NASHnal SOIL TESTING

www.nstengr.com

STRUCTURAL GEOTECHNICAL EXPLORATION REPORT FOR CANTILEVER SIGN STRUCTURES & A RETAINING WALL

PTB 199 Item 16 (D-91-078-21)
Smart Corridor Implementation Plan to IL 56 (Butterfield Rd.)
From IL 59 (Station 121+00) on the West end to the Crossing with York Rd. (Station 894+00) on the East end
62N32
PROJECT NUMBER 2022-1264-01G

Prepared For

AMES Engineering, Inc.
6330 Belmont Rd., Suite 4B
Downers Grove, IL 60516

23856 W. Andrew Rd., Unit 103, Plainfield, L 60585, Phone: (630) 780-5201, Fax: (630) 429-9099

NST
NASHnal
SOIL TESTING

www.nstengr.com

Mr. Ahsan Siddiqi **Date: 6/16/2023R**
AMES Engineering, Inc.
6330 Belmont Rd., Suite 4B
Downers Grove, IL 60516

RE: Structural Geotechnical Exploration Report for
Cantilever Sign Structures & A Retaining Wall
PTB 199 Item 16 (D-91-078-21)-Contract 62N32
Smart Corridor Implementation Plan to IL 56 (Butterfield Rd.)
From IL 59 (Station 121+00) on the West end to the Crossing with York Rd. (Station 894+00) on the East end.

Dear Mr. Siddiqi:

NASHnal Soil Testing, LLC (NST) has completed the Geotechnical Exploration & Engineering services for the above referenced project. The scope of our services was outlined in the Geotechnical Scope of Work on PTB 199-Item 16.

We have enjoyed working with you on this phase of the project. Should you have any questions or if we can be of further assistance, please do not hesitate to contact us.

Sincerely,
NASHnal Soil Testing, LLC

Umar T. Ahmad, PE
Registered Professional Engineer, Illinois
Registration # 062-055148

UMAR T. AHMAD
062-055148
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

Expires 11/30/2023

www.nstengr.com

Structural Geotechnical Exploration Report for
Cantilever Sign Structures & A Retaining Wall
PTB 199 Item 16 (D-91-078-21)
Smart Corridor Implementation Plan to IL 56 (Butterfield Rd.)
From IL 59 (Station 121+00) on the West end to the Crossing with York Rd. (Station 894+00) on the East end
Contract 62N32

PROJECT NUMBER 2022-1264-01G

23856 W. Andrew Rd., Unit 103, Plainfield, IL 60585, Phone: (630) 780-5201, Fax: (630) 429-9099

INTRODUCTION

Our scope of this Phase II project for the Improvements to the smart Corridor is to provide geotechnical exploration services for the traffic signs improvements at two locations (aka DMS-2 & DMS-3) and a variable height retaining wall with a maximum exposed height of 2.25 feet high proposed retaining wall at 22nd Street.

At the time of our site visit, the topography of the site retaining wall was relatively flat with the maximum elevation difference of about 1.76 feet between our borings. Elevations of borings are marked on the boring logs as provided by project surveyors, HR Green.

To evaluate the subsurface soil profile, the client requested to drill four (4) soil borings extending to a depth for 15 feet below existing grade for retaining wall at 22nd Street intersection with enterprise drive in Oakbrook, Illinois. Additionally, we were requested to drill two (2) soil borings extending to a depth of 60 feet each below the existing grade (BEG) for the traffic signs. These borings were located at Station 586+48.52 on eastbound Butterfield Rd @ Llyod Avenue in Lombard and at station 863+05.00 on westbound Butterfield Road in Lombard.

Based upon our findings in this subsurface investigation, we believe that there are no major limiting geotechnical concerns for the traffic signs and the retaining wall.

SCOPE OF SERVICES

The purpose of this report is to describe the soil and groundwater conditions encountered in our geotechnical exploration, review and evaluate these conditions with respect to the proposed project and present our recommendations for feasible methods for foundation support and earthwork design and construction. Our scope of services for this project, as outlined in our proposal, is limited to the following elements.

1. Our scope of work was to drill two (2) soil boring extending to a depth of 60 feet below the existing grade (BEG) for the traffic signs at DMS-2 at Station 586+48.52 on Butterfield Rd @ Llyod and Station 863+05.00 and four (4) soil borings to a depth of 15.0 feet BEG, for the retaining wall at 22nd Street.

2. Laboratory testing of selected samples for index classification and strength purposes and visual/manual classification of all recovered samples.

3. Development of Geotechnical recommendations, and preparation of this report presenting our findings, evaluations, and recommendations.

FIELD EXPLORATION PROCEDURES

A total of six (6) borings were drilled out of which, two (2) soil boring extending to a depth of 60 feet below the existing grade (BEG) for the traffic signs and four (4) soils borings to a depth of 15 feet below existing grade (BEG) for the retaining wall at locations marked by the client. The drilled soil boring locations are shown on the enclosed Plates 2A, 2B & 2C (Boring Location Diagram). The client specified the number, depth and the location of the borings.

The borings were drilled with a truck mounted CME drill rig, using hollow stem augers to advance the borehole. The soil sampling was performed in accordance with the split-barrel procedure (ASTM: D 1586) with an automatic hammer, and in-situ undisturbed samples were retrieved using a split spoon sampler. The crew prepared field logs noting the drilling and sampling methods along with Standard Penetration Test values (N-values, "blows per foot"), observed groundwater levels, and preliminary soil classifications. Representative samples of the recovered soils were placed in sealed jars to reduce moisture loss before being submitted to our laboratory for examination, testing, and final classification by a Geotechnical Engineer.

If present, groundwater levels in the boreholes were measured during and after drilling. The levels of any encountered water are noted on the respective logs. The observed groundwater levels are discussed under the "Groundwater Conditions" section of this report. The drill crew backfilled the boreholes with soil cuttings after completing the groundwater measurements.

LABORATORY TESTING AND CLASSIFICATION

A Geotechnical Engineer initiated the laboratory classification program by examining each sample to determine the major and minor components, while also noting the color, degree of saturation, and lenses or seams found in the samples. The Engineer directed that selected samples be tested for moisture content and unconfined compressive strength (by hand penetrometer). The test results are shown on the respective logs in the Appendix.

The Geotechnical Engineer visually/manually classified the soils based on texture and plasticity in accordance with the Unified Soil Classification System (USCS). The capital letters in parentheses following the written soil descriptions on the boring logs are estimated group symbols based on this system. A chart describing the properties of the groups under this system is also included in the Appendix. After the classification, the Geotechnical Engineer grouped the soils by type into the strata shown on the boring logs. The stratification lines shown are approximate, *in situ*, as the transition between soil types may be abrupt or gradual in both the horizontal and vertical directions.

All samples were inspected in the laboratory to verify the field classifications. A laboratory testing program was undertaken to characterize and determine engineering properties of the subsurface soils encountered in the area of the proposed culvert. The lab testing program included Moisture Content (AASHTO T-265), Atterberg Limits (AASHTO T-89/90), and Dry Unit Weight. The laboratory tests were performed in accordance with test procedures outlined in the IDOT Geotechnical Manual, and per ASTM and AASHTO requirements. Based on the laboratory test results, the soils encountered were classified according to the AASHTO and the Illinois Division of Highways (IDH) classification systems. The results of the laboratory testing program are shown along with the field test results in the **Soil Boring Logs** and in the **Laboratory Test Results.**

Soil samples will be retained for ninety (90) days after the date of this report. Please notify us if there is a desire to have the samples retained beyond this period; otherwise, the samples will be discarded.

SITE CONDITIONS

Topography/Surface Features

At the time of our site visit, the topography of each site was observed to be relatively flat, with all elevations of the borings being provided by the client’s sub-consultant HR Green.

Soil Conditions

The soils encountered are shown on the borehole log in the Appendix of this report. The soil characteristics have been established only at the specific boring locations and under the environmental conditions at the time of our field exploration. Variations in the soil stratigraphy, compressive strength of the soil, and moisture content were encountered; and additional variations probably exist between and around the borings. The nature and extent of these variations would not become evident until exposed by construction excavation.

In general, underlying the surficial asphalt/concrete and stone fill soils, the site is predominately formed of stiff to hard lean clay, sand seams, and very stiff sandy clay. The soil profile described below is a generalized description of the conditions encountered at the boring location. The borehole log should be referred to for more specific information.

Retaining Wall at 22nd Street:

In boring RWB-1, approximately 3 inches of asphalt (AS) and 10 inches of concrete (CON) were noted at the surface followed by brown, and dark brown SANDY CLAY (A-4) to an approximate depth of 3.5 feet below BEG. Underlying the brown and dark brown SANDY CLAY (A-4), hard, brown CLAY (A-6) was encountered to an approximate depth of 8.5 feet BEG followed by very stiff to stiff, brown, and gray CLAY (A-6) to the boring termination depth of 15 feet BEG. No free groundwater was encountered during or after drilling.

23856 W. Andrew Rd., Unit 103, Plainfield, IL 60585, Phone: (630) 780-5201, Fax: (630) 429-9099

In boring RWB-2, approximately 3 inches of asphalt (AS) and 10 inches of concrete (CON) were noted at the surface followed by brown and dark brown SANDY CLAY (A-4) to an approximate depth of 3.5 feet below BEG. Underlying the brown and dark brown SANDY CLAY (A-4), hard, brown CLAY (A-6) was encountered to an approximate depth of 6.0 feet BEG followed by very stiff brown CLAY (A-6) to an approximate depth of 13.5 feet BEG. Underlying the brown and gray CLAY (A-6) very stiff, gray and brown SANDY CLAY A-4) was encountered to the boring termination depth of 15 feet BEG. No free groundwater was encountered during or after drilling.

In boring RWB-3, approximately 3 inches of asphalt (AS) and 9 inches of concrete (CON) were noted at the surface followed by brown, and dark brown SANDY CLAY (A-4) to an approximate depth of 3.5 feet below BEG. Underlying the brown and dark brown SANDY CLAY (A-4), hard, brown CLAY (A-6) was encountered to an approximate depth of 6.0 feet BEG. Underlying the brown CLAY (A-6) hard, brown, and gray CLAY (A-6) was encountered to an approximate depth of 8.5 feet BEG followed by hard to very stiff, gray CLAY (A-6) to an approximate depth of 13.5 BEG. Underlying the gray lean clay, dense crushed GRAVEL and SAND (A-1-a) was encountered to the boring termination depth of 15 feet BEG. No free groundwater was encountered during or after drilling.

In boring RWB-4, approximately 3 inches of asphalt (AS) and 9 inches of concrete (CON) were noted at the surface followed by brown, and dark brown SANDY CLAY (A-4) to an approximate depth of 3.5 feet below BEG. Underlying the brown and dark brown SANDY CLAY (A-4), very stiff, brown CLAY (A-6) was encountered to an approximate depth of 6.0 feet BEG. Underlying the brown CLAY (A-6) hard, brown and gray CLAY (A-6) was encountered to an approximate depth of 11.0 feet BEG followed by very stiff, gray CLAY (A-6) to the boring termination depth of 15 feet BEG. Crushed Gravel and Sand seam (A-1) was encountered at approximately 14 feet BEG. No free groundwater was encountered during or after drilling.

Traffic Sign DMS-2 at Butterfield Rd. @ Llyod Ave, Station 586+48.52:

In boring B-5, approximately 12 inches of crushed Gravel (A-1) was noted at the surface followed by brown SANDY CLAY (A-4) to an approximate depth of 3.5 feet below BEG. Underlying the brown SANDY CLAY (A-4), stiff to hard, dark brown CLAY (A-6) was encountered to an approximate depth of 8.5 feet BEG followed by hard, brown CLAY (A-6) to an approximate depth of 13.5 feet BEG. Underlying the brown CLAY (A-6), brownish gray SANDY CLAY (A-4) was encountered to an approximate depth of 16.0 feet BEG followed by stiff to hard, gray SILTY CLAY (A-4) to an approximate depth of 18.5 feet BEG. Underlying the gray SILTY CLAY (A-4) hard, CLAY (A-6) was encountered to an approximate depth of 21.0 feet BEG followed by brownish gray SILTY CLAY (A-4) to an approximate depth of 28.5 feet BEG. Underlying the hard, brownish gray SILTY CLAY (A-4), hard, brownish gray, SANDY CLAY (A-4) was encountered to an approximate depth of 33.5 feet BEG. Underlying the brownish gray SANDY CLAY (A-4), very stiff, gray SANDY CLAY (A-4) was encountered to an approximate depth of 43.5 feet BEG followed by very stiff, gray CLAY (A-6) to an approximate depth of 53.5 feet BEG Underlying the

23856 W. Andrew Rd., Unit 103, Plainfield, IL 60585, Phone: (630) 780-5201, Fax: (630) 429-9099

gray CLAY (A-6), hard, gray SANDY CLAY (A-4) was encountered to an approximate depth of 58.5 feet BEG followed by dense crushed GRAVEL (A-1) to the boring termination depth of 60 feet BEG. No free groundwater was encountered during or after drilling.

Traffic Sign at DMS-3, Station 863+05.00:

In boring B-6, approximately 3 inches of asphalt and concrete (AS/CON) was noted at the surface followed by brown CLAY (A-6) to an approximate depth of 3.5 feet below BEG. Underlying the brown CLAY (A-6), hard, light brown, CLAY (A-6) was encountered to an approximate depth of 6.0 feet BEG followed by hard, brown, and gray, mottled CLAY (A-6) to an approximate depth of 8.5 feet BEG. Underlying the brown and gray mottled CLAY (A-6), very stiff, brown CLAY (A-6) was encountered to an approximate depth of 11.0 feet BEG followed by hard to very stiff, dark brown CLAY (A-6) to an approximate depth of 16.0 feet BEG. Underlying the dark brown CLAY (A-6), brown CLAY (A-6) was encountered to an approximate depth of 21.0 BEG. Underlying the brown CLAY (A-6), hard, gray lean clay was encountered to an approximate depth of 26.0 BEG followed by, medium dense, gray SANDY SILT (A-4) to an approximate depth of 33.5 feet BEG. Underlying the gray SANDY SILT (A-4), loose, gray lean SILTY SAND (A-4) was encountered to an approximate depth of 38.5 feet BEG followed by stiff, brownish gray CLAY (A-6) to an approximate depth of 43.5 feet BEG. Underlying the brownish gray CLAY (A-6), very stiff, brown and tan CLAY (A-6) was encountered to an approximate depth of 53.5 feet BEG followed by very stiff, gray SANDY CLAY (A-6) to an approximate depth of 58.5 feet BEG. Underlying the gray SANDY CLAY (A-6), dense, tan SANDY CLAY (A-6) was encountered to the boring termination depth of 60 feet BEG. SAND and GRAVEL (A-1-a) seams were encountered at approximately 19.0, 22.0, and 34.0 feet BEG feet BEG. No free groundwater was encountered during or after drilling.

The stiff to hard consistency of lean clay was exhibited by calibrated pocket penetrometer resistance (PPR) values of 1.24 ton per square foot (tsf) to 5.94 tsf. Natural moisture content in lean clayey soils was tested to be ranging from 8.9 to 28.0 percent.

Groundwater Conditions

Groundwater level observations were made during and upon completion of drilling. No groundwater was encountered during or after drilling at all borings.

It should be noted that groundwater levels are subject to seasonal and long-term variations in response to climatic conditions and man-made influences. Groundwater levels particularly in less permeable cohesive soils (clay) like those found at the site occasionally, may not have had adequate time to stabilize prior to backfilling the boreholes. The hydrostatic groundwater level and any perched water levels will vary in elevation seasonally and annually depending on local amounts of precipitation, evaporation, surface-runoff, infiltration, and land use. If detailed information about the groundwater levels is required, we recommend installing piezometers or monitoring wells to permit long-term observation of the groundwater levels and the fluctuations in these levels.

Brown and gray coloration is typically an indication of a semi-permanent groundwater table. The brown and gray coloration of clay soils is indicative of oxidation whereas the gray coloration is indicative of a lack of oxidation which tends to occur below the lowest level of groundwater.

REVIEW AND RECOMMENDATIONS

Discussion

Based upon our analysis of the soil conditions, limited geotechnical laboratory analysis, and the available project information, the following recommendations were developed. If the project characteristics are changed from those assumed herein, our recommendations should be reviewed to see whether any modifications are needed. The soil conditions that were found will permit the use of this area for the proposed construction with recommended upgrading of the existing soils where needed.

Seismic Parameters

The seismic exposure for the site is analyzed per the IDOT Geotechnical Manual, IDOT Bridge Design Manual, and Specifications.

The Seismic Soil Site Class was determined per the requirements of All Geotechnical Manual Users (AGMU) Memo 9.1, Design Guide for Seismic Site Class Determination, and the "Seismic Site Class Determination" Excel spreadsheet provided by IDOT. A global Site Class Definition was determined for this project, and was found to be Soil Site Class C. The Seismic Performance Zone (SPZ) was determined using Figure 2.3.10-3 in the IDOT Bridge Manual and was found to be Seismic Performance Zone 1.

The AASHTO Seismic Design Parameters program was used to determine the peak ground acceleration coefficient (PGA), and the short (S_{DS}) and long (S_{D1}) period design spectral acceleration coefficients for each of the proposed structures. For this section of the project, the S_{DS} and the S_{D1} were determined using AASHTO Guide Specifications as shown in Table 2. Given the site location and materials encountered, the potential for liquefaction is minimal.

Seismic Parameters

Building Code Reference	PGA	SDS	SD1
AASHTO Guide for LRFD Seismic Bridge Design	0.058g	0.127g	0.069g

23856 W. Andrew Rd., Unit 103, Plainfield, IL 60585, Phone: (630) 780-5201, Fax: (630) 429-9099

Soil Parameters

The Geotechnical Engineer determined the geotechnical parameters to be used for the project design based on the results of field and laboratory test data on individual boring logs as well as our experience. Unit weights, friction angles and shear strength parameters were estimated using corrected standard penetration test (SPT) results using published correlations for N values for the fill and cohesionless soils and in-situ and laboratory test results for cohesive soils. The SPT values were corrected for hammer efficiency. The hammer efficiency correction factor considers the use of a safety hammer system, generally estimated to be 60% efficient. Thus, correlations should be based upon what is currently termed as N60 data. The efficiency of the automatic hammer used for this exploration was estimated to be approximately 100% based on previous efficiency testing of the drill rigs equipped with such equipment. The correction for hammer efficiency is a direct ratio of relative efficiencies as follows:

$$N60 = N * (91/60)$$

* Where the N value is the field recorded blow counts.

Site Preparation

Prior to any construction, soils within the proposed retaining wall foundations (if found unsuitable) should be upgraded/undercut to carry the design loads. All existing topsoil and/or any other unsuitable fill materials should be removed below the footings. Voids created in doing this should be backfilled with select compacted granular fill. All existing utilities/structures (if encountered) should also be properly removed, and trenches should be backfilled with compacted granular fill.

