils designated as "unstable" via high moisture content were encountered at the various locations identified in Section 4.1.3.1 of this report. Although these materials were encountered throughout the site, guidance from ODOT's GDM states that *"For all Interstates and other divided highways with four or more lanes more than 1-mile in project length, the subgrade of the entire project shall be chemically stabilized (global stabilization),* except where *it is determined that soil is present where a majority of sulfate content values are found to be greater than 3,000 parts per million (ppm), or individual soil samples with sulfate contents greater than 5,000 ppm are present"* and therefore global chemical stabilization is recommended for the proposed rehabilitation project except where otherwise indicated in this report.

The global chemical stabilization of the referenced mainline and ramp subgrade soils included within this project, should be performed to a minimum depth of 12 inches utilizing cement as the stabilizing chemical. The stabilization efforts should extend a minimum of 18-inches beyond the edge of the paved roadway, shoulder or median. The mix design should be conducted in accordance with ODOT's CMS Supplement 1120 (Mixture Design for Chemically Stabilized Soils). For design purposes it may be assumed that the cement addition will be 5% using the following formula.

$$\text{Cement: } C = 0.75 \times T \times 115 \times 0.05$$

Where:

C = amount of chemical in pounds / square yard and

T = thickness of the treatment zone in inches

A dry density of 115-pounds per cubic foot (pcf) is assumed.

For areas where "unsuitable" A-4b (Silt) soils were encountered, it is recommended that either Excavate and Replace with geotextile (Item 204) be performed to a depth of 36 inches below the proposed top of subgrade, or chemical stabilization be performed to a depth of 14 inches. Our minimum recommended limits for the indicated project subgrade stabilization are provided in Table 7 below. Although, the minimum recommended limits are presented below, NEAS recommends that chemical stabilization be performed to a depth of 14 inches for the ***whole*** project portion of IR-490. NEAS recommends chemical stabilization to 14 inches along IR-490 because: 1) approximately 40% of the project portion of IR-490 requires 14 inches of chemical stabilization due to A-4b soil and these soils are spread throughout; 2) due to the 400 ft boring spacing, the presence of A-4b could be more prevalent at the site then identified and as chemical stabilization is to be performed, construction field quality control will not be able to verify or disprove the presence of A-4b soils within 3 feet of the planned subgrade; 3) it is our opinion that a consistent pavement section (including subgrade improvements) along the IR-490 project limits will yield superior performance for the project especially with respect to drainage and frost susceptibility; and, 4) for ease of construction purposes.

Table 7: Stabilization Recommendations

Start Station	End Station	Excavate and Replace w/ Item 204[1] (inches)	Chemical Stabilization (inches)	Unsuitable Subgrade Conditions	Borings Considered
IR-490 Mainline					
Begin Work	940+74	12	12	-	Global Stabilization
940+74	952+00	36	14	A-4b (Silt)	B-002-0-21, B-003-0-21, B-004-0-21
952+00	977+76	12	12	-	Global Stabilization
977+76	984+05	36	14	A-4b (Silt)	B-012-0-21, B-013-0-21
984+05	1031+11	12	12	-	Global Stabilization
1031+11	End Work	36	14	A-4b (Silt)	B-018-0-21, B-020-0-21
Ramp 7-7 C (NB 7th St to EB-490)					
Begin Work	End Work	36	14	A-4b (Silt)	B-012-0-21
Ramp C-7 (WB-490 to 7th St)					
Begin Work	End Work	36	14	A-4b (Silt)	B-033-0-21
Remainder of Project (Lane E-S, Ramp B-C, Ramp N-W, Ramp W-N, Ramp C-B, Ramp S-E, Ramp E-N)					
Begin Work	End Work	12	12	-	Global Stabilization

Notes:
1. Excavate and Replace depths for areas where Chemical Stabilization is not feasible.

It should be noted that per ODOT's GDM, *typical chemical stabilization equipment cannot stabilize areas less than 8 ft in width.* If it is anticipated that the project will require multiple maintenance of traffic phases, it is recommended that the roadway work is coordinated with the maintenance of traffic schemes in such a way that an 8-ft minimum width for chemical stabilization exists. If areas of less than 8 ft in width are anticipated, subgrade soils may be excavated out, mixed with stabilization chemical, and compacted in place, though this method is not practical for large areas

5. QUALIFICATIONS

This investigation was performed in accordance with accepted geotechnical engineering practice for the purpose of characterizing the subsurface conditions along the referenced portions of roadways. This report has been prepared for GPD, ODOT and their design consultants to be used solely in evaluating the subgrade soils within the project limits 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 test 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 occur in the nature, design or location of the proposed interstate rehabilitation work, 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 GPD Group in performing this geotechnical exploration for the CUY-490- 00.00 major rehabilitation project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

Brendan P. Andrews, P.E.
Project Geotechnical Engineer

Derar Tarawneh, Ph.D., E.I.
Geotechnical Staff Engineer

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APPENDIX A

BORING LOCATION PLAN

B-110-3-20
B-109-3-20
B-109-1-20
B-110-2-20
B-110-1-20
B-109-2-20
B-110-0-20
B-001-0-21
B-002-0-21
B-112-0-20
B-111-0-20
B-109-0-20
B-111-1-20
B-111-4-20
B-026-0-21
B-111-2-20
B-027-0-21
B-111-3-20
B-028-0-21
B-025-0-21
B-003-0-21
B-024-0-21
B-023-0-21
B-005-0-21
B-004-0-21

LEGEND

PROJECT BORING LOCATION

2020 HISTORIC BORING LOCATION

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN KCA
CHECKED BPA

BORING LOCATION PLAN

CUY-490-00.00

1/4

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B-033-0-21
B-034-0-21
B-013-0-21
B-014-0-21
B-011-0-21
B-012-0-21
B-009-0-21
B-010-0-21
B-029-0-21
B-007-0-21
B-008-0-21
B-032-0-21
B-022-0-21
B-030-0-21
B-006-0-21
B-031-0-21

LEGEND

PROJECT BORING LOCATION

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN KCA
CHECKED BPA

BORING LOCATION PLAN

CUY-490-00.00

2/4

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LEGEND

PROJECT BORING LOCATION

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN KCA
CHECKED BPA

BORING LOCATION PLAN

CUY-490-00.00

3
4

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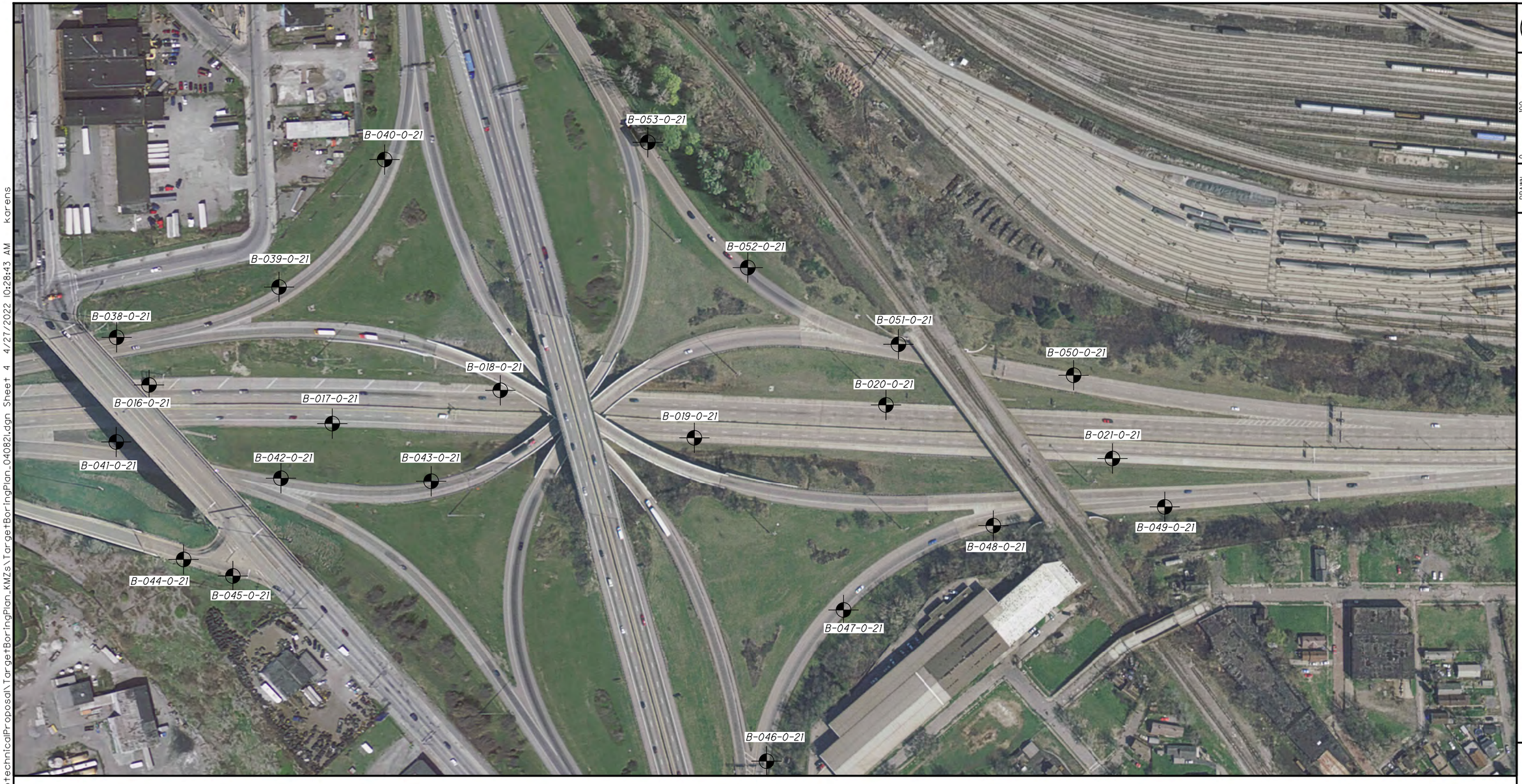

LEGEND

PROJECT BORING LOCATION

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN KCA
CHECKED BPA

BORING LOCATION PLAN

CUY-490-00.00

4
4

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APPENDIX B

BORING LOGS

S&ME JOB: 1179-20-021

PROJECT: CUY-90-6.83	DRILLING FIRM / OPERATORS: S&ME / C. BRUMMAGE	DRILL RIG: S&ME TRK 55 (R52)	STATION / OFFSET: 930+69, 5' RT	EXPLORATION ID: B-109-0-20
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / C. BRUMMAGE	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-90	
PID: 76779 BR ID: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 6/25/20	ELEVATION: 656.0 (MSL) EOB: 7.5 ft.	PAGE 1 OF 1
START: 8/13/20 END: 8/13/20	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 41.474054 N, 81.698962 W	

MATERIAL DESCRIPTION AND NOTES	ELEV. 656.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ASPHALT - 5 INCHES	655.6																		
CONCRETE - 10 INCHES	654.8																		
GRANULAR BASE - 3 INCHES	654.5																		
Medium-dense to dense gray **SANDY SILT**, trace clay, moist.		W 653.3	23 19 14	50	100	SS-1	-	0	0	54	38	8	NP	NP	NP	21	A-4a (2)	443	
			4 13 10	35	78	SS-2	-	0	0	62	35	3	NP	NP	NP	21	A-4a (V)	-	
		W 651.2	3 8 11	29	100	SS-3	-	-	-	-	-	-	-	-	-	20	A-4a (V)	-	
	648.5	EOB	10 11 11	33	78	SS-4	-	-	-	-	-	-	-	-	-	20	A-4a (V)	-	

NOTES:
- Seepage noted at 2.7' during drilling.
- Groundwater noted at 4.8' during drilling.
- After removal of augers, boring caved at 4.2' and was observed to be dry.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS

PLATE 153

S&ME JOB: 1179-20-021

PROJECT: CUY-90-6.83	DRILLING FIRM / OPERATORS: S&ME / C. BRUMMAGE	DRILL RIG: S&ME TRK 55 (R52)	STATION / OFFSET: 931+91, 38' LT	EXPLORATION ID: B-110-0-20
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / C. BRUMMAGE	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-90	
PID: 76779 BR ID: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 6/25/20	ELEVATION: 648.1 (MSL) EOB: 7.5 ft.	PAGE 1 OF 1
START: 9/14/20 END: 9/14/20	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 41.474197 N, 81.697498 W	

MATERIAL DESCRIPTION AND NOTES	ELEV. 648.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ASPHALT - 2-1/4 INCHES	647.9																		
CONCRETE - 10 INCHES	647.1																		
GRANULAR BASE - 5-3/4 INCHES	646.6																		
Medium-dense to very-dense brown **COARSE AND FINE SAND**, little fine gravel, little silt, trace clay, damp.	643.6	1 2 3 4	5 8 10	27	100	SS-1	-	17	22	45	13	3	NP	NP	NP	7	A-3a (0)	174	
			7 11 42	80	100	SS-2	-	-	-	-	-	-	-	-	-	9	A-3a (V)	-	
Dense to very-dense gray **SANDY SILT**, trace clay, trace fine gravel, moist.	640.6	5 6 7 EOB	12 17 19	54	100	SS-3	-	2	6	42	44	6	NP	NP	NP	17	A-4a (3)	-	
			20 13 14	41	100	SS-4	-	-	-	-	-	-	-	-	-	19	A-4a (V)	-	

NOTES:
- No seepage or groundwater noted during drilling.
- After removal of augers, boring caved at 4.9' and was observed to be dry.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; PLASTIC HOLE PLUG DEVICE; SOIL CUTTINGS

PLATE 157

S&ME JOB: 1179-20-021

PROJECT: CUY-90-6.83	DRILLING FIRM / OPERATORS: S&ME / C. BRUMMAGE	DRILL RIG: S&ME TRK 55 (R52)	STATION / OFFSET: 935+97, 5' RT	EXPLORATION ID: B-111-0-20	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / C. BRUMMAGE	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-90		
PID: 76779 BR ID: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 6/25/20	ELEVATION: 639.8 (MSL) EOB: 7.5 ft.		PAGE 1 OF 1
START: 8/13/20 END: 8/13/20	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 41.474104 N, 81.696012 W		

MATERIAL DESCRIPTION AND NOTES	ELEV. 639.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ASPHALT - 3-3/4 INCHES	639.5																		
CONCRETE - 10 INCHES	638.7																		
GRANULAR BASE - 4-1/4 INCHES	638.3																		
Very-dense brown **COARSE AND FINE SAND**, little silt, little fine gravel, trace clay, damp.	636.8	1 2	19 50	-	100	SS-1	-	11	24	48	12	5	NP	NP	NP	11	A-3a (0)	248	
Very-dense **GRAVEL**, some fine to coarse sand, trace silt, trace clay, damp.	635.3	3 4	11 33 50-4"	-	88	SS-2	-	70	17	9	3	1	NP	NP	NP	6	A-1-a (0)	-	
Hard gray **SILT**, some clay, trace fine to coarse sand, moist.	632.3	5 6 7 EOB	5 6 6 / 6 7 8	18 / 23	100 / 78	SS-3 / SS-4	4.0 / 4.0	0 / -	1 / -	5 / -	60 / -	34 / -	25 / -	17 / -	8 / -	20 / 20	A-4b (8) / A-4b (V)	- / -	

NOTES:
- No seepage or groundwater noted during drilling.
- After removal of augers, boring caved at 2.7' and was observed to be dry.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS

PLATE 162

S&ME JOB: 1179-20-021

PROJECT: CUY-90-6.83	DRILLING FIRM / OPERATORS: S&ME / C. BRUMMAGE	DRILL RIG: S&ME TRK 55 (R52)	STATION / OFFSET: 937+90, 5' LT	EXPLORATION ID: B-112-0-20	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / C. BRUMMAGE	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-90		
PID: 76779 BR ID: N/A	DRILLING METHOD: 2.25" HSA	CALIBRATION DATE: 6/25/20	ELEVATION: 635.8 (MSL) EOB: 6.5 ft.		PAGE 1 OF 1
START: 8/17/20 END: 8/17/20	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 41.474142 N, 81.695311 W		

MATERIAL DESCRIPTION AND NOTES	ELEV. 635.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ASPHALT - 3-3/4 INCHES	635.5																		
CONCRETE - 8-1/2 INCHES	634.8																		
GRANULAR BASE - 5-3/4 INCHES	634.3																		
PROBABLE FILL: Very-dense black, brown and gray **GRAVEL**, "and" fine to coarse sand, trace silt, trace clay, wet.		~~634.7~~ 1	50-5"	-	40	SS-1	-	55	23	15	5	2	NP	NP	NP	16	A-1-a (0)	197	
		2																	
		3	50-5"	-	80	SS-2	-	55	19	15	8	3	NP	NP	NP	17	A-1-a (V)	-	
		4																	
		5	50-5"	-	100	SS-3	-	-	-	-	-	-	-	-	-	21	A-1-a (V)	-	
	629.3	6 EOB	50	-	100	SS-4	-	-	-	-	-	-	-	-	-	15	A-1-a (V)	-	

NOTES:
- Water noted at 1.1' during drilling.
- After removal of augers, boring caved at 3.0', and water was measured at 0.9'.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS

PLATE 167

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 939+11, 39' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 632.9 (MSL) EOB: 7.5 ft.
START: 7/14/21 END: 7/14/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.474243, -81.694868

EXPLORATION ID B-001-0-21

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 632.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4.0" ASPHALT AND 8.0" CONCRETE AND 6.0" BASE (DRILLERS DESCRIPTION)	631.4	1																	
MEDIUM DENSE TO DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE TO SOME GRAVEL AND STONE FRAGMENTS, LITTLE SILT, TRACE CLAY, MOIST TO DAMP	628.4	2 3 4	10 14 13	37	39	SS-1	-	21	23	38	15	3	NP	NP	NP	11	A-3a (0)	1433	
			9 12 10	30	33	SS-2	-	-	-	-	-	-	-	-	-	9	A-3a (V)	-	
MEDIUM DENSE, BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, MOIST	626.9	5	8 10 12	30	61	SS-3	-	32	23	30	12	3	NP	NP	NP	12	A-1-b (0)	-	
MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, MOIST	625.4	6 7 EOB	7 9 11	27	56	SS-4	-	-	-	-	-	-	-	-	-	12	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / JL	DRILL RIG: CME 55T	STATION / OFFSET: 3+98, 10' RT.
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / JL	HAMMER: CME AUTOMATIC	ALIGNMENT: WALL 1
PID: SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 631.6 (MSL) EOB: 16.5 ft.
START: 10/19/22 END: 10/19/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 63.4	LAT / LONG: 41.474016, -81.694191

EXPLORATION ID B-001-1-21

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MATERIAL DESCRIPTION AND NOTES	ELEV. 631.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
5.0" ASPHALT AND 7.0" CONCRETE AND 7.0" BASE (DRILLERS DESCRIPTION)	630.0																	
DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE GRAVEL, LITTLE SILT, TRACE CLAY, MOIST **(FILL)**	626.6		14 15 14	31	67	SS-1	-	15	25	41	13	6	NP	NP	NP	12	A-3a (0)	
VERY STIFF, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO WET	617.1		4 6 7	14	67	SS-2	2.25	-	-	-	-	-	-	-	-	21	A-4b (V)	
			4 3 6	10	61	SS-3	3.50	0	0	1	72	27	25	18	7	19	A-4b (8)	
			2 3 7	11	67	SS-4	3.00	-	-	-	-	-	-	-	-	26	A-4b (V)	
			0 0 2	2	67	SS-5	3.00	-	-	-	-	-	-	-	-	27	A-4b (V)	
MEDIUM STIFF TO STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, WET	615.1	EOB	3 3 3	6	67	SS-6	1.00	0	0	1	54	45	30	19	11	28	A-6a (8)	

NOTES: GROUNWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE. DRILLED AS STAKED.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / JL	DRILL RIG: CME 55T	STATION / OFFSET: 2+66, 9' RT.
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / JL	HAMMER: CME AUTOMATIC	ALIGNMENT: WALL 1
PID: SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 632.0 (MSL) EOB: 16.5 ft.
START: 10/19/22 END: 10/19/22	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 63.4	LAT / LONG: 41.474025, -81.693708

EXPLORATION ID B-001-2-21

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
	632.0																	
5.0" ASPHALT AND 6.0" CONCRETE AND 8.0" BASE (DRILLERS DESCRIPTION)	630.4																	
DENSE, BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP **(FILL)**	628.5		4 14 15	31	56	SS-1	-	18	34	26	15	7	NP	NP	NP	8	A-1-b (0)	
HARD, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, DAMP	622.5		6 5 10	16	61	SS-2	4.25	-	-	-	-	-	-	-	-	17	A-4b (V)	
			4 4 6	11	67	SS-3	4.50	0	0	4	71	25	23	18	5	17	A-4b (8)	
MEDIUM DENSE, GRAY, **SILT**, LITTLE CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO WET					84	ST-1	-	0	0	7	75	18	NP	NP	NP	18	A-4b (8)	
			6 9 12	22	72	SS-4	-	-	-	-	-	-	-	-	-	17	A-4b (V)	
	615.5	EOB	4 10 13	24	67	SS-5	-	-	-	-	-	-	-	-	-	20	A-4b (V)	

NOTES: GROUNWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE. DRILLED AS STAKED.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 45B	STATION / OFFSET: 942+36, 47' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 632.1 (MSL) EOB: 7.5 ft.
START: 7/15/21 END: 7/15/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.474030, -81.693671

EXPLORATION ID B-002-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 632.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4.0" ASPHALT AND 8.0" CONCRETE AND 6.0" BASE (DRILLERS DESCRIPTION)	630.6																		
MEDIUM DENSE TO DENSE, BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, SS-2 CONTAINS A 2.0" SILT SEAM, DAMP		W 628.5	8 8 9	23	67	SS-1	-	21	36	25	13	5	NP	NP	NP	9	A-1-b (0)	227	
			7 6 8	19	78	SS-2	-	-	-	-	-	-	-	-	-	11	A-1-b (V)	-	
	626.4		8 11 12	31	39	SS-3A	-	-	-	-	-	-	-	-	-	9	A-1-b (V)	-	
HARD, BROWNISH GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, DAMP			10 10 13	31	61	SS-3B	4.50	3	1	3	65	28	27	18	9	13	A-4b (8)	-	
	624.6	EOB				SS-4	4.50	-	-	-	-	-	-	-	-	14	A-4b (V)	-	

NOTES: GROUNDWATER ENCOUNTERED AT 3.6' DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / JL	DRILL RIG: CME 55T	STATION / OFFSET: 1+44, 9' RT.
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / JL	HAMMER: CME AUTOMATIC	ALIGNMENT: WALL 1
PID: SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 631.2 (MSL) EOB: 16.5 ft.
START: 10/19/22 END: 10/19/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 63.4	LAT / LONG: 41.474044, -81.693267

EXPLORATION ID B-002-1-21

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 631.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
5.0" ASPHALT AND 7.0" CONCRETE AND 7.0" BASE (DRILLERS DESCRIPTION)	629.6	1																
DENSE, BROWNISH GRAY, **SANDY SILT**, LITTLE CLAY, LITTLE GRAVEL, DAMP **(FILL)**	626.7	2																
		3	11 18 21	41	72	SS-1	-	11	16	26	31	16	NP	NP	NP	11	A-4a (2)	
		4																
VERY STIFF, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP		5																
		6	6 7 8	16	50	SS-2	-	-	-	-	-	-	-	-	-	16	A-4b (V)	
		7																
		8	7 7 9	17	67	SS-3	-	0	0	3	71	26	24	17	7	16	A-4b (8)	
		9																
		10																
		11	3 7 8	16	50	SS-4	-	-	-	-	-	-	-	-	-	17	A-4b (V)	
		12																
		13	8 9 8	18	50	SS-5	-	-	-	-	-	-	-	-	-	16	A-4b (V)	
		14																
		15																
	614.7	16 EOB	5 9 7	17	44	SS-6	-	-	-	-	-	-	-	-	-	16	A-4b (V)	

NOTES: GROUNWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE. DRILLED AS STAKED.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / JL	DRILL RIG: CME 55T	STATION / OFFSET: 7' RT.	EXPLORATION ID B-002-2-21
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / JL	HAMMER: CME AUTOMATIC	ALIGNMENT: WALL 1	
PID: SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/24/22	ELEVATION: 633.2 (MSL) EOB: 16.5 ft.	PAGE 1 OF 1
START: 10/19/22 END: 10/19/22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 63.4	LAT / LONG: 41.474090, -81.692675	

MATERIAL DESCRIPTION AND NOTES	ELEV. 633.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
5.0" ASPHALT AND 7.0" CONCRETE AND 7.0" BASE (DRILLERS DESCRIPTION)	631.6	1																
STIFF TO HARD, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP TO MOIST		2																
		3	8 16 17	35	50	SS-1	-	-	-	-	-	-	-	-	-	12	A-4b (V)	
		4																
		5	4 6 8	15	50	SS-2	-	1	0	2	68	29	24	18	6	17	A-4b (8)	
		6																
		7	2 4 7	12	56	SS-3	-	-	-	-	-	-	-	-	-	18	A-4b (V)	
		8																
		9	6 9 10	20	44	SS-4	-	-	-	-	-	-	-	-	-	18	A-4b (V)	
		10																
		11	6 8 6	15	50	SS-5	-	0	0	3	71	26	24	18	6	18	A-4b (8)	
		12																
	616.7	13 EOB	2 4 6	11	56	SS-6	-	-	-	-	-	-	-	-	-	22	A-4b (V)	

NOTES: GROUNWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE. DRILLED AS STAKED.

