Roadway Geotechnical Report

Laramie Avenue Over I-290
IDOT PTB 204-014
FAI 290 at Laramie Avenue
Cook County, Illinois

Prepared for

Illinois Department of Transportation
Project Number: D-91-156-22

Project Design Engineer Team
Gannett Fleming, Inc.

Geotechnical Consultant:
GSG Consultants, Inc.

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March 5, 2024

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Robert Rose, PTOE, PE
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Gannett Fleming, Inc.
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Roadway Geotechnical Report
Laramie Avenue over I-290
Cook County, IL
IDOT PTB 204-014

Dear Mr. Rose

Attached is a copy of the Roadway Geotechnical Report for the above referenced project. The report provides a description of the site investigation, site conditions and construction recommendations. The site investigation for the roadway reconstruction included advancing seven (7) subgrade soil borings to depths of 10 feet each.

Should you have any questions or require additional information, please call us at 630-994-2600.

Sincerely,

Daniel DiMaggio

Daniel DiMaggio, E.I.T.
Project Engineer

Dawn Edgell

Dawn Edgell, P.E.
Sr. Project Engineer

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1.0 INTRODUCTION

GSG Consultants, Inc. (GSG) completed a geotechnical investigation for the roadway reconstruction project on Laramie Avenue over I-290 near the South Austin neighborhood of Chicago in Cook County, Illinois. The purpose of the investigation was to explore the subsurface conditions, to determine engineering properties of the subsurface soil, and to develop design and construction recommendations for the project. The general project limits are shown in **Exhibit 1**.

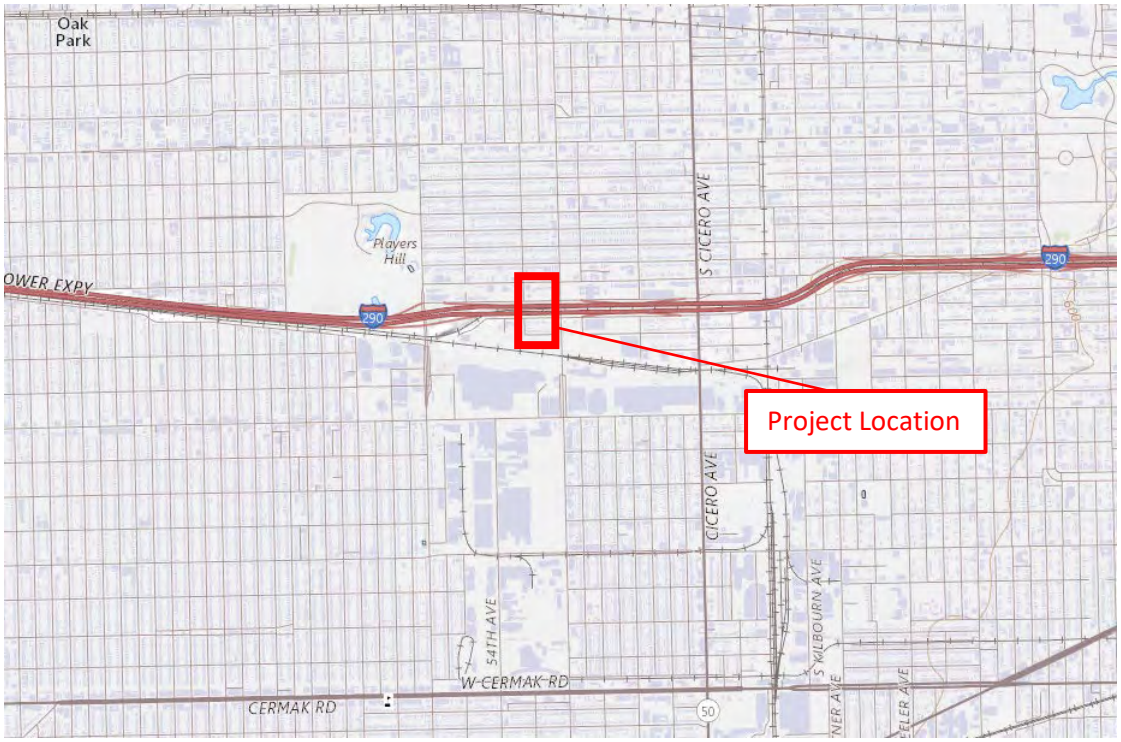


Exhibit 1 – Project Location Map
(Source: USGS Topographic Maps, usgs.gov)

1.1 Proposed Project Information

Based on preliminary design information provided by Gannett Fleming, Inc, the proposed project will include reconstruction of Laramie Avenue over I-290 extending approximately 400 feet north along Laramie Avenue; the intersection of Laramie Avenue and W. Lexington Street; and the intersection of Laramie Avenue and W. Flournoy Street. The improvements will include reconstruction, resurfacing and widening as part of the overall project for the Laramie Avenue bridge replacement.

It is anticipated that the proposed profile will be relatively consistent with the existing roadway profile. It is anticipated that minimal cut and fill (less than 3 feet) would be required for the proposed reconstruction of Laramie Avenue. It is anticipated that the proposed roadway drainage system will consist of curb and gutter.