The exposed, naturally occurring subgrade soil should be observed and tested by a Geotechnical Engineer or an experienced Materials Technician from an engineering office to identify the unsuitable soils if present. The subgrade soil should be carefully observed, and any unsuitable or unstable materials should be removed from the pavement subgrade areas. If perched water is encountered or if rain or snowfall occurs, dewatering may be required in these areas when exposed or if subjected to any other form of water infiltration that would saturate the area.

To backfill the over-excavated areas if any under the foundation, we recommend using imported granular material meeting the gradation requirements of IDOT CA-6. Clayey soils can also be used as backfill; however, it is difficult to compact clayey soils in the narrow trenches to achieve the project specifications.

Granular fill meeting IDT CA-6 gradation requirements should be placed in 8 to 10-inch loose lifts and compacted to at least 95% of the maximum Modified Proctor dry density (ASTM: D 1557). If used, clayey materials should be placed in 6 to 8-inch loose lifts and compacted to at least 95% of the maximum Modified Proctor dry density (ASTM: D 1557) or 98% of the maximum Standard Proctor dry density (ASTM: D 698). Please refer to the notes in the report Appendix concerning placement of compacted fill soils.

As revealed by the soil borings, the **retaining wall** subgrade soil will mostly be comprised of stiff to hard, brown sandy clay. This material is considered suitable for **retaining wall foundation** construction. Due to a possible presence of utilities in the areas of wall foundation, if encountered at footing depths, some improvement of the bearing soils may be required. It is recommended that the unsuitable soils, if encountered, should be undercut to a depth of about 2 feet below the bottom of the proposed footing grade along the footing and undercut areas then should be backfilled with a load bearing fill to the desired bottom of the footing grade.

Retaining Wall Foundation:

Allowed wall types include the following:

1. Mechanically stabilized earth (MSE) walls with segmental precast concrete facing
2. Prefabricated modular block facing,
3. Cast-in-place (CIP) reinforced concrete cantilever walls, or CIP concrete gravity retaining walls.

An IDOT geotechnical engineer, or an experienced person responsible/answerable to that engineer, shall observe wall foundation excavations immediately prior to foundation construction to confirm and document that contractor removed all undesirable materials (if encountered) and that the foundations bear on satisfactory material. Backfill for retaining wall is to be constructed using conventional construction methods. For MSE type walls, provide backfill material composed of durable, non-degradable, non-compressible material.

For other wall types, provide an internal drainage material behind the wall to assure positive drainage and prevent undesirable hydrostatic pressure build-up. Compact the backfill material as required for stability by design engineer. Place the backfill for the entire height of the wall or coordinate with the wall design, as needed, to provide positive lateral drainage.

We understand that the design of the retaining wall will be completed by the Client. We have assumed that the wall design will satisfy internal stability modes and is the responsibility of the wall designer.

Care should be exercised as not to disturb the bearing materials encountered at the bottom of the excavation. The exposed foundation subgrade should be carefully observed by IDOT's geotechnical engineer's representative to verify that the new footings will be placed on suitable bearing materials. Representative hand auger borings should be performed in the excavations to verify that the materials at the foundation subgrade resemble those described on the Boring Logs.

If encountered, any unsuitable, mixed, or low bearing soils should be completely removed from

23856 W. Andrew Rd., Unit 103, Plainfield, IL 60585, Phone: (630) 780-5201, Fax: (630) 429-9099

the footing areas. The required excavation to remove the low bearing or unstable soils should be carried out covering a zone within a 1 horizontal to 1 vertical plane extended downward and outward from the outer limits of the proposed footings. Over excavated areas should be backfilled with compacted load-bearing fill as mentioned previously.

In our opinion, the proposed retaining wall structure may be supported on the conventional isolated spread/column footings after the recommended site preparation and foundation bearing materials observation has been completed. For frost protection, footings for the retaining wall should bear at least 3.5 feet below the ground surface, provided that they are supported on competent materials and will not be subjected to freezing weather during or after construction.

Based on the Load and Resistance Factored Design (LRFD) methodology, standard spread footings for the retaining wall can be proportioned for a Nominal Bearing Resistance (qn): 6700 psf with a Resistance Factor (φb) of 0.45 and Factored Bearing Resistance (qR): = 3015 psf.

We also determined that the service bearing pressure of 3000 psf to be used for the settlement to be less than 1.0 inch for this maximum exposed height of 2.25' retaining wall.

Sign Foundation Support

It is our understanding that two (2) cantilever traffic sign structures will be installed at two locations within the project limit. It is understood that all the proposed foundation designs will adhere to the requirements of the OSC-S-9 of the IDOT Sign Structure Manual. The foundation diameters range from 36 to 42 inches, and the depths range from 17 to 33.5 feet. The geotechnical criteria for use of the standard foundation details specify that the foundation shaft length and diameter should be designed based the mast arm length, cantilever length/ weight, soil composition and average strength. The criteria for the application of the standard detail states that the foundations only apply to sites which have cohesive soils along the length of the shaft with an average unconfined compressive strength (Qu) greater than 1.25 tsf. If the soils encountered during drilling the foundation excavation fail to meet the requirement of the standard details, the district geotechnical engineer should be contacted to determine if a revised foundation design will be required.

Based on the soil exploration and testing program, asphalt and crushed aggregate material was found within the upper 1 foot of soil in both borings within the frost penetration depth. The lateral resistance of the upper 3.5 feet of soils in the frost penetration zone should be neglected in design. Due to the presence of predominately high strength cohesive soils within the borings, the foundation standards should still be applied for each traffic sign location.

Many references can be found in the IDOT Sign Manual that require Dynamic Message Sign (DMS) boards to be a Type III-A span type or alternative sign structures. It is the designer's responsibility to ensure that the restrictions for the sign type are met. If the sign panel and/or sign structure type are changed in the future, the designer should provide this information to the geotechnical design lead to determine if any changes to the structure foundation will be required.

The soils information shown in boring logs should be used to verify foundations for each traffic sign (DMS 2/B-5 & DMS 3/B-6). Soils must be visually inspected at each location to match those identified in the boring logs; if different soils are encountered during construction the engineer must be notified to provide revised parameters. Both borings contain predominately cohesive material with intermittent layers of lean and sandy materials.

NASHnal Soil Testing (NST) recommends consulting with IDOT Bureau of Bridges and Structures regarding the proposed sign structures. If a special design is required, the design soil parameters for each of the traffic sign locations should reference the Boring B-5 for DMS 2 sign & Boring B-6 for DMS 3 sign structure.

Drilled shafts for the proposed traffic sign structure are normally loaded laterally by wind forces and cantilever load. The ability of the shaft to resist these loads is dependent on the size of the shaft diameter and the passive pressures that develop in the soils along the shaft. Lateral loads on the drilled shafts should be analyzed for the maximum moments and lateral deflections. Software such as L-Pile and COM624 are normally used to determine the required shaft depth to resist the lateral loads, and the actual maximum moment and the anticipated shaft deflection. If the shaft deflection is excessive or if the embedment is inadequate to provide support, the shaft embedment could be increased to help address these issues. The shaft diameter should be increased if the deflection or the maximum moment is higher than the shaft designed resistance.

CONSTRUCTION CONSIDERATIONS

All work performed for the proposed project should conform to the requirements in the IDOT Standard Specifications for Road and Bridge Construction. Any variation from the IDOT manuals requirements should be approved by the design engineer.

The Drilled Shaft (Caisson) Construction:

The drilled shaft (caisson) construction should be completed in accordance with IDOT Standard Specification for Road and Bridge Construction, drilled shaft Section 516. The temporary casing construction method should be applied where sandy, lean or granular material is present within the proposed shaft depth. The temporary casing will may be required to prevent caving or excessive deformation of the hole, especially in the areas where silt is encountered. Drilled shaft construction with the use of a temporary casing should be completed in accordance with the article 516.06 (c) in the IDOT Standard Specification for Road and Bridge Construction.

 23856 W. Andrew Rd., Unit 103, Plainfield, IL 60585, Phone: (630) 780-5201, Fax: (630) 429-9099

Temporary casing is not anticipated due to the nature of lean clay encountered at DMS 2 or DMS 3 sign foundations, however contractor is advised to carry at least 15 feet of temporary casing during construction of both sign foundations. A permanent casing covering the entire shaft length is recommended for both foundations.

It is recommended that the concrete be ready on site as the caisson excavation is completed, so that the concrete can be placed immediately after completing the excavation. This diminishes the potential of water buildup in the bottom of the shaft if encountered. Bottom cleanliness of the drilled shaft excavation should be observed from the ground surface with the use of flood light or down-hole camera. Workers should not enter the shaft to manually clean the base of the shaft due to safety reasons.

Groundwater

Based on the conditions found in the borings, groundwater is not expected during the excavation for retaining wall footing or during the soil improvement process. Any water, which enters excavations from perched groundwater seepage, surface run-off, or direct precipitation, must be promptly pumped out. Water must not be allowed to pond on the subgrade soils since it could soften and disturb them. The contractor should be prepared to handle both surface and groundwater encountered during the construction. The contractor shall plan an appropriate dewatering scheme so that all construction activities are performed in dry and stable conditions, especially to avoid potential post construction settlement in sandy materials with shallow groundwater.

Structural fill should not be placed in standing water or on wet or disturbed soils. Placing fill, asphalt, or concrete into standing water or over disturbed soil can trap softened soil under the structure and lead to excessive post-construction settlement/cracking & rutting, even if the softened zone is only a few inches thick.

Free water is not anticipated in any of the caisson foundations either. However, if encountered, free water should be removed from the caisson's bottom prior to placing any concrete. The placement method of concrete for the caisson should be based on the amount of water present at the base of the shaft just prior to placing the concrete. Concrete can be placed using the free fall method, provided less than 2 inches of water is present at the base of the shaft at the time the concrete is being placed. If more than 2 inches of water is present, a tremie should be used to displace the water to the surface for removal.

Equipment Selection/Soil Disturbance

The soil types at this site, particularly the lean clays when they are saturated or during freeze/thaw conditions, could be disturbed by construction equipment. It is the contractor's responsibility to choose equipment and work procedures, which will not unduly disturb the subgrade soils in the construction and landscaped areas. The contractor should also route construction traffic away from areas of planned pavement and slabs, to minimize soil disturbance.

If the equipment that is chosen, causes rutting or pumping of the soils, it is the contractor's responsibility to switch to other types of equipment. The responsibility to properly select construction equipment to avoid disturbing soils on the site lies solely with the contractor. A note to this effect should be included in the project specifications.

Winter Construction

If the construction of this project begins or extends into the winter, the contractors must take special precautions. Only unfrozen fill and backfill should be used, and contractors may charge extra for importing unfrozen soil or keeping stockpiles of backfill from freezing. Clay soils will be especially difficult to work with under cold wet and/or freezing conditions. Placement of fill and/or asphalt/concrete must not be permitted on frozen soil, and the bearing soils or subgrade should not be allowed to freeze after the concrete is placed. All footing excavations should be protected from freezing conditions and maintained free of ponded water before asphalt/concrete placement. The footings should be cast as soon as possible after excavation is prepared and backfilled as soon as possible after the concrete has attained its strength.

Construction Safety

All excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P "Excavations and Trenches." This document states that excavation safety is solely the responsibility of the contractor; the determination of SAFE slopes for excavation and trenches is to be made by the contractor's "competent person." Reference to this OSHA requirement should be included in the job specifications. The temporary excavation slopes greater than 5 feet in depth should conform to OSHA regulations. In general, such slopes should not be steeper than 1.5 horizontal to 1 vertical (OSHA Soil Type C), unless shoring is used.

The responsibility to provide safe working conditions on this site for earthwork, construction, or any associated operations, is not borne in any manner by NASHnal Soil Testing, LLC.

Field Observation and Testing

Proper observation and testing during the construction phase of this project is an integral part of our recommendations. On-site observation during site preparation, fill placement, compaction, and footing construction, should be done by qualified personnel from IDOT/ IDOT representative or **OUR** office. Exposed soils in excavations for backfill should be tested by means of hand auguring, and with a Dynamic Cone Penetrometer (DCP) in sandy soils or a Static Cone Penetrometer (SCP) in clayey soils. Soils from the bottom of caisson should be inspected and tested by IDOT approved methods on site such as by using RiMac.

Proposed fill materials should be submitted to an IDOT approved lab for Proctor compaction tests, and tests to check compliance with our recommendations and project specifications. A representative number of field density tests should be taken in compacted fill to aid in judging its suitability. The building materials should be tested in accordance with the project specifications. We would be pleased to provide the testing services for this project.

GENERAL QUALIFICATIONS

This report has been prepared based on the soil and groundwater conditions found in our borings and on the design data that you have related to us. This report is intended solely for this project at the specific locations identified in the Introduction and Scope of Services. If there are any changes in size, scope, elevation, structural loads, location, use or nature of the structure from those discussed in the introduction of this report, or if our understanding of the project is incorrect or incomplete, we should be given the opportunity to review or modify our recommendations. If changes are made in the design and we are not given the opportunity to review these changes relative to our recommendations and to respond in writing, or we are not provided the opportunity to confirm the soil conditions are as expressed in this report during the construction of this project, our recommendations will not be considered valid. No specific efforts were performed to determine the thickness of the topsoil layer, the topsoil thickness given in our logs is an estimate. If the true thickness of topsoil is required, we recommend that numerous detailed hand augur probes be performed throughout this parcel.

For this geotechnical exploration, we drilled six (6) soil borings the specified areas. Variations in the subsurface conditions may be found during construction, and it is probable that additional variations exist on the site that cannot be determined from our boring or the site reconnaissance. These variations, which could include greater or shallower depths of unsuitable soils than found at our borings, would not become apparent until the excavation is started. No warranty, express or implied, is presented in this report with respect to the soil and groundwater conditions on this site.

23856 W. Andrew Rd., Unit 103, Plainfield, IL 60585, Phone: (630) 780-5201, Fax: (630) 429-9099

STANDARD OF CARE

The recommendations and opinions contained in this report are based on our interpretation of the subsurface conditions and represent our professional judgment. These judgments were determined in accordance with currently accepted engineering practices at this time and location, by professionals working under similar time and budget constraints. No other warranty is implied or intended.

Prepared by:

Umar T. Ahmad, PE
Registered Professional Engineer, Illinois
Registration # 062-055148 - Expires 11/30/2023

UMAR T. AHMAD
062-055148
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

23856 W. Andrew Rd., Unit 103, Plainfield, IL 60585, Phone: (630) 780-5201, Fax: (630) 429-9099

APPENDIX

SITE LOCATION DIAGRAM (Plate No. 1)

BORING LOCATION DIAGRAMS (Plates No. 2A, 2B & 2C)

BORING LOGS (Plate No. 3 to 10)

ATTERBERG LIMITS

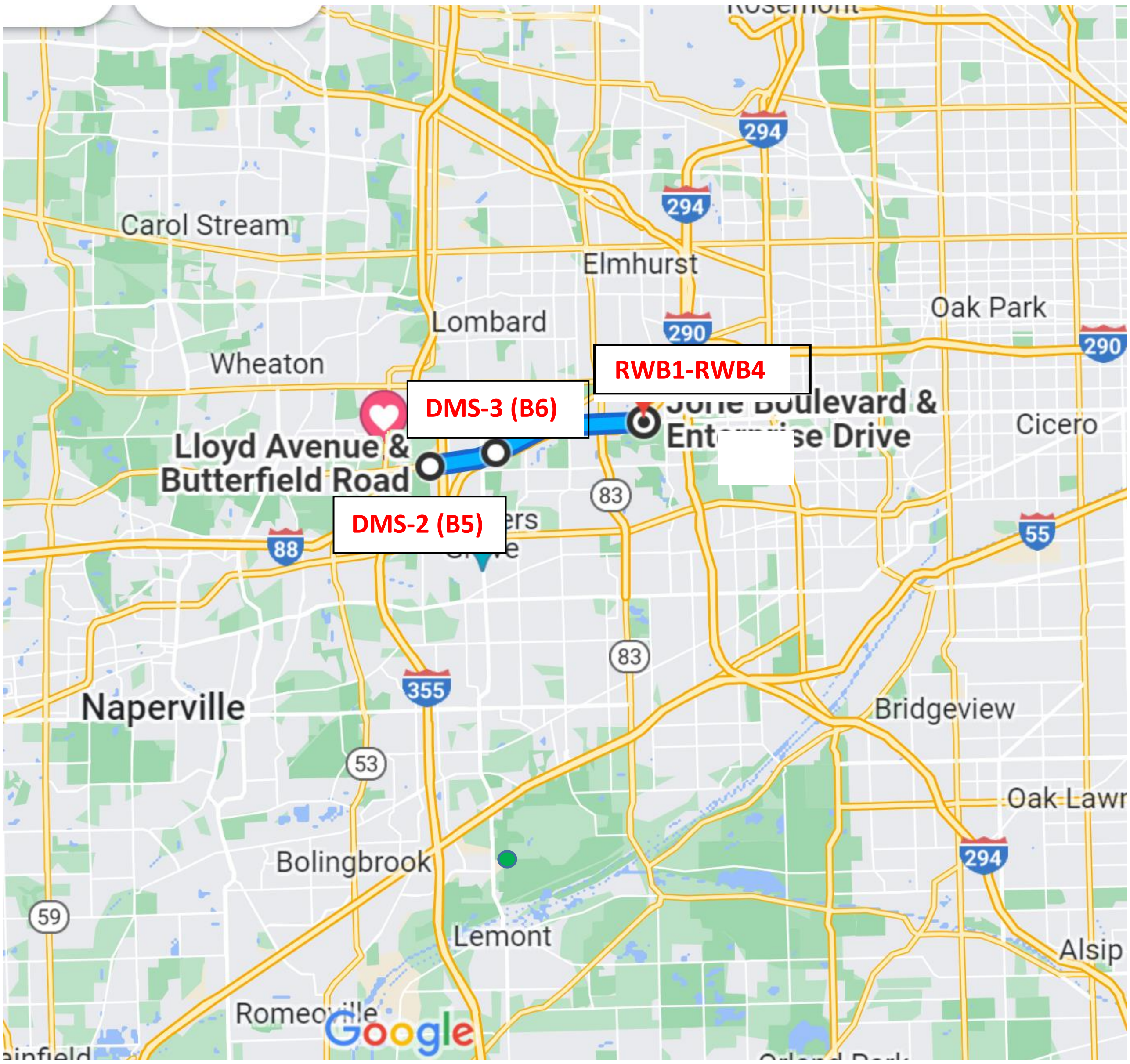
UNCONFINED COMPRESSIVE STREGTH (LAB DATA)