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 - 1/3/23 19:25 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\CUY-490-0.00\GINT FILES\CUY-490-0.00.GPJ

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 946+27, 40' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 631.5 (MSL) EOB: 7.5 ft.
START: 7/14/21 END: 7/14/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.474375, -81.692283

EXPLORATION ID B-003-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 631.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4.0" ASPHALT AND 8.0" CONCRETE AND 6.0" BASE (DRILLERS DESCRIPTION)	630.0																		
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, LITTLE GRAVEL, TRACE CLAY, CONTAINS IRON STAINING, DAMP	629.3	1	8 13 18	42	72	SS-1A	-	19	30	24	21	6	NP	NP	NP	7	A-3a (0)	647	
	628.5	2				SS-1B	-	2	4	7	71	16	22	18	4	13	A-4b (8)	-	
DENSE, GRAYISH BROWN, **SILT**, LITTLE CLAY, LITTLE SAND, TRACE GRAVEL, CONTAINS TRACE IRON STAINING, DAMP	627.0	3	7 12 13	34	50	SS-2	-	13	16	16	44	11	24	20	4	10	A-4a (4)	-	
DENSE, BROWN AND GRAY, **SANDY SILT**, LITTLE GRAVEL, LITTLE CLAY, CONTAINS IRON STAINING, DAMP		4 5	10 13 11	33	56	SS-3	-	-	-	-	-	-	-	-	-	14	A-4b (V)	-	
MEDIUM DENSE TO DENSE, GRAYISH BROWN, **SILT**, LITTLE CLAY, LITTLE SAND, TRACE GRAVEL, CONTAINS TRACE IRON STAINING, DAMP TO MOIST	624.0	6	8 7 7	19	67	SS-4	-	-	-	-	-	-	-	-	-	18	A-4b (V)	-	
		EOB 7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 45B	STATION / OFFSET: 950+05, 51' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 635.9 (MSL) EOB: 7.5 ft.
START: 7/16/21 END: 7/16/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.474338, -81.690864

EXPLORATION ID B-004-0-21

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MATERIAL DESCRIPTION AND NOTES	ELEV. 635.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
5.0" ASPHALT AND 9.0" CONCRETE AND 6.5" BASE (DRILLERS DESCRIPTION)	634.2	1																	
MEDIUM DENSE, BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, CONTAINS CONCRETE FRAGMENTS, DAMP	631.8	2 3 4	8 9 11	27	67	SS-1	-	29	25	19	22	5	NP	NP	NP	8	A-2-4 (0)	693	
			10 12 9	29	56	SS-2A	-	-	-	-	-	-	-	-	-	8	A-2-4 (V)	-	
						SS-2B	4.50	-	-	-	-	-	-	-	-	14	A-4b (V)	-	
HARD, BROWNISH GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, DAMP	628.4	5	5 9 10	26	89	SS-3	4.50	0	2	4	65	29	25	19	6	15	A-4b (8)	-	
	EOB	6 7	6 8 11	26	56	SS-4	4.50	-	-	-	-	-	-	-	-	17	A-4b (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 953+92, 41' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 635.3 (MSL) EOB: 7.5 ft.
START: 7/19/21 END: 7/19/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.474886, -81.689604

EXPLORATION ID B-005-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 635.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4" ASPHALT AND 8" CONCRETE AND 6" BASE (DRILLERS DESCRIPTION)	633.8	1																	
DENSE, BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, CONTAINS CONCRETE FRAGMENTS, CONTAINS IRON STAINING, DAMP **(FILL)**	632.3	2	9 10 16	35	28	SS-1	-	28	23	28	16	5	NP	NP	NP	6	A-1-b (0)	487	
DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, LITTLE GRAVEL, TRACE CLAY, CONTAINS IRON STAINING, DAMP	629.3	3 4 5	8 10 13	31	50	SS-2	-	14	22	36	22	6	NP	NP	NP	7	A-3a (0)	-	
			8 14 11	34	67	SS-3	-	-	-	-	-	-	-	-	-	10	A-3a (V)	-	
HARD, GRAYISH BROWN, **SILT**, LITTLE SAND, LITTLE CLAY, TRACE GRAVEL, CONTAINS IRON STAINING, MOIST	627.8	6 7 EOB	9 7 6	18	78	SS-4	4.25	-	-	-	-	-	-	-	-	16	A-4b (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/19/21 END: 7/19/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 957+83, 78' RT.
ALIGNMENT: IR-490
ELEVATION: 632.7 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.474904, -81.688112

EXPLORATION ID B-006-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 632.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
10" CONCRETE AND 7" BASE (DRILLERS DESCRIPTION)	631.3																		
MEDIUM DENSE, GRAY, **GRAVEL**, SOME SAND, TRACE SILT, TRACE CLAY, CONTAINS GRANULAR BASE, WET	629.7	W 629.7	4 6 5	15	44	SS-1	-	55	20	14	9	2	NP	NP	NP	21	A-1-a (0)	1187	
(FILL)																			
VERY STIFF TO HARD, BROWN, **SANDY SILT**, SOME CLAY, TRACE TO LITTLE GRAVEL, CONTAINS 1" SILT SEAMS, MOIST			4 4 7	15	67	SS-2	3.00	6	7	16	47	24	23	16	7	17	A-4a (7)	-	
			4 5 7	16	39	SS-3	4.25	-	-	-	-	-	-	-	-	21	A-4a (V)	-	
	625.2	EOB	5 6 8	19	50	SS-4	4.25	-	-	-	-	-	-	-	-	21	A-4a (V)	-	

NOTES: GROUNDWATER ENCOUNTERED AT 3.0' DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 45B	STATION / OFFSET: 961+53, 73' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 628.0 (MSL) EOB: 7.5 ft.
START: 7/17/21 END: 7/17/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.475610, -81.686998

EXPLORATION ID B-007-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
628.0																			
6" ASPHALT AND 6" CONCRETE (DRILLERS DESCRIPTION)	627.0																		
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME GRAVEL, LITTLE SILT, TRACE CLAY, CONTAINS CONCRETE FRAGMENTS, DAMP **(FILL)**	625.0	1 2 3	12 10 11	29	61	SS-1	-	27	7	48	16	2	NP	NP	NP	7	A-3a (0)	193	
		3 4	8 7 7	19	56	SS-2	-	-	-	-	-	-	-	-	-	9	A-3a (V)	-	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE GRAVEL, TRACE CLAY, DAMP TO MOIST		5 6	6 5 6	15	50	SS-3	-	9	13	58	17	3	NP	NP	NP	11	A-3a (0)	-	
	620.5	7	5 5 7	16	56	SS-4	-	-	-	-	-	-	-	-	-	9	A-3a (V)	-	
		EOB																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 965+28, 63' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 617.0 (MSL) EOB: 7.5 ft.
START: 7/19/21 END: 7/19/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.475534, -81.685547

EXPLORATION ID B-008-0-21

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MATERIAL DESCRIPTION AND NOTES	ELEV. 617.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
10.0" CONCRETE AND 7.0" BASE (DRILLERS DESCRIPTION)	615.6	1																	
MEDIUM DENSE, BROWN MOTTLED WITH ORANGISH BROWN AND GRAY, **SANDY SILT**, SOME GRAVEL, TRACE CLAY, CONTAINS IRON STAINING AND GLASS FRAGMENTS, DAMP **(FILL)**	614.0	2 3 4	4 10 9	26	44	SS-1	-	22	19	21	28	10	NP	NP	NP	9	A-4a (1)	1280	
			4 5 7	16	67	SS-2	4.50	-	-	-	-	-	-	-	-	11	A-4a (V)	-	
HARD, BROWN MOTTLED WITH ORANGISH BROWN AND GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, DAMP		5	7 10 12	30	78	SS-3	4.50	6	10	20	46	18	24	17	7	12	A-4a (6)	-	
	609.5	6 7 EOB	6 11 15	35	78	SS-4	4.50	-	-	-	-	-	-	-	-	14	A-4a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 45B	STATION / OFFSET: 969+07, 61' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 613.6 (MSL) EOB: 7.5 ft.
START: 7/14/21 END: 7/14/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.476061, -81.684277

EXPLORATION ID B-009-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8.0" ASPHALT AND 5.0" CONCRETE (DRILLERS DESCRIPTION)	613.6																		
	612.5																		
HARD, BROWNISH GRAY AND BROWN, **SANDY SILT**, LITTLE CLAY, TRACE TO LITTLE GRAVEL, DAMP		1	13 12 9	29	67	SS-1	4.50	10	18	28	32	12	21	16	5	10	A-4a (2)	313	
		2																	
		3	7 9 8	23	89	SS-2	4.50	15	15	17	36	17	27	18	9	15	A-4a (4)	-	
		4																	
		5	8 7 10	23	83	SS-3	4.50	-	-	-	-	-	-	-	-	14	A-4a (V)	-	
		6																	
	606.1	7 EOB	6 8 10	25	78	SS-4	4.50	-	-	-	-	-	-	-	-	13	A-4a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 972+85, 62' RT.	EXPLORATION ID B-010-0-21
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490	
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 616.8 (MSL) EOB: 7.5 ft.	PAGE 1 OF 1
START: 7/19/21 END: 7/19/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.475901, -81.682845	

MATERIAL DESCRIPTION AND NOTES	ELEV. 616.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8.0" CONCRETE AND 8.0" BASE (DRILLERS DESCRIPTION)	615.5																		
MEDIUM DENSE TO DENSE, BROWN AND GRAY, **GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, CONTAINS BRICK FRAGMENTS, DAMP **(FILL)**		1 2 3	10 11 9	27	67	SS-1	-	29	19	19	23	10	NP	NP	NP	12	A-2-4 (0)	553	
		4	10 12 15	37	72	SS-2	-	-	-	-	-	-	-	-	-	11	A-2-4 (V)	-	
		5	11 11 14	34	67	SS-3	-	23	20	22	26	9	NP	NP	NP	12	A-2-4 (0)	-	
@6.0' BECOMES GRAY	609.3	6 7 EOB	12 10 11	29	67	SS-4	-	-	-	-	-	-	-	-	-	11	A-2-4 (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 45B	STATION / OFFSET: 976+32, 61' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 622.9 (MSL) EOB: 7.5 ft.
START: 7/14/21 END: 7/14/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.476390, -81.681670

EXPLORATION ID B-011-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 622.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
7.5" ASPHALT AND 6.5" CONCRETE (DRILLERS DESCRIPTION)	621.7																		
MEDIUM DENSE TO DENSE, GRAY, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, WET		W 620.1	20 18 12	41	78	SS-1	-	35	33	20	10	2	NP	NP	NP	18	A-1-b (0)	2120	
	618.7		4 4 9	18	67	SS-2A	-	-	-	-	-	-	-	-	-	15	A-1-b (V)	-	
HARD, DARK GRAY, **SILT**, SOME CLAY, LITTLE SAND, TRACE GRAVEL, SLIGHTLY ORGANIC, DAMP	618.4					SS-2B	4.50	6	7	8	58	21	27	21	6	19	A-4b (8)	-	
			5 4 8	16	56	SS-3	-	-	-	-	-	-	-	-	-	21	A-1-b (V)	-	
MEDIUM DENSE, GRAY, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, WET	615.4	EOB	6 7 9	22	44	SS-4	-	-	-	-	-	-	-	-	-	21	A-1-b (V)	-	

NOTES: GROUNDWATER ENCOUNTERED AT 2.8' DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 979+20, 72' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 631.9 (MSL) EOB: 7.5 ft.
START: 7/19/21 END: 7/19/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.476182, -81.680543

EXPLORATION ID B-012-0-21

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MATERIAL DESCRIPTION AND NOTES	ELEV. 631.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 10" BASE (DRILLERS DESCRIPTION)	630.4																		
MEDIUM DENSE TO DENSE, GRAYISH BROWN, **SILT**, LITTLE CLAY, TRACE TO LITTLE SAND, TRACE GRAVEL, CONTAINS IRON STAINING, DAMP TO MOIST		1 2 3 4 5 6	9 13 14	37	78	SS-1	-	0	0	6	78	16	NP	NP	NP	14	A-4b (8)	733	
			8 11 10	29	61	SS-2	-	1	3	10	74	12	NP	NP	NP	15	A-4b (8)	-	
			8 10 11	29	72	SS-3	-	-	-	-	-	-	-	-	-	15	A-4b (V)	-	
	624.4	7 EOB	6 12 11	31	67	SS-4	-	-	-	-	-	-	-	-	-	14	A-4b (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 45B	STATION / OFFSET: 982+49, 63' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 635.5 (MSL) EOB: 7.5 ft.
START: 7/14/21 END: 7/14/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.476780, -81.679520

EXPLORATION ID B-013-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 635.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8.0" ASPHALT AND 6.0" CONCRETE (DRILLERS DESCRIPTION)	634.3	1																	
VERY STIFF TO HARD, GRAY AND BROWNISH GRAY, **SILT**, TRACE TO SOME SAND, TRACE TO LITTLE GRAVEL, TRACE CLAY, MOIST TO WET		2	15 11 6	23	44	SS-1	3.75	17	8	19	50	6	NP	NP	NP	17	A-4b (4)	900	
		3	10 7 7	19	67	SS-2	4.50	0	0	8	83	9	NP	NP	NP	22	A-4b (8)	-	
	629.5	4	6 7 10	23	78	SS-3	3.00	-	-	-	-	-	-	-	-	19	A-4b (V)	-	
HARD, BROWN AND GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, DAMP	628.0	5	7 9 11	27	100	SS-4	4.50	-	-	-	-	-	-	-	-	16	A-4a (V)	-	
		6 EOB																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 985+62, 74' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 648.4 (MSL) EOB: 7.5 ft.
START: 7/26/21 END: 7/26/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.476752, -81.678275

EXPLORATION ID B-014-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 648.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8.0" CONCRETE AND 9.0" BASE (DRILLERS DESCRIPTION)	647.0																		
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE GRAVEL, TRACE CLAY, DAMP		1	14 13 8	29	67	SS-1	-	18	20	38	19	5	NP	NP	NP	7	A-3a (0)	2133	
		2																	
		3	12 10 8	25	33	SS-2	-	17	12	57	12	2	NP	NP	NP	5	A-3a (0)	-	
		4																	
		5	6 7 5	16	67	SS-3	-	-	-	-	-	-	-	-	-	8	A-3a (V)	-	
		6																	
	640.9	7 EOB	5 6 4	14	39	SS-4	-	-	-	-	-	-	-	-	-	7	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 1021+43, 40' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 647.3 (MSL) EOB: 7.5 ft.
START: 7/26/21 END: 7/26/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.479772, -81.666011

EXPLORATION ID B-015-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 647.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8.0" CONCRETE AND 9.0" BASE (DRILLERS DESCRIPTION)	645.9																		
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, LITTLE GRAVEL, TRACE CLAY, DAMP		1	16 11 10	29	61	SS-1	-	11	15	46	21	7	NP	NP	NP	9	A-3a (0)	2367	
		2																	
		3	10 11 10	29	39	SS-2	-	-	-	-	-	-	-	-	-	7	A-3a (V)	-	
@4.5'; SS-3A BECOMES WET	642.5	4				SS-3A	-	-	-	-	-	-	-	-	-	19	A-3a (V)	-	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, TRACE SILT, TRACE CLAY, TRACE GRAVEL, DAMP		5	4 5 4	12	67	SS-3B	-	2	15	71	10	2	NP	NP	NP	8	A-3a (0)	-	
		6																	
	639.8	7 EOB	4 4 4	11	56	SS-4	-	-	-	-	-	-	-	-	-	6	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/23/21 END: 7/23/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 1025+70, 40' LT.
ALIGNMENT: IR-490
ELEVATION: 640.3 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.480032, -81.664827

EXPLORATION ID B-016-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 640.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 8" BASE (DRILLERS DESCRIPTION)	639.0	1																	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE GRAVEL, LITTLE SILT, TRACE CLAY, DAMP	637.3	2	10 8 10	25	67	SS-1	-	15	32	39	11	3	NP	NP	NP	10	A-3a (0)	973	
MEDIUM DENSE, BROWN, **FINE SAND**, "AND" COARSE SAND, TRACE SILT, TRACE GRAVEL, TRACE CLAY, DAMP		3	9 11 7	25	56	SS-2	-	-	-	-	-	-	-	-	-	5	A-3 (V)	-	
F.S.		4	8 10 7	23	72	SS-3	-	7	37	46	8	2	NP	NP	NP	5	A-3 (0)	-	
		5																	
		6																	
	632.8	7	7 7 8	20	67	SS-4	-	-	-	-	-	-	-	-	-	4	A-3 (V)	-	
		EOB																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 1029+41, 39' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 629.8 (MSL) EOB: 7.5 ft.
START: 7/23/21 END: 7/23/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.479807, -81.663473

EXPLORATION ID B-017-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 629.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 8" BASE (DRILLERS DESCRIPTION)	628.5	1																	
MEDIUM DENSE, BROWN AND ORANGISH BROWN, **COARSE AND FINE SAND**, SOME SILT, TRACE GRAVEL, TRACE CLAY, DAMP TO MOIST **(FILL)**		2	7 9 10	26	44	SS-1	-	0	11	59	25	5	NP	NP	NP	9	A-3a (0)	0	
		3	9 7 8	20	39	SS-2	-	9	10	50	24	7	NP	NP	NP	12	A-3a (0)	-	
	623.8	4	10 9 11	27	50	SS-3	-	-	-	-	-	-	-	-	-	9	A-3a (V)	-	
HARD, BROWN, **SILT**, LITTLE CLAY, LITTLE SAND, TRACE GRAVEL, MOIST	622.3	5	11 9 13	30	44	SS-4	4.50	-	-	-	-	-	-	-	-	18	A-4b (V)	-	
		6																	
		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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 1032+80, 42' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 624.6 (MSL) EOB: 7.5 ft.
START: 7/23/21 END: 7/23/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.479983, -81.662227

EXPLORATION ID B-018-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 624.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 6" BASE (DRILLERS DESCRIPTION)	623.4	1																	
MEDIUM DENSE, BROWN, **SANDY SILT**, TRACE GRAVEL, TRACE CLAY, DAMP	621.6	2	9 10 12	30	67	SS-1	-	8	8	36	44	4	NP	NP	NP	14	A-4a (3)	627	
MEDIUM DENSE TO DENSE, BROWNISH GRAY, **SILT**, LITTLE SAND, TRACE CLAY, TRACE GRAVEL, WET		3	10 10 13	31	67	SS-2	-	0	1	10	80	9	NP	NP	NP	20	A-4b (8)	-	
		4	8 6 7	18	56	SS-3	-	-	-	-	-	-	-	-	-	21	A-4b (V)	-	
		5																	
		6	6 7 6	18	67	SS-4	-	-	-	-	-	-	-	-	-	26	A-4b (V)	-	
	617.1 EOB	7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/23/21 END: 7/23/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 1036+77, 37' RT.
ALIGNMENT: IR-490
ELEVATION: 624.2 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.479708, -81.660794

EXPLORATION ID B-019-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 624.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 8" BASE (DRILLERS DESCRIPTION)	622.9	1																	
MEDIUM DENSE TO DENSE, GRAYISH BROWN AND GRAY, **SANDY SILT**, TRACE GRAVEL, TRACE CLAY, MOIST TO WET		2	8 11 12	31	44	SS-1	-	8	8	34	44	6	NP	NP	NP	16	A-4a (3)	820	
		3	7 9 11	27	67	SS-2	-	-	-	-	-	-	-	-	-	19	A-4a (V)	-	
	618.2	4	7 8 8	22	56	SS-3	-	2	2	45	44	7	NP	NP	NP	20	A-4a (3)	-	
MEDIUM DENSE, GRAY, **SILT**, LITTLE CLAY, LITTLE SAND, TRACE GRAVEL, MOIST	616.7	5	9 10 10	27	67	SS-4	-	-	-	-	-	-	-	-	-	18	A-4b (V)	-	
		EOB 6																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 1040+62, 48' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 631.2 (MSL) EOB: 7.5 ft.
START: 7/23/21 END: 7/23/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.479881, -81.659372

EXPLORATION ID B-020-0-21

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MATERIAL DESCRIPTION AND NOTES	ELEV. 631.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 6" BASE (DRILLERS DESCRIPTION)	630.0	1																	
DENSE, BROWN AND GRAY, **GRAVEL AND STONE FRAGMENTS WITH SAND**, SOME SILT, TRACE CLAY, CONTAINS GRANULAR BASE MATERIAL, MOIST	628.5	2	6 13 11	33	44	SS-1A	-	37	21	17	21	4	NP	NP	NP	13	A-1-b (0)	2600	
						SS-1B	-	-	-	-	-	-	-	-	-	14	A-4b (V)	-	
	627.7	3				SS-2A	-	1	0	14	73	12	NP	NP	NP	19	A-4b (8)	-	
MEDIUM DENSE TO DENSE, BROWNISH GRAY, **SILT**, LITTLE SAND, LITTLE CLAY, TRACE GRAVEL, WET	626.7	4	7 11 9	27	67	SS-2B	-	-	-	-	-	-	-	-	-	18	A-3 (V)	-	
MEDIUM DENSE, BROWN, **FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, WET		5	6 10 11	29	72	SS-3	-	0	0	23	69	8	NP	NP	NP	19	A-4b (8)	-	
MEDIUM DENSE TO DENSE, BROWNISH GRAY, **SILT**, SOME SAND, TRACE CLAY, TRACE GRAVEL, WET	623.7	6	5 4 4	11	89	SS-4	-	-	-	-	-	-	-	-	-	19	A-4b (V)	-	
EOB		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 1045+27, 40' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-490
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 641.1 (MSL) EOB: 7.5 ft.
START: 7/23/21 END: 7/23/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.479571, -81.657699

EXPLORATION ID B-021-0-21

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 641.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 8" BASE (DRILLERS DESCRIPTION)	639.8	1																	
MEDIUM DENSE TO DENSE, BROWN AND GRAY, **GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, CONTAINS TRACE IRON STAINING, DAMP TO WET **(FILL)**	636.6	2 3 4	12 8 10	25	44	SS-1	-	28	13	34	20	5	NP	NP	NP	10	A-2-4 (0)	1400	
			12 14 13	37	44	SS-2	-	-	-	-	-	-	-	-	-	15	A-2-4 (V)	-	
MEDIUM DENSE, DARK BROWN, **COARSE AND FINE SAND**, SOME SILT, LITTLE GRAVEL, TRACE CLAY, CONTAINS GLASS FRAGMENTS, WET **(FILL)**	635.1	5	11 10 8	25	56	SS-3	-	19	17	36	22	6	NP	NP	NP	14	A-3a (0)	-	
DENSE, DARK BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, CONTAINS GLASS FRAGMENTS, WET **(FILL)**	633.6	6 7 EOB	12 13 13	35	50	SS-4	-	-	-	-	-	-	-	-	-	14	A-2-4 (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/16/21 END: 7/16/21

DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH
SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 3058+12, 5' LT.
ALIGNMENT: LANE E-S
ELEVATION: 632.1 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.475375, -81.688184

EXPLORATION ID B-022-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4.0" ASPHALT AND 8.0" CONCRETE (DRILLERS DESCRIPTION)	632.1 631.1																		
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE GRAVEL, LITTLE SILT, TRACE CLAY, DAMP	629.1	1 2	18 11 8	26	89	SS-1	-	17	10	57	13	3	NP	NP	NP	10	A-3a (0)	400	
MEDIUM DENSE, BROWN, **FINE SAND**, TRACE SILT, TRACE COARSE SAND, TRACE CLAY, TRACE GRAVEL, WET		3 4	6 7 8	20	61	SS-2	-	0	5	87	7	1	NP	NP	NP	24	A-3 (0)	-	
		5	5 7 5	16	100	SS-3	-	-	-	-	-	-	-	-	-	22	A-3 (V)	-	
	624.9	6 7	7 7 7	19	78	SS-4A	-	-	-	-	-	-	-	-	-	23	A-3 (V)	-	
MEDIUM DENSE, GRAY, **SILT**, LITTLE SAND, LITTLE CLAY, TRACE GRAVEL, WET	624.6	EOB				SS-4B	-	-	-	-	-	-	-	-	-	22	A-4b (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 45B	STATION / OFFSET: 3054+65, 6' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: LANE E-S
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 638.5 (MSL) EOB: 7.5 ft.
START: 7/15/21 END: 7/15/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.475127, -81.689447

EXPLORATION ID B-023-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 638.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4.0" ASPHALT AND 8.0" CONCRETE (DRILLERS DESCRIPTION)	637.5																		
MEDIUM DENSE, BROWN AND GRAY, **GRAVEL AND STONE FRAGMENTS WITH SAND**, TRACE SILT, TRACE CLAY, DAMP TO MOIST		1	11 9 10	26	22	SS-1	-	51	17	21	9	2	NP	NP	NP	11	A-1-b (0)	1573	
		2	5 5 4	12	39	SS-2	-	51	16	21	10	2	NP	NP	NP	11	A-1-b (0)	-	
	632.6	3	7 6 7	18	56	SS-3	-	-	-	-	-	-	-	-	-	16	A-1-b (V)	-	
VERY STIFF, GRAY, **SILT**, LITTLE CLAY, TRACE SAND, TRACE GRAVEL, MOIST	631.0	4	6 6 7	18	67	SS-4	2.75	-	-	-	-	-	-	-	-	20	A-4b (V)	-	
		EOB 5																	
		6																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/16/21 END: 7/16/21

DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH
SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 3050+96, 5' LT.
ALIGNMENT: LANE E-S
ELEVATION: 652.7 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.474960, -81.690732

EXPLORATION ID B-024-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 652.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4.0" ASPHALT AND 7.0" CONCRETE (DRILLERS DESCRIPTION)	651.8																		
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, LITTLE GRAVEL, TRACE CLAY, CONTAINS TRACE IRON STAINING, MOIST	649.7		9 11 10	29	78	SS-1	-	11	15	39	27	8	NP	NP	NP	11	A-3a (0)	133	
MEDIUM DENSE, BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, WET	646.7	W 647.3	8 7 7	19	67	SS-2	-	18	33	29	16	4	NP	NP	NP	15	A-1-b (0)	-	
			7 9 10	26	78	SS-3	-	-	-	-	-	-	-	-	-	17	A-1-b (V)	-	
HARD, BROWNISH GRAY, **SILT**, LITTLE CLAY, LITTLE SAND, TRACE GRAVEL, DAMP	645.2	EOB	10 10 11	29	72	SS-4	4.50	-	-	-	-	-	-	-	-	14	A-4b (V)	-	