1.2 Regional Geology

GSG reviewed several published documents to determine the regional geological setting in the area. The site is in central Cook County, in the South Austin neighborhood of Chicago, Illinois. The surficial geologic deposits in this area are typically glacial drift deposited during the Wisconsin Glacial Age and sediments deposited by the various high-level states of the Des Plaines River. The subsurface profile in the area consists of deposits of silty clay, sand, silt, and gravel extending to approximately 40 to 70 feet below ground surface, at which point bedrock is encountered. This is generally consistent with the rock depths encountered in the subsurface investigation. The bedrock consists of the Silurian System, which consists of dolomite that varies from extremely argillaceous, silty and cherty to exceptionally pure.

1.3 Climate Conditions

The geotechnical field exploration was performed between October 4 and October 9, 2023. The climate conditions for the months of April to October are summarized in **Table 1**. The data in this table was obtained from the National Weather Service Forecast Office website for Chicago, Illinois and the surrounding area. The data was evaluated to determine any effects of temperature and precipitation on the water table level and soil moisture content that was encountered at the site at the time the borings were performed.

The average monthly temperatures were typically higher than average, except for June through August where it was noted to be slightly lower than normal. The monthly precipitation totals were about 2.5 to 4 inches less than normal for the months of April through June; 7.1 inches higher than normal for the month of July; and close to normal for the months of August, September, and October. The monthly snowfall was lower than average for the month of April and average for the rest of the months. Considering the net temperature, precipitation and snow averages, it can be expected that the moisture contents of the surficial soils and water levels were lower than normal levels during the drilling in the month of October.

Table 1 – Climate Conditions

Date (M-Y)	Temperature (F°)		Precipitation (in.)		Snowfall (in.)	
	Mean	Departure from Norm.	Total	Departure from Norm.	Total	Departure from Norm.
April - 2023	52.6	1.7	1.64	-2.51	T*	-1.0
May - 2023	63.3	1.4	0.58	-4.17	0.0	0.0
June - 2023	71.7	-0.2	2.02	-2.51	0.0	0.0
July - 2023	75.8	-0.9	11.13	7.11	0.0	0.0
August - 2023	74.3	-0.7	4.02	-0.08	0.0	0.0
September - 2023	68.8	1.0	3.23	-0.10	0.0	0.0
October - 2023	56.3	1.0	3.33	0.53	0.3	0.3

Note: All the field work was completed by October 9, 2023.
*Trace Precipitation

2.0 SITE SUBSURFACE EXPLORATION PROGRAM

This section describes the subsurface exploration program and laboratory testing program completed as part of this project. The subsurface exploration program was performed in accordance with applicable IDOT geotechnical manuals and procedures.

2.1 Subsurface Exploration Program

The roadway subsurface soil investigation was conducted between October 4 and October 9, 2023. Seven (7) subgrade soil borings (SGB) were advanced to depths of 10 feet each. The borings were completed through the existing pavement along Laramie Avenue. The soil boring locations were selected by GSG in coordination with Gannett Fleming, then completed at locations based on field conditions and site accessibility. The coordinates and existing ground surface elevations shown on the soil boring logs were obtained by GSG using handheld surveying equipment. The as-drilled locations of the soil borings are shown on the Soil Boring Location Plan and Subsurface Profiles (**Appendix A**). **Table 2** presents a list of the borings completed along with their location information.

Table 2 – Summary of Subsurface Exploration Borings

Boring ID	Station*	Offset (ft) / Direction	Northing (ft)	Easting (ft)	Depth (ft)	Surface Elevation (ft)
SGB-01	1524+98.90	27.23 / LT	1,896,752.715	1,141,794.321	10.0	607.80
SGB-02	1522+17.62	17.88 / RT	1,896,510.072	1,141,847.898	10.0	608.14
SGB-03	1517+91.87	22.27 / LT	1,896,046.279	1,141,823.866	10.0	607.47
SGB-04	1522+15.38	181.21 / LT	1,896,464.006	1,141,650.296	10.0	607.94
SGB-05	1522+17.62	167.31 / RT	1,896,478.364	1,141,998.527	10.0	607.82
SGB-06	1518+66.99	186.24 / LT	1,896,115.655	1,141,657.379	10.0	607.54
SGB-07	1518+64.30	142.61 / RT	1,896,124.405	1,141,986.128	10.0	607.16

*Based on proposed Laramie Avenue Stationing

The soil borings were drilled using a truck mounted Diedrich D-50 drill rig (efficiency 95.5%) and a truck mounted Mobile B-57 drill rig (efficiency 89%), equipped with 3¼-inch I.D. hollow stem augers and an automatic hammer. Soil sampling was performed according to AASHTO T 206, "Penetration Test and Split Barrel Sampling of Soils." Soil samples were obtained at 2.5-foot intervals to the boring termination depths. Water level measurements were made in each boring when evidence of free groundwater was detected on the drill rods or in the samples. The boreholes were also checked for free water immediately after auger removal, and before filling the open boreholes with soil cuttings and surface patching with asphalt.

GSG's field representative inspected, visually classified and logged the soil samples during the subsurface exploration activities and performed unconfined compressive strength tests on cohesive soil samples using a calibrated Rimac compression tester and a calibrated hand penetrometer in accordance with IDOT procedures and requirements. Representative soil samples were collected from each sample interval and were placed in jars and returned to the laboratory for further testing and evaluation.