KEY TO TEST DATA

CLASSIFICATION OF SOILS

NOTES ON PLACEMENT OF COMPACTED FILL

23856 W. Andrew Rd., Unit 103, Plainfield, IL 60585, Phone: (630) 780-5201, Fax: (630) 429-9099



2022-1269-01G

Plate No. 1

PTB 199 Item 16 (D-91-078-21)
Smart Corridor Implementation Plan to IL 56
From IL 59 to IL-50 (Cicero Ave.)
Site Location Diagram

BORING LOCATION - PLATE 2A

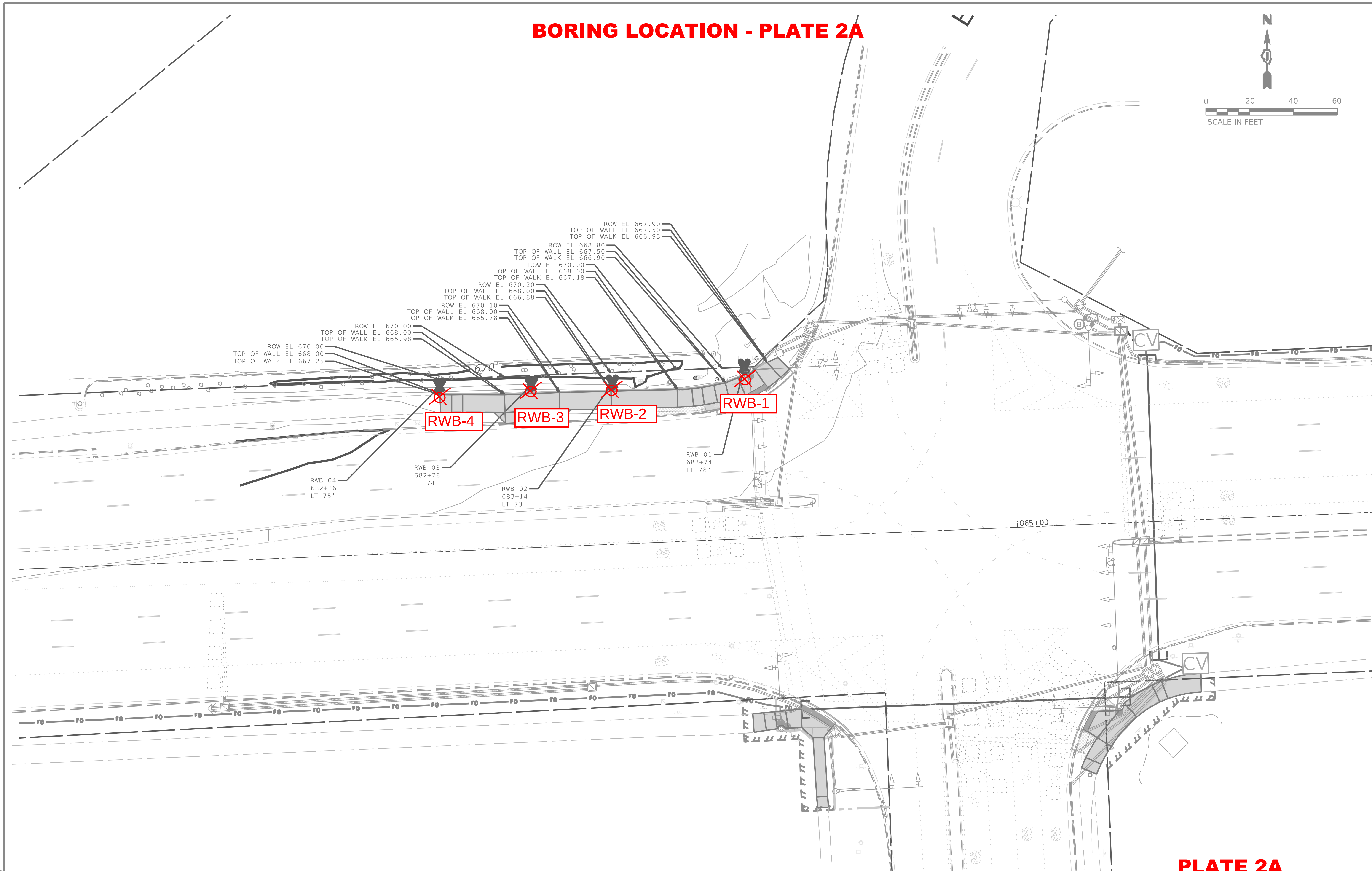


PLATE 2A

MODEL: $MODELNAME$
FILE NAME: $FILEL$

AMES Engineering, Inc. CONSULTING ENGINEERS 6330 Belmont Road, Unit 4B Downers Grove, IL 60516	USER NAME = $USER$	DESIGNED - JAR	REVISED -
		DRAWN - MD	REVISED -
	PLOT SCALE = $SCALE$	CHECKED - AS	REVISED -
	PLOT DATE = $DATE$	DATE - 9-26-2022	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

DMS 4 SITE PLAN
IL 56 /BUTTERFIELD ROAD /22ND ST.

SCALE: 1"=20' | SHEET 1 OF 1 SHEETS | STA. | TO STA.

F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
3545	2020-265-SUR, SW & TS	DUPAGE/COOK		
		CONTRACT NO. 62N32		
	ILLINOIS	FED. AID PROJECT		

Long Section Number

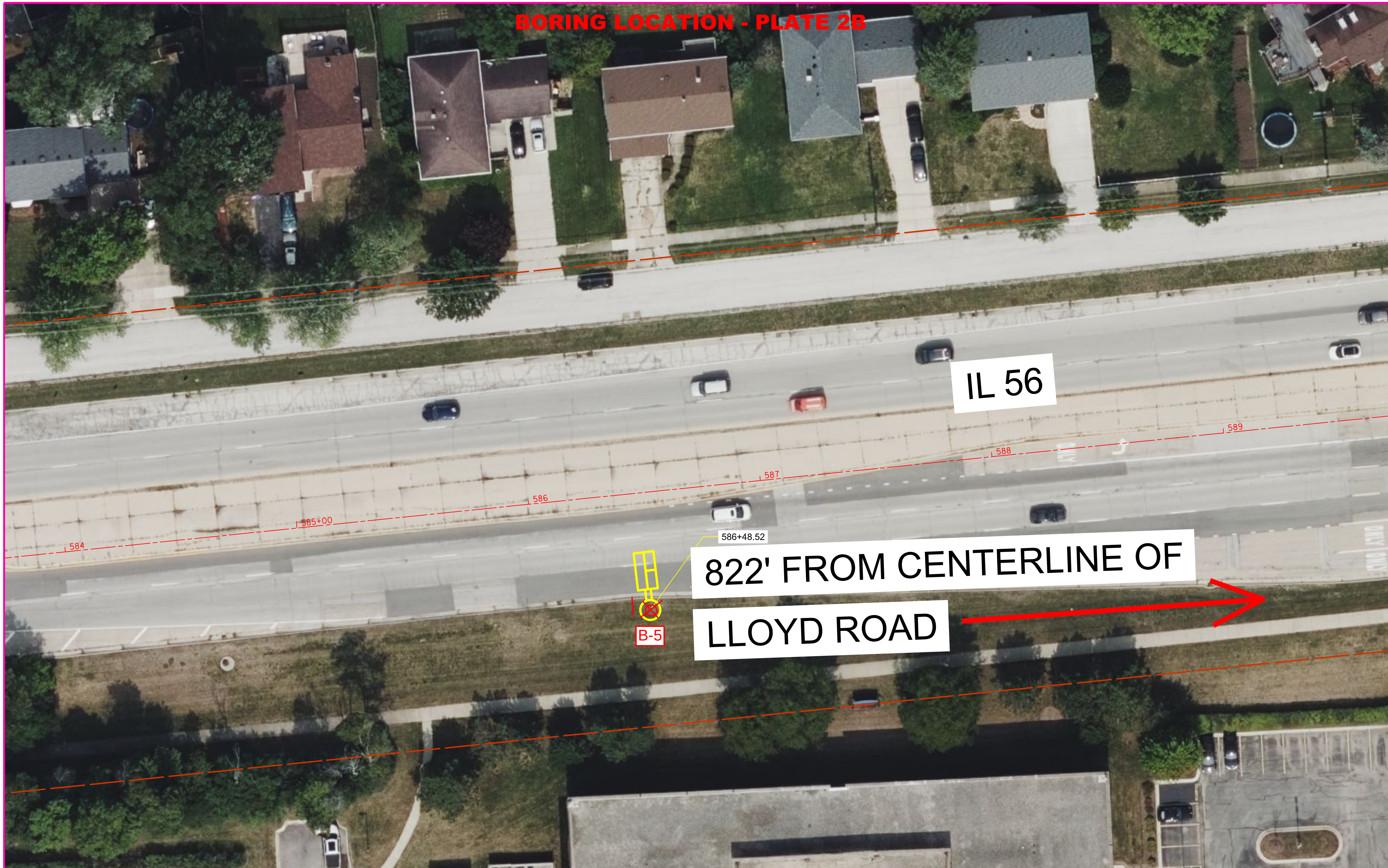


PLATE 2B

USER NAME = $USER$		DESIGNED - ______	REVISED - ______
		DRAWN - ______	REVISED - ______
PLOT SCALE = $SCALE$		CHECKED - ______	REVISED - ______
PLOT DATE = $DATE$		DATE - ______	REVISED - ______

MODEL: $MODELNAME$
FILE NAME: $FILEL$

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL 56 FROM IL 59 TO IL 50
DMS LOCATION 2

SCALE: SCALE | SHEET 0 OF 1 SHEETS | STA. ______ TO STA. ______

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
ROUTE	SECTION	COUNTY	1	1
		CONTRACT NO. CNT. NO.		
	ILLINOIS	FED. AID PROJECT		

Long Section Number

BORING LOCATION - PLATE 2C

MODEL: $MODELNAME$
FILE NAME: $FILEL$

USER NAME = $USER$	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
	DRAWN -	REVISED -	
PLOT SCALE = $SCALE$	CHECKED -	REVISED -	
PLOT DATE = $DATE$	DATE -	REVISED -	

IL 56 FROM IL 59 TO IL 50
DMS LOCATION 3

SCALE: | SHEET OF 1 SHEETS | STA. | TO STA.

F.A.### RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	Section			DMS 3
		CONTRACT NO.		
	ILLINOIS	FED. AID PROJECT		

Long Section Number

NST NASHnal SOIL TESTING

23856 W. Andrew Rd., Unit 103, Plainfield,

BOREHOLE LOG

Number **RWB-1**

Plate #3

Client	Ames Engineering, Inc.
Location	22nd Street, STA 683+74, LT 78'
Job Number	2022-1264-01G (D-91-078-21)
Drill Rig Type	CME
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2
Boring Elevation (ft)	667.876 **Date:** 9/13/2022

Sample #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Sample Depth	Graphic	Soil Description	Elevation (ft)
						0.5		AS	**3" Asphalt**	667.38
						1.0		CONC	**10" Concrete**	666.88
						1.5			**Brown and Dark Brown Sandy Clay (A-4)**	666.38
1	SS	N/A	2	9.4	10,10,8	2.0			Trace Gravel	665.88
						2.5		A-4		665.38
						3.0				664.88
						3.5				664.38
						4.0			**Brown Clay (A-6)**	663.88
2	SS	5.86	14	19.2	3,6,9	4.5			with Sand, trace Gravel, Hard	663.38
						5.0			**Unit Weight 110.2 pcf**	662.88
						5.5				662.38
						6.0		A-6		661.88
						6.5				661.38
3	SS	5.36	24	20.1	3,8,8	7.0				660.88
						7.5				660.38
						8.0				659.88
						8.5				659.38
						9.0			**Brown and Gray Lean Clay (A-6)**	658.88
4	SS	3.13	20	19.1	3,5,7	9.5			Trace Sand and Gravel, Very Stiff	658.38
						10.0			**Unit Weight 110.0 pcf**	657.88
						10.5				657.38
						11.0				656.88
						11.5				656.38
5	SS	1.65	24	21.2	3,4,6	12.0		A-6	**Unit Weight 103.3 pcf**	655.88
						12.5			Stiff	655.38
						13.0				654.88
						13.5				654.38
						14.0				653.88
6	SS	1.81	18	18.2	4,4,7	14.5				653.38
						15.0			**Unit Weight 107.0 pcf**	652.88

End of Boring 15'

Water Level While Drilling : Dry

Water Level After Drilling : Dry

Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification. Plasticity index and liquid limit were estimated using ASTM D2488 due to insufficient material availability

NST NASHnal SOIL TESTING

23856 W. Andrew Rd., Unit 103, Plainfield,

BOREHOLE LOG

Number **RWB-2**

Plate #4

Client	Ames Engineering, Inc.
Location	22nd Street, STA 683+14, LT 73'
Job Number	2022-1264-01G (D-91-078-21)
Drill Rig Type	CME
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2
Boring Elevation (ft)	669.633 **Date:** 9/13/2022

Sample #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Sample Depth	Graphic	Soil Description	Elevation (ft)
						0.5		AS	**3" Asphalt**	669.13
						1.0		CONC	**10" Concrete**	668.63
						1.5		A-4	**Brown and Dark Brown Sandy Clay (A-4)**	668.13
1	SS	N/A	8	19.5	9,10,4	2.0			**Unit Weight 111.8 pcf**	667.63
						2.5				667.13
						3.0				666.63
						3.5				666.13
						4.0		A-6	**Brown Lean Clay (A-6)**	665.63
2	SS	4.49	18	19	4,7,9	4.5			Trace Sand and Gravel, Hard	665.13
						5.0			**Unit Weight 113.9 pcf**	664.63
						5.5				664.13
						6.0				663.63
						6.5		A-6	**Brown and Gray Lean Clay (A-6)**	663.13
3	SS	5.57	24	19.1	5,7,10	7.0			Trace Sand and Gravel, Hard	662.63
						7.5			**Unit Weight 101.6pcf**	662.13
						8.0				661.63
						8.5				661.13
						9.0			Very Stiff	660.63
4	SS	3.42	18	19.7	4,5,6	9.5			**Unit Weight 112.4 pcf**	660.13
						10.0				659.63
						10.5				659.13
						11.0				658.63
						11.5			Very Stiff	658.13
5	SS	2.89	24	20.9	2,4,6	12.0			**Unit Weight 107.0 pcf**	657.63
						12.5				657.13
						13.0				656.63
						13.5				656.13
6	SS	2.89	18	13.7	3,8,8	14.0		A-4	**Gray and Brown Sandy Clay (A-4)**	655.63
						14.5			Very Stiff	655.13
						15.0			**Unit Weight 114.3 pcf**	654.63

End of Boring 15'

Water Level While Drilling : Dry

Water Level After Drilling : Dry

Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification. Plasticity index and liquid limit were estimated using ASTM D2488 due to insufficient material availability

NST NASHnal SOIL TESTING

23856 W. Andrew Rd., Unit 103, Plainfield,

BOREHOLE LOG

Number RWB-3

Plate #5

Client	Ames Engineering, Inc.
Location	22nd Street, STA 682+78, LT 74'
Job Number	2022-1264-01G (D-91-078-21)
Drill Rig Type	CME
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2
Boring Elevation (ft)	668.597 **Date:** 9/13/2022

Sample #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Sample Depth	Graphic	Soil Description	Elevation (ft)
						0.5		AS	**3" Asphalt**	668.10
						1.0		CONC	**9" Concrete**	667.60
						1.5			**Brown and Dark Brown Sandy Clay (A-4)**	667.10
1	SS	N/A	2	9.5	9,6,7	2.0			Trace Gravel	666.60
						2.5		A-4		666.10
						3.0				665.60
						3.5				665.10
						4.0			**Brown Lean Clay With Gray Streaks (A-6)**	664.60
2	SS	3.71	12	19.8	3,2,3	4.5			Trace Sand and Gravel, Hard	664.10
						5.0		A-6	**Unit Weight 104.5 pcf**	663.60
						5.5				663.10
						6.0				662.60
						6.5			**Brown and Gray Lean Clay (A-6)**	662.10
3	SS	4.95	24	18.1	5,8,10	7.0			Trace Sand and Gravel, Hard	661.60
						7.5		A-6	**Unit Weight 113.3 pcf**	661.10
						8.0				660.60
						8.5				660.10
						9.0			**Gray Lean Clay (A-6)**	659.60
4	SS	4.54	24	20.2	3,5,6	9.5			Trace Sand and Gravel, Hard	659.10
						10.0			**Unit Weight 105.5 pcf**	658.60
						10.5				658.10
						11.0		A-6		657.60
						11.5			**Unit Weight 107.9 pcf**	657.10
5	SS	3.26	20	20.9	4,4,6	12.0			Very Stiff	656.60
						12.5				656.10
						13.0				655.60
						13.5				655.10
						14.0			**Crushed Gravel and Sand (A-1-a)**	654.60
6	SS	N/A	0	11.9	15,17,18	14.5		A-1-a		654.10
						15.0				653.60

End of Boring 15'
Water Level While Drilling : Dry
Water Level After Drilling : Dry
Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification. Plasticity index and liquid limit were estimated using ASTM D2488 due to insufficient material availability

NST NASHnal SOIL TESTING

23856 W. Andrew Rd., Unit 103, Plainfield,

BOREHOLE LOG

Number	RWB-4
Plate #6	

Client	Ames Engineering, Inc.
Location	22nd Street, STA 682+36, LT 75'
Job Number	2022-1264-01G (D-91-078-21)
Drill Rig Type	CME
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2
Boring Elevation (ft)	668.719 **Date:** 9/13/2022

Sample #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Sample Depth	Graphic	Soil Description	Elevation (ft)
						0.5		AS	**3" Asphalt**	668.22
						1.0		CONC	**9" Concrete**	667.72
						1.5		A-4	**Brown and Dark Brown Sandy Clay (A-4)**	667.22
1	SS	N/A	2	9.7	9,9,4	2.0			Trace Gravel	666.72
						2.5				666.22
						3.0				665.72
						3.5				665.22
						4.0		A-6	**Brown Lean Clay (A-6)**	664.72
2	SS	2.68	18	21.6	3,4,5	4.5			Trace Sand and Gravel, Very Stiff	664.22
						5.0			**Unit Weight 106.1 pcf**	663.72
						5.5				663.22
						6.0				662.72
						6.5		A-6	**Brown and Gray Lean Clay (A-6)**	662.22
3	SS	3.71	24	20.3	3,6,8	7.0			Trace Sand and Gravel,Hard	661.72
						7.5			**Unit Weight 104.6 pcf**	661.22
						8.0				660.72
						8.5				660.22
						9.0			**Unit Weight 111.9 pcf**	659.72
4	SS	4.33	14	19.4	3,4,7	9.5				659.22
						10.0				658.72
						10.5				658.22
						11.0				657.72
						11.5		A-6	**Gray Lean Clay (A-6)**	657.22
5	SS	2.27	20	20.9	3,4,4	12.0			Very Stiff	656.72
						12.5			**Unit Weight 103.3 pcf**	656.22
						13.0				655.72
						13.5				655.22
						14.0			**Crushed Gravel and Sand Seam (A-1)**	654.72
6	SS	2.47	14	21.6	3,6,20	14.5			Very Stiff	654.22
						15.0				653.72