NOTES: GROUNDWATER ENCOUNTERED AT 5.4' DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 45B	STATION / OFFSET: 3047+38, 2' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: LANE E-S
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 667.3 (MSL) EOB: 7.5 ft.
START: 7/16/21 END: 7/16/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.474695, -81.691991

EXPLORATION ID B-025-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 667.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4" ASPHALT AND 8" CONCRETE (DRILLERS DESCRIPTION)	666.3	1																	
MEDIUM DENSE, BROWN AND GRAY, **GRAVEL AND STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, CONTAINS GRANULAR BASE MATERIAL AND CONCRETE FRAGMENTS, DAMP **(FILL)**	664.3	2	18 10 12	30	56	SS-1	-	21	29	29	16	5	NP	NP	NP	5	A-1-b (0)	560	
		3	8 10 9	26	39	SS-2	-	-	-	-	-	-	-	-	-	5	A-1-b (V)	-	
MEDIUM DENSE TO DENSE, BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP		4	13 15 16	42	72	SS-3	-	18	32	31	15	4	NP	NP	NP	6	A-1-b (0)	-	
		5	12 14 14	38	89	SS-4	-	-	-	-	-	-	-	-	-	6	A-1-b (V)	-	
	659.8	6 EOB																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 45B	STATION / OFFSET: 3041+89, 27' RT.	EXPLORATION ID B-026-0-21
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: LANE E-S	
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 677.8 (MSL) EOB: 7.5 ft.	PAGE 1 OF 1
START: 7/16/21 END: 7/16/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.473661, -81.693337	

MATERIAL DESCRIPTION AND NOTES	ELEV. 677.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
6" ASPHALT AND 7" CONCRETE (DRILLERS DESCRIPTION)	676.7																		
MEDIUM DENSE TO DENSE, BROWN, **COARSE AND FINE SAND**, SOME GRAVEL, LITTLE SILT, TRACE CLAY, CONTAINS TRACE IRON STAINING, DAMP		1 2 3	18 13 14	37	56	SS-1	-	23	25	31	16	5	NP	NP	NP	7	A-3a (0)	73	
		4	10 12 11	31	56	SS-2	-	25	24	32	15	4	NP	NP	NP	6	A-3a (0)	-	
		5	13 10 10	27	44	SS-3	-	-	-	-	-	-	-	-	-	7	A-3a (V)	-	
@6.0'; SS-4 BECOMES TRACE GRAVEL		6	10 12 13	34	67	SS-4	-	-	-	-	-	-	-	-	-	8	A-3a (V)	-	
	670.3	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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 45B	STATION / OFFSET: 3038+16, 27' RT.	EXPLORATION ID B-027-0-21
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: LANE E-S	
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 674.5 (MSL) EOB: 7.5 ft.	PAGE 1 OF 1
START: 7/13/21 END: 7/13/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.472695, -81.693585	

MATERIAL DESCRIPTION AND NOTES	ELEV. 674.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4" ASPHALT AND 6" CONCRETE (DRILLERS DESCRIPTION)	673.7																		
MEDIUM DENSE, BROWN BECOMING BROWN AND GRAY, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, SS-1 AND SS-4 CONTAIN IRON STAINING, DAMP TO MOIST		1	11 11 10	29	50	SS-1	-	5	10	54	25	6	NP	NP	NP	10	A-3a (0)	240	
		2																	
		3	10 8 11	26	67	SS-2	-	-	-	-	-	-	-	-	-	9	A-3a (V)	-	
		4																	
		5	4 4 8	16	28	SS-3	-	7	20	39	26	8	NP	NP	NP	8	A-3a (0)	-	
		6																	
	667.0	7 EOB	8 7 6	18	39	SS-4	-	-	-	-	-	-	-	-	-	12	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/13/21 END: 7/13/21

DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH
SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 3034+13, 26' RT.
ALIGNMENT: LANE E-S
ELEVATION: 669.4 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.471613, -81.693416

EXPLORATION ID B-028-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 669.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" ASPHALT AND 4" CONCRETE (DRILLERS DESCRIPTION)	668.4																		
MEDIUM DENSE TO VERY DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE GRAVEL, TRACE CLAY, SS-2 CONTAINS ASPHALT FRAGMENTS AND IRON STAINING, DAMP		1	8 10 9	26	78	SS-1	-	11	33	35	17	4	NP	NP	NP	9	A-3a (0)	93	
		2																	
		3	7 8 8	22	67	SS-2	-	-	-	-	-	-	-	-	-	7	A-3a (V)	-	
		4																	
		5	9 8 13	29	67	SS-3	-	-	-	-	-	-	-	-	-	7	A-3a (V)	-	
		6																	
	661.9	7 EOB	12 18 20	52	56	SS-4	-	-	-	-	-	-	-	-	-	6	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 67+99, 145' RT.	EXPLORATION ID B-029-0-21
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP 7-7C	
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 643.8 (MSL) EOB: 7.5 ft.	PAGE 1 OF 1
START: 7/20/21 END: 7/20/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.475721, -81.679351	

MATERIAL DESCRIPTION AND NOTES	ELEV. 643.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
10" CONCRETE AND 7" BASE (DRILLERS DESCRIPTION)	642.4																		
MEDIUM DENSE TO DENSE, BROWN AND ORANGISH BROWN, **COARSE AND FINE SAND**, SOME SILT, TRACE TO LITTLE GRAVEL, TRACE CLAY, SS-1 CONTAINS TRACE IRON STAINING, DAMP		1	9 10 15	34	72	SS-1	-	10	23	34	26	7	NP	NP	NP	9	A-3a (0)	300	
(FILL)	639.8	2	9 5 6	15	50	SS-2A	-	14	28	30	23	5	NP	NP	NP	8	A-3a (0)	-	
		3				SS-2B	-	-	-	-	-	-	-	-	-	11	A-3a (V)	-	
MEDIUM DENSE, GRAY AND BROWN, **COARSE AND FINE SAND**, SOME SILT, LITTLE GRAVEL, LITTLE CLAY, DAMP		4	7 6 7	18	61	SS-3	-	-	-	-	-	-	-	-	-	6	A-3a (V)	-	
		5	5 4 4	11	67	SS-4	-	-	-	-	-	-	-	-	-	9	A-3a (V)	-	
	636.3	6 EOB																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 68+99, 19' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP 7-7C
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 624.2 (MSL) EOB: 7.5 ft.
START: 7/20/21 END: 7/20/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.475167, -81.679382

EXPLORATION ID B-030-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 624.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
10" CONCRETE AND 7" BASE (DRILLERS DESCRIPTION)	622.8	1																	
HARD, BROWN MOTTLED GRAY, **SANDY SILT**, LITTLE CLAY, LITTLE GRAVEL, CONTAINS BRICK FRAGMENTS AND IRON STAINING, DAMP **(FILL)**	621.2	2 3 4	14 20 21	56	50	SS-1	4.50	13	12	11	47	17	29	22	7	12	A-4a (6)	873	
VERY DENSE, LIGHT GRAY, **GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, DAMP	619.7	4 5	16 22 24	63	33	SS-2	-	26	27	21	21	5	NP	NP	NP	8	A-2-4 (0)	-	
HARD, BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, DAMP	616.7	6 7 EOB	9 12 16	38	67	SS-3	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)	-	
			9 11 13	33	56	SS-4	4.50	-	-	-	-	-	-	-	-	13	A-4a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 72+21, 23' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP 7-7C
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 623.3 (MSL) EOB: 7.5 ft.
START: 7/20/21 END: 7/20/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.474849, -81.680357

EXPLORATION ID B-031-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
HARD, BROWN, **SANDY SILT**, LITTLE GRAVEL, LITTLE CLAY, DAMP **(FILL)**	623.3	1	6 9 8	23	72	SS-1	4.50	18	18	18	31	15	24	17	7	11	A-4a (2)	100	
MEDIUM DENSE TO DENSE, BROWN AND ORANGISH BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, CONTAINS IRON STAINING AND TRACE BRICK FRAGMENTS, DAMP **(FILL)**	620.3	2 3 4	8 10 10	27	50	SS-2	-	27	26	18	22	7	NP	NP	NP	9	A-2-4 (0)	-	
		5	12 14 11	34	56	SS-3	-	-	-	-	-	-	-	-	-	10	A-2-4 (V)	-	
	615.8	6 7 EOB	8 12 15	37	61	SS-4	-	-	-	-	-	-	-	-	-	11	A-2-4 (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 76+12, 11' RT.	EXPLORATION ID B-032-0-21
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP 7-7C	
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 621.4 (MSL) EOB: 7.5 ft.	PAGE 1 OF 1
START: 7/20/21 END: 7/20/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.475534, -81.681133	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
HARD, GRAYISH BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, CONTAINS TRACE IRON STAINING, DAMP	621.4	1																	
		2	6 11 14	34	72	SS-1	4.50	9	12	13	48	18	25	18	7	11	A-4a (6)	960	
		3	6 10 14	33	61	SS-2	4.50	10	12	19	44	15	23	16	7	11	A-4a (5)	-	
		4	6 16 12	38	67	SS-3	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)	-	
		5	10 16 17	45	78	SS-4	4.50	-	-	-	-	-	-	-	-	12	A-4a (V)	-	
	613.9	6 EOB																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 84+46, 21' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP C-7
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 656.6 (MSL) EOB: 7.5 ft.
START: 7/20/21 END: 7/20/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.477226, -81.679002

EXPLORATION ID B-033-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 656.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
10" CONCRETE AND 8" BASE (DRILLERS DESCRIPTION)	655.1																		
HARD, BROWN MOTTLED WITH ORANGISH BROWN AND GRAY, **SILT**, LITTLE TO SOME CLAY, LITTLE SAND, TRACE GRAVEL, CONTAINS IRON STAINING, DAMP		1 2 3 4 5 6 7	9 6 7	18	72	SS-1	4.50	6	7	7	60	20	29	22	7	17	A-4b (8)	733	
			5 5 6	15	67	SS-2	4.50	7	7	8	58	20	29	22	7	16	A-4b (8)	-	
			5 6 4	14	67	SS-3	4.50	-	-	-	-	-	-	-	-	21	A-4b (V)	-	
	649.1	EOB	4 6 4	14	61	SS-4	4.50	-	-	-	-	-	-	-	-	17	A-4b (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 82+28, 16' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP C-7
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 663.4 (MSL) EOB: 7.5 ft.
START: 7/20/21 END: 7/20/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.476953, -81.679724

EXPLORATION ID B-034-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 663.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 9" BASE (DRILLERS DESCRIPTION)	662.0																		
MEDIUM DENSE, BROWN AND GRAY, **STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, CONTAINS BRICK FRAGMENTS, DAMP **(FILL)**	660.4	1–2	4 9 8	23	39	SS-1	-	41	21	17	15	6	NP	NP	NP	9	A-1-b (0)	1413	
MEDIUM DENSE, GRAY, **STONE FRAGMENTS**, SOME SAND, TRACE SILT, TRACE CLAY, CONTAINS BRICK FRAGMENTS, DAMP **(FILL)**	658.9	2–3	5 7 8	20	44	SS-2	-	51	20	15	10	4	NP	NP	NP	8	A-1-a (0)	-	
HARD, GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, MOIST	657.4	3–4	6 7 6	18	39	SS-3	4.50	-	-	-	-	-	-	-	-	15	A-4a (V)	-	
MEDIUM DENSE, GRAY, **STONE FRAGMENTS**, SOME SAND, TRACE SILT, TRACE CLAY, DAMP	655.9	4–5	7 8 10	25	22	SS-4	-	-	-	-	-	-	-	-	-	7	A-1-a (V)	-	
	EOB	5–6																	
		6–7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 17+69, 31' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP B-C
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 667.4 (MSL) EOB: 7.5 ft.
START: 7/22/21 END: 7/22/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.480347, -81.667621

EXPLORATION ID B-035-0-21

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MATERIAL DESCRIPTION AND NOTES	ELEV. 667.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8.0" CONCRETE AND 8.0" BASE (DRILLERS DESCRIPTION)	666.1																		
MEDIUM DENSE, DARK BROWN AND GRAY, **COARSE AND FINE SAND**, LITTLE TO SOME SILT, LITTLE GRAVEL, TRACE CLAY, WET TO MOIST		1 2 3 4 5 6 7	3 5 4	12	67	SS-1	-	13	19	43	20	5	NP	NP	NP	15	A-3a (0)	153	
			3 5 3	11	22	SS-2	-	15	20	36	24	5	NP	NP	NP	11	A-3a (0)	-	
			4 5 3	11	39	SS-3	-	-	-	-	-	-	-	-	-	11	A-3a (V)	-	
	659.9	EOB	6 4 5	12	50	SS-4	-	-	-	-	-	-	-	-	-	11	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 15+10, 2' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP B-C
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 665.1 (MSL) EOB: 7.5 ft.
START: 7/21/21 END: 7/21/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.479942, -81.668381

EXPLORATION ID B-036-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 665.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
6" CONCRETE AND 8" BASE (DRILLERS DESCRIPTION)	663.9	1																	
MEDIUM DENSE, BROWN, **SANDY SILT**, LITTLE GRAVEL, TRACE CLAY, CONTAINS IRON STAINING, DAMP **(FILL)**	662.1	2	7 8 10	25	56	SS-1	-	16	21	24	29	10	NP	NP	NP	9	A-4a (1)	367	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, LITTLE GRAVEL, TRACE CLAY, CONTAINS IRON STAINING, DAMP **(FILL)**	660.6	3 4	6 7 7	19	44	SS-2	-	12	20	35	26	7	NP	NP	NP	9	A-3a (0)	-	
MEDIUM DENSE TO DENSE, BROWN, **SANDY SILT**, TRACE TO LITTLE GRAVEL, TRACE CLAY, CONTAINS IRON STAINING, SS-4 CONTAINS BRICK FRAGMENTS, DAMP **(FILL)**	657.6	5	11 9 12	29	78	SS-3	-	-	-	-	-	-	-	-	-	9	A-4a (V)	-	
	EOB	6 7	11 10 13	31	67	SS-4	-	-	-	-	-	-	-	-	-	10	A-4a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/21/21 END: 7/21/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 120+53, 8' LT.
ALIGNMENT: RAMP N-W
ELEVATION: 651.4 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.480121, -81.666407

EXPLORATION ID B-037-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 651.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 8" BASE (DRILLERS DESCRIPTION)	650.1																		
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE TO SOME GRAVEL, LITTLE SILT, TRACE CLAY, DAMP		1 2 3 4 5 6 7	12 9 11	27	56	SS-1	-	26	24	26	18	6	NP	NP	NP	6	A-3a (0)	860	
			7 9 7	22	39	SS-2	-	16	26	35	17	6	NP	NP	NP	7	A-3a (0)	-	
			6 10 7	23	44	SS-3	-	-	-	-	-	-	-	-	-	5	A-3a (V)	-	
	643.9	EOB	7 9 8	23	61	SS-4	-	-	-	-	-	-	-	-	-	6	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/21/21 END: 7/21/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 124+26, 1' LT.
ALIGNMENT: RAMP N-W
ELEVATION: 649.1 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.480298, -81.665064

EXPLORATION ID B-038-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 649.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 8" BASE (DRILLERS DESCRIPTION)	647.8																		
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE TO LITTLE GRAVEL, TRACE CLAY, MOIST		1 2 3 4 5 6 7	6 5 5 6	15	67	SS-1	-	17	23	41	14	5	NP	NP	NP	11	A-3a (0)	340	
			5 5 5 6	15	67	SS-2	-	8	18	50	19	5	NP	NP	NP	11	A-3a (0)	-	
			6 4 6	14	44	SS-3	-	-	-	-	-	-	-	-	-	11	A-3a (V)	-	
	641.6	EOB	6 7 8	20	50	SS-4	-	-	-	-	-	-	-	-	-	11	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 127+74, 4' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP N-W
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 657.9 (MSL) EOB: 7.5 ft.
START: 7/21/21 END: 7/21/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.480570, -81.663858

EXPLORATION ID B-039-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 657.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 9" BASE (DRILLERS DESCRIPTION)	656.5																		
MEDIUM DENSE, BROWN, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, CONTAINS CONCRETE FRAGMENTS, DAMP **(FILL)**		1	6 8 8	22	56	SS-1	-	27	44	21	7	1	NP	NP	NP	7	A-1-b (0)	793	
		2																	
		3	6 7 8	20	50	SS-2	-	16	49	26	7	2	NP	NP	NP	4	A-1-b (0)	-	
		4																	
		5	6 6 7	18	44	SS-3	-	-	-	-	-	-	-	-	-	5	A-1-b (V)	-	
		6																	
	650.4	7 EOB	5 6 6	16	39	SS-4	-	-	-	-	-	-	-	-	-	4	A-1-b (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 131+20, 7' LT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP N-W
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 669.4 (MSL) EOB: 7.5 ft.
START: 7/22/21 END: 7/22/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.481275, -81.663067

EXPLORATION ID B-040-0-21

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MATERIAL DESCRIPTION AND NOTES	ELEV. 669.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
6" CONCRETE AND 8" BASE (DRILLERS DESCRIPTION)	668.2																		
DENSE, BROWN, **FINE SAND**, SOME COARSE SAND, LITTLE GRAVEL, TRACE SILT, TRACE CLAY, DAMP (FILL)	666.4	1	10 18 12	41	56	SS-1	-	13	28	51	6	2	NP	NP	NP	9	A-3 (0)	413	
MEDIUM DENSE, BROWN, **FINE SAND**, SOME COARSE SAND, TRACE SILT, TRACE CLAY, TRACE GRAVEL, DAMP (FILL)		2	6 4 4	11	56	SS-2	-	0	28	66	5	1	NP	NP	NP	5	A-3 (0)	-	
		3	4 5 5	14	56	SS-3	-	-	-	-	-	-	-	-	-	7	A-3 (V)	-	
	661.9	4	4 4 6	14	78	SS-4	-	-	-	-	-	-	-	-	-	4	A-3 (V)	-	
		EOB																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/21/21 END: 7/21/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 623+88, 12' LT.
ALIGNMENT: RAMP W-N
ELEVATION: 640.6 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.479716, -81.665074

EXPLORATION ID B-041-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
MEDIUM DENSE TO DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE TO LITTLE GRAVEL, TRACE CLAY, CONTAINS TRACE IRON STAINING, DAMP TO WET	640.6	1																	
		2	6 9 11	27	50	SS-1	-	10	32	31	19	8	NP	NP	NP	10	A-3a (0)	2800	
		3	7 10 10	27	61	SS-2	-	18	31	28	17	6	NP	NP	NP	30	A-3a (0)	-	
		4	7 11 12	31	56	SS-3	-	-	-	-	-	-	-	-	-	6	A-3a (V)	-	
		5	8 12 11	31	67	SS-4	-	-	-	-	-	-	-	-	-	5	A-3a (V)	-	
	633.1	6 EOB																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 627+30, RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP W-N
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 639.4 (MSL) EOB: 7.5 ft.
START: 7/21/21 END: 7/21/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.479505, -81.663858

EXPLORATION ID B-042-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 639.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 9" BASE (DRILLERS DESCRIPTION)	638.0																		
MEDIUM DENSE, LIGHT BROWN AND GRAY, **GRAVEL AND STONE FRAGMENTS WITH SAND**, TRACE TO LITTLE SILT, TRACE CLAY, CONTAINS CONCRETE FRAGMENTS AND TRACE IRON STAINING, DAMP **(FILL)**		1	10 11 10	29	44	SS-1	-	31	32	24	11	2	NP	NP	NP	8	A-1-b (0)	1300	
		2	7 9 10	26	50	SS-2	-	23	40	25	10	2	NP	NP	NP	10	A-1-b (0)	-	
		3	7 8 13	29	44	SS-3	-	-	-	-	-	-	-	-	-	5	A-1-b (V)	-	
		4	9 12 10	30	39	SS-4	-	-	-	-	-	-	-	-	-	4	A-1-b (V)	-	
	631.9	5 EOB																	
		6																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/21/21 END: 7/21/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 630+38, 4' LT.
ALIGNMENT: RAMP W-N
ELEVATION: 641.4 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.479481, -81.662745

EXPLORATION ID B-043-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 641.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRETE AND 8" BASE (DRILLERS DESCRIPTION)	640.1	1																	
DENSE, BROWN AND GRAY, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP	638.4	2	6 13 24	50	56	SS-1	-	23	28	27	17	5	NP	NP	NP	10	A-1-b (0)	933	
MEDIUM DENSE TO DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE GRAVEL, TRACE CLAY, DAMP TO MOIST		3	7 18 12	41	44	SS-2	-	18	30	29	18	5	NP	NP	NP	11	A-3a (0)	-	
		4	7 9 8	23	67	SS-3	-	-	-	-	-	-	-	-	-	12	A-3a (V)	-	
		5	8 7 10	23	61	SS-4	-	-	-	-	-	-	-	-	-	10	A-3a (V)	-	
	633.9	6 EOB																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 15+45, 1' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP C-B
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 670.6 (MSL) EOB: 7.5 ft.
START: 7/23/21 END: 7/23/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.479059, -81.664584

EXPLORATION ID B-044-0-21

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MATERIAL DESCRIPTION AND NOTES	ELEV. 670.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8.0" CONCRETE AND 7.5" BASE (DRILLERS DESCRIPTION)	669.3																		
MEDIUM DENSE, GRAY AND BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP TO MOIST **(FILL)**		1	4 5 5	14	56	SS-1	-	47	19	15	14	5	NP	NP	NP	6	A-1-b (0)	1080	
		2																	
		3	4 3 6	12	33	SS-2	-	-	-	-	-	-	-	-	-	8	A-1-b (V)	-	
		4																	
		5	5 6 7	18	33	SS-3	-	48	22	12	13	5	NP	NP	NP	8	A-1-b (0)	-	
		6																	
	663.1	7 EOB	5 6 4	14	33	SS-4	-	-	-	-	-	-	-	-	-	9	A-1-b (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 16+50, 5' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP C-B
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 674.0 (MSL) EOB: 7.5 ft.
START: 7/23/21 END: 7/23/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.478964, -81.664220

EXPLORATION ID B-045-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 674.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8.0" CONCRETE AND 7.5" BASE (DRILLERS DESCRIPTION)	672.7	1																	
MEDIUM DENSE, GRAY, **GRAVEL**, SOME SAND, TRACE SILT, TRACE CLAY, DAMP **(FILL)**	671.0	2	5 6 5	15	56	SS-1	-	54	20	14	9	3	NP	NP	NP	4	A-1-a (0)	340	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, MOIST TO DAMP		3	4 4 4	11	39	SS-2	-	5	7	60	21	7	NP	NP	NP	14	A-3a (0)	-	
		4	4 5 5	14	44	SS-3	-	-	-	-	-	-	-	-	-	12	A-3a (V)	-	
		5	6 5 4	12	72	SS-4	-	-	-	-	-	-	-	-	-	9	A-3a (V)	-	
	666.5	6 EOB																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 335+69, 7' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP S-E
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 658.9 (MSL) EOB: 7.5 ft.
START: 7/22/21 END: 7/22/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.477904, -81.660282

EXPLORATION ID B-046-0-21

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MATERIAL DESCRIPTION AND NOTES	ELEV. 658.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4" ASPHALT AND 6" CONCRETE AND 6" BASE (DRILLERS DESCRIPTION)	657.6	1																	
MEDIUM DENSE TO DENSE, BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP	655.2	2	10 13 15	38	56	SS-1	-	20	34	27	14	5	NP	NP	NP	6	A-1-b (0)	253	
		3	10 8 10	25	50	SS-2A	-	-	-	-	-	-	-	-	-	6	A-1-b (V)	-	
						SS-2B	4.50	0	1	3	67	29	25	19	6	15	A-4b (8)	-	
HARD, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, DAMP		4	10 9 10	26	67	SS-3	4.50	-	-	-	-	-	-	-	-	16	A-4b (V)	-	
		5																	
		6	9 11 10	29	67	SS-4	4.50	-	-	-	-	-	-	-	-	18	A-4b (V)	-	
	651.4	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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/22/21 END: 7/22/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 339+21, 4' RT.
ALIGNMENT: RAMP S-E
ELEVATION: 649.5 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.478742, -81.659701

EXPLORATION ID B-047-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 649.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4" ASPHALT AND 8" CONCRETE AND 6" BASE (DRILLERS DESCRIPTION)	648.0																		
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE TO SOME SILT, TRACE CLAY, TRACE GRAVEL, MOIST		1	6 9 10	26	56	SS-1	-	8	23	51	13	5	NP	NP	NP	12	A-3a (0)	67	
		2	5 6 8	19	67	SS-2	-	6	17	46	21	10	NP	NP	NP	11	A-3a (0)	-	
		3	4 6 5	15	56	SS-3	-	-	-	-	-	-	-	-	-	13	A-3a (V)	-	
		4	4 5 4	12	67	SS-4	-	-	-	-	-	-	-	-	-	13	A-3a (V)	-	
	642.0	5 EOB																	
		6																	
		7																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/22/21 END: 7/22/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 342+76, 3' RT.
ALIGNMENT: RAMP S-E
ELEVATION: 640.4 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.479209, -81.658594

EXPLORATION ID B-048-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 640.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8" CONCRTETE AND 8" BASE (DRILLERS DESCRIPTION)	639.1	1																	
MEDIUM DENSE, BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP	637.4	2	14 12 10	30	56	SS-1	-	35	22	28	12	3	NP	NP	NP	9	A-1-b (0)	2387	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, LITTLE GRAVEL, TRACE CLAY, DAMP	635.9	3 4	7 7 8	20	67	SS-2	-	14	17	40	23	6	NP	NP	NP	10	A-3a (0)	-	
MEDIUM DENSE, GRAY, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, MOIST	634.4	5	5 6 9	20	61	SS-3	-	-	-	-	-	-	-	-	-	12	A-1-b (V)	-	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, LITTLE GRAVEL, TRACE CLAY, DAMP	632.9	6 7 EOB	5 4 5	12	56	SS-4	-	-	-	-	-	-	-	-	-	10	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/23/21 END: 7/23/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 346+29, 6' RT.
ALIGNMENT: RAMP S-E
ELEVATION: 643.2 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.479298, -81.657315