2.2 Laboratory Testing Program

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. The following laboratory tests were performed on representative soil samples:

- Moisture content ASTM D2216 / AASHTO T-265
- Organic Content ASTM D2974

The laboratory tests were performed in accordance with test procedures outlined in the IDOT Geotechnical Manual (2020), 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 included in the Laboratory Test Results **(Appendix C)** and are also shown along with the field test results in the Soil Boring Logs **(Appendix B)**.

2.3 Subsurface Conditions

This section provides a brief description of the soils encountered in the borings performed in the vicinity of the proposed improvements. Variations in the general subsurface soil profile were noted during the drilling activities. Detailed descriptions of the subsurface soils are provided in the soil boring logs and are shown graphically in the **Boring Location Plan & Subsurface Profiles**. The soil boring logs provide specific conditions encountered at each boring location and include soil descriptions, stratifications, penetration resistance, elevations, location of the samples, and laboratory test data. Unless otherwise noted, soil descriptions indicated on boring logs are visual identifications. The stratifications shown on the boring logs represent the conditions only at the actual boring locations and represent the approximate boundary between subsurface materials; however, the actual transition may be gradual.

Laramie Avenue

Borings SGB-01, 02 and 03 were drilled through the roadway along Laramie Avenue and initially encountered 4 to 11 inches of asphalt, followed by 6 to 8 inches of concrete in borings SGB-02 and SGB-03, and followed by 7 to 16 inches of aggregate base beneath the pavement sections. The surface elevations of the borings remained relatively consistent ranging from 607 to 608 feet.

Below the pavement materials, boring SGB-01 encountered dark brown silty clay fill to a depth of 9.5 feet, followed by brown sand fill to the boring termination depth of 10 feet; boring SGB-02 encountered gray and black gravel fill to a depth of 6 feet; boring SGB-03 encountered gray and black sand fill to a depth of 9 feet.

Beneath the fill materials, borings SGB-02 and SGB-03 encountered stiff to hard brown silty clay to the boring termination depths of 10 feet. The unconfined compressive strength of the stiff to hard brown silty clay soils ranged between 1.5 and 5.4 tons per square foot (tsf), with an average strength of 3.9 tsf.

W. Flournoy Street

Borings SGB-04 and SGB-05 were drilled through the roadway along W. Flournoy Street and initially encountered 4 to 10 inches of asphalt, followed by 8 inches of concrete beneath the asphalt in SGB-05, and 6 inches of aggregate base beneath the asphalt in SGB-04.

Below the pavement materials, borings SGB-04 and SGB-05 encountered brown and gray silty clay fill to depths of 3.5 to 7 feet, followed by stiff to hard brown silty clay to depths of 9 to 10 feet below grade. Boring SGB-05 encountered very stiff gray silty clay from a depth of 9 feet to the boring termination depth of 10 feet. The unconfined compressive strength of the stiff to hard brown silty clay soils ranged between 1.3 and 5.2 tsf, with an average strength of 3.6 tsf. The very stiff gray silty clay had an unconfined compressive strength of 3.3 tsf.

W. Lexington Street

Borings SGB-06 and SGB-07 were drilled in the roadway along W. Lexington Street and initially encountered 4 to 5 inches of asphalt, followed by 8.5 inches of concrete in SGB-07, and followed by 13 inches of aggregate base beneath the pavement sections.

Below the pavement materials, SGB-06 and SGB-07 encountered brown sand fill to depths of 2.5 to 4 feet, followed by stiff to hard gray and brown silty clay to depths of 6 to 8.5 feet, followed by very

stiff gray silty clay to the boring termination depths of 10 feet. Boring SGB-07 noted a loose gray sand layer from 8.5 to 9.5 feet. The unconfined compressive strength of the stiff to hard gray and brown silty clay soils ranged between 1.9 and 5.2 tsf, with an average strength of 3.4 tsf. The unconfined compressive strength of the very stiff gray silty clay soils ranged between 2.5 and 4.0 tsf, with an average strength of 3.3 tsf. The loose gray sand layer had an SPT blow count 'N' value of 8 blows per foot (bpf).

2.4 Groundwater Conditions

Water levels were checked in each boring to determine the general groundwater conditions present at the site and were measured while drilling and after each boring was completed. Groundwater was observed during drilling at borings SGB-02, 03, 06 and 07 at depths of 1 to 3.5 feet (El. 606.5 to 603.7 feet), which was likely perched within the existing granular fill materials. Groundwater was not encountered during or immediately after drilling at the remaining soil boring locations. None of the borings were left open after leaving the site due to safety concerns.

Based on the observed water levels and soil color change from brown to gray, it is anticipated that the long-term groundwater level is near 6 to 9 feet below existing grade (approx. El. 601.5 to 598.7 feet). Perched water may also be present within the existing fill materials observed in the borings. Water level readings were made in the boreholes at times and under conditions shown on the boring logs and stated in the text of this report. However, it should be noted that fluctuations in groundwater level may occur due to variations in the rainfall, other climatic conditions, or other factors not evident at the time measurements were made and reported herein.