End of Boring 15'

Water Level While Drilling : Dry

Water Level After Drilling : Dry

Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification. Plasticity index and liquid limit were estimated using ASTM D2488 due to insufficient material availability

NASHnal SOIL TESTING

23856 W. Andrew Rd., Unit 103, Plainfield

BOREHOLE LOG

Number **B-5**

Plate #7

Client	Ames Engineering, Inc.
Location	DMS 2, Butterfield Rd.@ Llyod, STA 586+48.52 RT 40'
Job Number	2022-1264-01G (D-91-078-21)
Drill Rig Type	CME
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2 - No Offset
Boring Elevation (ft)	749.838 **Date:** 9/9/2022

Sample # /RUN #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)/%	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Sample Depth	Graphic	Soil Description	Elevation (ft)
						0.5		A-1	**Crushed Gravel (A-1)**	749.34
						1.0				748.84
						1.5			**Brown Sandy Clay (A-4)**	748.34
1	SS	N/A	2	14.7	5,4,3	2.0			Trace Sand and Gravel	747.84
						2.5		A-4		747.34
						3.0				746.84
						3.5				746.34
						4.0			**Dark Brown Lean Clay (A-6)**	745.84
2	SS	1.69	20	16.7	3,3,4	4.5			Trace Sand and Gravel, Stiff	745.34
						5.0				744.84
						5.5				744.34
						6.0		A-6		743.84
						6.5			Hard	743.34
3	SS	5.94	12	13.1	5,11,12	7.0			**Unit Weight 141.9 pcf**	742.84
						7.5				742.34
						8.0				741.84
						8.5				741.34
						9.0			**Brown Lean Clay (A-6)**	740.84
4	SS	4.54	24	18.0	4,6,10	9.5			Trace Sand and Gravel, Hard	740.34
						10.0			**Unit Weight 128.5 pcf**	739.84
						10.5				739.34
						11.0		A-6		738.84
						11.5				738.34
5	SS	N/A	6	19.1	4,6,7	12.0				737.84
						12.5				737.34
						13.0				736.84
						13.5				736.34
						14.0			**Brownish Gray Sandy Clay (A-4)**	735.84
6	SS	N/A	6	28.0	5,5,8	14.5			Trace Gravel	735.34
						15.0		A-4		734.84
						15.5				734.34
						16.0				733.84
						16.5			**Gray Silty Clay (A-4)**	733.34
7	SS	1.48	10	13.4	3,5,12	17.0			With Gravel, Stiff	732.84
						17.5		A-4	**Unit Weight 147.1 pcf**	732.34
						18.0				731.84
						18.5				731.34
						19.0			**Gray Lean Clay (A-6)**	730.84
8	SS	4.99	10	15.5	3,6,9	19.5			With Gravel, Hard, Pushed Rock	730.34
						20.0		A-6	**Unit Weight 145.1 pcf**	729.84
						20.5				729.34
						21.0				728.84
						21.5			**Brownish Gray Silty Clay (A-4)**	728.34
9	SS	N/A	6	17.2	4,7,10	22.0			With Gravel	727.84
						22.5				727.34
						23.0				726.84
						23.5				726.34
						24.0				725.84
10	SS	1.69	12	10.2	4,5,4	24.5			With Gravel, Stiff	725.34
						25.0		A-4		724.84
						25.5				724.34
						26.0				723.84
						26.5				723.34
11	SS	1.20	14	11.1	4,7,7	27.0			Trace Gravel, Stiff	722.84
						27.5				722.34
						28.0				721.84
						28.5				721.34
						29.0			**Brownish Gray Sandy Clay (A-4)**	720.84
12	SS	4.82	10	11.8	4,7,8	29.5		A-4	Trace Gravel, Hard	720.34
						30.0			**Unit Weight 147.6 pcf**	719.84

End of Boring 60'

Water Level While Drilling : Dry

Water Level After Drilling : Dry

Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification, plasticity index and liquid limit (wherever material was available) using ASTM D2488 & D4318

NASHnal SOIL TESTING

23856 W. Andrew Rd., Unit 103, Plainfield

BOREHOLE LOG

Number B-5

Plate #8

Client	Ames Engineering, Inc.
Location	DMS 2, Butterfield Rd.@ Llyod, STA 586+48.52, RT 40'
Job Number	2022-1264-01G (D-91-078-21)
Drill Rig Type	CME
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2 - No Offset
Boring Elevation (ft)	749.838 **Date:** 9/9/2022

Sample # /RUN #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)%	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Sample Depth	Graphic	Soil Description	Elevation (ft)
						30.5			**Brownish Gray Sandy Clay (A-4)**	719.34
						31.0				718.84
						31.5				718.34
						32.0		A-4		717.84
						32.5				717.34
						33.0				716.84
						33.5				716.34
						34.0			**Gray Sandy Clay (A-4)**	715.84
13	SS	2.14	14	18.9	4,5,6	34.5			Trace Gravel, Very Stiff	715.34
						35.0			Unit Weight 140.1 pcf	714.84
						35.5				714.34
						36.0				713.84
						36.5				713.34
						37.0				712.84
						37.5				712.34
						38.0				711.84
						38.5		A-4		711.34
						39.0			18.00	710.84
14	SS	N/A	14	20.1	7,9,11	39.5				710.34
						40.0				709.84
						40.5				709.34
						41.0				708.84
						41.5				708.34
						42.0				707.84
						42.5				707.34
						43.0				706.84
						43.5				706.34
						44.0			**Gray Lean Clay (A-6)**	705.84
15	SS	N/A	8	9.5	42,27,17	44.5			Trace Sand, with Gravel	705.34
						45.0				704.84
						45.5				704.34
						46.0				703.84
						46.5				703.34
						47.0				702.84
						47.5				702.34
						48.0				701.84
						48.5		A-6		701.34
						49.0			Very Stiff	700.84
16	SS	2.68	10	14	10,14,11	49.5			**Unit Weight 147.5 pcf**	700.34
						50.0				699.84
						50.5				699.34
						51.0				698.84
						51.5				698.34
						52.0				697.84
						52.5				697.34
						53.0				696.84
						53.5				696.34
						54.0			**Gray Sandy Clay (A-4)**	695.84
17	SS	4.74	14	18.7	3,13,18	54.5			Trace Gravel, Hard	695.34
						55.0			**Unit Weight 139.9 pcf**	694.84
						55.5				694.34
						56.0		A-4		693.84
						56.5				693.34
						57.0				692.84
						57.5				692.34
						58.0				691.84
						58.5				691.34
						59.0			**Crushed Gravel (A-1)**	690.84
18	SS	N/A	6	11.8	7,12,22	59.5		A-1	Dense	690.34
						60.0				689.84

End of Boring 60'

Water Level While Drilling : Dry

Water Level After Drilling : Dry

Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification, plasticity index and liquid limit (wherever material was available) using ASTM D2488 & D4318

BOREHOLE LOG

NST NASHnal SOIL TESTING

23856 W. Andrew Rd., Unit 103, Plainfield

Number	B-6
	Plate #9
Client	Ames Engineering, Inc.
Location	DMS-3 STA. 627+94.82, LT 30'
Job Number	2022-1264-01G (D-91-078-21)
Drill Rig Type	CME
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2 (25' Offset S. from Survey Point)
Boring Elevation (ft)	735.795
Date:	9/7/2022

Sample # /RUN #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)/%	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Sample Depth	Graphic	Soil Description	Elevation (ft)
						0.5		AS/CONC	**3" of Asphalt, 7" of Aggregate (AS/CON)**	735.30
						1.0				734.80
						1.5		A-6	**Brown Lean Clay (A-6)**	734.30
1	SS	N/A	14	11.8	6,4,6	2.0			With Sand, trace Gravel	733.80
						2.5			**Unit Weight 123.8 pcf**	733.30
						3.0				732.80
						3.5				732.30
						4.0		A-6	**Light Brown Lean Clay (A-6)**	731.80
2	SS	3.50	12	15.8	3,7,8	4.5			With Sand, trace Gravel, Hard	731.30
						5.0			**Unit Weight 114.4 pcf**	730.80
						5.5				730.30
						6.0				729.80
						6.5		A-6	**Brown & Gray Mottled Lean Clay (A-6)**	729.30
3	SS	4.74	12	14.7	3,7,8	7.0			With Sand, trace Gravel, Hard	728.80
						7.5			**Unit Weight 119.3 pcf**	728.30
						8.0				727.80
						8.5				727.30
						9.0		A-6	**Brown Lean Clay (A-6)**	726.80
4	SS	2.89	18	15.3	4,8,9	9.5			With Sand and Gravel, Very Stiff	726.30
						10.0			**Unit Weight 110.9 pcf**	725.80
						10.5				725.30
						11.0				724.80
						11.5		A-6	**Dark Brown Lean Clay (A-6)**	724.30
5	SS	5.98	14	14.1	8,9,13	12.0			Trace Sand and Gravel, Hard	723.80
						12.5			**Unit Weight 125.2 pcf**	723.30
						13.0				722.80
						13.5				722.30
						14.0				721.80
6	SS	3.92	12	15.5	5,8,10	14.5			Very Stiff	721.30
						15.0			**Unit Weight 121.5 pcf**	720.80
						15.5				720.30
						16.0				719.80
						16.5		A-6	**Brown Lean Clay (A-6)**	719.30
7	SS	N/A	10	15.3	4,6,8	17.0			Top 4" Sand & Gravel Seam	718.80
						17.5			**Unit Weight 124.0 pcf**	718.30
						18.0				717.80
						18.5				717.30
						19.0			**Sand and Gravel (A-1-a) seam at the top**	716.80
8	SS	N/A	6	12.3	4,6,9	19.5			**Unit Weight 127.1 pcf**	716.30
						20.0				715.80
						20.5				715.30
						21.0				714.80
						21.5		A-6	**Gray Lean Clay (A-6)**	714.30
9	SS	5.77	12	13.6	5,8,11	22.0			Top 2" **Sand & Gravel (A-1-a)** Seam	713.80
						22.5			With Gravel, Hard	713.30
						23.0			**Unit Weight 130.7 pcf**	712.80
						23.5				712.30
						24.0			Hard	711.80
10	SS	4.95	12	16.5	4,8,11	24.5			**Unit Weight 117.3 pcf**	711.30
						25.0				710.80
						25.5				710.30
						26.0				709.80
						26.5		A-4	**Gray Sandy Silt (A-4)**	709.30
11	SS	N/A	14	19.3	10,11,13	27.0			Medium Dense	708.80
						27.5			**Unit Weight 122.4 pcf**	708.30
						28.0				707.80
						28.5				707.30
						29.0			With Gravel	706.80
12	SS	N/A	14	17.7	8,11,12	29.5				706.30
						30.0				705.80

End of Boring 60'

Water Level While Drilling : Dry

Water Level After Drilling : Dry

Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification, plasticity index and liquid limit wherever material was available using ASTM D2488 & D4318

NASHnal SOIL TESTING
23856 W. Andrew Rd., Unit 103, Plainfield

BOREHOLE LOG

Number **B-6**

Plate #10

Client	Ames Engineering, Inc.
Location	DMS-3 STA. 627+94.82 LT 30'
Job Number	2022-1264-01G (D-91-078-21)
Drill Rig Type	CME
Sampler Type	Split Spoon (SS)
Boring Location	See Plate 2 (25' Offset S. from Survey Point)
Boring Elevation (ft)	735.795 **Date:** 9/7/2022

Sample # /RUN #	Sampling Method	Rimac Qu (tsf)	Sample Recovery (in)/%	Moisture Content (%)	SPT Values (Blows/6 in)	Depth (ft)	Sample Depth	Graphic	Soil Description	Elevation (ft)
						30.5			**Gray Sandy Silt (A-4)**	705.30
						31.0				704.80
						31.5				704.30
						32.0		A-4		703.80
						32.5				703.30
						33.0				702.80
						33.5				702.30
						34.0			**Gray Silty Sand (A-4)**	701.80
13	SS	N/A	6	19.5	8,10,11	34.5			**Sand and Gravel (A-1-a)** Seam, Medium Dense	701.30
						35.0				700.80
						35.5				700.30
						36.0		A-4		699.80
						36.5				699.30
						37.0				698.80
						37.5				698.30
						38.0				697.80
						38.5				697.30
						39.0			**Brownish Gray Lean Clay (A-6)**	696.80
14	SS	1.24	18	11.4	3,3,9	39.5			Trace Sand and Gravel, Stiff	696.30
						40.0			**Unit Weight 138.8 pcf**	695.80
						40.5				695.30
						41.0		A-6		694.80
						41.5				694.30
						42.0				693.80
						42.5				693.30
						43.0				692.80
						43.5				692.30
						44.0			**Brown and Tan Lean Clay (A-6)**	691.80
15	SS	2.89	8	8.9	11,47,31	44.5			Trace Sand and Gravel, Very Stiff	691.30
						45.0			**Possible cobble in front of the split spoon.**	690.80
						45.5				690.30
						46.0				689.80
						46.5				689.30
						47.0				688.80
						47.5				688.30
						48.0				687.80
						48.5		A-6		687.30
						49.0			Very Stiff,	686.80
16	SS	1.65	24	16.3	4,3,7	49.5			**Unit Weight 129.0 pcf**	686.30
						50.0				685.80
						50.5				685.30
						51.0				684.80
						51.5				684.30
						52.0				683.80
						52.5				683.30
						53.0				682.80
						53.5				682.30
						54.0			**Gray Sandy Clay (A-6)**	681.80
17	SS	2.68	10	12.5	9,7,15	54.5			Trace Gravel, Very Stiff	681.30
						55.0			**Unit Weight 127.4 pcf**	680.80
						55.5				680.30
						56.0		A-6		679.80
						56.5				679.30
						57.0				678.80
						57.5				678.30
						58.0				677.80
						58.5				677.30
						59.0			**Tan Sandy Clay (A-4)**	676.80
18	SS	N/A	6	15.2	12,15,16	59.5		A-6	With Gravel	676.30
						60.0				675.80

End of Boring 60'
Water Level While Drilling : Dry
Water Level After Drilling : Dry
Cave In Depth : None

Note: Soil group symbol and group name are determined based on visual classification, plasticity index and liquid limit wherever material was available using ASTM D2488 & D4318

ATTERBERG LIMITS (ASTM D 4318)

Date Tested: 10/27/2022

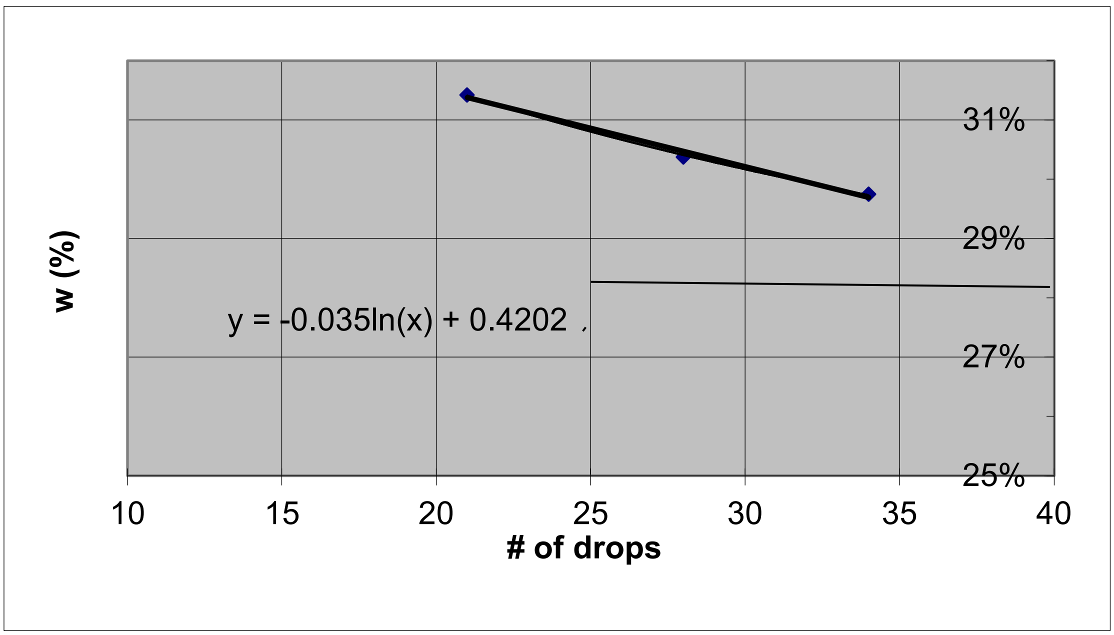
Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)

Description of Soil: Brown Lean Clay (CL)

Boring No. B-1

Sample No. S2 & S3 (3.5-7.5')

# of drops =	21	28	34	
container No.	P17A	P11A	P223	
container Wt	11.126	11.294	11.247	g
container + wet sample =	22.887	22.136	23.629	g
container + dry sample =	20.075	19.610	20.790	g
dry sample (Mdry) =	8.95	8.32	9.54	g
Water content (w) =	31.4%	30.4%	29.7%	%



LL = 30.8%

container No.	P20A	P115
container Wt	11.283	11.229
container + wet sample =	20.597	20.603
container + dry sample =	19.253	19.295
dry sample (Mdry) =	7.97	8.07
Water content (w) =	16.9%	16.2%

Average

PL = 16.5%

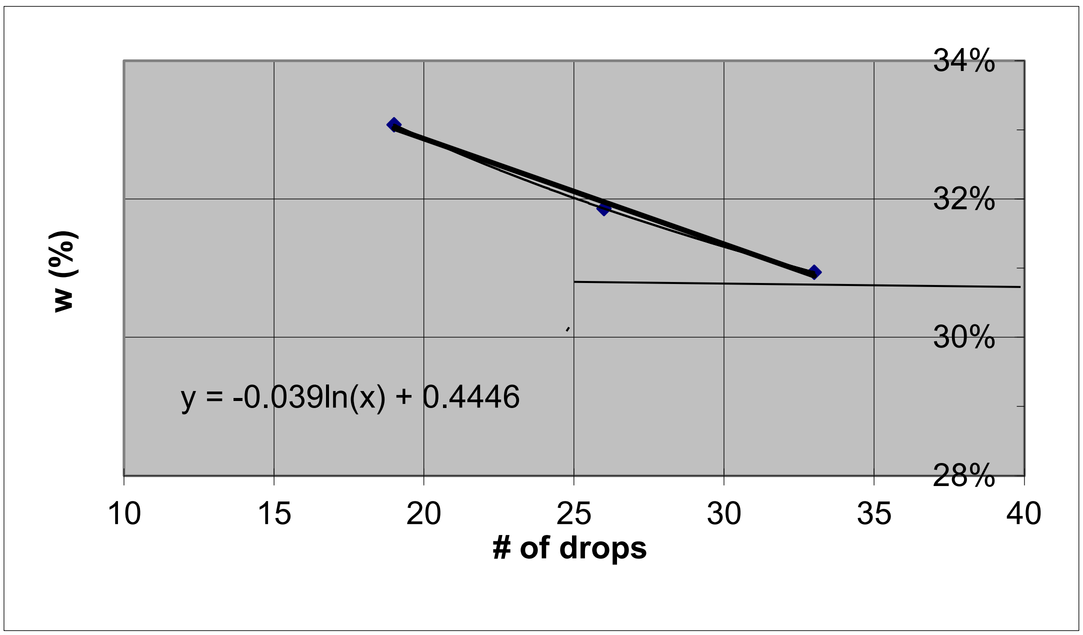
PI = LL - PL = 14.3%

ATTERBERG LIMITS (ASTM D 4318)