EXPLORATION ID B-049-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 643.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8.0" CONCRETE AND 7.5" BASE (DRILLERS DESCRIPTION)	641.9																		
LOOSE TO MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE TO SOME SILT, TRACE CLAY, TRACE GRAVEL, WET **(FILL)**		1 2 3 4 5 6 7	4 6 5	15	67	SS-1	-	0	2	82	14	2	NP	NP	NP	23	A-3a (0)	20	
			3 4 3	10	72	SS-2	-	1	3	68	26	2	NP	NP	NP	20	A-3a (0)	-	
			4 4 3	10	67	SS-3	-	-	-	-	-	-	-	-	-	27	A-3a (V)	-	
@6.0'; SS-4 CONTAINS A 2.0" CONCRETE FRAGMENT	635.7	EOB	3 3 4	10	78	SS-4	-	-	-	-	-	-	-	-	-	20	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/23/21 END: 7/23/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 744+41, 4' LT.
ALIGNMENT: RAMP E-N
ELEVATION: 640.2 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.480037, -81.657981

EXPLORATION ID B-050-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 640.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
8.0" CONCRETE AND 7.5" BASE (DRILLERS DESCRIPTION)	638.9																		
MEDIUM DENSE, BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, CONTAINS SLAG, WET **(FILL)**	635.7	1	7 9 12	29	56	SS-1	-	45	19	23	12	1	NP	NP	NP	16	A-1-b (0)	1100	
		2	8 7 11	25	56	SS-2	-	-	-	-	-	-	-	-	-	14	A-1-b (V)	-	
MEDIUM DENSE TO DENSE, WHITE AND BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, CONTAINS SLAG, WET **(FILL)**	632.7	3	12 14 10	33	39	SS-3	-	40	28	20	11	1	NP	NP	NP	45	A-1-b (0)	-	
		4	9 11 10	29	44	SS-4	-	-	-	-	-	-	-	-	-	41	A-1-b (V)	-	
		5																	
		6																	
		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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 740+80, 2' RT.
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP E-N
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 636.2 (MSL) EOB: 7.5 ft.
START: 7/23/21 END: 7/23/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.480218, -81.659276

EXPLORATION ID B-051-0-21

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MATERIAL DESCRIPTION AND NOTES	ELEV. 636.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
10.0" CONCRETE AND 7.0" BASE (DRILLERS DESCRIPTION)	634.8	1																	
DENSE, BROWN AND GRAY, **STONE FRAGMENTS WITH SAND**, TRACE SILT, TRACE CLAY, DAMP **(FILL)**	633.2	2	12 16 13	39	50	SS-1	-	37	20	26	14	3	NP	NP	NP	9	A-1-b (0)	3000	
MEDIUM DENSE TO DENSE, BROWN, **SANDY SILT**, TRACE CLAY, TRACE GRAVEL, DAMP TO MOIST		3	10 10 7	23	72	SS-2	-	5	9	49	30	7	NP	NP	NP	10	A-4a (0)	-	
		4																	
		5	9 11 8	26	56	SS-3	-	-	-	-	-	-	-	-	-	7	A-4a (V)	-	
	629.2	6	10 13 15	38	78	SS-4A	-	-	-	-	-	-	-	-	-	14	A-4a (V)	-	
DENSE, BROWN, **SILT**, LITTLE SAND, TRACE CLAY, TRACE GRAVEL, MOIST	628.7	EOB 7				SS-4B	-	-	-	-	-	-	-	-	-	21	A-4b (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

PROJECT: CUY-490-0.00
TYPE: SUBGRADE
PID: 107408 SFN:
START: 7/23/21 END: 7/23/21

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 45B
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 12/5/19
ENERGY RATIO (%): 81.7

STATION / OFFSET: 737+33, 4' LT.
ALIGNMENT: RAMP E-N
ELEVATION: 643.4 (MSL) EOB: 7.5 ft.
LAT / LONG: 41.480654, -81.660386

EXPLORATION ID B-052-0-21

MATERIAL DESCRIPTION AND NOTES	ELEV. 643.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4" ASPHALT AND 8" CONCRETE AND 6" BASE (DRILLERS DESCRIPTION)	641.9																		
MEDIUM DENSE TO DENSE, BROWN, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE CLAY, TRACE GRAVEL, DAMP TO MOIST		1	7 11 12	31	50	SS-1	-	0	13	75	9	3	NP	NP	NP	6	A-3a (0)	40	
		2	6 10 9	26	44	SS-2	-	1	21	61	12	5	NP	NP	NP	13	A-3a (0)	-	
		3	5 6 6	16	44	SS-3	-	-	-	-	-	-	-	-	-	7	A-3a (V)	-	
		4	4 4 6	14	56	SS-4	-	-	-	-	-	-	-	-	-	7	A-3a (V)	-	
	635.9	5																	
		6																	
		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

PROJECT: CUY-490-0.00	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 45B	STATION / OFFSET: 733+99, 4' LT.	EXPLORATION ID B-053-0-21
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP E-N	
PID: 107408 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 657.0 (MSL) EOB: 7.5 ft.	PAGE 1 OF 1
START: 7/23/21 END: 7/23/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.7	LAT / LONG: 41.481367, -81.661138	

MATERIAL DESCRIPTION AND NOTES	ELEV. 657.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
4" ASPHALT AND 8" CONCRETE AND 6" BASE (DRILLERS DESCRIPTION)	655.5	1																	
VERY STIFF TO HARD, BROWN, **SANDY SILT**, LITTLE CLAY, TRACE TO LITTLE GRAVEL, CONTAINS TRACE BRICK FRAGMENTS, SS-2 CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP **(FILL)**	652.5	2	10 6 10	22	50	SS-1	4.50	14	18	30	25	13	22	15	7	12	A-4a (1)	347	
		3	10 8 7	20	56	SS-2	-	6	20	33	27	14	19	14	5	10	A-4a (1)	-	
VERY DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE TO SOME SILT, TRACE TO LITTLE GRAVEL, TRACE CLAY, CONTAINS TRACE IRON STAINING, DAMP	649.5	4 5	16 18 21	53	72	SS-3	-	-	-	-	-	-	-	-	-	8	A-3a (V)	-	
	EOB	6 7	17 21 20	56	78	SS-4	-	-	-	-	-	-	-	-	-	8	A-3a (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

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

APPENDIX B

SULFATE TEST DATA REPORT

OHIO DEPARTMENT OF TRANSPORTATION

DETERMINING SULFATE CONTENT IN SOILS

SUPPLEMENT 1122

Project C-R-S:	CUY-490-0.00
PID No:	107408
Report Date:	9/21/2021
Consultant:	NEAS Inc.
Technician:	L. Rosenbeck

Boring ID & Sample #	Station	Offset	Latitude & Longitude or State Plane Coordinates		Elevation	Soaking Time (hr)	Replicate Sample Readings						Sulfate Content (ppm)
							1		2		3		
							Dilution	Reading	Dilution	Reading	Dilution	Reading	
B-001-0-21 SS-1			41.474243	-81.694868	632.9	17.7	20	76	20	68	20	71	**1433**
B-002-0-21 SS-1			41.474030	-81.693671	632.1	18.8	20	15	20	7	20	12	**227**
B-003-0-21 SS-1A			41.474375	-81.692283	631.5	18.4	20	34	20	31	20	32	**647**
B-004-0-21 SS-1			41.474338	-81.690864	635.9	18.8	20	34	20	33	20	37	**693**
B-005-0-21 SS-1			41.474886	-81.689604	635.3	18.4	20	26	20	26	20	21	**487**
B-006-0-21 SS-1			41.474904	-81.688112	632.7	18.4	40	30	40	30	40	29	**1187**
B-007-0-21 SS-1			41.475610	-81.686998	628	17.7	20	10	20	9	20	10	**193**
B-008-0-21 SS-1			41.475534	-81.685547	617	17.3	40	32	40	30	40	34	**1280**
B-009-0-21 SS-1			41.476061	-81.684277	613.6	18.8	20	15	20	17	20	15	**313**
B-010-0-21 SS-1			41.475901	-81.682845	616.8	17.3	20	27	20	28	20	28	**553**
B-011-0-21 SS-1			41.476390	-81.681670	622.9	18.8	40	47	40	53	40	59	**2120**
B-012-0-21 SS-1			41.476182	-81.680543	631.9	18.4	20	37	20	35	20	38	**733**
B-013-0-21 SS-1			41.476780	-81.679520	635.5	18.8	20	44	20	50	20	41	**900**
B-014-0-21 SS-1			41.476752	-81.678275	648.4	17.4	40	55	40	53	40	52	**2133**
B-015-0-21 SS-1			41.479772	-81.666011	647.3	17.4	100	25	100	19	100	27	**2367**
B-016-0-21 SS-1			41.480032	-81.664827	640.3	16.9	20	50	20	48	20	48	**973**
B-017-0-21 SS-1			41.479807	-81.663473	629.8	17.2	20	0	20	0	20	0	**0**
B-018-0-21 SS-1			41.479983	-81.662227	624.6	17.7	20	30	20	31	20	33	**627**

B-019-0-21 SS-1			41.479708	-81.660794	624.2	17.2	20	48	20	39	20	36	**820**
B-020-0-21 SS-1			41.479881	-81.659372	631.2	17.8	40	66	40	66	40	63	**2600**
B-021-0-21 SS-1			41.479571	-81.657699	641.1	16.9	40	33	40	38	40	34	**1400**
B-022-0-21 SS-1			41.475375	-81.688184	632.1	17.4	20	19	20	22	20	19	**400**
B-023-0-21 SS-1			41.475127	-81.689447	638.5	17.4	40	39	40	37	40	42	**1573**
B-024-0-21 SS-1			41.474960	-81.690732	652.7	17.4	20	7	20	6	20	7	**133**
B-025-0-21 SS-1			41.474695	-81.691991	667.3	17.9	20	30	20	29	20	25	**560**
B-026-0-21 SS-1			41.473661	-81.693337	677.8	17.8	20	4	20	3	20	4	**73**
B-027-0-21 SS-1			41.472695	-81.693585	674.5	17.9	20	13	20	12	20	11	**240**
B-028-0-21 SS-1			41.471613	-81.693416	669.4	18.0	20	5	20	5	20	4	**93**
B-029-0-21 SS-1			41.475721	-81.679351	643.8	17.9	20	15	20	15	20	15	**300**
B-030-0-21 SS-1			41.475167	-81.679382	624.2	17.9	20	45	20	41	20	45	**873**
B-031-0-21 SS-1			41.474849	-81.680357	623.3	18.2	20	5	20	5	20	5	**100**
B-032-0-21 SS-1			41.475534	-81.681133	621.4	16.9	20	47	20	46	20	51	**960**
B-033-0-21 SS-1			41.477226	-81.679002	656.6	16.8	20	33	20	39	20	38	**733**
B-034-0-21 SS-1			41.476953	-81.679724	663.4	17.1	20	65	20	72	20	75	**1413**
B-035-0-21 SS-1			41.480347	-81.667621	667.4	17.4	20	8	20	7	20	8	**153**
B-036-0-21 SS-1			41.479942	-81.668381	665.1	16.9	20	18	20	18	20	19	**367**
B-037-0-21 SS-1			41.480121	-81.666407	651.4	18.0	20	44	20	41	20	44	**860**
B-038-0-21 SS-1			41.480298	-81.665064	649.1	18.0	20	17	20	17	20	17	**340**
B-039-0-21 SS-1			41.480570	-81.663858	657.9	16.9	20	40	20	39	20	40	**793**
B-040-0-21 SS-1			41.481275	-81.663067	669.4	17.0	20	24	20	19	20	19	**413**
B-041-0-21 SS-1			41.479716	-81.665074	640.6	17.1	100	23	100	33	100	28	**2800**
B-042-0-21 SS-1			41.479505	-81.663858	639.4	16.9	20	67	20	67	20	61	**1300**
B-043-0-21 SS-1			41.479481	-81.662745	641.4	18.0	20	48	20	44	20	48	**933**
B-044-0-21 SS-1			41.479059	-81.664584	670.6	16.8	20	52	20	52	20	58	**1080**
B-045-0-21 SS-1			41.478964	-81.664220	674	17.3	20	18	20	16	20	17	**340**
B-046-0-21 SS-1			41.477904	-81.660282	658.9	16.8	20	13	20	13	20	12	**253**
B-047-0-21 SS-1			41.478742	-81.659701	649.5	16.9	20	4	20	3	20	3	**67**
B-048-0-21 SS-1			41.479209	-81.658594	640.4	16.8	40	61	40	58	40	60	**2387**
B-049-0-21 SS-1			41.479298	-81.657315	643.2	18.2	20	1	20	1	20	1	**20**
B-050-0-21 SS-1			41.480037	-81.657981	640.2	17.9	20	56	20	53	20	56	**1100**
B-051-0-21 SS-1			41.480218	-81.659276	636.2	17.9	100	30	100	28	100	32	**3000**

B-052-0-21 SS-1			41.480654	-81.660386	643.4	18.1	20	2	20	2	20	2	**40**
B-053-0-21 SS-1			41.481367	-81.661138	657	17.9	20	18	20	17	20	17	**347**
													0

APPENDIX D

GEOTECHNICAL BULLETIN 1 (GB1) ANALYSIS SPREADSHEETS

ENTIRE PROJECT

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Wednesday, August 30, 2023

Brendan P. Andrews
2868 East Kemper Rd.
Cincinnati, OH 45241

(920) 427-0671
brendan.andrews@neasinc.com

NO. OF BORINGS: 57

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-109-0-20	IR-90	930+69	5	RT	S&ME TRK 55 (R52)	90	656.0	654.4	1.6 C
2	B-110-0-20	IR-90	931+91	38	LT	S&ME TRK 55 (R52)	90	648.1	645.9	2.2 C
3	B-111-0-20	IR-90	935+97	5	RT	S&ME TRK 55 (R52)	90	639.8	638.3	1.5 C
4	B-112-0-20	IR-90	937+90	5	LT	S&ME TRK 55 (R52)	90	635.8	634.5	1.3 C
5	B-001-0-21	IR-490	939+11	39	LT	CME 45B	82	632.9	632.0	0.9 C
6	B-002-0-21	IR-490	942+36	47	RT	CME 45B	82	632.1	628.6	3.5 C
7	B-003-0-21	IR-490	946+27	40	LT	CME 45B	82	631.5	631.1	0.4 C
8	B-004-0-21	IR-490	950+05	51	RT	CME 45B	82	635.9	633.4	2.5 C
9	B-005-0-21	IR-490	953+92	41	LT	CME 45B	82	635.3	634.5	0.8 C
10	B-006-0-21	IR-490	957+83	78	RT	CME 45B	82	632.7	631.9	0.8 C
11	B-007-0-21	IR-490	961+53	73	LT	CME 45B	82	628.0	626.3	1.7 C
12	B-008-0-21	IR-490	965+28	63	RT	CME 45B	82	617.0	617.2	0.2 F
13	B-009-0-21	IR-490	969+07	61	LT	CME 45B	82	613.6	613.0	0.6 C
14	B-010-0-21	IR-490	972+85	62	RT	CME 45B	82	616.8	614.0	2.9 C
15	B-011-0-21	IR-490	976+32	61	LT	CME 45B	82	622.9	623.1	0.3 F
16	B-012-0-21	IR-490	979+20	72	RT	CME 45B	82	631.9	628.5	3.4 C
17	B-013-0-21	IR-490	982+49	63	LT	CME 45B	82	635.5	637.0	1.5 F
18	B-014-0-21	IR-490	985+62	74	RT	CME 45B	82	648.4	645.5	2.9 C
19	B-015-0-21	IR-490	1021+43	40	RT	CME 45B	82	647.3	649.4	2.2 F
20	B-016-0-21	IR-490	1025+70	40	LT	CME 45B	82	640.3	638.7	1.7 C
21	B-017-0-21	IR-490	1029+41	39	RT	CME 45B	82	629.8	628.7	1.0 C
22	B-018-0-21	IR-490	1032+80	42	LT	CME 45B	82	624.6	622.7	1.9 C
23	B-019-0-21	IR-490	1036+77	37	RT	CME 45B	82	624.2	622.4	1.8 C
24	B-020-0-21	IR-490	1040+62	48	LT	CME 45B	82	631.2	629.9	1.3 C
25	B-021-0-21	IR-490	1045+27	40	RT	CME 45B	82	641.1	642.4	1.2 F
26	B-022-0-21	IR-490	3058+12	5	LT	CME 45B	82	632.1	632.0	0.1 C
27	B-023-0-21	LANE E-S	3054+54	6	LT	CME 45B	82	638.5	638.1	0.4 C
28	B-024-0-21	LANE E-S	3050+96	5	LT	CME 45B	82	652.7	651.6	1.0 C
29	B-025-0-21	LANE E-S	3047+38	2	LT	CME 45B	82	667.3	666.2	1.1 C
30	B-026-0-21	LANE E-S	3041+89	27	RT	CME 45B	82	677.8	678.7	0.9 F
31	B-027-0-21	LANE E-S	3038+16	27	RT	CME 45B	82	674.5	674.7	0.2 F
32	B-028-0-21	LANE E-S	3034+13	26	RT	CME 45B	82	669.4	667.9	1.5 C
33	B-029-0-21	Ramp 7-7C	67+99	145	RT	CME 45B	82	643.8	642.3	1.5 C
34	B-030-0-21	Ramp 7-7C	68+99	19	RT	CME 45B	82	624.2	622.7	1.6 C
35	B-031-0-21	Ramp 7-7C	72+21	23	RT	CME 45B	82	623.8	622.5	1.2 C
36	B-032-0-21	Ramp 7-7C	76+12	11	RT	CME 45B	82	622.0	622.0	0.0 C
37	B-033-0-21	Ramp C-7	84+46	21	LT	CME 45B	82	656.6	655.5	1.1 C
38	B-034-0-21	Ramp C-7	82+28	16	RT	CME 45B	82	663.4	662.4	1.0 C
39	B-035-0-21	Ramp B-C	17+69	31	LT	CME 45B	82	667.4	666.1	1.3 C
40	B-036-0-21	Ramp B-C	15+10	2	LT	CME 45B	82	665.1	663.9	1.2 C
41	B-037-0-21	Ramp N-W	120+53	8	LT	CME 45B	82	651.4	650.3	1.0 C
42	B-038-0-21	Ramp N-W	124+26	1	LT	CME 45B	82	649.1	647.5	1.6 C
43	B-039-0-21	Ramp N-W	127+74	4	LT	CME 45B	82	657.9	657.0	0.9 C
44	B-040-0-21	Ramp N-W	131+20	7	LT	CME 45B	82	669.4	668.7	0.7 C
45	B-041-0-21	Ramp W-N	623+88	12	LT	CME 45B	82	640.6	638.4	2.2 C

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
46	B-042-0-21	Ramp W-N	627+30	0	RT	CME 45B	82	639.4	638.8	0.6 C
47	B-043-0-21	Ramp W-N	630+38	4	LT	CME 45B	82	641.4	640.5	0.9 C
48	B-044-0-21	Ramp C-B	15+45	1	RT	CME 45B	82	670.6	669.9	0.8 C
49	B-045-0-21	Ramp C-B	16+50	5	RT	CME 45B	82	674.0	673.3	0.7 C
50	B-046-0-21	Ramp S-E	335+69	7	RT	CME 45B	82	658.9	657.3	1.6 C
51	B-047-0-21	Ramp S-E	339+21	4	RT	CME 45B	82	649.5	647.9	1.5 C
52	B-048-0-21	Ramp S-E	342+76	3	RT	CME 45B	82	640.4	637.7	2.8 C
53	B-049-0-21	Ramp S-E	346+29	6	RT	CME 45B	82	643.2	643.5	0.3 F
54	B-050-0-21	Ramp E-N	744+41	4	LT	CME 45B	82	640.2	638.8	1.4 C
55	B-051-0-21	Ramp E-N	740+80	2	RT	CME 45B	82	636.2	634.3	1.8 C
56	B-052-0-21	Ramp E-N	737+33	4	LT	CME 45B	82	643.4	642.6	0.8 C
57	B-053-0-21	Ramp E-N	733+99	4	LT	CME 45B	82	657.0	655.9	1.1 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	-0.1	1.4	50						38	8	46	21	10	A-4a	8	443		Mc			
	109-0	SS-2	3.0	4.5	1.4	2.9	35						35	3	38	21	10	A-4a	5			Mc			
	20	SS-3	4.5	6.0	2.9	4.4	29									20	10	A-4a	8						
		SS-4	6.0	7.5	4.4	5.9	33	29								20	10	A-4a	8						
2	B	SS-1	1.5	3.0	-0.7	0.8	27						13	3	16	7	8	A-3a	0	174					
	110-0	SS-2	3.0	4.5	0.8	2.3	80									9	8	A-3a	0						
	20	SS-3	4.5	6.0	2.3	3.8	54						44	6	50	17	10	A-4a	8						
		SS-4	6.0	7.5	3.8	5.3	41	27								19	10	A-4a	8						
3	B	SS-1	1.5	3.0	0.0	1.5	50						12	5	17	11	8	A-3a	0	248					
	111-0	SS-2	3.0	4.5	1.5	3.0	50						3	1	4	6	6	A-1-a	0						
	20	SS-3	4.5	6.0	3.0	4.5	18			25	17	8	60	34	94	20	12	A-4b	8						
		SS-4	6.0	7.5	4.5	6.0	23	18								20	10	A-4b	8						
4	B	SS-1	1.5	1.9	0.2	0.6	50						5	2	7	16	6	A-1-a	0	197					
	112-0	SS-2	3.0	3.4	1.7	2.1	50						8	3	11	17	6	A-1-a	0						
	20	SS-3	4.5	4.9	3.2	3.6	50									21	6	A-1-a	0						
		SS-4	6.0	6.5	4.7	5.2	50	30								15	6	A-1-a	0						
5	B	SS-1	1.5	3.0	0.6	2.1	37						15	3	18	11	8	A-3a	0	1433					
	001-0	SS-2	3.0	4.5	2.1	3.6	30									9	8	A-3a	0						
	21	SS-3	4.5	6.0	3.6	5.1	30						12	3	15	12	6	A-1-b	0						
		SS-4	6.0	7.5	5.1	6.6	27	27								12	8	A-3a							
6	B	SS-1	1.5	3.0	-2.0	-0.5	23						13	5	18	9	6	A-1-b	0	227					
	002-0	SS-2	3.0	4.5	-0.5	1.0	19									11	6	A-1-b	0						
	21	SS-3A	4.5	5.5	1.0	2.0	31									9	6	A-1-b	0						
		SS-3B	5.5	6.0	2.0	2.5	31	19	4.5	27	18	9	65	28	93	13	13	A-4b	8		A-4b		**30"**		
7	B	SS-1A	1.5	2.2	1.1	1.8	42						21	6	27	7	8	A-3a	0	647					
	003-0	SS-1B	2.2	3.0	1.8	2.6	42			22	18	4	71	16	87	13	13	A-4b	8		A-4b				
	21	SS-2	3.0	4.5	2.6	4.1	34			24	20	4	44	11	55	10	15	A-4a	4						
		SS-3	4.5	6.0	4.1	5.6	33	30								14	10	A-4b	8						
8	B	SS-1	1.5	3.0	-1.0	0.5	27						22	5	27	8	10	A-2-4	0	693					
	004-0	SS-2A	3.0	4.0	0.5	1.5	29									8	10	A-2-4	0						
	21	SS-2B	4.0	4.5	1.5	2.0	29		4.5							14	10	A-4b	8		A-4b	Mc			
		SS-3	4.5	6.0	2.0	3.5	26	26	4.5	25	19	6	65	29	94	15	14	A-4b	8		A-4b		**42"**		
9	B	SS-1	1.5	3.0	0.7	2.2	35						16	5	21	6	6	A-1-b	0	487					
	005-0	SS-2	3.0	4.5	2.2	3.7	31						22	6	28	7	8	A-3a	0						
	21	SS-3	4.5	6.0	3.7	5.2	34									10	8	A-3a	0						
		SS-4	6.0	7.5	5.2	6.7	18	18	4.25							16	10	A-4b							