3.0 GEOTECHNICAL ANALYSES

This section provides GSG's geotechnical analysis and recommendations for the design of the proposed roadway improvements based on the results of the field exploration, laboratory testing, and geotechnical analysis.

3.1 Settlement

It is anticipated that the proposed profile will be relatively consistent with the existing roadway profile. It is anticipated that minimal cut and fill (less than 3 feet) would be required for the proposed reconstruction of Laramie Avenue. The anticipated settlement caused by the improvement is expected to be negligible.

3.2 Global Slope Stability

IDOT requires that slope stability analysis be performed in areas where the cut or fill heights will exceed 15 feet in height. For the proposed improvements, it is anticipated that the proposed grades will generally match the existing grades; therefore, no slope stability analysis was required for this report.

3.3 Drainage Characteristics

The drainage characteristics of the site were evaluated per the IDOT Geotechnical Manual (2020), Section 6.3.4.1, based on the subgrade soil type and moisture condition, depth of water table, project topography, the anticipated profile grade line, and depth and grade of drainage ditch along the roadways. It is anticipated that the roadway reconstruction for Laramie Avenue will be supported on subgrade soils consisting of existing silty clay fill materials or existing granular fill materials.

Based on the preliminary plans and existing conditions, GSG anticipates that the proposed drainage will consist of an enclosed drainage system with curb and gutter with slopes greater than 0.5%. GSG utilized Table 6.3.4.1-1, Drainage Classification in the IDOT Geotechnical Manual, to assign the drainage classes for the site. The drainage class should be taken as Fair along the roadways within the project limits.

3.4 Frost Susceptibility

The frost susceptibility of the subgrade soils was evaluated per Section 6.3.2.2.3 of the IDOT Geotechnical Manual. The maximum anticipated frost penetration depth below pavement in northern Illinois is 45 to 60 inches for extreme weather conditions. The frost susceptibility was evaluated for the soils encountered that would be within the proposed roadway subgrade. The frost

class for the subgrade soils in these areas was assigned using Table 6.3.2.2.3-1, Frost Susceptibility Classification of Soils, in the IDOT Geotechnical Manual. The subgrade soils along the proposed improvement area were found to have a Frost Class of F2 (low to medium frost susceptibility) for the granular fill soils and a Frost Class of F3 (High) for the clay fill soils.

Perched water could be present in the upper soil layers, particularly in existing granular fill materials and any confined granular layers. Water trapped in the soil layers closer to the pavement section is susceptible to frost action and should be considered when designing the proposed roadway. Treatment measures, such as maintaining proper drainage of the subgrade soils through underdrains could be considered.

3.5 Subgrade Support Rating

The subgrade support rating (SSR) was determined based on the physical properties of in-situ soils present beneath the proposed pavement section. The SSR includes three categories (poor, fair, and granular), and are used to determine the depth of soil treatment to provide a stable working platform that is required to prevent excessive rutting and moisture related problems during construction activities. Granular soils have the highest rating and provide a stable working platform that may require less than a 12-inch improved subgrade layer, while poor subgrade may require more than 12 inches to provide stable subgrade during construction activities. The anticipated subgrade soils encountered in most of the borings at the proposed roadway grades were generally sand fill soils. These soils have a Subgrade Support Rating (SSR) of Granular. The silty clay fill soils encountered at the site have a SSR of Fair.

3.6 Illinois Bearing Ratio

The Illinois Bearing Ratio (IBR) is a measure of the support provided by the roadbed soils for the new pavement. On proposed pavements bearing on granular existing fill soils, it is recommended that an IBR value of ten (10) be used for the roadway pavement design where granular fill soils are present. It is recommended that an IBR value of three (3) be used for the roadway pavement design where clay fill soils are present.

3.7 Organic Content

Typically, soils with an organic content in excess of 10 percent are considered unsuitable to remain below proposed pavement areas. Soils were tested for suspected high organic contents when black soils with high moisture contents were encountered in the near surface materials. The results from

the organic content tests are displayed in **Table 3**. Highly organic materials were not encountered in any of the samples tested.

Table 3 – Summary of Organic Test Data

Boring ID	Depth (feet)	Soil Description	Organic Content (%)
SGB-01	3.5 – 5.0	Silty Clay Fill	4.3
SGB-04	3.5 – 5.0	Silty Clay Fill	3.8

4.0 GEOTECHNICAL ROADWAY DESIGN RECOMMENDATIONS

This section provides GSG's geotechnical recommendations for the design of the proposed roadway based on the results of the field exploration, laboratory testing, and geotechnical analysis. The proposed pavement section should be designed according to the IDOT Mechanistic Pavement Design (MPD). IDOT policy requires providing a minimum of 12 inches of improved subgrade beneath the pavement section to ensure a stable construction platform. Subgrade improvements including any undercuts or compaction of existing soils should be completed to the proposed elevations in the design plan and in accordance with the Subgrade Treatment and Recommendations section of this report.

4.1 Subgrade Preparation

It is our understanding that the existing roadway for the Laramie Avenue Bridge over I-290 is to be completely reconstructed. It is recommended that all existing pavement and base course be stripped within the limits of the proposed improvements, including any existing concrete curbs. Based on the pavement thickness encountered at the boring locations, it is anticipated that pavement stripping depths of asphalt and/or concrete materials will range from approximately 5 to 14.5 inches; an average stripping depth of 12 inches should be used for quantity estimates. Undercuts of the subgrade soils and backfilling should be based on the recommendations provided in this report, and field evaluation of the materials encountered during construction. Any unstable or unsuitable materials encountered during construction activities should be removed and replaced with compacted structural fill.