Date Tested: 10/27/2022

Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)
Description of Soil: Brown Lean Clay (CL)
Boring No. B2
Sample No. S 5 & 6 (13.5-15')

# of drops =	19	26	33	
container No.	P17A	P11A	P223	
container Wt	11.378	10.928	11.312	g
container + wet sample =	22.370	22.040	22.565	g
container + dry sample =	19.638	19.355	19.906	g
dry sample (Mdry) =	8.26	8.43	8.59	g
Water content (w) =	33.1%	31.9%	30.9%	%



LL = 32.0%

container No.	P20A	P115
container Wt	11.293	11.148
container + wet sample =	20.457	19.906
container + dry sample =	19.213	18.673
dry sample (Mdry) =	7.92	7.53
Water content (w) =	15.7%	16.4%

Average
PL = 16.0%

PI = LL - PL = 16.0%

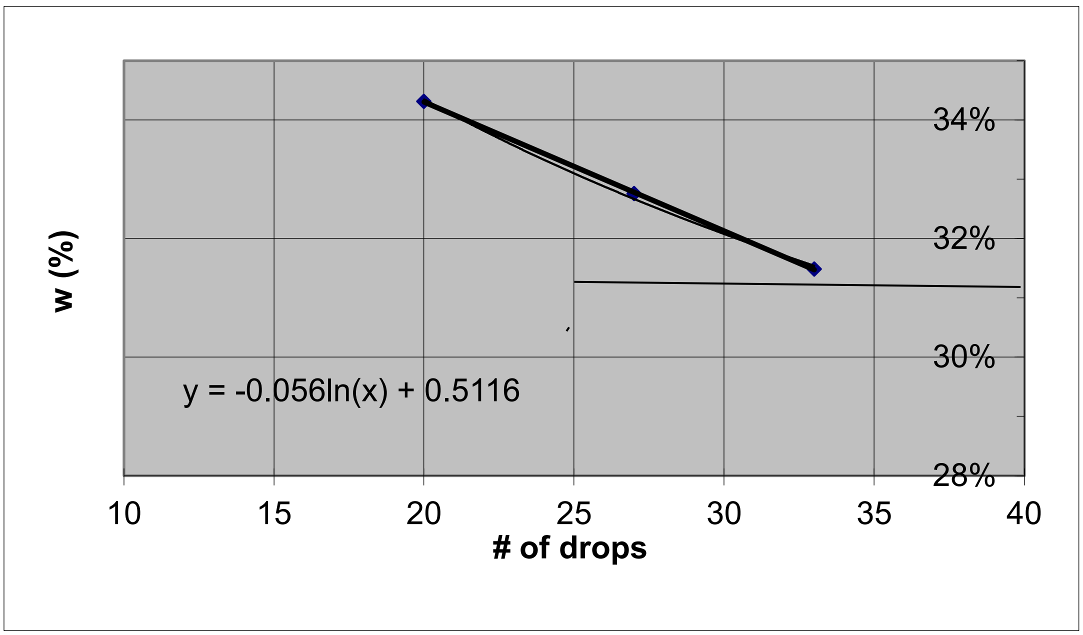
ATTERBERG LIMITS (ASTM D 4318)

NASHnal SOIL TESTING

Date Tested: 10/27/2022

Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)
Description of Soil: Gray Lean Clay (CL)
Boring No. B3
Sample No. S5 (11.0-12.5')

# of drops =	20	27	33	
container No.	P17A	P11A	P223	
container Wt	12.364	11.220	11.153	g
container + wet sample =	22.796	23.568	22.291	g
container + dry sample =	20.131	20.521	19.624	g
dry sample (Mdry) =	7.77	9.30	8.47	g
Water content (w) =	34.3%	32.8%	31.5%	%



LL = 33.0%

container No.	P20A	P115
container Wt	11.355	11.334
container + wet sample =	20.031	20.177
container + dry sample =	18.854	18.948
dry sample (Mdry) =	7.50	7.61
Water content (w) =	15.7%	16.1%

Average
PL = 15.9%

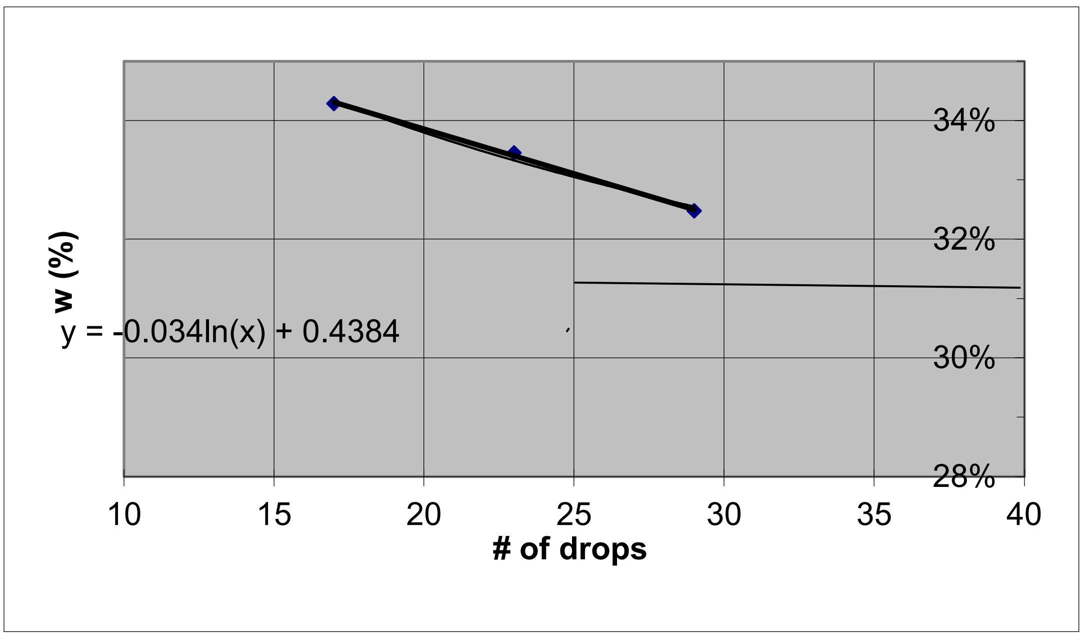
PI = LL - PL = 17.1%

ATTERBERG LIMITS (ASTM D 4318)

Date Tested: 10/27/2022

Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)
Description of Soil: Brown and Gray Lean Clay (CL)
Boring No. B4
Sample No. S3 (6-7.5')

# of drops =	17	23	29	
container No.	P17A	P11A	P223	
container Wt	11.092	11.131	11.222	g
container + wet sample =	21.436	21.399	20.971	g
container + dry sample =	18.795	18.825	18.581	g
dry sample (Mdry) =	7.70	7.69	7.36	g
Water content (w) =	34.3%	33.5%	32.5%	%



LL = 33.0%

container No.	P20A	P115
container Wt	11.511	11.323
container + wet sample =	20.168	20.021
container + dry sample =	18.905	18.715
dry sample (Mdry) =	7.39	7.39
Water content (w) =	17.1%	17.7%

Average
PL = 17.4%

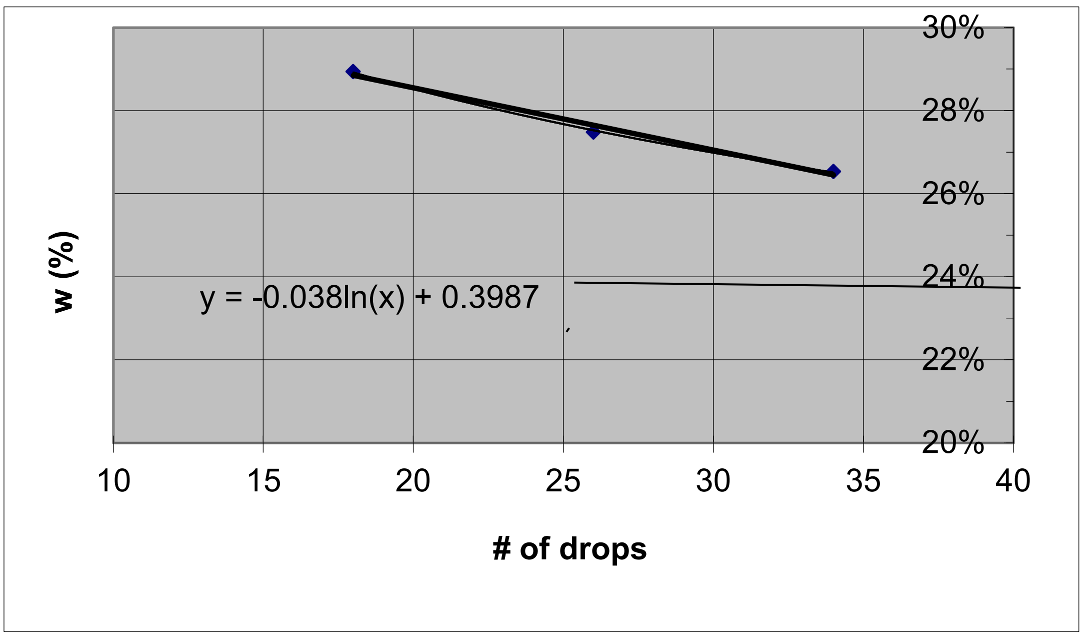
PI = LL - PL = 15.6%

Butterfield Rd. at Llyod-B5
ATTERBERG LIMITS (ASTM D 4318)

Date Tested: 10/21/2022

Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)
Description of Soil: Brown Lean Clay (CL)
Boring No. B5
Sample No. S3 & S4 (6.0-10')

# of drops =	18	26	34	
container No.	P17A	P11A	P223	
container Wt	11.111	11.002	11.278	g
container + wet sample =	25.899	25.920	21.907	g
container + dry sample =	22.580	22.704	19.678	g
dry sample (Mdry) =	11.47	11.70	8.40	g
Water content (w) =	28.9%	27.5%	26.5%	%



LL = 27.7%

container No.	P20A	P115
container Wt	11.281	10.944
container + wet sample =	20.187	19.786
container + dry sample =	19.055	18.670
dry sample (Mdry) =	7.77	7.73
Water content (w) =	14.6%	14.4%

Average
PL = 14.5%

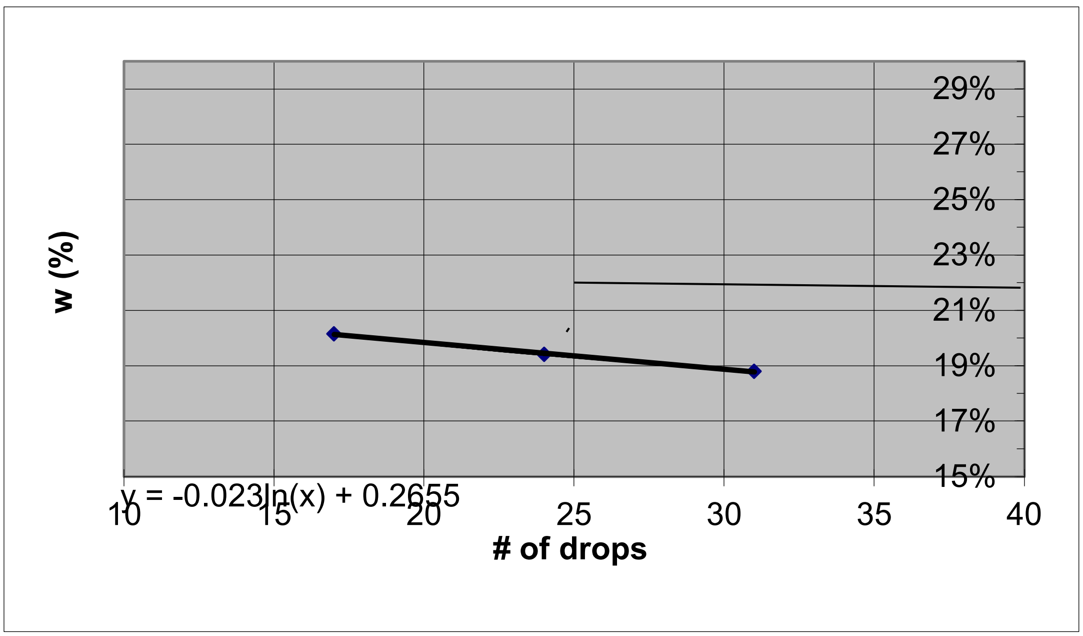
PI = LL - PL = 13.2%

Butterfield Rd. at Llyod-B5
ATTERBERG LIMITS (ASTM D 4318)

Date Tested: 10/21/2022

Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)
Description of Soil: Gray Silty Clay (CL-ML)
Boring No. B-5
Sample Non. S7 (16.0-17.5')

# of drops =	17	24	31	
container No.	P17A	P11A	P223	
container Wt	11.230	11.143	11.214	g
container + wet sample =	24.369	24.406	27.936	g
container + dry sample =	22.165	22.250	25.290	g
dry sample (Mdry) =	10.94	11.11	14.08	g
Water content (w) =	20.2%	19.4%	18.8%	%



LL = 19.3%

container No.	P20A	P115
container Wt	11.048	11.393
container + wet sample =	19.658	20.719
container + dry sample =	18.751	19.734
dry sample (Mdry) =	7.70	8.34
Water content (w) =	11.8%	11.8%

Average
PL = 11.8%

PI = LL - PL = 7.5%

Butterfield Rd. at Llyod-B5
ATTERBERG LIMITS (ASTM D 4318)

Date Tested: 10/21/2022

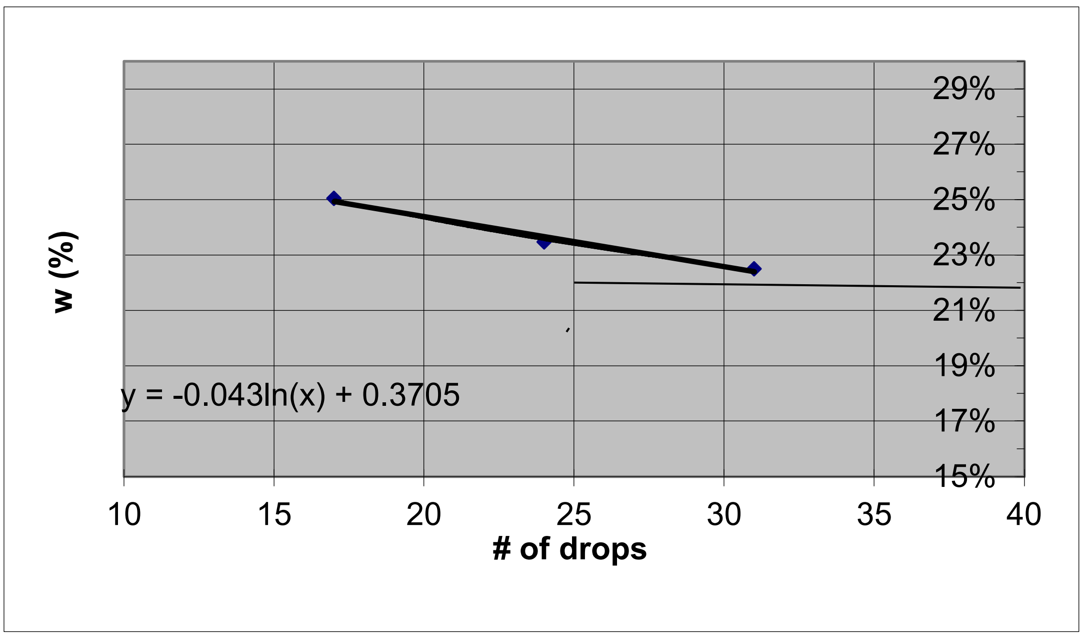
Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)

Description of Soil: Gray Lean Clay (CL)

Boring No. B5

Sample No. S8 (18.5-20.0')

# of drops =	17	24	31	
container No.	P23	P16	P56	
container Wt	11.538	11.525	11.374	g
container + wet sample =	26.758	26.073	25.514	g
container + dry sample =	23.710	23.308	22.917	g
dry sample (Mdry) =	12.17	11.78	11.54	g
Water content (w) =	25.0%	23.5%	22.5%	%



LL = 23.4%

container No.	P20A	P115
container Wt	11.344	11.242
container + wet sample =	20.814	20.073
container + dry sample =	19.767	19.051
dry sample (Mdry) =	8.42	7.81
Water content (w) =	12.4%	13.1%

Average

PL = 12.8%

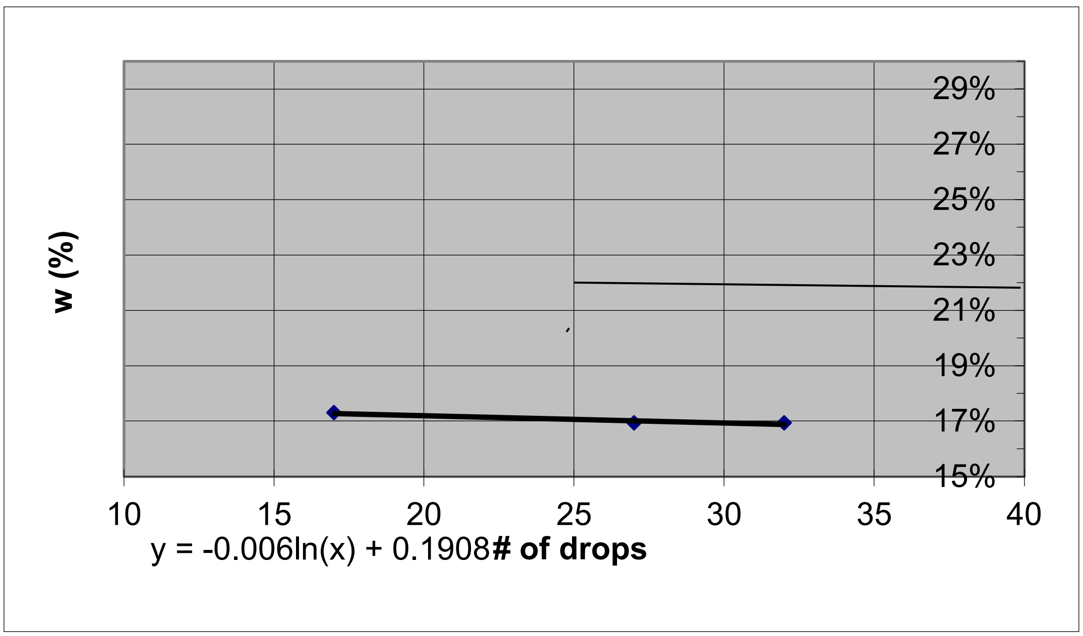
PI = LL - PL = 10.7%

Butterfield Rd. at Llyod-B5
ATTERBERG LIMITS (ASTM D 4318)