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Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
10	B	SS-1	1.5	3.0	0.7	2.2	15						9	2	11	21	6	A-1-a	0	1187					
	006-0	SS-2	3.0	4.5	2.2	3.7	15		3	23	16	7	47	24	71	17	11	A-4a	7						
	21	SS-3	4.5	6.0	3.7	5.2	16		4.25							21	10	A-4a	8						
		SS-4	6.0	7.5	5.2	6.7	19	15	4.25							21	10	A-4a							
11	B	SS-1	1.5	3.0	-0.2	1.3	29						16	2	18	7	8	A-3a	0	193					
	007-0	SS-2	3.0	4.5	1.3	2.8	19									9	8	A-3a	0						
	21	SS-3	4.5	6.0	2.8	4.3	15						17	3	20	11	8	A-3a	0						
		SS-4	6.0	7.5	4.3	5.8	16	15								9	8	A-3a	0						
12	B	SS-1	1.5	3.0	1.7	3.2	26						28	10	38	9	10	A-4a	5	1280					
	008-0	SS-2	3.0	4.5	3.2	4.7	16		4.5							11	10	A-4a	8						
	21	SS-3	4.5	6.0	4.7	6.2	30		4.5	24	17	7	46	18	64	12	12	A-4a	6						
		SS-4	6.0	7.5	6.2	7.7	35	16	4.5							14	10	A-4a							
13	B	SS-1	1.5	3.0	0.9	2.4	29		4.5	21	16	5	32	12	44	10	11	A-4a	2	313					
	009-0	SS-2	3.0	4.5	2.4	3.9	23		4.5	27	18	9	36	17	53	15	13	A-4a	4						
	21	SS-3	4.5	6.0	3.9	5.4	23		4.5							14	10	A-4a	8						
		SS-4	6.0	7.5	5.4	6.9	25	23	4.5							13	10	A-4a							
14	B	SS-1	1.5	3.0	-1.4	0.1	27						23	10	33	12	10	A-2-4	0	553					
	010-0	SS-2	3.0	4.5	0.1	1.6	37									11	10	A-2-4	0						
	21	SS-3	4.5	6.0	1.6	3.1	34						26	9	35	12	10	A-2-4	0						
		SS-4	6.0	7.5	3.1	4.6	29	27								11	10	A-2-4	0						
15	B	SS-1	1.5	3.0	1.8	3.3	41						10	2	12	18	6	A-1-b	0	2120					
	011-0	SS-2A	3.0	4.0	3.3	4.3	18									15	6	A-1-b	0						
	21	SS-2B	4.0	4.5	4.3	4.8	18		4.5	27	21	6	58	21	79	19	16	A-4b	8						
		SS-3	4.5	6.0	4.8	6.3	16	16								21	6	A-1-b	0						
16	B	SS-1	1.5	3.0	-1.9	-0.4	37						78	16	94	14	10	A-4b	8	733					
	012-0	SS-2	3.0	4.5	-0.4	1.1	29						74	12	86	15	10	A-4b	8		A-4b	Mc			
	21	SS-3	4.5	6.0	1.1	2.6	29									15	10	A-4b	8		A-4b	Mc	31"		
		SS-4	6.0	7.5	2.6	4.1	31	29								14	10	A-4b	8						
17	B	SS-1	1.5	3.0	3.0	4.5	23		3.75				50	6	56	17	10	A-4b	8	900					
	013-0	SS-2	3.0	4.5	4.5	6.0	19		4.5				83	9	92	22	10	A-4b	8						
	21	SS-3	4.5	6.0	6.0	7.5	23		3							19	10	A-4b							
		SS-4	6.0	7.5	7.5	9.0	27	19	4.5							16	10	A-4b							
18	B	SS-1	1.5	3.0	-1.4	0.1	29						19	5	24	7	8	A-3a	0	2133					
	014-0	SS-2	3.0	4.5	0.1	1.6	25						12	2	14	5	8	A-3a	0						
	21	SS-3	4.5	6.0	1.6	3.1	16									8	8	A-3a	0						
		SS-4	6.0	7.5	3.1	4.6	14	14								7	8	A-3a	0						

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Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
19	B	SS-1	1.5	3.0	3.7	5.2	29						21	7	28	9	8	A-3a	0	2367					
	015-0	SS-2	3.0	4.5	5.2	6.7	29									7	8	A-3a							
	21	SS-3A	4.5	5.0	6.7	7.2	12									19	8	A-3a							
		SS-3B	5.0	6.0	7.2	8.2	12	29					10	2	12	8	8	A-3a							
20	B	SS-1	1.5	3.0	-0.2	1.3	25						11	3	14	10	8	A-3a	0	973					
	016-0	SS-2	3.0	4.5	1.3	2.8	25									5	8	A-3	0						
	21	SS-3	4.5	6.0	2.8	4.3	23						8	2	10	5	8	A-3	0						
		SS-4	6.0	7.5	4.3	5.8	20	20								4	8	A-3	0						
21	B	SS-1	1.5	3.0	0.5	2.0	26						25	5	30	9	8	A-3a	0	0					
	017-0	SS-2	3.0	4.5	2.0	3.5	20						24	7	31	12	8	A-3a	0						
	21	SS-3	4.5	6.0	3.5	5.0	27									9	8	A-3a	0						
		SS-4	6.0	7.5	5.0	6.5	30	20	4.5							18	10	A-4b	8						
22	B	SS-1	1.5	3.0	-0.4	1.1	30						44	4	48	14	10	A-4a	8	627		Mc			
	018-0	SS-2	3.0	4.5	1.1	2.6	31						80	9	89	20	10	A-4b	8		A-4b	Mc			
	21	SS-3	4.5	6.0	2.6	4.1	18									21	10	A-4b	8						
		SS-4	6.0	7.5	4.1	5.6	18	18								26	10	A-4b	8						
23	B	SS-1	1.5	3.0	-0.3	1.2	31						44	6	50	16	10	A-4a	8	820		Mc			
	019-0	SS-2	3.0	4.5	1.2	2.7	27									19	10	A-4a	8			Mc			
	21	SS-3	4.5	6.0	2.7	4.2	22						44	7	51	20	10	A-4a	8						
		SS-4	6.0	7.5	4.2	5.7	27	22								18	10	A-4b	8						
24	B	SS-1A	1.5	2.5	0.2	1.2	33						21	4	25	13	6	A-1-b	0	2600					
	020-0	SS-1B	2.5	3.0	1.2	1.7	33									14	10	A-4b	8		A-4b	Mc			
	21	SS-2A	3.0	3.5	1.7	2.2	27						73	12	85	19	10	A-4b	8		A-4b	Mc	26''		
		SS-2B	3.5	4.5	2.2	3.2	27	27								18	8	A-3	0						
25	B	SS-1	1.5	3.0	2.7	4.2	25						20	5	25	10	10	A-2-4	0	1400					
	021-0	SS-2	3.0	4.5	4.2	5.7	37									15	10	A-2-4	0						
	21	SS-3	4.5	6.0	5.7	7.2	25						22	6	28	14	8	A-3a							
		SS-4	6.0	7.5	7.2	8.7	35	25								14	10	A-2-4							
26	B	SS-1	1.5	3.0	1.4	2.9	26						13	3	16	10	8	A-3a	0	400					
	022-0	SS-2	3.0	4.5	2.9	4.4	20						7	1	8	24	8	A-3	0						
	21	SS-3	4.5	6.0	4.4	5.9	16									22	8	A-3	0						
		SS-4A	6.0	7.0	5.9	6.9	19	16								23	8	A-3							
27	B	SS-1	1.5	3.0	1.1	2.6	26						9	2	11	11	6	A-1-b	0	1573					
	023-0	SS-2	3.0	4.5	2.6	4.1	12						10	2	12	11	6	A-1-b	0						
	21	SS-3	4.5	6.0	4.1	5.6	18									16	6	A-1-b	0						
		SS-4	6.0	7.5	5.6	7.1	18	12	2.75							20	10	A-4b							

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Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
28	B	SS-1	1.5	3.0	0.5	2.0	29						27	8	35	11	8	A-3a	0	133					
	024-0	SS-2	3.0	4.5	2.0	3.5	19						16	4	20	15	6	A-1-b	0						
	21	SS-3	4.5	6.0	3.5	5.0	26									17	6	A-1-b	0						
		SS-4	6.0	7.5	5.0	6.5	29	19	4.5							14	10	A-4b	8						
29	B	SS-1	1.5	3.0	0.4	1.9	30						16	5	21	5	6	A-1-b	0	560					
	025-0	SS-2	3.0	4.5	1.9	3.4	26									5	6	A-1-b	0						
	21	SS-3	4.5	6.0	3.4	4.9	42						15	4	19	6	6	A-1-b	0						
		SS-4	6.0	7.5	4.9	6.4	38	26								6	6	A-1-b	0						
30	B	SS-1	1.5	3.0	2.4	3.9	37						16	5	21	7	8	A-3a	0	73					
	026-0	SS-2	3.0	4.5	3.9	5.4	31						15	4	19	6	8	A-3a	0						
	21	SS-3	4.5	6.0	5.4	6.9	27									7	8	A-3a							
		SS-4	6.0	7.5	6.9	8.4	34	27								8	8	A-3a							
31	B	SS-1	1.5	3.0	1.7	3.2	29						25	6	31	10	8	A-3a	0	240					
	027-0	SS-2	3.0	4.5	3.2	4.7	26									9	8	A-3a	0						
	21	SS-3	4.5	6.0	4.7	6.2	16						26	8	34	8	8	A-3a	0						
		SS-4	6.0	7.5	6.2	7.7	18	16								12	8	A-3a							
32	B	SS-1	1.5	3.0	0.0	1.5	26						17	4	21	9	8	A-3a	0	93					
	028-0	SS-2	3.0	4.5	1.5	3.0	22									7	8	A-3a	0						
	21	SS-3	4.5	6.0	3.0	4.5	29									7	8	A-3a	0						
		SS-4	6.0	7.5	4.5	6.0	52	22								6	8	A-3a	0						
33	B	SS-1	1.5	3.0	0.0	1.5	34						26	7	33	9	8	A-3a	0	300					
	029-0	SS-2A	3.0	4.0	1.5	2.5	15						23	5	28	8	8	A-3a	0						
	21	SS-2B	4.0	4.5	2.5	3.0	15									11	8	A-3a	0						
		SS-3	4.5	6.0	3.0	4.5	18	15								6	8	A-3a	0						
34	B	SS-1	1.5	3.0	-0.1	1.4	56		4.5	29	22	7	47	17	64	12	17	A-4a	6	873					
	030-0	SS-2	3.0	4.5	1.4	2.9	63						21	5	26	8	10	A-2-4	0						
	21	SS-3	4.5	6.0	2.9	4.4	38		4.5							12	10	A-4a	8						
		SS-4	6.0	7.5	4.4	5.9	33	30	4.5							13	10	A-4a	8						
35	B	SS-1	1.5	3.0	0.3	1.8	23		4.5	24	17	7	31	15	46	11	12	A-4a	2	100					
	031-0	SS-2	3.0	4.5	1.8	3.3	27						22	7	29	9	10	A-2-4	0						
	21	SS-3	4.5	6.0	3.3	4.8	34									10	10	A-2-4	0						
		SS-4	6.0	7.5	4.8	6.3	37	23								11	10	A-2-4	0						
36	B	SS-1	1.5	3.0	1.5	3.0	34		4.5	25	18	7	48	18	66	11	13	A-4a	6	960					
	032-0	SS-2	3.0	4.5	3.0	4.5	33		4.5	23	16	7	44	15	59	11	11	A-4a	5						
	21	SS-3	4.5	6.0	4.5	6.0	38		4.5							12	10	A-4a	8						
		SS-4	6.0	7.5	6.0	7.5	45	30	4.5							12	10	A-4a							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
37	B	SS-1	1.5	3.0	0.4	1.9	18		4.5	29	22	7	60	20	80	17	17	A-4b	8	733	A-4b				
	033-0	SS-2	3.0	4.5	1.9	3.4	15		4.5	29	22	7	58	20	78	16	17	A-4b	8		A-4b		40"		
	21	SS-3	4.5	6.0	3.4	4.9	14		4.5							21	10	A-4b	8						
		SS-4	6.0	7.5	4.9	6.4	14	14	4.5							17	10	A-4b	8						
38	B	SS-1	1.5	3.0	0.5	2.0	23						15	6	21	9	6	A-1-b	0	1413					
	034-0	SS-2	3.0	4.5	2.0	3.5	20						10	4	14	8	6	A-1-a	0						
	21	SS-3	4.5	6.0	3.5	5.0	18		4.5							15	10	A-4a	8						
		SS-4	6.0	7.5	5.0	6.5	25	18								7	6	A-1-a							
39	B	SS-1	1.5	3.0	0.2	1.7	12						20	5	25	15	8	A-3a	0	153					
	035-0	SS-2	3.0	4.5	1.7	3.2	11						24	5	29	11	8	A-3a	0						
	21	SS-3	4.5	6.0	3.2	4.7	11									11	8	A-3a	0						
		SS-4	6.0	7.5	4.7	6.2	12	11								11	8	A-3a	0						
40	B	SS-1	1.5	3.0	0.3	1.8	25						29	10	39	9	10	A-4a	6	367					
	036-0	SS-2	3.0	4.5	1.8	3.3	19						26	7	33	9	8	A-3a	0						
	21	SS-3	4.5	6.0	3.3	4.8	29									9	10	A-4a	8						
		SS-4	6.0	7.5	4.8	6.3	31	19								10	10	A-4a	8						
41	B	SS-1	1.5	3.0	0.5	2.0	27						18	6	24	6	8	A-3a	0	860					
	037-0	SS-2	3.0	4.5	2.0	3.5	22						17	6	23	7	8	A-3a	0						
	21	SS-3	4.5	6.0	3.5	5.0	23									5	8	A-3a	0						
		SS-4	6.0	7.5	5.0	6.5	23	22								6	8	A-3a	0						
42	B	SS-1	1.5	3.0	-0.1	1.4	15						14	5	19	11	8	A-3a	0	340					
	038-0	SS-2	3.0	4.5	1.4	2.9	15						19	5	24	11	8	A-3a	0						
	21	SS-3	4.5	6.0	2.9	4.4	14									11	8	A-3a	0						
		SS-4	6.0	7.5	4.4	5.9	20	14								11	8	A-3a	0						
43	B	SS-1	1.5	3.0	0.6	2.1	22						7	1	8	7	6	A-1-b	0	793					
	039-0	SS-2	3.0	4.5	2.1	3.6	20						7	2	9	4	6	A-1-b	0						
	21	SS-3	4.5	6.0	3.6	5.1	18									5	6	A-1-b	0						
		SS-4	6.0	7.5	5.1	6.6	16	16								4	6	A-1-b							
44	B	SS-1	1.5	3.0	0.8	2.3	41						6	2	8	9	8	A-3	0	413					
	040-0	SS-2	3.0	4.5	2.3	3.8	11						5	1	6	5	8	A-3	0						
	21	SS-3	4.5	6.0	3.8	5.3	14									7	8	A-3	0						
		SS-4	6.0	7.5	5.3	6.8	14	11								4	8	A-3							
45	B	SS-1	1.5	3.0	-0.7	0.8	29						11	2	13	8	6	A-1-b	0	1300					
	041-0	SS-2	3.0	4.5	0.8	2.3	26						10	2	12	10	6	A-1-b	0						
	21	SS-3	4.5	6.0	2.3	3.8	29									5	6	A-1-b	0						
		SS-4	6.0	7.5	3.8	5.3	30	26								4	6	A-1-b	0						

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
46	B	SS-1	1.5	3.0	0.9	2.4	50						17	5	22	10	6	A-1-b	0	933					
	042-0	SS-2	3.0	4.5	2.4	3.9	41						18	5	23	11	8	A-3a	0						
	21	SS-3	4.5	6.0	3.9	5.4	23									12	8	A-3a	0						
		SS-4	6.0	7.5	5.4	6.9	23	23								10	8	A-3a							
47	B	SS-1	1.5	3.0	0.6	2.1	27						19	8	27	10	8	A-3a	0	2800					
	043-0	SS-2	3.0	4.5	2.1	3.6	27						17	6	23	30	8	A-3a	0						
	21	SS-3	4.5	6.0	3.6	5.1	31									6	8	A-3a	0						
		SS-4	6.0	7.5	5.1	6.6	31	27								5	8	A-3a							
48	B	SS-1	1.5	3.0	0.8	2.3	14						14	5	19	6	6	A-1-b	0	1080					
	044-0	SS-2	3.0	4.5	2.3	3.8	12									8	6	A-1-b	0						
	21	SS-3	4.5	6.0	3.8	5.3	18						13	5	18	8	6	A-1-b	0						
		SS-4	6.0	7.5	5.3	6.8	14	12								9	6	A-1-b							
49	B	SS-1	1.5	3.0	0.8	2.3	15						9	3	12	4	6	A-1-a	0	340					
	045-0	SS-2	3.0	4.5	2.3	3.8	11						21	7	28	14	8	A-3a	0						
	21	SS-3	4.5	6.0	3.8	5.3	14									12	8	A-3a	0						
		SS-4	6.0	7.5	5.3	6.8	12	11								9	8	A-3a							
50	B	SS-1	1.5	3.0	-0.1	1.4	38						14	5	19	6	6	A-1-b	0	253					
	046-0	SS-2A	3.0	4.5	1.4	2.9	25									6	6	A-1-b	0						
	21	SS-2B	4.5	6.0	2.9	4.4	25		4.5	25	19	6	67	29	96	15	14	A-4b	8						
		SS-3	6.0	7.5	4.4	5.9	26	25	4.5							16	10	A-4b	8						
51	B	SS-1	1.5	3.0	0.0	1.5	26						13	5	18	12	8	A-3a	0	67					
	047-0	SS-2	3.0	4.5	1.5	3.0	19						21	10	31	11	8	A-3a	0						
	21	SS-3	4.5	6.0	3.0	4.5	15									13	8	A-3a	0						
		SS-4	6.0	7.5	4.5	6.0	12	12								13	8	A-3a	0						
52	B	SS-1	1.5	3.0	-1.3	0.3	30						12	3	15	9	6	A-1-b	0	2387					
	048-0	SS-2	3.0	4.5	0.3	1.8	20						23	6	29	10	8	A-3a	0						
	21	SS-3	4.5	6.0	1.8	3.3	20									12	6	A-1-b	0						
		SS-4	6.0	7.5	3.3	4.8	12	12								10	8	A-3a	0						
53	B	SS-1	1.5	3.0	1.8	3.3	15						14	2	16	23	8	A-3a	0	20					
	049-0	SS-2	3.0	4.5	3.3	4.8	10						26	2	28	20	8	A-3a	0						
	21	SS-3	4.5	6.0	4.8	6.3	10									27	8	A-3a	0						
		SS-4	6.0	7.5	6.3	7.8	10	10								20	8	A-3a							
54	B	SS-1	1.5	3.0	0.1	1.6	29						12	1	13	16	6	A-1-b	0	1100					
	050-0	SS-2	3.0	4.5	1.6	3.1	25									14	6	A-1-b	0						
	21	SS-3	4.5	6.0	3.1	4.6	33						11	1	12	45	6	A-1-b	0						
		SS-4	6.0	7.5	4.6	6.1	29	25								41	6	A-1-b	0						

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
55	B	SS-1	1.5	3.0	-0.3	1.2	39						14	3	17	9	6	A-1-b	0	3000					
	051-0	SS-2	3.0	4.5	1.2	2.7	23						30	7	37	10	10	A-4a	5						
	21	SS-3	4.5	6.0	2.7	4.2	26									7	10	A-4a	8						
		SS-4A	6.0	7.0	4.2	5.2	38	23								14	10	A-4a	8						
56	B	SS-1	1.5	3.0	0.7	2.2	31						9	3	12	6	8	A-3a	0	40					
	052-0	SS-2	3.0	4.5	2.2	3.7	26						12	5	17	13	8	A-3a	0						
	21	SS-3	4.5	6.0	3.7	5.2	16									7	8	A-3a	0						
		SS-4	6.0	7.5	5.2	6.7	14	14								7	8	A-3a							
57	B	SS-1	1.5	3.0	0.4	1.9	22		4.5	22	15	7	25	13	38	12	10	A-4a	1	347					
	053-0	SS-2	3.0	4.5	1.9	3.4	20			19	14	5	27	14	41	10	10	A-4a	1						
	21	SS-3	4.5	6.0	3.4	4.9	53									8	8	A-3a	0						
		SS-4	6.0	7.5	4.9	6.4	56	20								8	8	A-3a	0						

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 57

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 8/30/2023

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

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

Design CBR	10

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	3%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	8%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	71%	HP > 2	17%
M+	5%		
Rock	0%		
Unsuitable	14%		

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

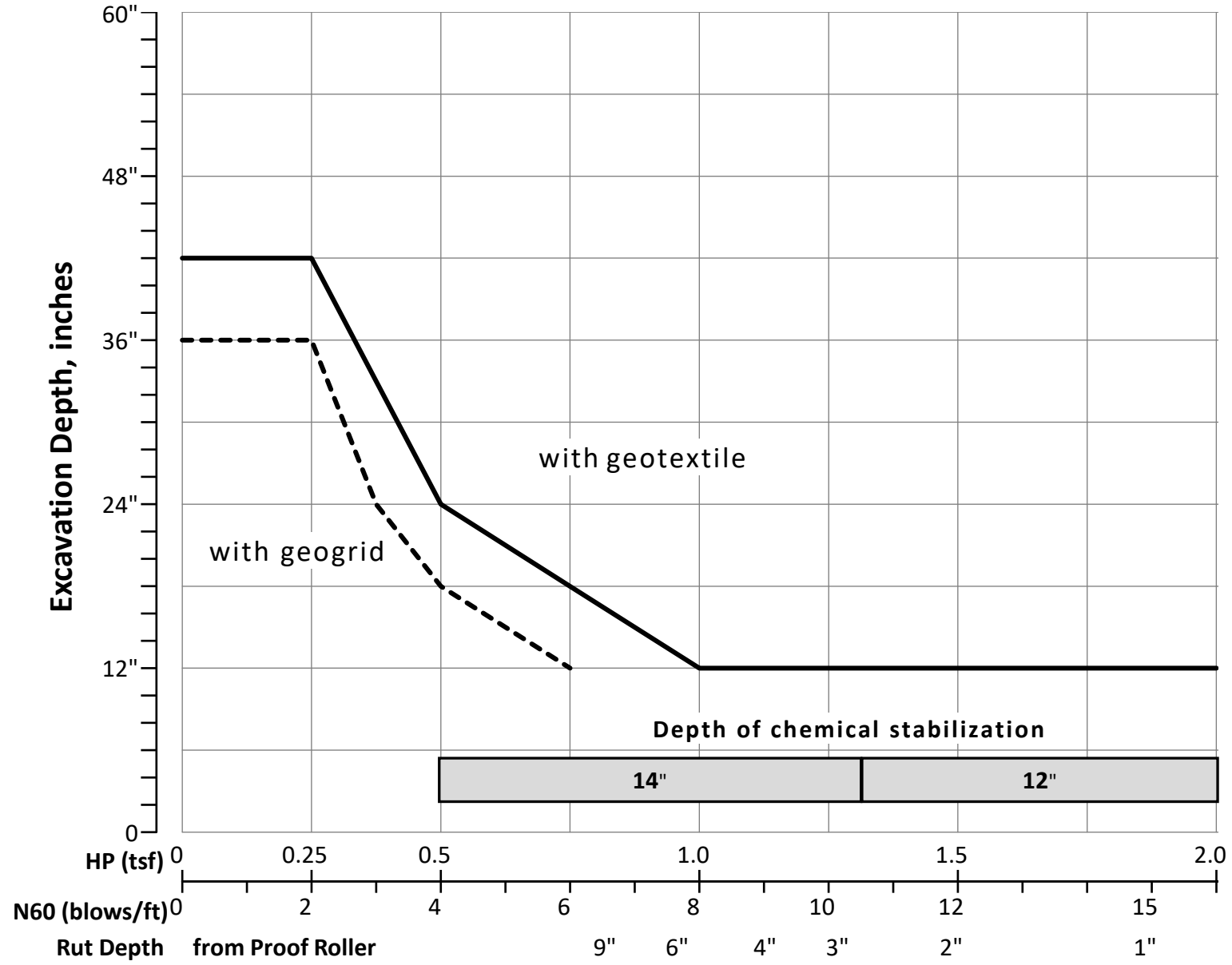
% Proposed Subgrade Surface	
Unstable & Unsuitable	18%
Unstable	9%
Unsuitable	9%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	27	20	4.34	25	18	7	26	7	33	12	9	2
Maximum	80	30	4.50	29	22	9	83	34	96	45	17	8
Minimum	10	10	2.75	19	14	4	3	1	4	4	6	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	9	40	13	0	0	0	11	83	39	31	0	0	0	0	0	0	0	226
Percent	0%	4%	18%	6%	0%	0%	0%	5%	37%	17%	14%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	86%									14%								100%
Surface Class Count	0	6	27	8	0	0	0	4	41	20	14	0	0	0	0	0	0	0	120
Surface Class Percent	0%	5%	23%	7%	0%	0%	0%	3%	34%	17%	12%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
4.34	0.50	☐ HP
20.35	6.00	☐ N60L

Average HP
Average N_{60L}

MAINLINE IR-490

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

IR-490 Mainline -Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Wednesday, August 30, 2023

Brendan P. Andrews
2868 East Kemper Rd.
Cincinnati, OH 45241

(920) 427-0671
brendan.andrews@neasinc.com

NO. OF BORINGS: 25

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-109-0-20	IR-90	930+69	5	RT	S&ME TRK 55 (R52)	90	656.0	654.4	1.6 C
2	B-110-0-20	IR-90	931+91	38	LT	S&ME TRK 55 (R52)	90	648.1	645.9	2.2 C
3	B-111-0-20	IR-90	935+97	5	RT	S&ME TRK 55 (R52)	90	639.8	638.3	1.5 C
4	B-112-0-20	IR-90	937+90	5	LT	S&ME TRK 55 (R52)	90	635.8	634.5	1.3 C
5	B-001-0-21	IR-490	939+11	39	LT	CME 45B	82	632.9	632.0	0.9 C
6	B-002-0-21	IR-490	942+36	47	RT	CME 45B	82	632.1	628.6	3.5 C
7	B-003-0-21	IR-490	946+27	40	LT	CME 45B	82	631.5	631.1	0.4 C
8	B-004-0-21	IR-490	950+05	51	RT	CME 45B	82	635.9	633.4	2.5 C
9	B-005-0-21	IR-490	953+92	41	LT	CME 45B	82	635.3	634.5	0.8 C
10	B-006-0-21	IR-490	957+83	78	RT	CME 45B	82	632.7	631.9	0.8 C
11	B-007-0-21	IR-490	961+53	73	LT	CME 45B	82	628.0	626.3	1.7 C
12	B-008-0-21	IR-490	965+28	63	RT	CME 45B	82	617.0	617.2	0.2 F
13	B-009-0-21	IR-490	969+07	61	LT	CME 45B	82	613.6	613.0	0.6 C
14	B-010-0-21	IR-490	972+85	62	RT	CME 45B	82	616.8	614.0	2.9 C
15	B-011-0-21	IR-490	976+32	61	LT	CME 45B	82	622.9	623.1	0.3 F
16	B-012-0-21	IR-490	979+20	72	RT	CME 45B	82	631.9	628.5	3.4 C
17	B-013-0-21	IR-490	982+49	63	LT	CME 45B	82	635.5	637.0	1.5 F
18	B-014-021	IR-490	985+62	74	RT	CME 45B	82	648.4	645.5	2.9 C
19	B-015-0-21	IR-490	1021+43	40	RT	CME 45B	82	647.3	649.4	2.2 F
20	B-016-0-21	IR-490	1025+70	40	LT	CME 45B	82	640.3	638.7	1.7 C
21	B-017-0-21	IR-490	1029+41	39	RT	CME 45B	82	629.8	628.7	1.0 C
22	B-018-0-21	IR-490	1032+80	42	LT	CME 45B	82	624.6	622.7	1.9 C
23	B-019-0-21	IR-490	1036+77	37	RT	CME 45B	82	624.2	622.4	1.8 C
24	B-020-0-21	IR-490	1040+62	48	LT	CME 45B	82	631.2	629.9	1.3 C
25	B-021-0-21	IR-490	1045+27	40	RT	CME 45B	82	641.1	642.4	1.2 F