4.2 Subgrade Treatment and Recommendations

The suitability of the existing subgrade soils for the proposed reconstruction were evaluated in terms of frost susceptibly, stability, settlement, and drainage. The evaluation included determining the presence of unstable, compressible deposits, low-strength soils, high organic content soils, and soils with high-moisture content immediately below the proposed pavement section. Based on the subsurface soil conditions encountered at the boring locations, we do not anticipate any undercutting will be required for the roadway reconstruction.

If unsuitable subgrade is encountered during construction, treatment options for unsuitable subgrade soils generally include mechanical stabilization, chemical stabilization, or soil modification. Mechanical stabilization includes methods such as removal and replacement with select materials or using geosynthetics (geotextiles and/or geogrids). Geosynthetic materials should be selected based on Sections 6.18.1.4 and 6.18.1.6 of the IDOT Geotechnical Manual; aggregate should be selected

based on Section 1004, Coarse Aggregates, of the IDOT SSRBC (2022). Chemical stabilization or soil modification includes the use of additives to improve the engineering properties of the in-situ soils. The choice of a specific treatment option depends on several factors, including soil type; required treatment depth; construction variables (cost, availability, and time); project location; and treatment objective. Based on the subsurface conditions, mechanical stabilization and chemical modification methods can be used to remediate the unsuitable soils noted at the site. Based on the project location in urban and residential areas, GSG recommends mechanical stabilization as the preferred option; chemical treatment options should not be used near residential areas. Additional recommendations for the subgrade treatment are included in Section 5.2.

4.3 Drainage Recommendation

The drainage classification of Fair should be used for the project design. The overall groundwater depth is assumed deeper than the anticipated frost depth of 45 to 60 inches for the northern Illinois region. However, pavement systems could become saturated following periods of precipitation. The proposed subgrade and pavement should have proper surface grading to prevent water from accumulating and ponding. GSG recommends installing lateral and longitudinal underdrain systems as recommended in Section 6.3.4.2 of the IDOT Geotechnical Manual to maintain the subgrade from deteriorating. The traverse underdrains should be installed at a spacing of 300 feet at low points and undercut areas. To provide drainage for the proposed pavement, we recommend installing longitudinal pipe underdrains below the pavement for the roadways. The underdrains should tie into the storm water drainage system and should be installed per Article 601 in the IDOT Standard Specifications.

5.0 CONSTRUCTION CONSIDERATIONS

All work performed for the proposed project should conform to the requirements in the IDOT Standard Specifications for Road and Bridge Construction (SSRBC, 2022) and the IDOT Subgrade Stability Manual (2005). Any deviation from the requirements in the manuals above should be approved by the design engineer.

5.1 Site Preparation

GSG recommends removing all existing pavements, concrete, vegetation, topsoil, and any soft or unsuitable/deleterious materials from the proposed construction areas. Site preparation in areas where the new pavements will be constructed will require removal of existing asphalt, concrete and surface gravel. Based on the pavement thickness encountered at the boring locations, it is anticipated that pavement stripping depths of asphalt / concrete materials will range from approximately 10 to 14.5 inches; an average stripping depth of 12 inches should be used for quantity estimates. Subgrade improvements, including any undercuts or compaction of existing soils should be completed to the proposed elevations in the design plan and in accordance with the recommendations provided herein.

The contractor should not mix any existing base course materials with existing subgrade soils during the stripping and stockpiling activities. The subgrade below the base course should be evaluated in accordance with the Subgrade Preparation section of this report. Where possible, the engineer may require proof-rolling of the subgrade with a 20 to 30-ton loaded truck or other pneumatic-tired vehicle of similar size and weight. The purpose of the proof-rolling is to locate soft, weak, or excessively wet soils present at the time of construction. Proof-rolling should be performed during a time of good weather and not while the site is wet, frozen, or severely desiccated. Any unsuitable materials observed during the evaluation and proof-rolling operations should be undercut and replaced with compacted structural fill and/or stabilized in-place. The possible need for, and extent of, undercutting and/or in-place stabilization required can best be determined by the geotechnical engineer at the time of construction.

5.2 Pavement Subgrade Preparation

The stability of the subgrade should be evaluated immediately after excavation and prior to placement of base aggregate in the field in accordance with the IDOT Subgrade Stability Manual (2005) to determine if additional treatment is required. The subgrade soils inspection should include visual inspection and performing a proof roll using heavy equipment or heavily loaded tandem axle dump truck with a minimum gross weight of 25 tons to check for deflection or rutting. Areas with

excessive rutting and deflection shall be evaluated using a dynamic cone penetrometer (DCP) and static cone penetrometer (SCP) to determine the depth of required treatment in accordance with the IDOT Subgrade Stability Manual (2005) and IDOT SSRBC (2022), Section 301. The subgrade should be prepared in accordance with Section 301, Subgrade preparation, of the IDOT SSRBC (2022).