Date Tested: 10/21/2022

Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)
Description of Soil: Brownish Gray Silty Clay (CL-ML)
Boring No. B5
Sample No. S9-S11(21.0-27.5')

# of drops =	17	27	32	
container No.	P227	P12	P40	
container Wt	11.124	11.309	11.155	g
container + wet sample =	23.825	26.557	27.495	g
container + dry sample =	21.951	24.349	25.128	g
dry sample (Mdry) =	10.83	13.04	13.97	g
Water content (w) =	17.3%	16.9%	16.9%	%



LL = 17.0%

container No.	P20A	P115
container Wt	12.375	11.346
container + wet sample =	22.212	21.997
container + dry sample =	21.118	20.813
dry sample (Mdry) =	8.74	9.47
Water content (w) =	12.5%	12.5%

Average
PL = 12.5%

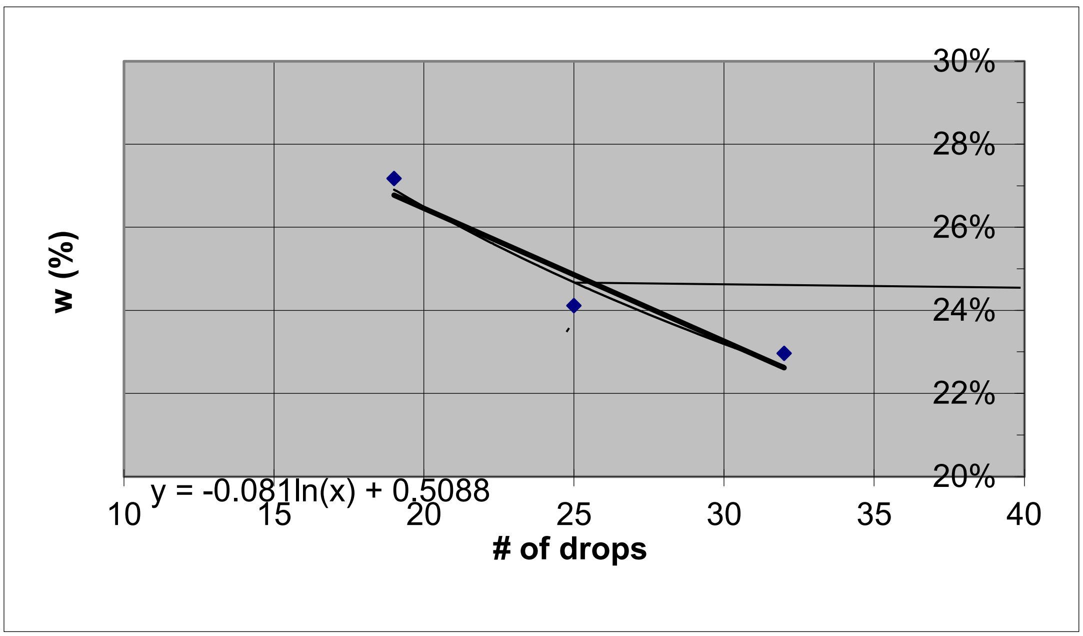
PI = LL - PL = 4.5%

ATTERBERG LIMITS (ASTM D 4318)

Date Tested: 10/20/2022

Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)
Description of Soil: Brown Lean Clay (CL)
Boring No. B6
Sample No. S1 (1-2.5')

# of drops =	19	25	32	
container No.	P17A	P11A	P223	
container Wt	11.179	11.195	11.142	g
container + wet sample =	25.415	22.103	22.115	g
container + dry sample =	22.373	19.984	20.066	g
dry sample (Mdry) =	11.19	8.79	8.92	g
Water content (w) =	27.2%	24.1%	23.0%	%



LL = 24.7%

container No.	P20A	P115
container Wt	11.202	11.297
container + wet sample =	19.451	21.066
container + dry sample =	18.470	19.924
dry sample (Mdry) =	7.27	8.63
Water content (w) =	13.5%	13.2%

Average
PL = 13.4%

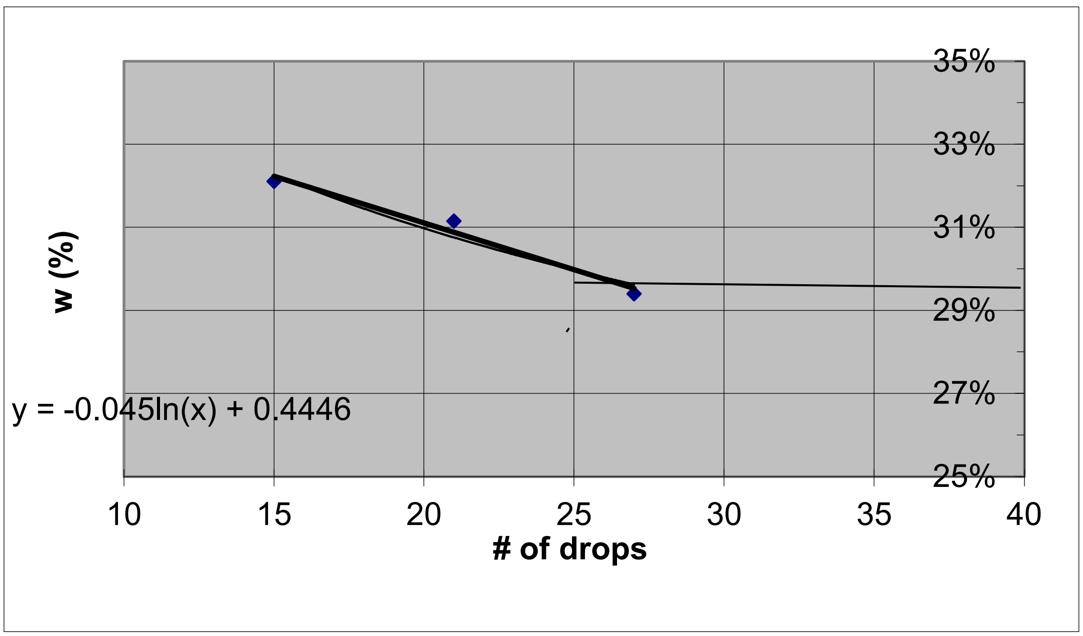
PI = LL - PL = 11.3%

ATTERBERG LIMITS (ASTM D 4318)

Date Tested: 10/20/2022

Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)
Description of Soil: Light Brown Lean Clay (CL)
Boring No. B6
Sample No. S2 (3.5-5.0')

# of drops =	15	21	27	
container No.	P17A	P11A	P223	
container Wt	10.914	11.292	11.201	g
container + wet sample =	22.572	23.360	23.186	g
container + dry sample =	19.739	20.494	20.463	g
dry sample (Mdry) =	8.83	9.20	9.26	g
Water content (w) =	32.1%	31.1%	29.4%	%



LL = 30.1%

container No.	P20A	P115
container Wt	11.195	11.250
container + wet sample =	22.590	20.566
container + dry sample =	21.090	19.330
dry sample (Mdry) =	9.90	8.08
Water content (w) =	15.2%	15.3%

Average
PL = 15.2%

PI = LL - PL = 14.9%

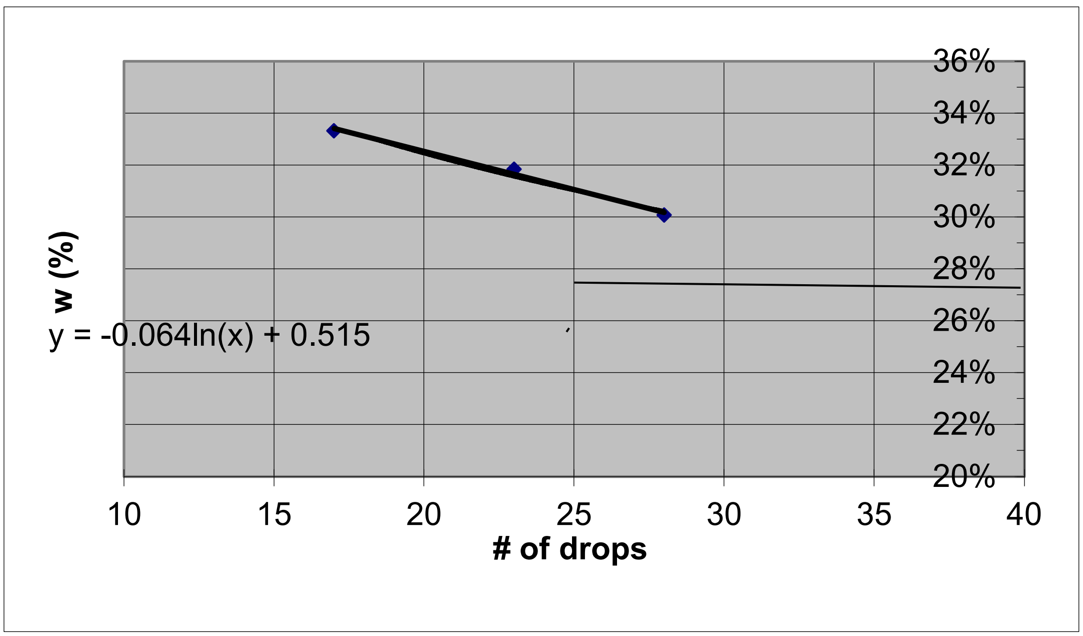
ATTERBERG LIMITS (ASTM D 4318)

NASHnal SOIL TESTING

Date Tested: 10/20/2022

Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)
Description of Soil: Brown and Gray Lean Clay (CL)
Boring No. B6
Sample No. S3 (6.0-7.5')

# of drops =	17	23	28	
container No.	P17A	P11A	P223	
container Wt	11.443	11.224	10.928	g
container + wet sample =	22.802	22.634	24.608	g
container + dry sample =	19.963	19.879	21.445	g
dry sample (Mdry) =	8.52	8.66	10.52	g
Water content (w) =	33.3%	31.8%	30.1%	%



LL = 31.3%

container No.	P20A	P115
container Wt	11.240	11.021
container + wet sample =	20.990	19.392
container + dry sample =	19.112	18.783
dry sample (Mdry) =	7.87	7.76
Water content (w) =	23.9%	7.8%

Average PL = 15.9%

PI = LL - PL = 15.4%

ATTERBERG LIMITS (ASTM D 4318)

Date Tested: 10/20/2022

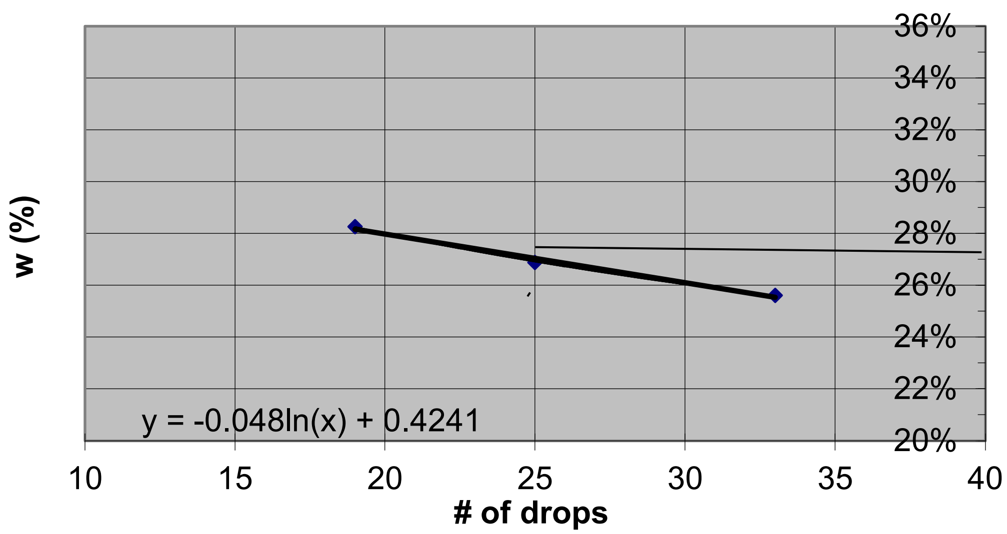
Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)

Description of Soil: Brown Lean Clay (CL)

Boring No. B6

Sample No. S4 (8.5-10.0')

# of drops =	19	25	33	
container No.	P17A	P11A	P223	
container Wt	11.021	11.266	11.226	g
container + wet sample =	24.129	23.827	23.310	g
container + dry sample =	21.241	21.166	20.847	g
dry sample (Mdry) =	10.22	9.90	9.62	g
Water content (w) =	28.3%	26.9%	25.6%	%



LL = 26.9%

container No.	P20A	P115
container Wt	11.149	11.283
container + wet sample =	20.616	20.020
container + dry sample =	19.463	18.913
dry sample (Mdry) =	8.31	7.63
Water content (w) =	13.9%	14.5%

Average

PL = 14.2%

PI = LL - PL = 12.7%

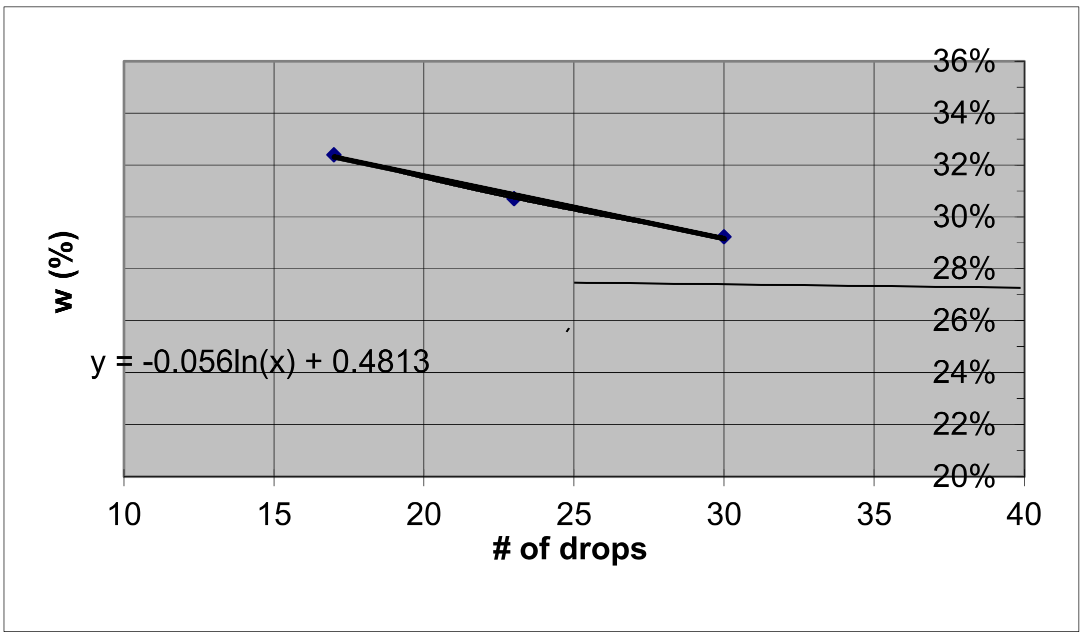
ATTERBERG LIMITS (ASTM D 4318)

NST NASHnal SOIL TESTING

Date Tested: 10/20/2022

Project: PTB 199, Item 6-Smart Corridor Implementation Plan to IL 56 from IL 59 to IL 50 (Cicero Ave.)
Description of Soil: Dark Brown Lean Clay (CL)
Boring No. B6
Sample No. S5 & S6 (11.0-15.0')

# of drops =	17	23	30	
container No.	P17A	P11A	P223	
container Wt	11.210	11.015	11.132	g
container + wet sample =	23.169	24.923	26.090	g
container + dry sample =	20.243	21.656	22.706	g
dry sample (Mdry) =	9.03	10.64	11.57	g
Water content (w) =	32.4%	30.7%	29.2%	%



LL = 30.4%

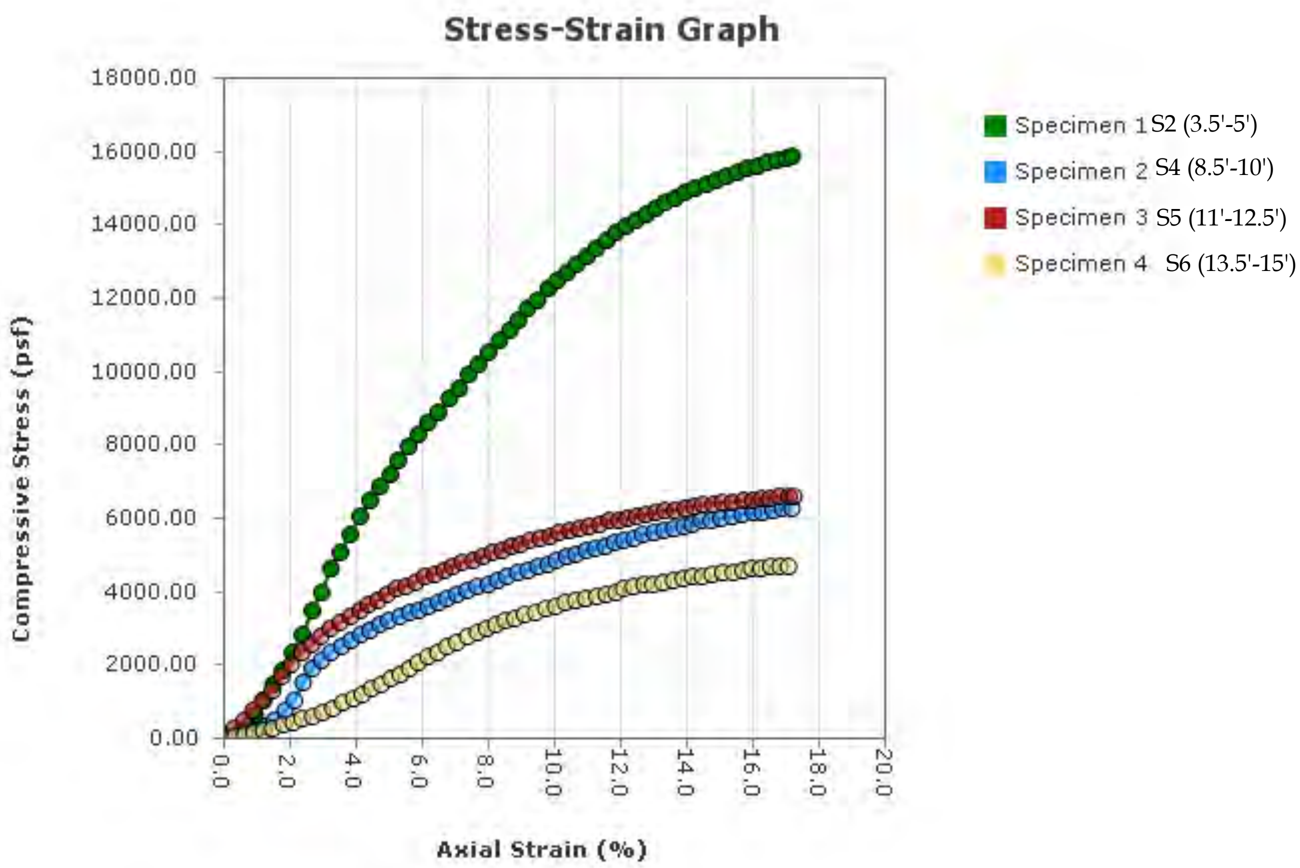
container No.	P20A	P115
container Wt	11.380	10.930
container + wet sample =	20.901	19.269
container + dry sample =	19.608	18.127
dry sample (Mdry) =	8.23	7.20
Water content (w) =	15.7%	15.9%