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	-0.1	1.4	50						38	8	46	21	10	A-4a	8	443		Mc			
	109-0	SS-2	3.0	4.5	1.4	2.9	35						35	3	38	21	10	A-4a	5			Mc			
	20	SS-3	4.5	6.0	2.9	4.4	29									20	10	A-4a	8						
		SS-4	6.0	7.5	4.4	5.9	33	29								20	10	A-4a	8						
2	B	SS-1	1.5	3.0	-0.7	0.8	27						13	3	16	7	8	A-3a	0	174					
	110-0	SS-2	3.0	4.5	0.8	2.3	80									9	8	A-3a	0						
	20	SS-3	4.5	6.0	2.3	3.8	54						44	6	50	17	10	A-4a	8						
		SS-4	6.0	7.5	3.8	5.3	41	27								19	10	A-4a	8						
3	B	SS-1	1.5	3.0	0.0	1.5	50						12	5	17	11	8	A-3a	0	248					
	111-0	SS-2	3.0	4.5	1.5	3.0	50						3	1	4	6	6	A-1-a	0						
	20	SS-3	4.5	6.0	3.0	4.5	18			25	17	8	60	34	94	20	12	A-4b	8						
		SS-4	6.0	7.5	4.5	6.0	23	18								20	10	A-4b	8						
4	B	SS-1	1.5	1.9	0.2	0.6	50						5	2	7	16	6	A-1-a	0	197					
	112-0	SS-2	3.0	3.4	1.7	2.1	50						8	3	11	17	6	A-1-a	0						
	20	SS-3	4.5	4.9	3.2	3.6	50									21	6	A-1-a	0						
		SS-4	6.0	6.5	4.7	5.2	50	30								15	6	A-1-a	0						
5	B	SS-1	1.5	3.0	0.6	2.1	37						15	3	18	11	8	A-3a	0	1433					
	001-0	SS-2	3.0	4.5	2.1	3.6	30									9	8	A-3a	0						
	21	SS-3	4.5	6.0	3.6	5.1	30						12	3	15	12	6	A-1-b	0						
		SS-4	6.0	7.5	5.1	6.6	27	27								12	8	A-3a							
6	B	SS-1	1.5	3.0	-2.0	-0.5	23						13	5	18	9	6	A-1-b	0	227					
	002-0	SS-2	3.0	4.5	-0.5	1.0	19									11	6	A-1-b	0						
	21	SS-3A	4.5	5.5	1.0	2.0	31									9	6	A-1-b	0						
		SS-3B	5.5	6.0	2.0	2.5	31	19	4.5	27	18	9	65	28	93	13	13	A-4b	8		A-4b		**30"**		
7	B	SS-1A	1.5	2.2	1.1	1.8	42						21	6	27	7	8	A-3a	0	647					
	003-0	SS-1B	2.2	3.0	1.8	2.6	42			22	18	4	71	16	87	13	13	A-4b	8		A-4b				
	21	SS-2	3.0	4.5	2.6	4.1	34			24	20	4	44	11	55	10	15	A-4a	4						
		SS-3	4.5	6.0	4.1	5.6	33	30								14	10	A-4b	8						
8	B	SS-1	1.5	3.0	-1.0	0.5	27						22	5	27	8	10	A-2-4	0	693					
	004-0	SS-2A	3.0	4.0	0.5	1.5	29									8	10	A-2-4	0						
	21	SS-2B	4.0	4.5	1.5	2.0	29		4.5							14	10	A-4b	8		A-4b	Mc			
		SS-3	4.5	6.0	2.0	3.5	26	26	4.5	25	19	6	65	29	94	15	14	A-4b	8		A-4b		**42"**		
9	B	SS-1	1.5	3.0	0.7	2.2	35						16	5	21	6	6	A-1-b	0	487					
	005-0	SS-2	3.0	4.5	2.2	3.7	31						22	6	28	7	8	A-3a	0						
	21	SS-3	4.5	6.0	3.7	5.2	34									10	8	A-3a	0						
		SS-4	6.0	7.5	5.2	6.7	18	18	4.25							16	10	A-4b							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
10	B	SS-1	1.5	3.0	0.7	2.2	15						9	2	11	21	6	A-1-a	0	1187					
	006-0	SS-2	3.0	4.5	2.2	3.7	15		3	23	16	7	47	24	71	17	11	A-4a	7						
	21	SS-3	4.5	6.0	3.7	5.2	16		4.25							21	10	A-4a	8						
		SS-4	6.0	7.5	5.2	6.7	19	15	4.25							21	10	A-4a							
11	B	SS-1	1.5	3.0	-0.2	1.3	29						16	2	18	7	8	A-3a	0	193					
	007-0	SS-2	3.0	4.5	1.3	2.8	19									9	8	A-3a	0						
	21	SS-3	4.5	6.0	2.8	4.3	15						17	3	20	11	8	A-3a	0						
		SS-4	6.0	7.5	4.3	5.8	16	15								9	8	A-3a	0						
12	B	SS-1	1.5	3.0	1.7	3.2	26						28	10	38	9	10	A-4a	5	1280					
	008-0	SS-2	3.0	4.5	3.2	4.7	16		4.5							11	10	A-4a	8						
	21	SS-3	4.5	6.0	4.7	6.2	30		4.5	24	17	7	46	18	64	12	12	A-4a	6						
		SS-4	6.0	7.5	6.2	7.7	35	16	4.5							14	10	A-4a							
13	B	SS-1	1.5	3.0	0.9	2.4	29		4.5	21	16	5	32	12	44	10	11	A-4a	2	313					
	009-0	SS-2	3.0	4.5	2.4	3.9	23		4.5	27	18	9	36	17	53	15	13	A-4a	4						
	21	SS-3	4.5	6.0	3.9	5.4	23		4.5							14	10	A-4a	8						
		SS-4	6.0	7.5	5.4	6.9	25	23	4.5							13	10	A-4a							
14	B	SS-1	1.5	3.0	-1.4	0.1	27						23	10	33	12	10	A-2-4	0	553					
	010-0	SS-2	3.0	4.5	0.1	1.6	37									11	10	A-2-4	0						
	21	SS-3	4.5	6.0	1.6	3.1	34						26	9	35	12	10	A-2-4	0						
		SS-4	6.0	7.5	3.1	4.6	29	27								11	10	A-2-4	0						
15	B	SS-1	1.5	3.0	1.8	3.3	41						10	2	12	18	6	A-1-b	0	2120					
	011-0	SS-2A	3.0	4.0	3.3	4.3	18									15	6	A-1-b	0						
	21	SS-2B	4.0	4.5	4.3	4.8	18		4.5	27	21	6	58	21	79	19	16	A-4b	8						
		SS-3	4.5	6.0	4.8	6.3	16	16								21	6	A-1-b	0						
16	B	SS-1	1.5	3.0	-1.9	-0.4	37			NP	NP	NP	78	16	94	14	11	A-4b	8						
	012-0	SS-2	3.0	4.5	-0.4	1.1	29			NP	NP	NP	74	12	86	15	11	A-4b	8		A-4b	Mc			
	21	SS-3	4.5	6.0	1.1	2.6	29									15	10	A-4b	8		A-4b	Mc	31"		
		SS-4	6.0	7.5	2.6	4.1	31	29								14	10	A-4b	8						
17	B	SS-1	1.5	3.0	3.0	4.5	23		3.75				50	6	56	17	10	A-4b	8	900					
	013-0	SS-2	3.0	4.5	4.5	6.0	19		4.5				83	9	92	22	10	A-4b	8						
	21	SS-3	4.5	6.0	6.0	7.5	23		3							19	10	A-4b							
		SS-4	6.0	7.5	7.5	9.0	27	19	4.5							16	10	A-4b							
18	B	SS-1	1.5	3.0	-1.4	0.1	29						19	5	24	7	8	A-3a	0	2133					
	014-0	SS-2	3.0	4.5	0.1	1.6	25						12	2	14	5	8	A-3a	0						
	1	SS-3	4.5	6.0	1.6	3.1	16									8	8	A-3a	0						
		SS-4	6.0	7.5	3.1	4.6	14	14								7	8	A-3a	0						

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
19	B	SS-1	1.5	3.0	3.7	5.2	29						21	7	28	9	8	A-3a	0	2367					
	015-0	SS-2	3.0	4.5	5.2	6.7	29									7	8	A-3a							
	21	SS-3A	4.5	5.0	6.7	7.2	12									19	8	A-3a							
		SS-3B	5.0	6.0	7.2	8.2	12	29					10	2	12	8	8	A-3a							
20	B	SS-1	1.5	3.0	-0.2	1.3	25						11	3	14	10	8	A-3a	0	973					
	016-0	SS-2	3.0	4.5	1.3	2.8	25									5	8	A-3	0						
	21	SS-3	4.5	6.0	2.8	4.3	23						8	2	10	5	8	A-3	0						
		SS-4	6.0	7.5	4.3	5.8	20	20								4	8	A-3	0						
21	B	SS-1	1.5	3.0	0.5	2.0	26						25	5	30	9	8	A-3a	0	0					
	017-0	SS-2	3.0	4.5	2.0	3.5	20						24	7	31	12	8	A-3a	0						
	21	SS-3	4.5	6.0	3.5	5.0	27									9	8	A-3a	0						
		SS-4	6.0	7.5	5.0	6.5	30	20	4.5							18	10	A-4b	8						
22	B	SS-1	1.5	3.0	-0.4	1.1	30						44	4	48	14	10	A-4a	8	627		Mc			
	018-0	SS-2	3.0	4.5	1.1	2.6	31						80	9	89	20	10	A-4b	8		A-4b	Mc			
	21	SS-3	4.5	6.0	2.6	4.1	18									21	10	A-4b	8						
		SS-4	6.0	7.5	4.1	5.6	18	18								26	10	A-4b	8						
23	B	SS-1	1.5	3.0	-0.3	1.2	31						44	6	50	16	10	A-4a	8	820		Mc			
	019-0	SS-2	3.0	4.5	1.2	2.7	27									19	10	A-4a	8			Mc			
	21	SS-3	4.5	6.0	2.7	4.2	22						44	7	51	20	10	A-4a	8						
		SS-4	6.0	7.5	4.2	5.7	27	22								18	10	A-4b	8						
24	B	SS-1A	1.5	2.5	0.2	1.2	33						21	4	25	13	6	A-1-b	0	2600					
	020-0	SS-1B	2.5	3.0	1.2	1.7	33									14	10	A-4b	8		A-4b	Mc			
	21	SS-2A	3.0	3.5	1.7	2.2	27						73	12	85	19	10	A-4b	8		A-4b	Mc	26''		
		SS-2B	3.5	4.5	2.2	3.2	27	27								18	8	A-3	0						
25	B	SS-1	1.5	3.0	2.7	4.2	25						20	5	25	10	10	A-2-4	0	1400					
	021-0	SS-2	3.0	4.5	4.2	5.7	37									15	10	A-2-4	0						
	21	SS-3	4.5	6.0	5.7	7.2	25						22	6	28	14	8	A-3a							
		SS-4	6.0	7.5	7.2	8.7	35	25								14	10	A-2-4							

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 25

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 8/30/2023

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

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

Design CBR	9

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	0%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	1%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	80%	HP > 2	19%
M+	12%		
Rock	0%		
Unsuitable	23%		

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

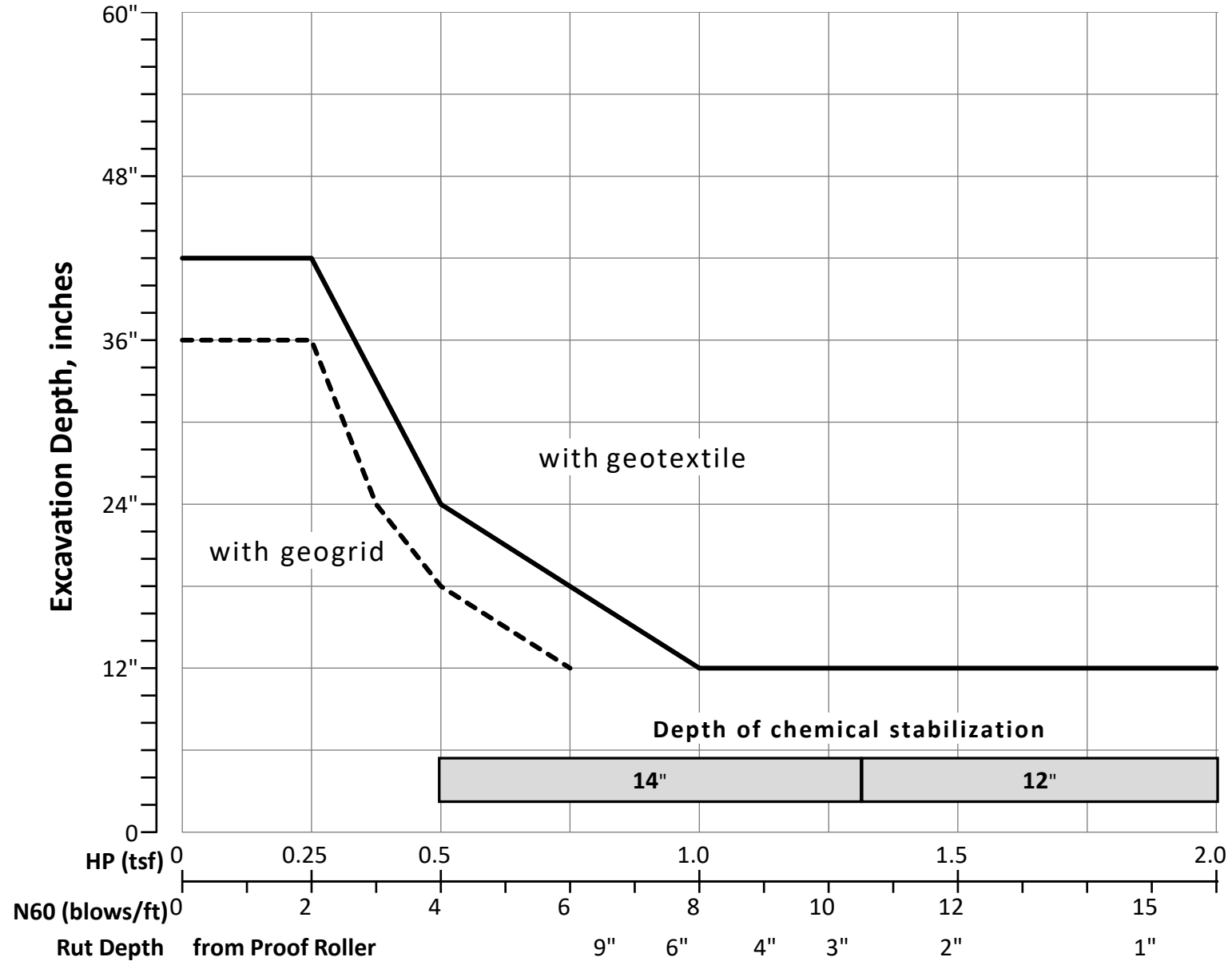
% Proposed Subgrade Surface	
Unstable & Unsuitable	35%
Unstable	19%
Unsuitable	16%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	29	22	4.28	25	18	7	32	8	40	14	9	3
Maximum	80	30	4.50	27	21	9	83	34	94	26	16	8
Minimum	12	14	3.00	21	16	4	3	1	4	4	6	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	6	8	9	0	0	0	4	26	22	23	0	0	0	0	0	0	0	98
Percent	0%	6%	8%	9%	0%	0%	0%	4%	27%	22%	23%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	77%									23%								100%
Surface Class Count	0	4	6	6	0	0	0	2	15	12	12	0	0	0	0	0	0	0	57
Surface Class Percent	0%	7%	11%	11%	0%	0%	0%	4%	26%	21%	21%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
4.28	0.50	☐ HP
22.36	6.00	☐ N60L

Average HP
Average N_{60L}

Lane E-S (WB-490 to SB-71)

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

Lane E-S (WB-490 to SB-71) -Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Friday, March 3, 2023

Brendan P. Andrews
2868 East Kemper Rd.
Cincinnati, OH 45241

(920) 427-0671
brendan.andrews@neasinc.com

NO. OF BORINGS: 6

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-023-0-21	LANE E-S	3054+54	6	LT	CME 45B	82	638.5	638.1	0.4 C
2	B-024-0-21	LANE E-S	3050+96	5	LT	CME 45B	82	652.7	651.6	1.0 C
3	B-025-0-21	LANE E-S	3047+38	2	LT	CME 45B	82	667.3	666.2	1.1 C
4	B-026-0-21	LANE E-S	3041+89	27	RT	CME 45B	82	677.8	678.7	0.9 F
5	B-027-0-21	LANE E-S	3038+16	27	RT	CME 45B	82	674.5	674.7	0.2 F
6	B-028-0-21	LANE E-S	3034+13	26	RT	CME 45B	82	669.4	667.9	1.5 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	1.1	2.6	26						9	2	11	11	6	A-1-b	0	1573					
	023-0	SS-2	3.0	4.5	2.6	4.1	12						10	2	12	11	6	A-1-b	0						
	21	SS-3	4.5	6.0	4.1	5.6	18									16	6	A-1-b	0						
		SS-4	6.0	7.5	5.6	7.1	18	12	2.75							20	10	A-4b							
2	B	SS-1	1.5	3.0	0.5	2.0	29						27	8	35	11	8	A-3a	0	133					
	024-0	SS-2	3.0	4.5	2.0	3.5	19						16	4	20	15	6	A-1-b	0						
	21	SS-3	4.5	6.0	3.5	5.0	26									17	6	A-1-b	0						
		SS-4	6.0	7.5	5.0	6.5	29	19	4.5							14	10	A-4b	8						
3	B	SS-1	1.5	3.0	0.4	1.9	30						16	5	21	5	6	A-1-b	0	560					
	025-0	SS-2	3.0	4.5	1.9	3.4	26									5	6	A-1-b	0						
	21	SS-3	4.5	6.0	3.4	4.9	42						15	4	19	6	6	A-1-b	0						
		SS-4	6.0	7.5	4.9	6.4	38	26								6	6	A-1-b	0						
4	B	SS-1	1.5	3.0	2.4	3.9	37						16	5	21	7	8	A-3a	0	73					
	026-0	SS-2	3.0	4.5	3.9	5.4	31						15	4	19	6	8	A-3a	0						
	21	SS-3	4.5	6.0	5.4	6.9	27									7	8	A-3a							
		SS-4	6.0	7.5	6.9	8.4	34	27								8	8	A-3a							
5	B	SS-1	1.5	3.0	1.7	3.2	29						25	6	31	10	8	A-3a	0	240					
	027-0	SS-2	3.0	4.5	3.2	4.7	26									9	8	A-3a	0						
	21	SS-3	4.5	6.0	4.7	6.2	16						26	8	34	8	8	A-3a	0						
		SS-4	6.0	7.5	6.2	7.7	18	16								12	8	A-3a							
6	B	SS-1	1.5	3.0	0.0	1.5	26						17	4	21	9	8	A-3a	0	93					
	028-0	SS-2	3.0	4.5	1.5	3.0	22									7	8	A-3a	0						
	21	SS-3	4.5	6.0	3.0	4.5	29									7	8	A-3a	0						
		SS-4	6.0	7.5	4.5	6.0	52	22								6	8	A-3a	0						

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 6

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 3/3/2023

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

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

Design CBR	13

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	0%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	5%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	77%	HP > 2	9%
M+	0%		
Rock	0%		
Unsuitable	8%		

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

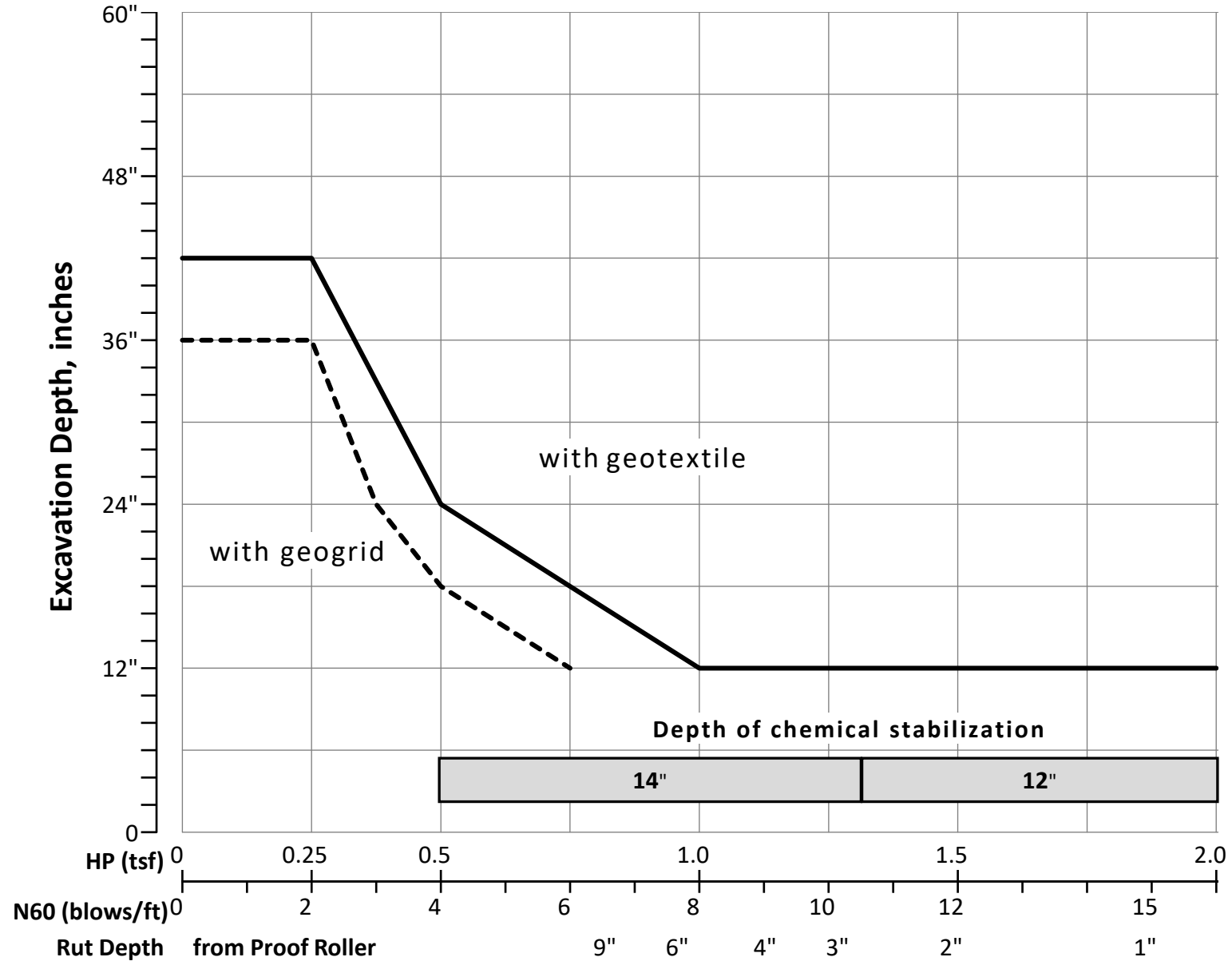
% Proposed Subgrade Surface	
Unstable & Unsuitable	0%
Unstable	0%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	28	20	3.63				17	5	22	10	7	0
Maximum	52	27	4.50	0	0	0	27	8	35	20	10	8
Minimum	12	12	2.75	0	0	0	9	2	11	5	6	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	9	0	0	0	0	0	13	0	2	0	0	0	0	0	0	0	24
Percent	0%	0%	38%	0%	0%	0%	0%	0%	54%	0%	8%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	92%									8%								100%
Surface Class Count	0	0	5	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	10
Surface Class Percent	0%	0%	50%	0%	0%	0%	0%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
3.63	0.50	☐ HP
20.33	6.00	☐ N60L

Average HP
Average N_{60L}

RAMP 7-7C (NB 7th St to EB-490)

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

Ramp 7-7C (NB 7th St. to EB-490) Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Friday, March 3, 2023