Treatment for unstable and unsuitable soils encountered during proofrolling and subgrade evaluation may include the use of a geotextile fabric, removal, and replacement with approved structural fill for small areas. Subgrade improvements should be based on the recommendations in the Subgrade Treatment and Recommendations Section of this report or based on field evaluation of the materials during construction. Field evaluation of the subgrade soils should be conducted in accordance with the procedures outlined in the IDOT Geotechnical Manual and Subgrade Stability Manual, and under the supervision of a licensed geotechnical engineer.

5.3 Existing Utilities

Before proceeding with construction, all existing underground utility lines that will interfere with construction should be completely relocated from beneath the proposed construction areas. Where possible, existing utility lines that are to be abandoned in place should be removed and/or plugged with cement grout. All excavations resulting from underground utilities removal activities should be cleaned of loose and disturbed materials, including all previously placed backfill, and backfilled with suitable fill materials in accordance with the requirements of this section. During the clearing and stripping operations, positive surface drainage should be maintained to prevent the accumulation of water.

5.4 Site Excavations

Site excavations are expected to encounter various types of soils as described in the Subsurface Exploration section of this report. The contractor will be responsible for providing safe excavation during the construction activities of the project. All excavations should be conducted in accordance with applicable federal, state, and local safety regulations, including, but not limited to the Occupational Safety and Health Administration (OSHA) excavation safety standards. Excavation stability and soil pressures on temporary shoring are dependent on soil conditions, depth of excavations, installation procedures, and the magnitude of any surcharge loads on the ground surface adjacent to the excavation. Excavation near existing structures and underground utilities should be performed with extreme care to avoid undermining existing structures. Excavations should not extend below the level of adjacent existing foundations or utilities unless underpinning or other support is installed. It is the responsibility of the contractor for field determinations of

applicable conditions and providing adequate shoring for all excavation activities.

5.5 Borrow Material and Compaction Requirements

If borrow material is to be used for onsite construction, it should conform to Section 204 "Borrow and Furnish Excavations" of the latest IDOT Construction Manual. GSG recommends that subgrade preparation, and structural fill placement and compaction be inspected by a GSG geotechnical engineer to verify the type and strength of soil materials present at the site and their conformance with the geotechnical recommendations in this report.

The fill material should be free of organic matter and debris and should be placed and compacted in accordance with Section 205, Embankment, of the IDOT SSRBC (2022). Earth-moving operations should be avoided during excessively cold or wet weather to avoid freezing of softening subgrade soils. Fill should be placed in lifts and compacted according to Section 205, Embankment (IDOT, 2022). Backfill materials for undercut areas should be placed in 8-inch loose lifts and should be compacted to 95% of the maximum dry density as determined by AASTHO T 99, Standard Proctor Method.

5.6 Groundwater Management

It is anticipated that the long-term groundwater level is between elevations 601.5 to 598.7 feet. Perched water may be encountered within the existing fill materials encountered at the boring locations. GSG does not anticipate groundwater related issues for the proposed improvements. If rainwater run-off or groundwater is accumulated at the base of excavations, the contractor should remove accumulated water using conventional sump pit and pump procedures and maintain a dry and stable excavation. The location of the sump should be determined by the contractor based on field conditions. During earthmoving activities at the site, grading should be performed to ensure that drainage is maintained throughout the construction period. Water should not be allowed to accumulate in the foundation area either during or after construction. Undercut and excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater or surface run-off. Grades should be sloped away from the excavations to minimize runoff from entering.

If water seepage occurs during excavations or where wet conditions are encountered such that the water cannot be removed with conventional sumping, we recommend placing open grade stone similar to IDOT CA-7 to stabilize the bottom of the excavation below the water table. The CA-7 stone should be placed 12 inches above the water table, in 12-inch lifts, and should be compacted with

the use of a heavy smooth drum roller or heavy vibratory plate compactor until stable. The remaining portion of the excavation beneath the footings should be backfilled using approved structural fill.