Average PL = 15.8%

PI = LL - PL = 14.6%

Unconfined Compression Test

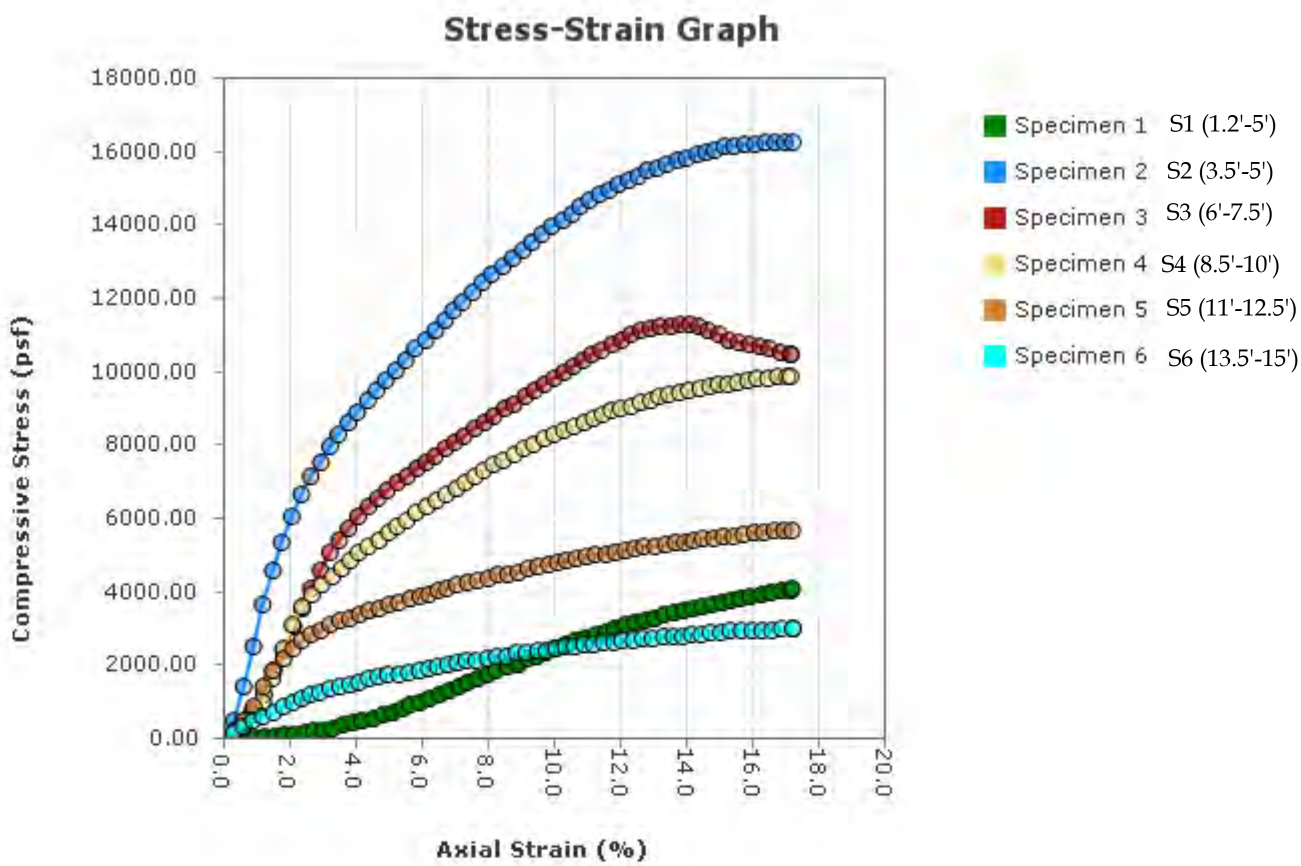
Unconfined



Project:	PTB-199-16
Project Number:	2022-1269-01T
Received Date:	9/13/2022
Sampling Date:	9/13/2022
Sample Number:	RWB-1
Sample Depth:	1-15 ft
Boring Number:	B-1, Samples 2, 4, 5 & 6
Location:	22ND Street
Client Name:	IDOT
Remarks:	

Unconfined Compression Test

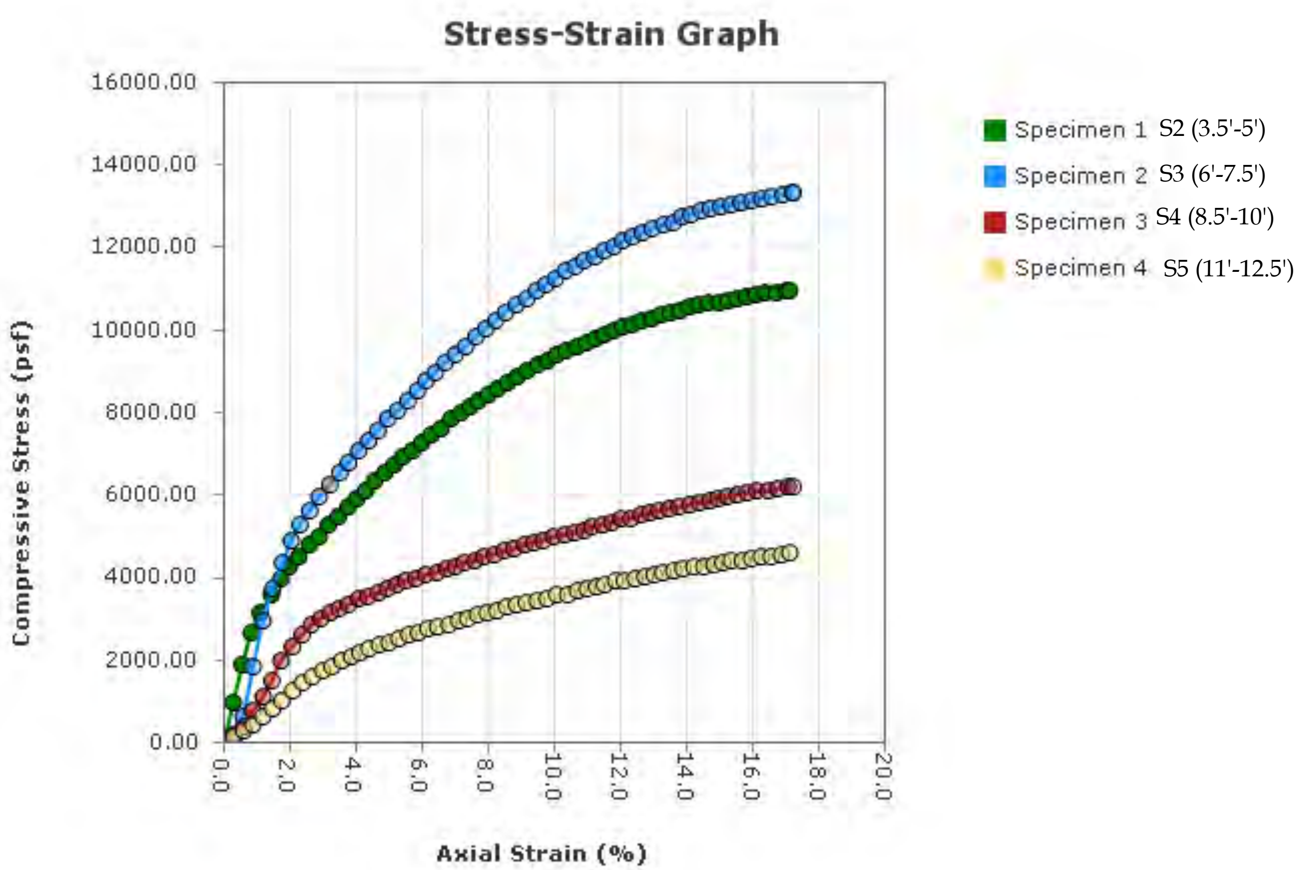
Unconfined



Project:	PTB-199-16
Project Number:	2022-1269-01T
Received Date:	9/13/2022
Sampling Date:	9/13/2022
Sample Number:	RWB-2
Sample Depth:	1-15 ft
Boring Number:	B-2 , Samples 1, 2, 3, 4, 5 & 6
Location:	22ND Street
Client Name:	IDOT
Remarks:	

Unconfined Compression Test

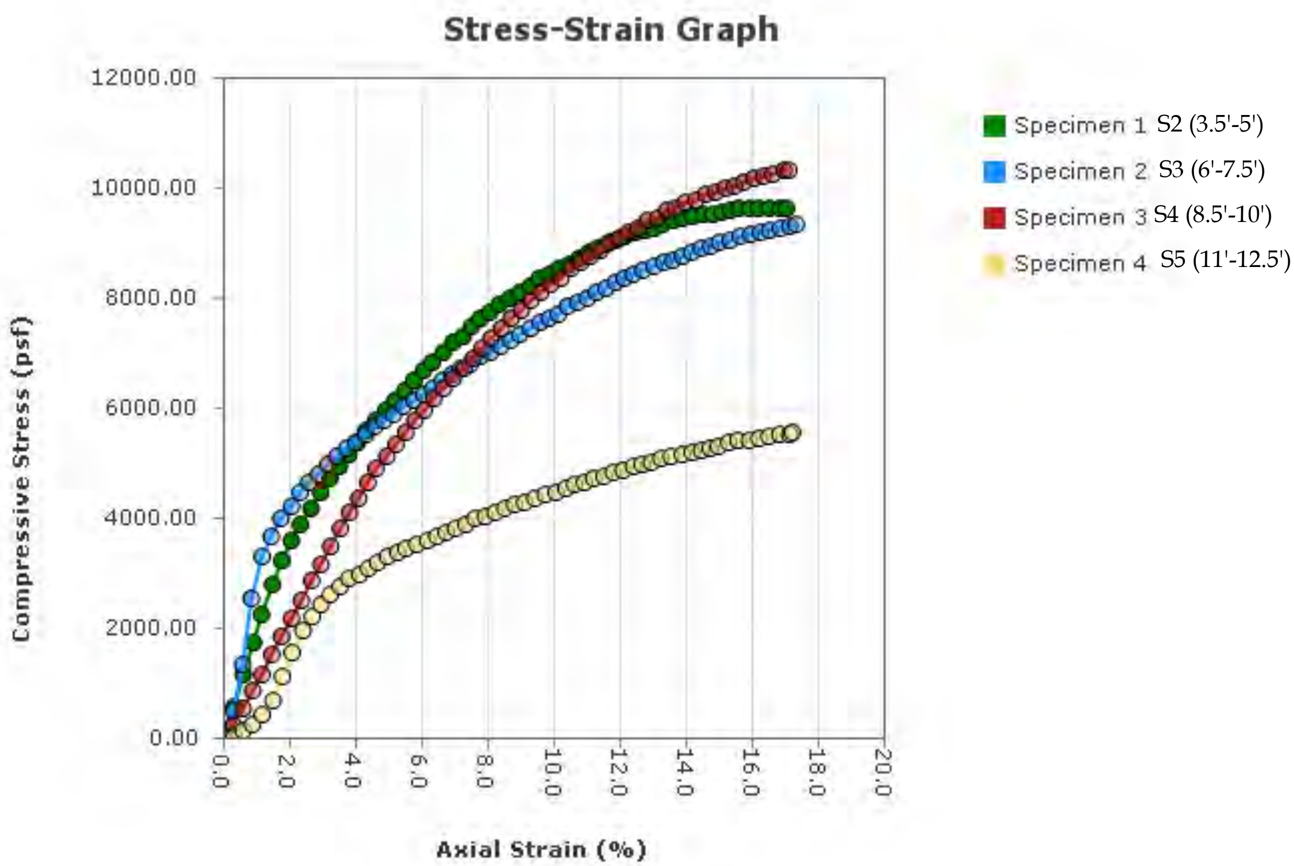
Unconfined



Project:	PTB-199-16
Project Number:	2022-1269-01T
Received Date:	9/13/2022
Sampling Date:	9/13/2022
Sample Number:	RWB-3
Sample Depth:	1-15 ft
Boring Number:	3 , Samples 2, 3, 4 & 5
Location:	22ND Street
Client Name:	IDOT
Remarks:	

Unconfined Compression Test

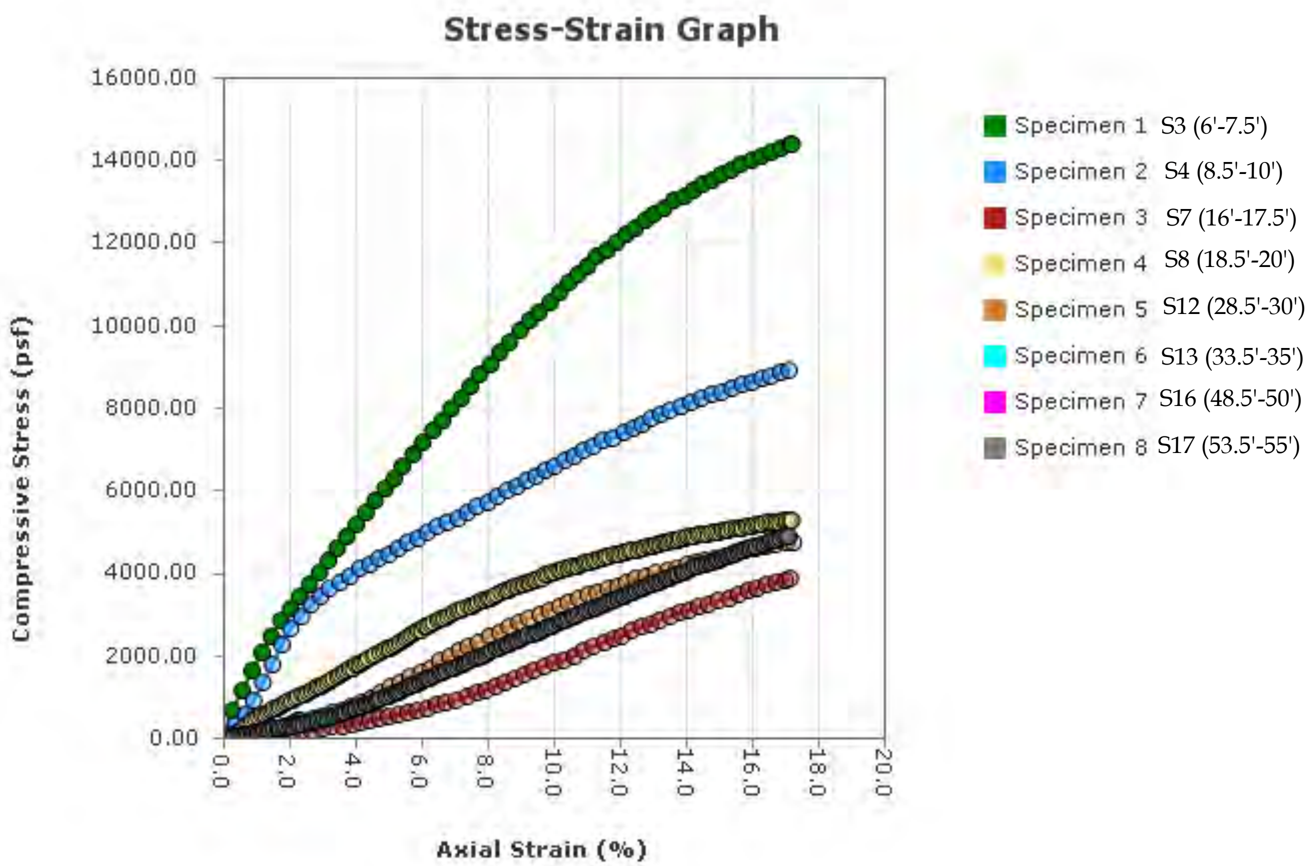
Unconfined



Project:	PTB-199-16
Project Number:	2022-1269-01T
Received Date:	9/13/2022
Sampling Date:	9/13/2022
Sample Number:	RWB-4
Sample Depth:	1-15 ft
Boring Number:	4, Samples 2, 3, 4 & 5
Location:	22ND Street
Client Name:	IDOT
Remarks:	