Brendan P. Andrews
2868 East Kemper Rd.
Cincinnati, OH 45241

(920) 427-0671
brendan.andrews@neasinc.com

NO. OF BORINGS: 5

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-029-0-21	Ramp 7-7C	67+99	145	RT	CME 45B	82	643.8	642.3	1.5 C
2	B-030-0-21	Ramp 7-7C	68+99	19	RT	CME 45B	82	624.2	622.7	1.6 C
3	B-031-0-21	Ramp 7-7C	72+21	23	RT	CME 45B	82	623.8	622.5	1.2 C
4	B-032-0-21	Ramp 7-7C	76+12	11	RT	CME 45B	82	622.0	622.0	0.0 C
5	B-012-0-21	Ramp 7-7C	79+20	20	LT	CME 45B	82	631.9	630.1	1.8 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	0.0	1.5	34						26	7	33	9	8	A-3a	0	300					
	029-0	SS-2A	3.0	4.0	1.5	2.5	15						23	5	28	8	8	A-3a	0						
	21	SS-2B	4.0	4.5	2.5	3.0	15									11	8	A-3a	0						
		SS-3	4.5	6.0	3.0	4.5	18	15								6	8	A-3a	0						
2	B	SS-1	1.5	3.0	-0.1	1.4	56		4.5	29	22	7	47	17	64	12	17	A-4a	6	873					
	030-0	SS-2	3.0	4.5	1.4	2.9	63						21	5	26	8	10	A-2-4	0						
	21	SS-3	4.5	6.0	2.9	4.4	38		4.5							12	10	A-4a	8						
		SS-4	6.0	7.5	4.4	5.9	33	30	4.5							13	10	A-4a	8						
3	B	SS-1	1.5	3.0	0.3	1.8	23		4.5	24	17	7	31	15	46	11	12	A-4a	2	100					
	031-0	SS-2	3.0	4.5	1.8	3.3	27						22	7	29	9	10	A-2-4	0						
	21	SS-3	4.5	6.0	3.3	4.8	34									10	10	A-2-4	0						
		SS-4	6.0	7.5	4.8	6.3	37	23								11	10	A-2-4	0						
4	B	SS-1	1.5	3.0	1.5	3.0	34		4.5	25	18	7	48	18	66	11	13	A-4a	6	960					
	032-0	SS-2	3.0	4.5	3.0	4.5	33		4.5	23	16	7	44	15	59	11	11	A-4a	5						
	21	SS-3	4.5	6.0	4.5	6.0	38		4.5							12	10	A-4a	8						
		SS-4	6.0	7.5	6.0	7.5	45	30	4.5							12	10	A-4a							
5	B	SS-1	1.5	3.0	-0.3	1.2	37						78	16	94	14	10	A-4b	8	733	A-4b	Mc			
	012-0	SS-2	3.0	4.5	1.2	2.7	29						74	12	86	15	10	A-4b	8		A-4b	Mc	33"		
	21	SS-3	4.5	6.0	2.7	4.2	29									15	10	A-4b	8						
		SS-4	6.0	7.5	4.2	5.7	31	29								14	10	A-4b	8						

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 5

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 3/3/2023

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

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

Design CBR	8

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	0%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	0%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	85%	HP > 2	40%
M+	10%		
Rock	0%		
Unsuitable	20%		

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

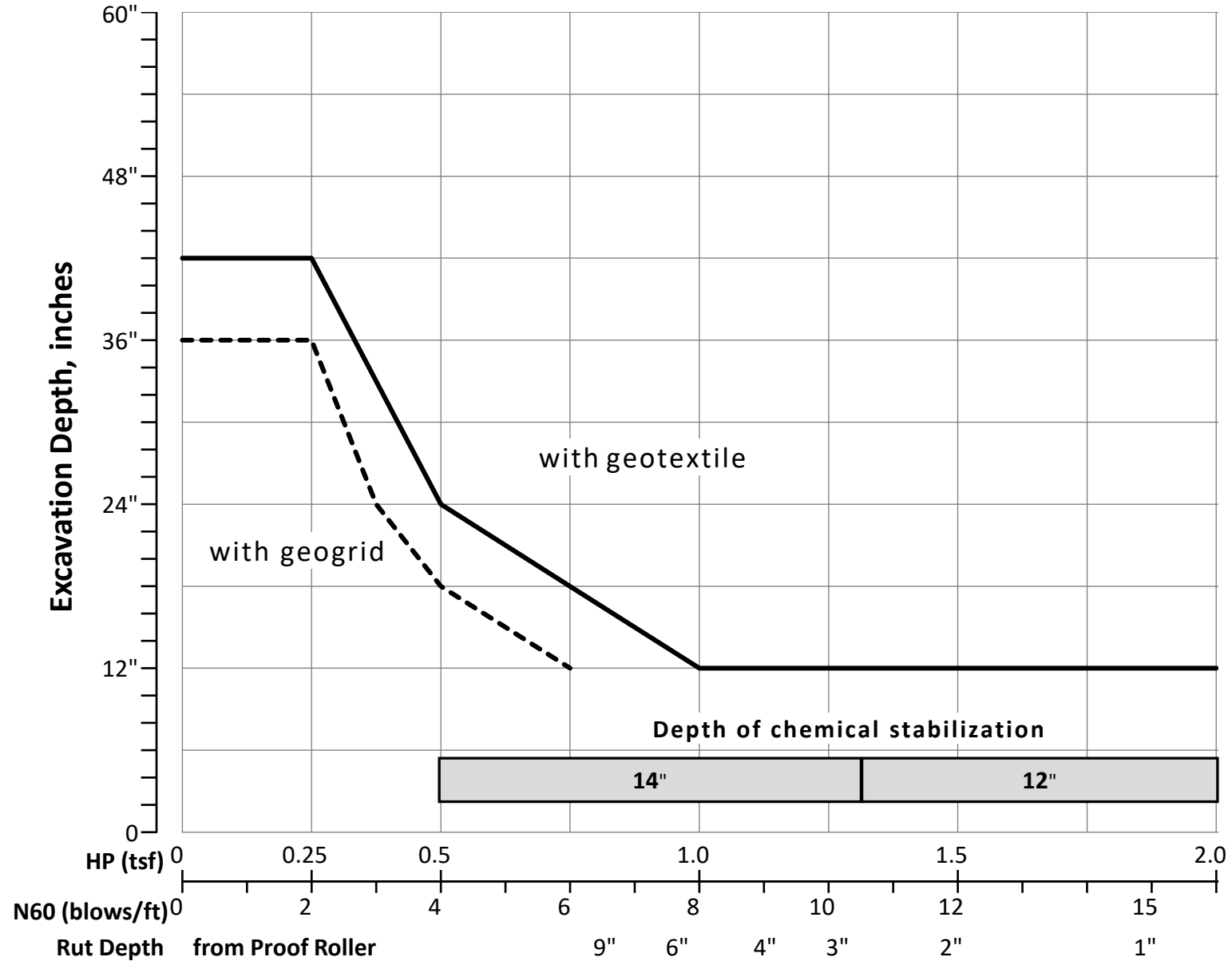
% Proposed Subgrade Surface	
Unstable & Unsuitable	36%
Unstable	18%
Unsuitable	18%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	33	25	4.50	25	18	7	41	12	53	11	10	4
Maximum	63	30	4.50	29	22	7	78	18	94	15	17	8
Minimum	15	15	4.50	23	16	7	21	5	26	6	8	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	4	0	0	0	0	4	8	4	0	0	0	0	0	0	0	20
Percent	0%	0%	0%	20%	0%	0%	0%	0%	20%	40%	20%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	80%									20%								100%
Surface Class Count	0	0	0	2	0	0	0	0	3	3	3	0	0	0	0	0	0	0	11
Surface Class Percent	0%	0%	0%	18%	0%	0%	0%	0%	27%	27%	27%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
4.50	0.50	☐ HP
25.40	6.00	☐ N60L

Average HP
Average N_{60L}

RAMP C-7 (WB-490 to 7th St)

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

Ramp C-7 (WB-490 to 7th St) -Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Friday, March 3, 2023

Brendan P. Andrews
2868 East Kemper Rd.
Cincinnati, OH 45241

(920) 427-0671
brendan.andrews@neasinc.com

NO. OF BORINGS: 2

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-033-0-21	Ramp C-7	84+46	21	LT	CME 45B	82	656.6	655.5	1.1 C
2	B-034-0-21	Ramp C-7	82+28	16	RT	CME 45B	82	663.4	662.4	1.0 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	0.4	1.9	18		4.5	29	22	7	60	20	80	17	17	A-4b	8	733	A-4b				
	033-0	SS-2	3.0	4.5	1.9	3.4	15		4.5	29	22	7	58	20	78	16	17	A-4b	8		A-4b		**40''**		
	21	SS-3	4.5	6.0	3.4	4.9	14		4.5							21	10	A-4b	8						
		SS-4	6.0	7.5	4.9	6.4	14	14	4.5							17	10	A-4b	8						
2	B	SS-1	1.5	3.0	0.5	2.0	23						15	6	21	9	6	A-1-b	0	1413					
	034-0	SS-2	3.0	4.5	2.0	3.5	20						10	4	14	8	6	A-1-a	0						
	21	SS-3	4.5	6.0	3.5	5.0	18		4.5							15	10	A-4a	8						
		SS-4	6.0	7.5	5.0	6.5	25	18								7	6	A-1-a							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 2

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 3/3/2023

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

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

Design CBR	7

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	0%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	25%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	38%	HP > 2	63%
M+	0%		
Rock	0%		
Unsuitable	50%		

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

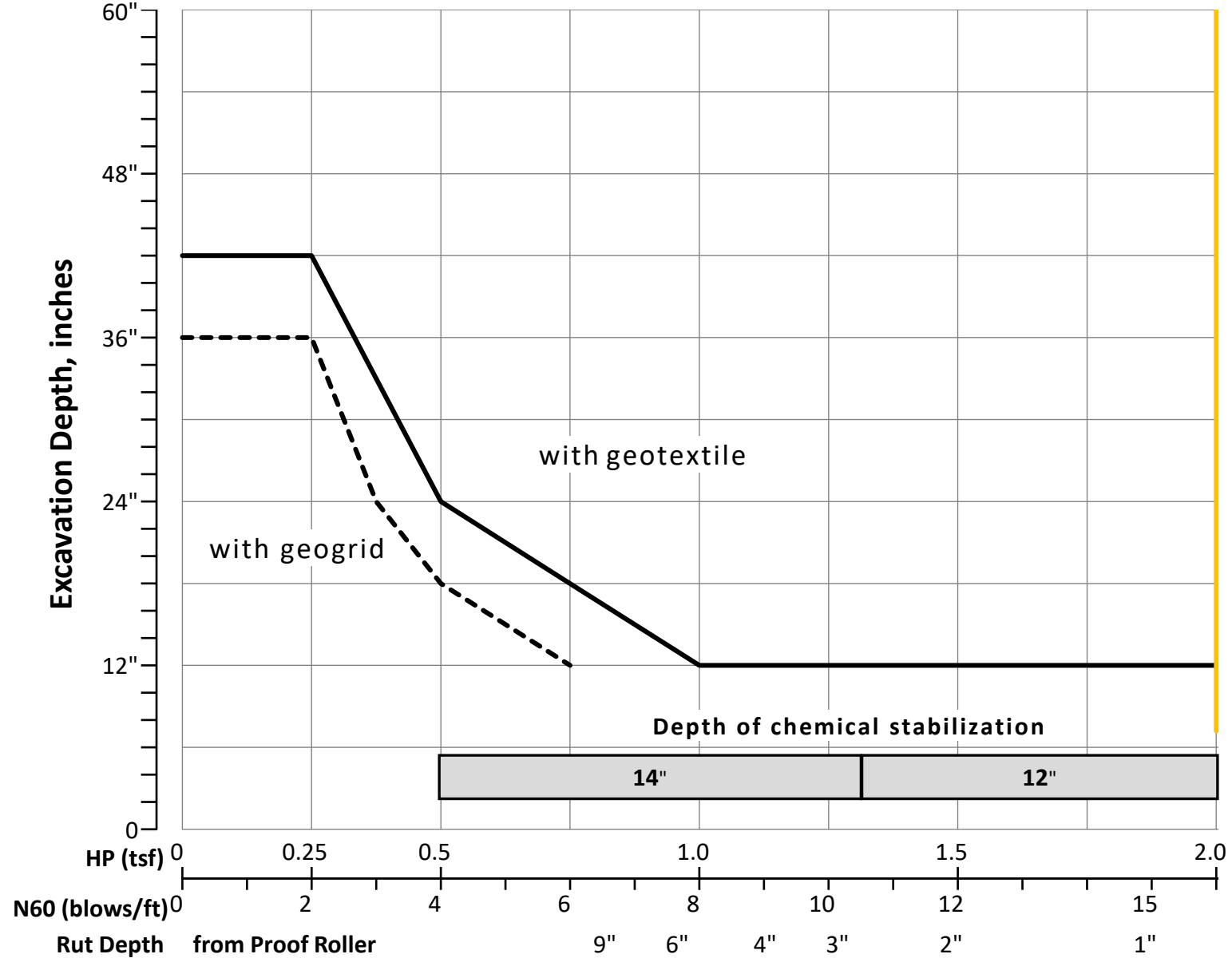
% Proposed Subgrade Surface	
Unstable & Unsuitable	50%
Unstable	0%
Unsuitable	50%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	18	16	4.50	29	22	7	36	13	48	14	10	6
Maximum	25	18	4.50	29	22	7	60	20	80	21	17	8
Minimum	14	14	4.50	29	22	7	10	4	14	7	6	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	2	1	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	8
Percent	0%	25%	13%	0%	0%	0%	0%	0%	0%	13%	50%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	50%									50%								100%
Surface Class Count	0	1	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	4
Surface Class Percent	0%	25%	25%	0%	0%	0%	0%	0%	0%	0%	50%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
4.50	0.50	☐ HP
16.00	6.00	☐ N60L

Average HP
Average N_{60L}

RAMP B-C (Rockefeller Ave to WB-490)

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

Ramp B-C (Rockefeller Ave to WB-490) -Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Friday, March 3, 2023

Brendan P. Andrews
2868 East Kemper Rd.
Cincinnati, OH 45241

(920) 427-0671
brendan.andrews@neasinc.com

NO. OF BORINGS: 2

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-035-0-21	Ramp B-C	17+69	31	LT	CME 45B	82	667.4	666.1	1.3 C
2	B-036-0-21	Ramp B-C	15+10	2	LT	CME 45B	82	665.1	663.9	1.2 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	0.2	1.7	12						20	5	25	15	8	A-3a	0	153					
	035-0	SS-2	3.0	4.5	1.7	3.2	11						24	5	29	11	8	A-3a	0						
	21	SS-3	4.5	6.0	3.2	4.7	11									11	8	A-3a	0						
		SS-4	6.0	7.5	4.7	6.2	12	11								11	8	A-3a	0						
2	B	SS-1	1.5	3.0	0.3	1.8	25						29	10	39	9	10	A-4a	6	367					
	036-0	SS-2	3.0	4.5	1.8	3.3	19						26	7	33	9	8	A-3a	0						
	21	SS-3	4.5	6.0	3.3	4.8	29									9	10	A-4a	8						
		SS-4	6.0	7.5	4.8	6.3	31	19								10	10	A-4a	8						

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 2

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 3/3/2023

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

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

Design CBR	9

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	25%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	25%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	38%	HP > 2	0%
M+	0%		
Rock	0%		
Unsuitable	0%		

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

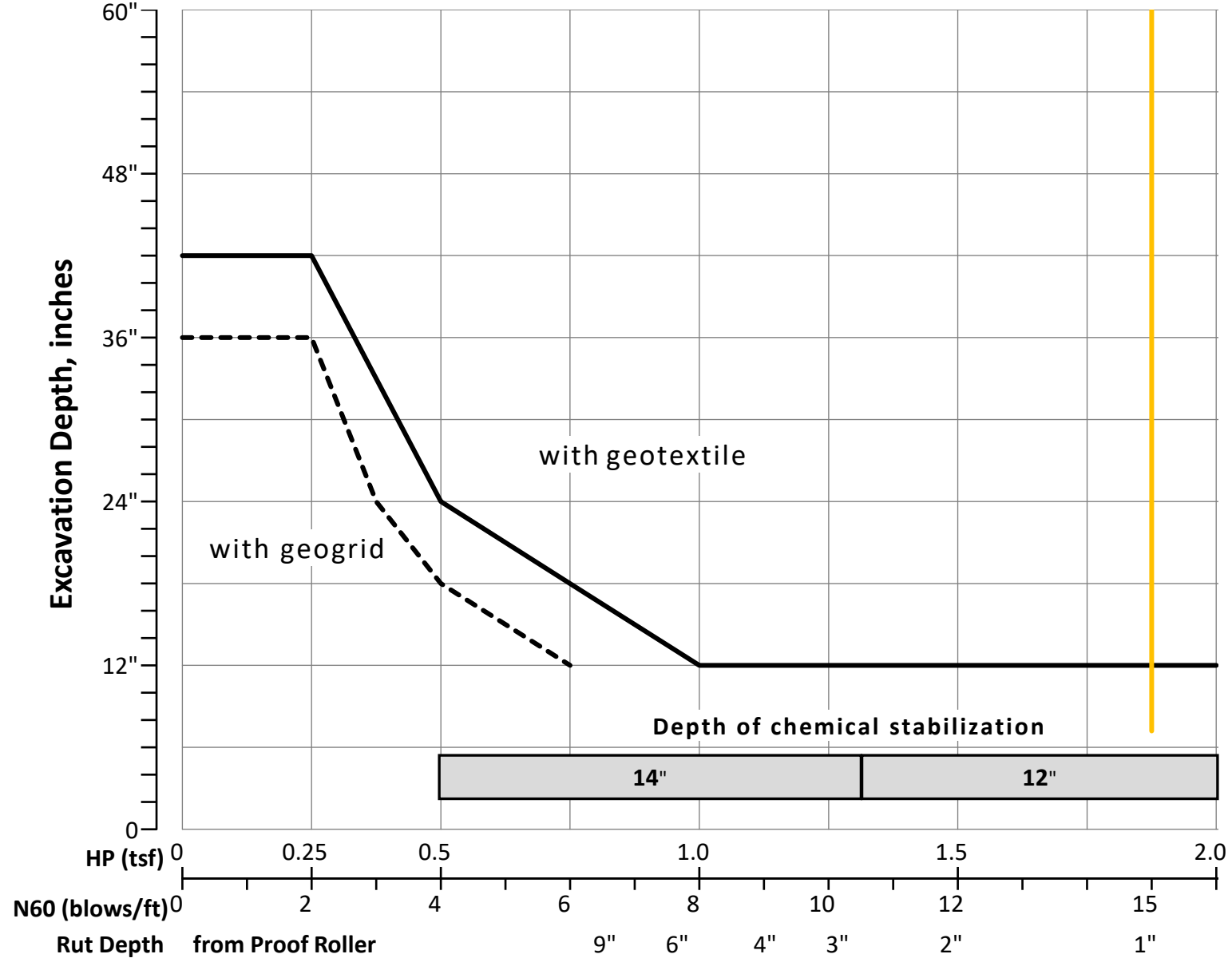
% Proposed Subgrade Surface	
Unstable & Unsuitable	0%
Unstable	0%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	19	15					25	7	32	11	9	3
Maximum	31	19	0.00	0	0	0	29	10	39	15	10	8
Minimum	11	11	0.00	0	0	0	20	5	25	9	8	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	0	0	0	0	0	5	3	0	0	0	0	0	0	0	0	8
Percent	0%	0%	0%	0%	0%	0%	0%	0%	63%	38%	0%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	100%									0%								100%
Surface Class Count	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	4
Surface Class Percent	0%	0%	0%	0%	0%	0%	0%	0%	75%	25%	0%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
	20.00	☑ HP
15.00	6.00	☐ N60L

Average HP
Average N_{60L}

RAMP N-W (SB-77 to WB-490)

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

Ramp N-W (SB-77 to WB-490) -Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Friday, March 3, 2023

Brendan P. Andrews
2868 East Kemper Rd.
Cincinnati, OH 45241

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NO. OF BORINGS: 4

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-037-0-21	Ramp N-W	120+53	8	LT	CME 45B	82	651.4	650.3	1.0 C
2	B-038-0-21	Ramp N-W	124+26	1	LT	CME 45B	82	649.1	647.5	1.6 C
3	B-039-0-21	Ramp N-W	127+74	4	LT	CME 45B	82	657.9	657.0	0.9 C
4	B-040-0-21	Ramp N-W	131+20	7	LT	CME 45B	82	669.4	668.7	0.7 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	0.5	2.0	27						18	6	24	6	8	A-3a	0	860					
	037-0	SS-2	3.0	4.5	2.0	3.5	22						17	6	23	7	8	A-3a	0						
	21	SS-3	4.5	6.0	3.5	5.0	23									5	8	A-3a	0						
		SS-4	6.0	7.5	5.0	6.5	23	22								6	8	A-3a	0						
2	B	SS-1	1.5	3.0	-0.1	1.4	15						14	5	19	11	8	A-3a	0	340					
	038-0	SS-2	3.0	4.5	1.4	2.9	15						19	5	24	11	8	A-3a	0						
	21	SS-3	4.5	6.0	2.9	4.4	14									11	8	A-3a	0						
		SS-4	6.0	7.5	4.4	5.9	20	14								11	8	A-3a	0						
3	B	SS-1	1.5	3.0	0.6	2.1	22						7	1	8	7	6	A-1-b	0	793					
	039-0	SS-2	3.0	4.5	2.1	3.6	20						7	2	9	4	6	A-1-b	0						
	21	SS-3	4.5	6.0	3.6	5.1	18									5	6	A-1-b	0						
		SS-4	6.0	7.5	5.1	6.6	16	16								4	6	A-1-b							
4	B	SS-1	1.5	3.0	0.8	2.3	41						6	2	8	9	8	A-3	0	413					
	040-0	SS-2	3.0	4.5	2.3	3.8	11						5	1	6	5	8	A-3	0						
	21	SS-3	4.5	6.0	3.8	5.3	14									7	8	A-3	0						
		SS-4	6.0	7.5	5.3	6.8	14	11								4	8	A-3							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 4

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 3/3/2023

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

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

Design CBR	13

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	6%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	19%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	50%	HP > 2	0%
M+	0%		
Rock	0%		
Unsuitable	0%		

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

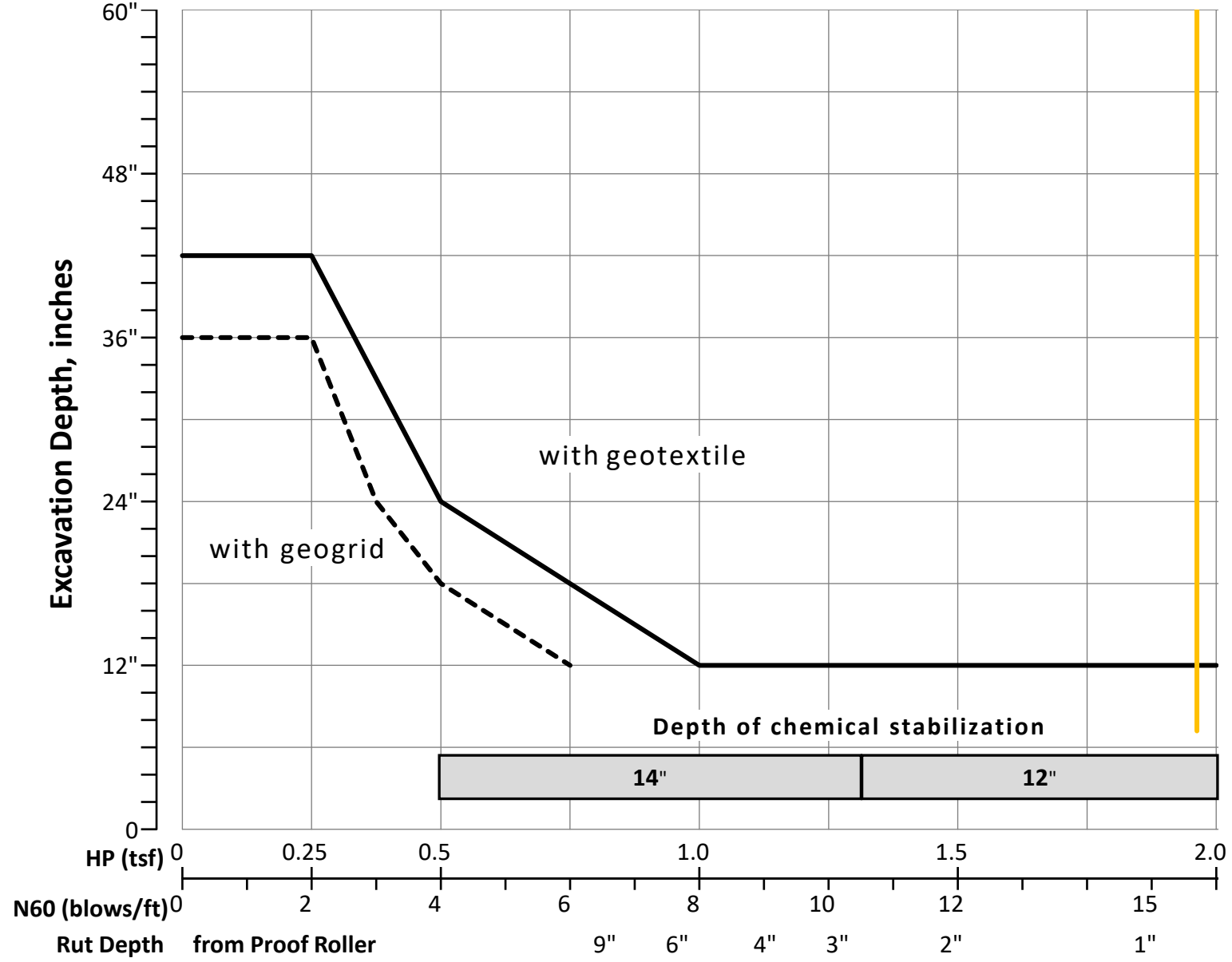
% Proposed Subgrade Surface	
Unstable & Unsuitable	0%
Unstable	0%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	20	16					12	4	15	7	8	0
Maximum	41	22	0.00	0	0	0	19	6	24	11	8	0
Minimum	11	11	0.00	0	0	0	5	1	6	4	6	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	4	0	0	0	0	4	8	0	0	0	0	0	0	0	0	0	16
Percent	0%	0%	25%	0%	0%	0%	0%	25%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	100%									0%								100%
Surface Class Count	0	0	2	0	0	0	0	2	4	0	0	0	0	0	0	0	0	0	8
Surface Class Percent	0%	0%	25%	0%	0%	0%	0%	25%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
	20.00	☑ HP
15.75	6.00	☐ N60L

Average HP
Average N_{60L}

RAMP W-N (EB-490 to NB-77)

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

Ramp W-N (EB-490 to NB-77) -Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Friday, March 3, 2023

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2868 East Kemper Rd.
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(920) 427-0671
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NO. OF BORINGS: 3