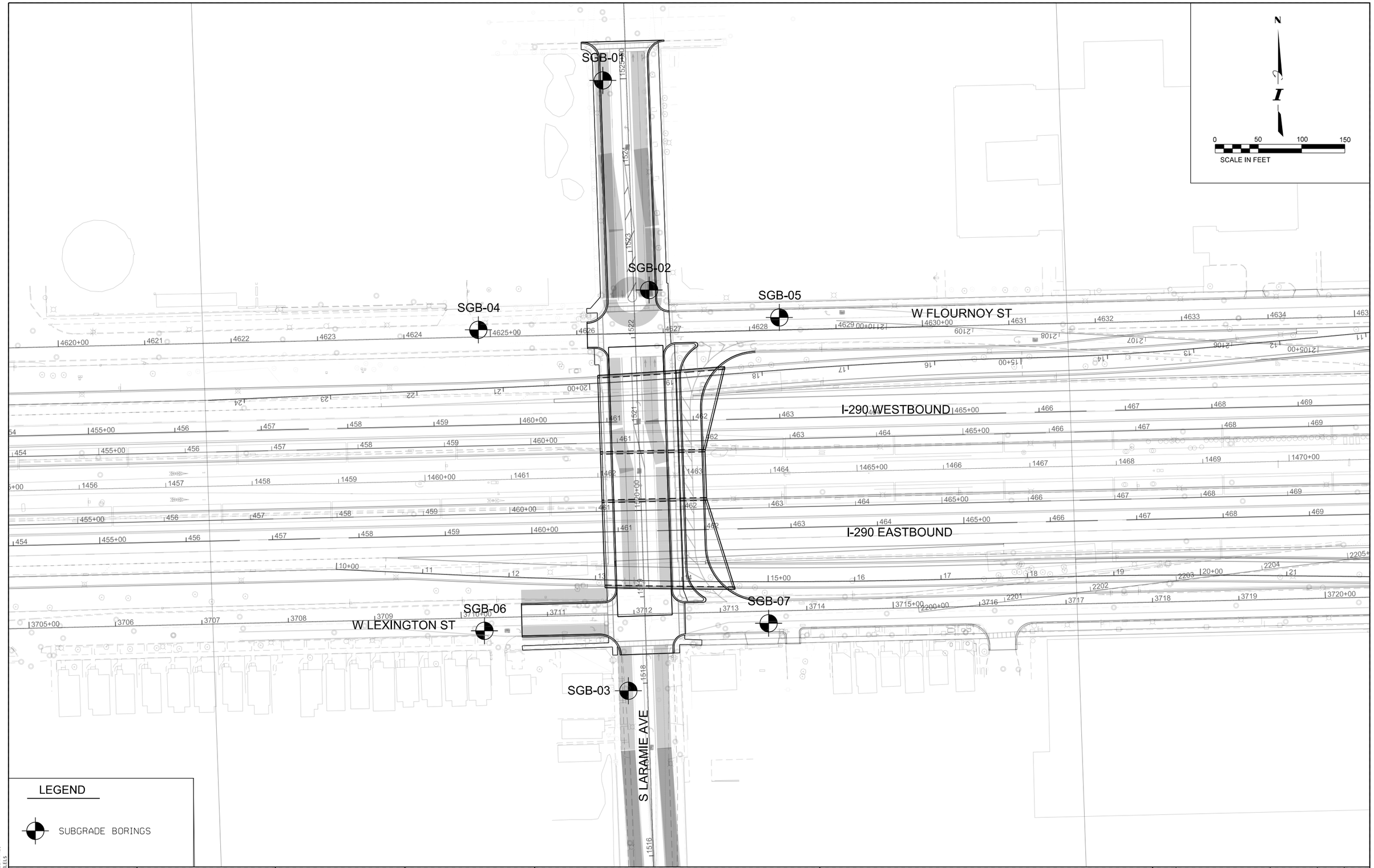
6.0 LIMITATIONS

This report has been prepared for the exclusive use of Illinois DOT (IDOT) and its Design Section Engineer. The recommendations provided in the report are specific to the project described herein and are based on the information obtained from the soil borings located within the project limits. The analyses performed and the recommendations provided in this report are based on subsurface conditions determined at the location of the borings. This report does not reflect all variations that may occur between boring locations or at some other time, the nature and extent of which may not become evident until during the time of construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and review the recommendations presented herein.

APPENDIX A

SOIL BORING LOCATION PLAN

AND SUBSURFACE PROFILES



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GSG CONSULTANTS, INC.
735 E. REMINGTON RD, SCHAUMBURG, IL 60173
TEL: +1630.994.2600 | WWW.GSG-CONSULTANTS.COM

USER NAME = $USER$	DESIGNED - DD	REVISED -
	DRAWN - NN	REVISED -
PLOT SCALE = $SCALE$	CHECKED - DE	REVISED -
PLOT DATE = $DATE$	DATE - 01/05/2024	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

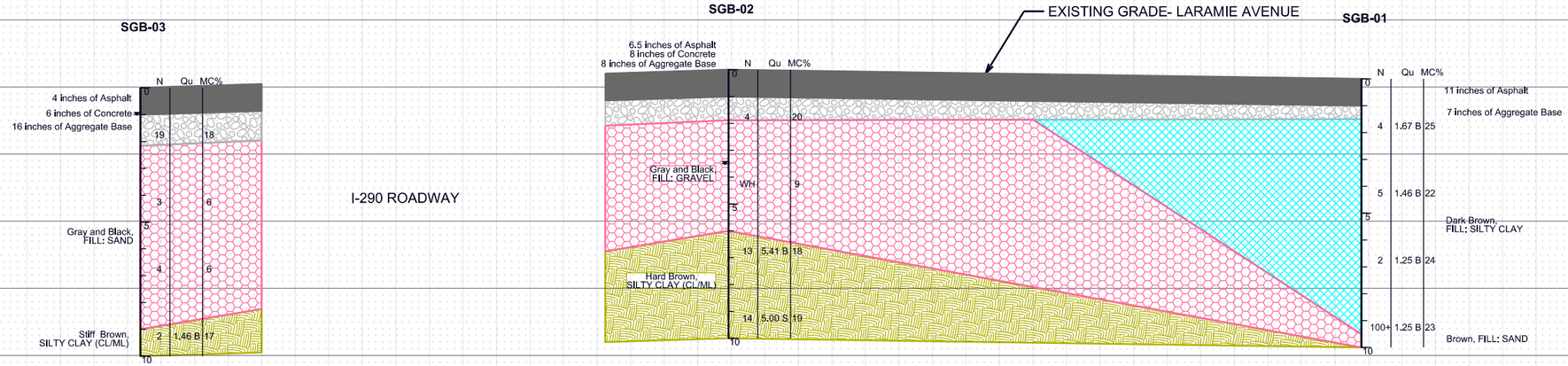
IDOT PTB 204–014
PROPOSED ROADWAY LARAMIE AVENUE OVER I–290
BORING LOCATION PLAN