Unconfined Compression Test

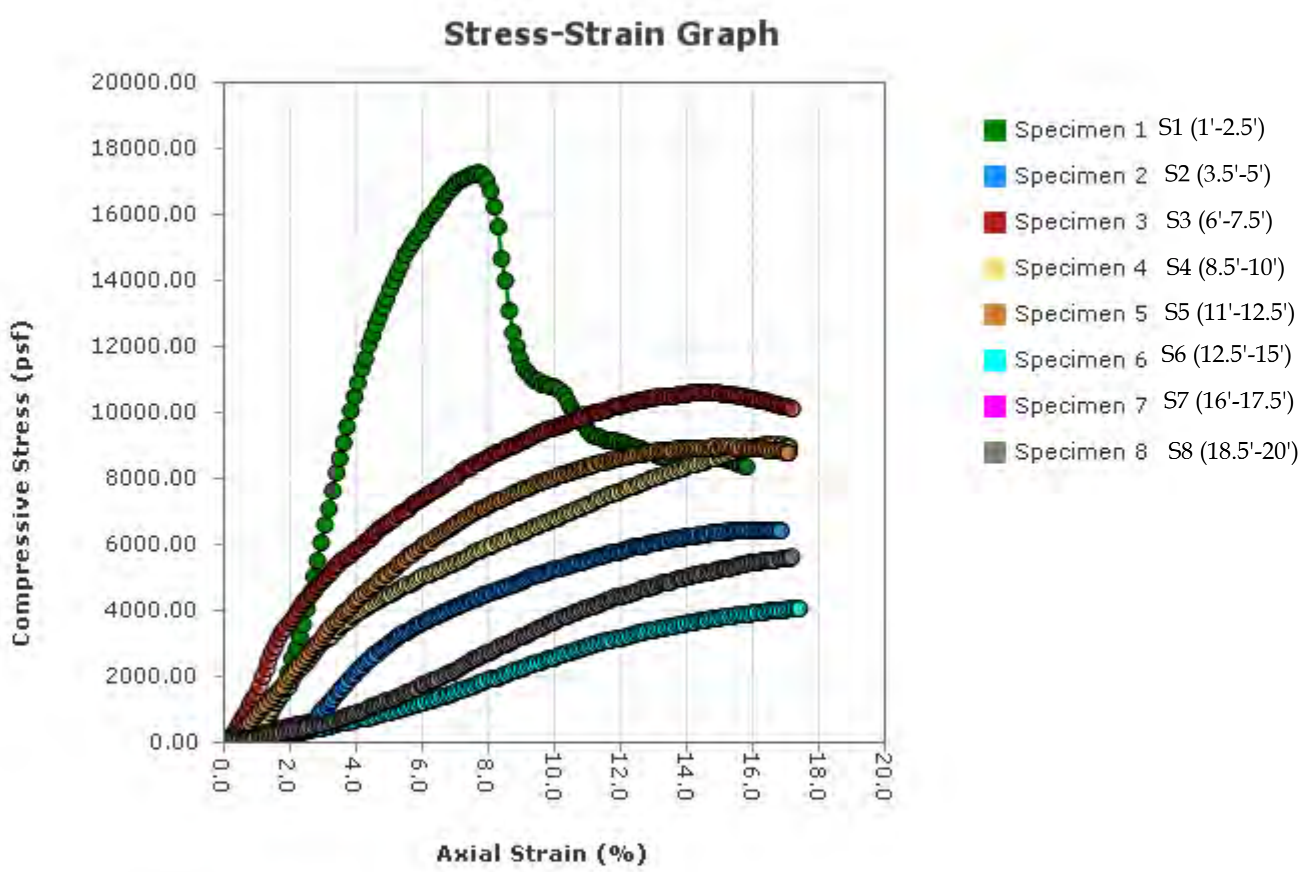
Unconfined



Project: PTB-199-16
Project Number: 2022-1269-01T
Received Date: 9/9/2022
Sampling Date: 9/9/2022
Sample Number: 119-16
Sample Depth: 6-55 Feet
Boring Number: B-5, Samples 3, 4, 7, 8, 12, 13, 16 & 17
Location: STA 586+48.52 Butterfield Road Llyod
Client Name: IDOT
Remarks: Butterfield Road @Lloyd

Unconfined Compression Test

Unconfined



Project: PTB-199-16

Project Number: 2022-1269-01T

Received Date: 9/7/2022

Sampling Date: 9/7/2022

Sample Number: DMS-3

Sample Depth: 1-20 Feet

Boring Number: B-6, Samples 1, 2, 3, 4, 5, 6, 7 & 8

Location: STA 863+05.00 DM S-3

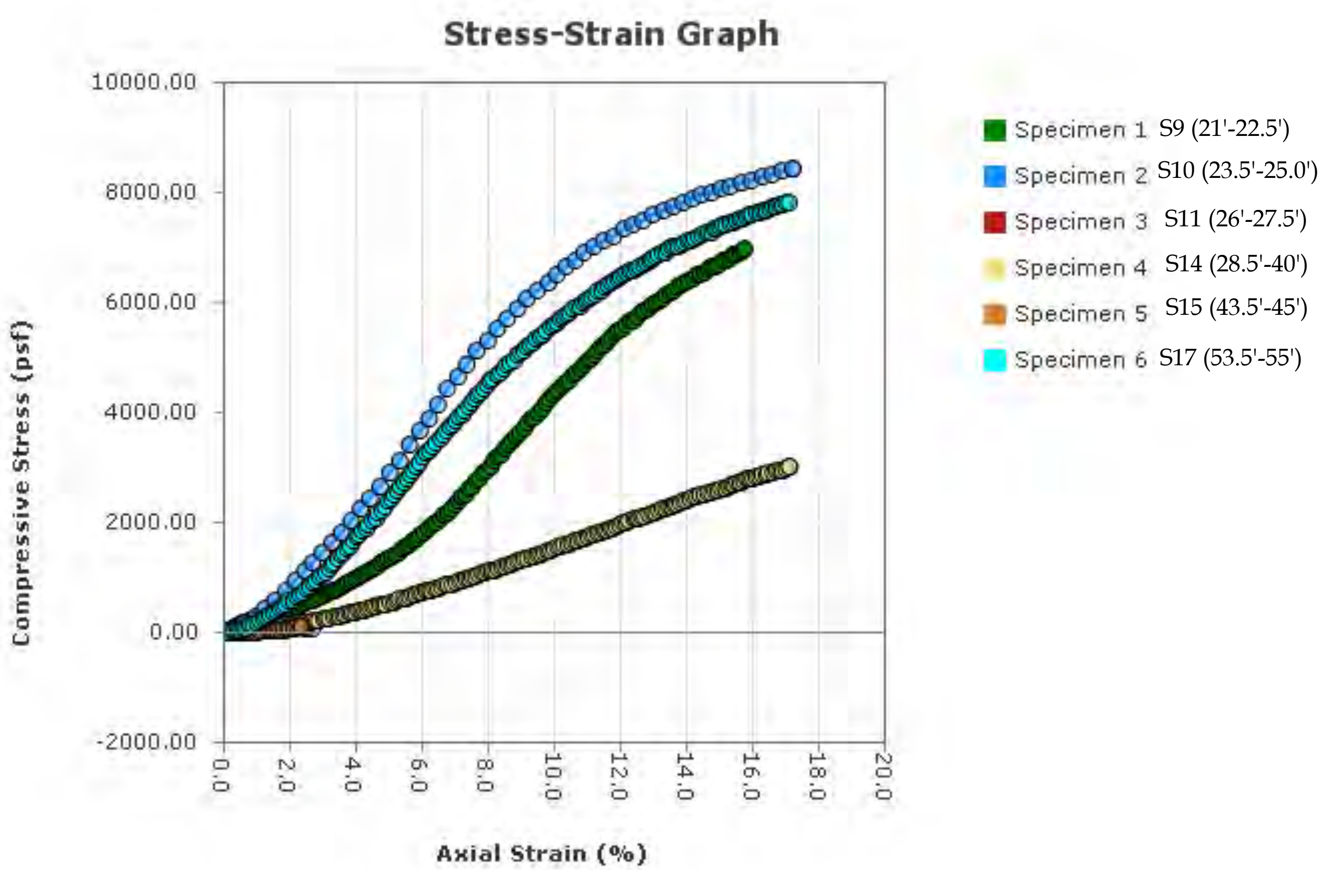
Client Name: IDOT

Remarks:

Test Date: 9/27/2022 Checked By: UA Date: 9/28/2022

Unconfined Compression Test

Unconfined



Project:	PTB-199-16
Project Number:	2022-1269-01T
Received Date:	9/7/2022
Sampling Date:	9/7/2022
Sample Number:	DMS-3_53.5-55(17)
Sample Depth:	20-55(17) Feet
Boring Number:	B-6, Samples 9, 10, 11, 14, 15 & 17)
Location:	STA 863+05.00 DMS-3
Client Name:	IDOT
Remarks:	DMS-3_53.5-55(17)

NST NASHnal SOIL TESTING

KEY TO TEST DATA

DRILLING & SAMPLING SYMBOLS:

SL = SS with Liner
SS = Split Spoon — 1%" I.D., 2" O.D., unless otherwise noted
ST = Shelby Tube — 2" O.D., unless otherwise noted
PA = Power Auger
DB = Diamond Bit — NX: BX: AX
AS = Auger Sample
JS = Jar Sample
VS = Vane Shear

ST = *3"* Shelby Tube
HS = Hollow Stem Auger
WS = Wash Sample
FT = Fish Trail
RB = Rock Bit
BS = Bulk Sample
PM = Pressuremeter test—in situ

Standard "N" Penetration = Blows per foot of a 140 pound hammer falling *30* inches on a 2-inch OD split spoon, except where noted.

WATER TABLE MEASUREMENT SYMBOLS

WL = Water Level
WCI = Cave In
DCI = Dry Cave In
WS = While Sampling
WD = While Drilling
BC = Before Casing Removal
ACR = After Casing Removal
AB = After Boring

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In impervious soils, the accurate determination of ground water elevations is not possible even after several days observation, and additional evidence of ground water elevations must be sought.

GRADATION DESCRIPTION & TERMINOLOGY

Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on *a* #200 sieve; they are described as: clays or clayey silts if they are cohesive, and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency, and their plasticity.

Major Component Of Sample	Size Range	Descriptive Term(s) (Of Components Also Present in Sample)	Percent of Dry Weight
Boulders	Over 8 in. (200mm)	Trace	1 — 9 .
Cobbles	8 in. to *3* in. (200mm to 75mm)	Little	10 — 19
Gravel	*3* in. to #4 sieve (75mm to 2mm)	Some	20 — 34
Sand	#4 to #200 sieve (2mm to .074mm)	And	35 — 50
Silt	Passing #200 sieve (0.074mm to 0.005mm)		
Clay	Smaller than 0.005mm		

CONSISTENCY OF COHESIVE SOILS

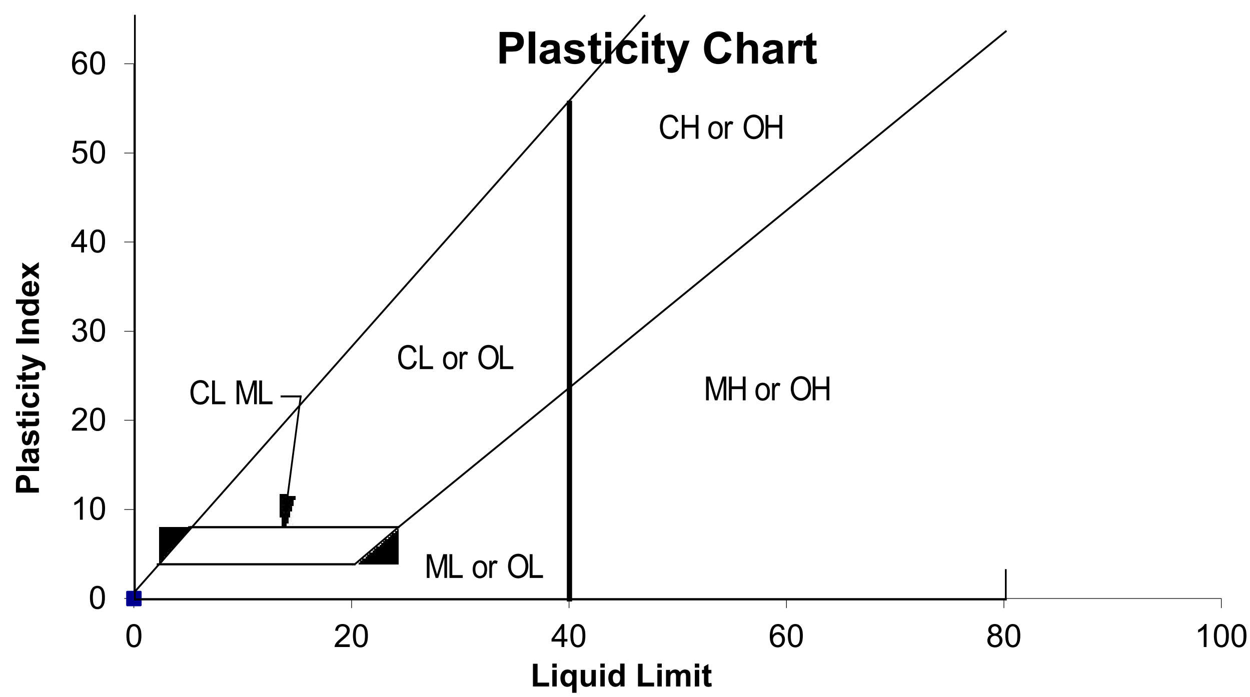
Unconfined Comp. Strength, Qu, tsf	Consistency
<0.25 —	Very Soft
0.25— 0.49	Soft
0.50 — 0.99	Medium (Firm)
1.00— 1.99	Stiff
2.00 — 3.99	Very Stiff
4.00 — 8.00	Hard
>8.00	Very Hard

RELATIVE DENSITY OF GRANULAR SOILS

N — Blows/ft.	Relative Density
0 — 3	Very Loose
4 — 9	Loose
10 — 29	Medium Dense
30 — 49	Dense
50 — 80	Very Dense
80 +	Extremely Dense

UNIFIED SOIL CLASSIFICATION CHART

CRITERIA FOR ASSIGNING GROUP NAMES & GROUP SYMBOLS USING LABORATORY TEST RESULTS				Soil Classification	
				Group Symbol	**Group Name**
COURSE-GRAINED SOILS **More than 50% retained on #200 Sieve**	**GRAVELS** More than 50% of course fractions are retained on #4 sieve	**CLEAN GRAVELS** Less than 5% fines	Cu ≤ 4 and 1 ≤ Cc ≤ 3	**GW**	Well Graded Gravel
			Cu < 4 and/or 1 > Cc > 3	**GP**	Poorly Graded Gravel
		GRAVELS With more than 12% fines	Fines classify as ML or MH	**GM**	Silty Gravel
			Fines classify as CL or CH	**GC**	Clayey Gravel
	SANDS 50% or more of course fractions passes #4 sieve	**CLEAN SANDS** Less than 5% fines	Cu ≤ 6 and 1 ≤ Cc ≤ 3	**SW**	Well Graded Sand
			Cu < 6 and/or 1 > Cc > 3	**SP**	Poorly Graded Sand
		SANDS With more than 12% fines	Fines classify as ML or MH	**SM**	Silty Sand
			Fines classify as CL or CH	**SC**	Clayey Sand
FINE-GRAINED SOILS **50% or More Passed the #200 Sieve**	**SILTS & CLAYS** Liquid Limit Lower than 50%	Inorganic	PI > 7 and plots on or above "A" line	**CL**	Non to Low Plasticity Clay
			PI < 4 and plots below "A" line	**ML**	Silt
		Organic	$\frac{\text{Liquid Limit (Oven Dried)}}{\text{Liquid Limit (Not Dried)}} < 0.75$	**OL**	Organic Clay or Silt
	SILTS & CLAYS Liquid Limit 50% or Higher	Inorganic	PI plots on or above "A" line	**CH**	Highly Plastic Clay
			PI plots below "A" line	**MH**	Elastic Silt
		Organic	$\frac{\text{Liquid Limit (Oven Dried)}}{\text{Liquid Limit (Not Dried)}} < 0.75$	**OH**	Organic Clay or Silt
Highly Organic Soils		Primarily organic material, darker and with organic odor		**PT**	Peat



NOTES ON PLACEMENT OF COMPACTED FILL SOIL

GENERAL

The placement of compacted fill for support of foundations, floor slabs, pavements, or earth structures should be carried out by an experienced excavator with the proper equipment. The excavator must be prepared to adapt his procedures, equipment, and materials to the type of project, to weather conditions, and the structural requirements of the architect and engineer. Methods and materials used in summer may not be applicable in winter; fill used in dry excavations may not be suitable in wet excavations or during periods of precipitation; proposed fill soil may require wetting or drying for proper placement and compaction. Conditions may also vary during the course of a project or in different areas of the site. These needs should be addressed in the project drawings and specifications.

EXCAVATION/BACKFILL BELOW THE WATER TABLE

It is common to have to excavate and replace unsuitable soils below the water table for site correction. As a general rule of prudent construction technique, we recommend that excavation/backfill below the water table not be permitted, unless the excavation is dewatered. Numerous problems can develop when this procedure is attempted without dewatering.

- Inability of the equipment operators and soil technicians to observe that all unsuitable soil/materials have been removed from the base of the excavation.
- Inability to observe and measure that proper lateral oversizing is provided.
- Inability to prevent or correct sloughing of excavation sidewalls, which can result in unsuitable soils trapped within the select backfill.
- Inability of the contractor to adequately and uniformly compact the backfill.
- Possibility of disturbance of the suitable soils at the base of the excavation.

The dewatering methods, normally chosen at the contractor's option, should follow prudent construction practice. Excavations in clay can often be dewatered with sump pits and pumps; this technique would not be applicable for excavation extending into permeable granular soil, especially for depths significantly below the water table. Dewatering granular soils should normally be done with well points or wells. When dewatering is needed, we strongly recommend that the procedures be discussed at pre-bid or pre-construction meetings. The architect and engineer should review the dewatering technique chosen by the contractor before construction starts; it should not be left until excavation is under way.

The selection of proper backfill materials is important when working in dewatered excavations. Even with dewatering, the base is usually wet and the contractor must be careful not to disturb the base. We recommend that the first lifts of backfill be a clean medium to course grain sand with less than 5% passing the #200 sieve. The use of silty sand, clayey sand, or cohesive/semi-cohesive soils is not recommended for such situations. The excavator should be required to submit samples of the proposed material(s) he plans to use as backfill before the fill is hauled to the site, so that it can be tested for suitability.

WINTER EARTHWORK CONSTRUCTION

Winter earthwork presents its own range of problems, which must be overcome; the situation may be complicated by the need for dewatering discussed above.

During freezing conditions, the fill used must not be frozen when delivered to the site. It also must not be allowed to freeze during or after compaction. Since the ability to work the soil while keeping it from freezing depends in part on the soil type, the specifications should require the contractor to submit a sample of his proposed fill before construction starts, for laboratory testing. If the soil engineer and structural engineer determine that it is not suitable, it should be rejected. In general, silty sand, clayey sand, and cohesive/semi-cohesive soils should not be used as fill under freezing conditions. All frozen soil of any type should be rejected for use as compacted fill.

It is important that compacted fill be protected from freezing after it is placed. The excavator should be required to submit a plan for protecting the soil. The plan should include details on the type and amount of material (straw, blankets, extra loose fill, topsoil, etc.) proposed for use as frost protection. The need to protect the soil from freezing is ongoing throughout construction and applies both before and after concrete is placed, until backfilling for final frost protection is completed. Foundations placed on frozen soil can experience heaving and significant settlement, rotation, or other movement as the soil thaws. Such movement can also occur if the soil is allowed to freeze after the concrete is placed and then allowed to thaw. The higher the percentage of fines (clay and silt, P-200 material) in the fill, the more critical is the need for protection from freezing.