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-041-0-21	Ramp W-N	623+88	12	LT	CME 45B	82	640.6	638.4	2.2 C
2	B-042-0-21	Ramp W-N	627+30	0	RT	CME 45B	82	639.4	638.8	0.6 C
3	B-043-0-21	Ramp W-N	630+38	4	LT	CME 45B	82	641.4	640.5	0.9 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	-0.7	0.8	29						11	2	13	8	6	A-1-b	0	1300					
	041-0	SS-2	3.0	4.5	0.8	2.3	26						10	2	12	10	6	A-1-b	0						
	21	SS-3	4.5	6.0	2.3	3.8	29									5	6	A-1-b	0						
		SS-4	6.0	7.5	3.8	5.3	30	26								4	6	A-1-b	0						
2	B	SS-1	1.5	3.0	0.9	2.4	50						17	5	22	10	6	A-1-b	0	933					
	042-0	SS-2	3.0	4.5	2.4	3.9	41						18	5	23	11	8	A-3a	0						
	21	SS-3	4.5	6.0	3.9	5.4	23									12	8	A-3a	0						
		SS-4	6.0	7.5	5.4	6.9	23	23								10	8	A-3a							
3	B	SS-1	1.5	3.0	0.6	2.1	27						19	8	27	10	8	A-3a	0	2800					
	043-0	SS-2	3.0	4.5	2.1	3.6	27						17	6	23	30	8	A-3a	0						
	21	SS-3	4.5	6.0	3.6	5.1	31									6	8	A-3a	0						
		SS-4	6.0	7.5	5.1	6.6	31	27								5	8	A-3a							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 3

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 3/3/2023

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

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

Design CBR	13

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	0%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	0%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	100%	HP > 2	0%
M+	0%		
Rock	0%		
Unsuitable	0%		

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

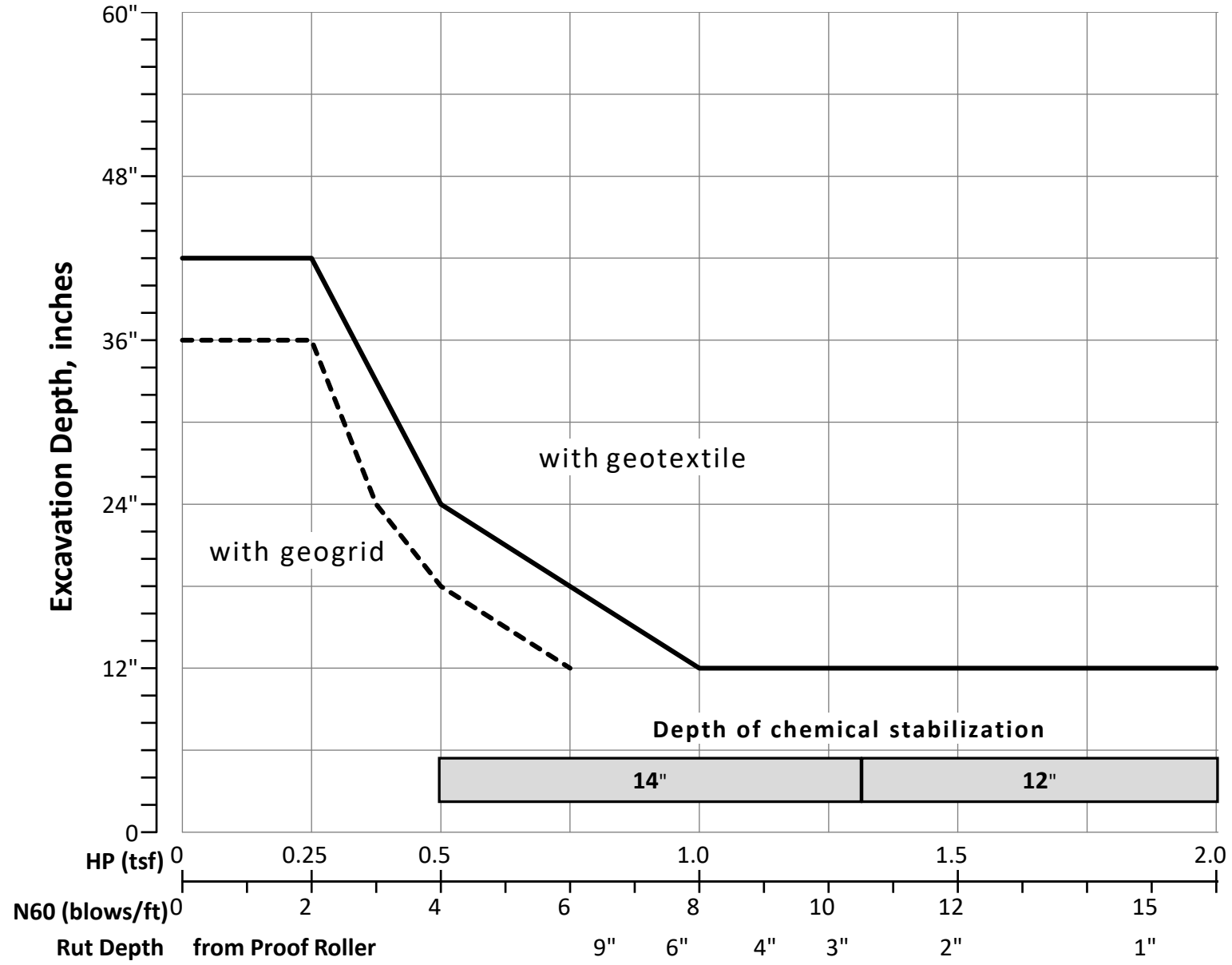
% Proposed Subgrade Surface	
Unstable & Unsuitable	0%
Unstable	0%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	31	25					15	5	20	10	7	0
Maximum	50	27	0.00	0	0	0	19	8	27	30	8	0
Minimum	23	23	0.00	0	0	0	10	2	12	4	6	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	5	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	12
Percent	0%	0%	42%	0%	0%	0%	0%	0%	58%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	100%									0%								100%
Surface Class Count	0	0	4	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	7
Surface Class Percent	0%	0%	57%	0%	0%	0%	0%	0%	43%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
	20.00	☑ HP
25.33	6.00	☐ N60L

Average HP
Average N_{60L}

RAMP C-B (EB-490 to Broadway Ave)

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

Ramp C-B (EB-490 to Broadway Ave) -Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Friday, March 3, 2023

Brendan P. Andrews
2868 East Kemper Rd.
Cincinnati, OH 45241

(920) 427-0671
brendan.andrews@neasinc.com

NO. OF BORINGS: 2

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-044-0-21	Ramp C-B	15+45	1	RT	CME 45B	82	670.6	669.9	0.8 C
2	B-045-0-21	Ramp C-B	16+50	5	RT	CME 45B	82	674.0	673.3	0.7 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	0.8	2.3	14						14	5	19	6	6	A-1-b	0	1080					
	044-0	SS-2	3.0	4.5	2.3	3.8	12									8	6	A-1-b	0						
	21	SS-3	4.5	6.0	3.8	5.3	18						13	5	18	8	6	A-1-b	0						
		SS-4	6.0	7.5	5.3	6.8	14	12								9	6	A-1-b							
2	B	SS-1	1.5	3.0	0.8	2.3	15						9	3	12	4	6	A-1-a	0	340					
	045-0	SS-2	3.0	4.5	2.3	3.8	11						21	7	28	14	8	A-3a	0						
	21	SS-3	4.5	6.0	3.8	5.3	14									12	8	A-3a	0						
		SS-4	6.0	7.5	5.3	6.8	12	11								9	8	A-3a							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 2

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 3/3/2023

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

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

Design CBR	13

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	13%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	63%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	0%	HP > 2	0%
M+	0%		
Rock	0%		
Unsuitable	0%		

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

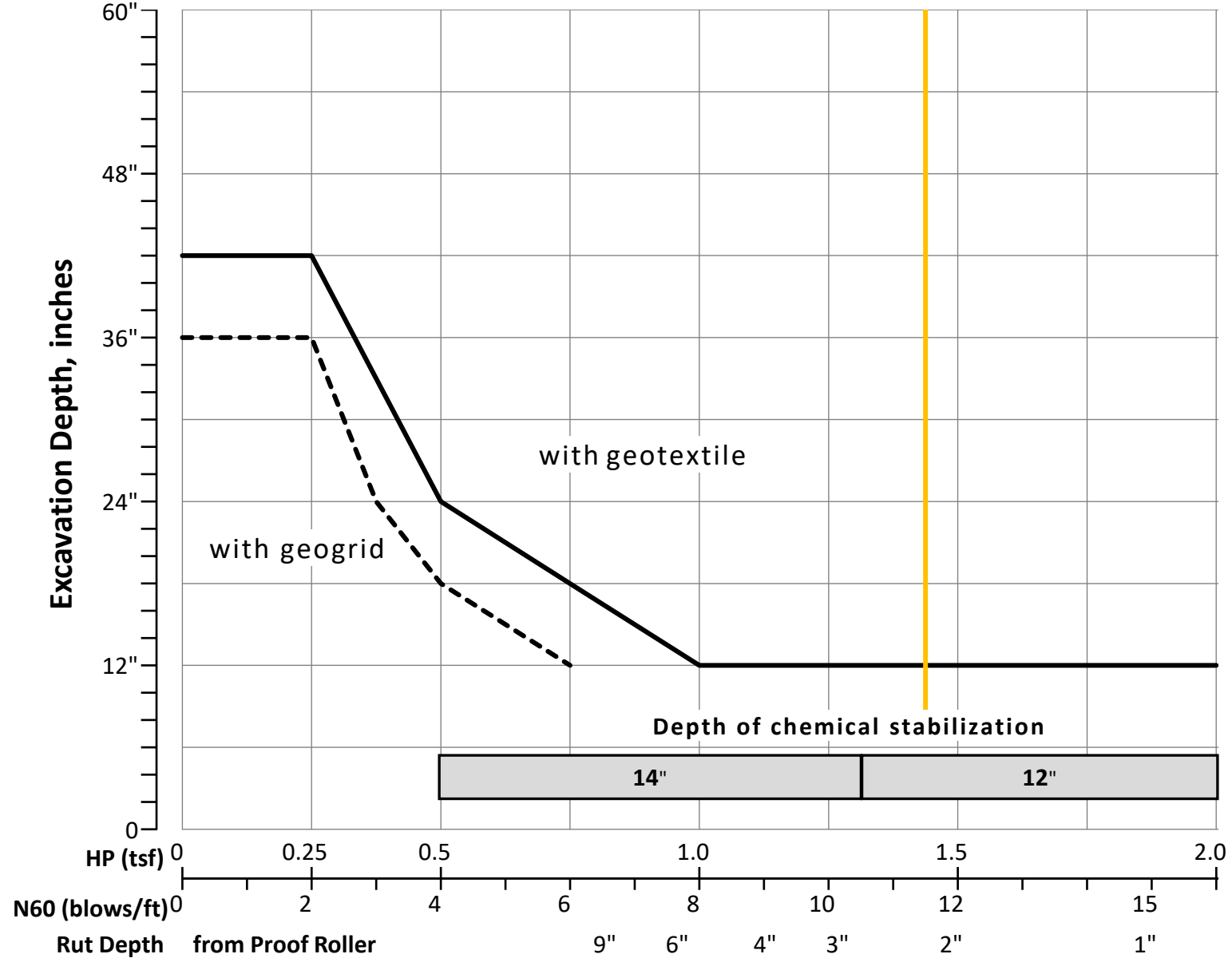
% Proposed Subgrade Surface	
Unstable & Unsuitable	0%
Unstable	0%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	14	12					14	5	19	9	7	0
Maximum	18	12	0.00	0	0	0	21	7	28	14	8	0
Minimum	11	11	0.00	0	0	0	9	3	12	4	6	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	1	4	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	8
Percent	0%	13%	50%	0%	0%	0%	0%	0%	38%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	100%									0%								100%
Surface Class Count	0	1	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4
Surface Class Percent	0%	25%	50%	0%	0%	0%	0%	0%	25%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
	20.00	☑ HP
11.50	6.00	☐ N60L

Average HP
Average N_{60L}

RAMP S-E (NB-77 to EB-490)

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

Ramp S-E (NB-77 to EB-490) -Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Friday, March 3, 2023

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NO. OF BORINGS: 4

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-046-0-21	Ramp S-E	335+69	7	RT	CME 45B	82	658.9	657.3	1.6 C
2	B-047-0-21	Ramp S-E	339+21	4	RT	CME 45B	82	649.5	647.9	1.5 C
3	B-048-0-21	Ramp S-E	342+76	3	RT	CME 45B	82	640.4	637.7	2.8 C
4	B-049-0-21	Ramp S-E	346+29	6	RT	CME 45B	82	643.2	643.5	0.3 F

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	-0.1	1.4	38						14	5	19	6	6	A-1-b	0	253					
	046-0	SS-2A	3.0	4.5	1.4	2.9	25									6	6	A-1-b	0						
	21	SS-2B	4.5	6.0	2.9	4.4	25		4.5	25	19	6	67	29	96	15	14	A-4b	8						
		SS-3	6.0	7.5	4.4	5.9	26	25	4.5							16	10	A-4b	8						
2	B	SS-1	1.5	3.0	0.0	1.5	26						13	5	18	12	8	A-3a	0	67					
	047-0	SS-2	3.0	4.5	1.5	3.0	19						21	10	31	11	8	A-3a	0						
	21	SS-3	4.5	6.0	3.0	4.5	15									13	8	A-3a	0						
		SS-4	6.0	7.5	4.5	6.0	12	12								13	8	A-3a	0						
3	B	SS-1	1.5	3.0	-1.3	0.3	30						12	3	15	9	6	A-1-b	0	2387					
	048-0	SS-2	3.0	4.5	0.3	1.8	20						23	6	29	10	8	A-3a	0						
	21	SS-3	4.5	6.0	1.8	3.3	20									12	6	A-1-b	0						
		SS-4	6.0	7.5	3.3	4.8	12	12								10	8	A-3a	0						
4	B	SS-1	1.5	3.0	1.8	3.3	15						14	2	16	23	8	A-3a	0	20					
	049-0	SS-2	3.0	4.5	3.3	4.8	10						26	2	28	20	8	A-3a	0						
	21	SS-3	4.5	6.0	4.8	6.3	10									27	8	A-3a	0						
		SS-4	6.0	7.5	6.3	7.8	10	10								20	8	A-3a							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 4

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 3/3/2023

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

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

Design CBR	12

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	13%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	13%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	53%	HP > 2	13%
M+	0%		
Rock	0%		
Unsuitable	13%		

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

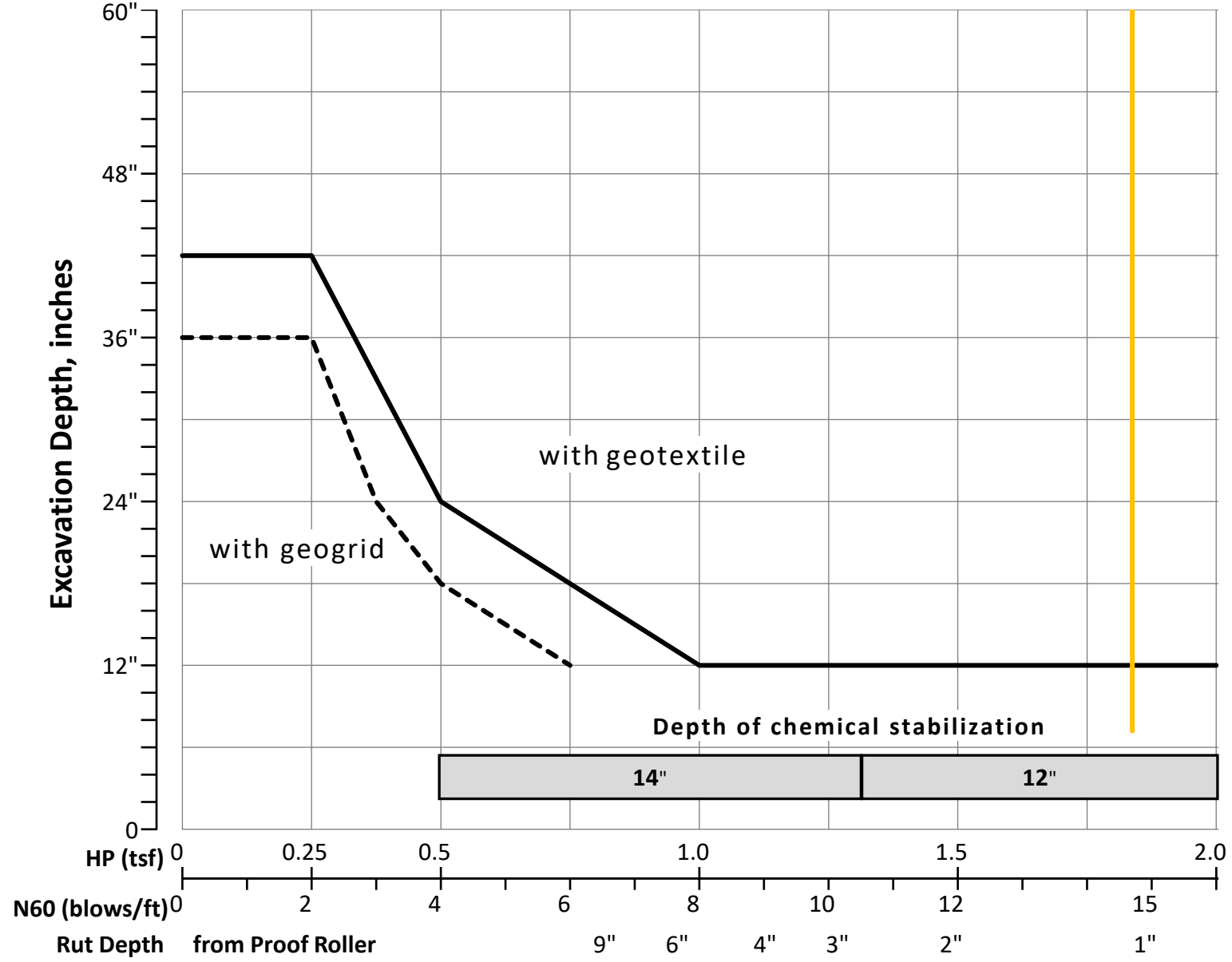
% Proposed Subgrade Surface	
Unstable & Unsuitable	0%
Unstable	0%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	20	15	4.50	25	19	6	24	8	32	14	8	1
Maximum	38	25	4.50	25	19	6	67	29	96	27	14	8
Minimum	10	10	4.50	25	19	6	12	2	15	6	6	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	4	0	0	0	0	0	10	0	2	0	0	0	0	0	0	0	16
Percent	0%	0%	25%	0%	0%	0%	0%	0%	63%	0%	13%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	88%									13%								100%
Surface Class Count	0	0	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	8
Surface Class Percent	0%	0%	50%	0%	0%	0%	0%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
4.50	0.50	☐ HP
14.75	6.00	☐ N60L

Average HP
Average N_{60L}

RAMP E-N (WB-490 to NB-77)

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

CUY-490-0.00
PID 107408

Ramp E-N (WB-490 to NB-77) -Interstate Route 490 Major Rehabilitation

NEAS, Inc.

Prepared By: Derar M. Tarawneh
Date prepared: Friday, March 3, 2023

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NO. OF BORINGS: 4

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-050-0-21	Ramp E-N	744+41	4	LT	CME 45B	82	640.2	638.8	1.4 C
2	B-051-0-21	Ramp E-N	740+80	2	RT	CME 45B	82	636.2	634.3	1.8 C
3	B-052-0-21	Ramp E-N	737+33	4	LT	CME 45B	82	643.4	642.6	0.8 C
4	B-053-0-21	Ramp E-N	733+99	4	LT	CME 45B	82	657.0	655.9	1.1 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.5	3.0	0.1	1.6	29						12	1	13	16	6	A-1-b	0	1100					
	050-0	SS-2	3.0	4.5	1.6	3.1	25									14	6	A-1-b	0						
	21	SS-3	4.5	6.0	3.1	4.6	33						11	1	12	45	6	A-1-b	0						
		SS-4	6.0	7.5	4.6	6.1	29	25								41	6	A-1-b	0						
2	B	SS-1	1.5	3.0	-0.3	1.2	39						14	3	17	9	6	A-1-b	0	3000					
	051-0	SS-2	3.0	4.5	1.2	2.7	23						30	7	37	10	10	A-4a	5						
	21	SS-3	4.5	6.0	2.7	4.2	26									7	10	A-4a	8						
		SS-4A	6.0	7.0	4.2	5.2	38	23								14	10	A-4a	8						
3	B	SS-1	1.5	3.0	0.7	2.2	31						9	3	12	6	8	A-3a	0	40					
	052-0	SS-2	3.0	4.5	2.2	3.7	26						12	5	17	13	8	A-3a	0						
	21	SS-3	4.5	6.0	3.7	5.2	16									7	8	A-3a	0						
		SS-4	6.0	7.5	5.2	6.7	14	14								7	8	A-3a							
4	B	SS-1	1.5	3.0	0.4	1.9	22		4.5	22	15	7	25	13	38	12	10	A-4a	1	347					
	053-0	SS-2	3.0	4.5	1.9	3.4	20			19	14	5	27	14	41	10	10	A-4a	1						
	21	SS-3	4.5	6.0	3.4	4.9	53									8	8	A-3a	0						
		SS-4	6.0	7.5	4.9	6.4	56	20								8	8	A-3a	0						

PID: PID 107408

County-Route-Section: CUY-490-0.00
No. of Borings: 4

Geotechnical Consultant: NEAS, Inc.
Prepared By: Derar M. Tarawneh
Date prepared: 3/3/2023

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

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

Design CBR	11

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	0%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	6%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	88%	HP > 2	6%
M+	0%		
Rock	0%		
Unsuitable	0%		

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

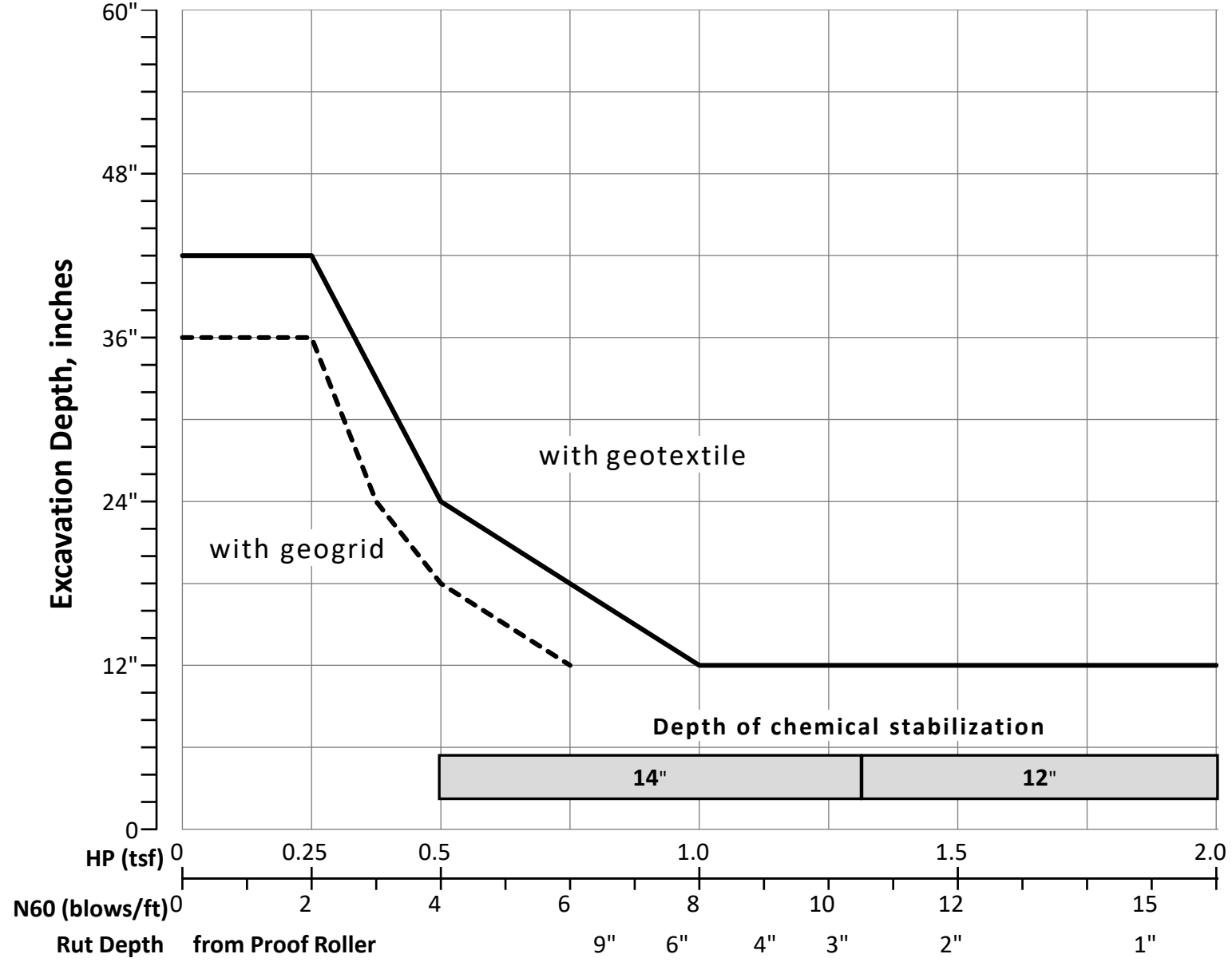
% Proposed Subgrade Surface	
Unstable & Unsuitable	0%
Unstable	0%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	30	21	4.50	21	15	6	18	6	23	14	8	2
Maximum	56	25	4.50	22	15	7	30	14	41	45	10	8
Minimum	14	14	4.50	19	14	5	9	1	12	6	6	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	5	0	0	0	0	0	6	5	0	0	0	0	0	0	0	0	16
Percent	0%	0%	31%	0%	0%	0%	0%	0%	38%	31%	0%	0%	0%	0%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	100%									0%								100%
Surface Class Count	0	0	3	0	0	0	0	0	2	4	0	0	0	0	0	0	0	0	9
Surface Class Percent	0%	0%	33%	0%	0%	0%	0%	0%	22%	44%	0%	0%	0%	0%	0%	0%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
4.50	0.50	☐ HP
20.50	6.00	☐ N60L

Average HP
Average N_{60L}