SCALE: 1:50 | SHEET 1 OF 1 SHEETS | STA. | TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	3	1
		CONTRACT NO. PTB 204-014		
		ILLINOIS	FED. AID PROJECT	

LEGEND

PAVEMENT		FILL: SAND / GRAVEL		SANDY CLAY / LOAM	
BASE COURSE		SILTY CLAY		SILTY SAND / SAND LOAM	
TOPSOIL		SAND		ORGANIC SILTY CLAY	
FILL: CLAY / SILTY CLAY		SILT / SILTY LOAM		BEDROCK	



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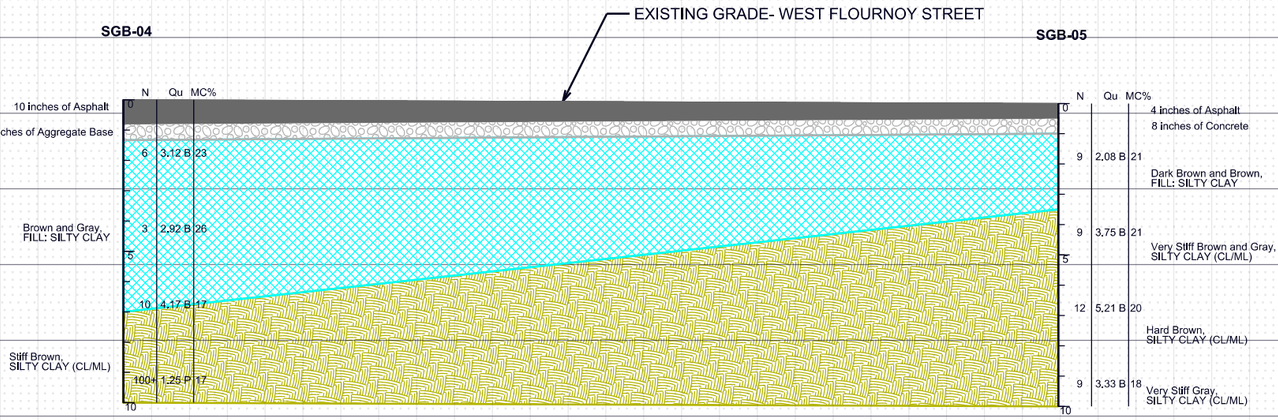
FILE NAME: T:\Illinois DOT\Gannett Fleming 204-014\Geotechnical\Exhibits\Roadway\DGN\IDOT PTB 204-014 Proposed Roadway Laramie Avenue over I-290-Profile-01.dgn

GSG CONSULTANTS, INC. 735 E REMINGTON RD, SCHAUMBURG, IL 60173 TEL: +1630.994.2600 | WWW.GSG-CONSULTANTS.COM	USER NAME = nnano	DESIGNED - DD	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	IDOT PTB 204-014 PROPOSED ROADWAY LARAMIE AVENUE OVER I-290 BORING PROFILE
		DRAWN - NN	REVISED -		
	PLOT SCALE = 240.0000 ' / ft.	CHECKED - DE	REVISED -		SCALE: AS NOTED | SHEET 1 OF 3 SHEETS | STA. 1517+75 TO STA. 1525+50
	PLOT DATE = 2/12/2024	DATE - 01/11/2024	REVISED -		

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	4	2
		CONTRACT NO. PTB 204-014		
	ILLINOIS | FED. AID PROJECT			

LEGEND

PAVEMENT	FILL: SAND / GRAVEL	SANDY CLAY / LOAM
BASE COURSE	SILTY CLAY	CLAYEY SAND / SILT
TOPSOIL	SAND	ORGANIC SILTY CLAY
FILL: CLAY / SILTY CLAY	SILT / SILTY LOAM	BEDROCK



4624+75 | 4625+00 | 4625+25 | 4625+50 | 4625+75 - 4628+00 | 4628+25 | 4628+50 | 4628+75 | 4629+00

GSG CONSULTANTS, INC.
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USER NAME = nnano	DESIGNED - DD	REVISED -	
	DRAWN - NN	REVISED -	
PLOT SCALE = 240.0000 ' / ft.	CHECKED - DE	REVISED -	
PLOT DATE = 2/12/2024	DATE - 01/11/2024	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IDOT PTB 204–014
PROPOSED ROADWAY LARAMIE AVENUE OVER I–290
BORING PROFILE

SCALE: AS NOTED | SHEET 2 OF 3 SHEETS | STA. 4624+75 | TO STA. 4629+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	4	3
		CONTRACT NO. PTB 204-014		
	ILLINOIS	FED. AID PROJECT		

LEGEND

PAVEMENT	FILL: SAND / GRAVEL	SANDY CLAY / LOAM
BASE COURSE	SILTY CLAY	SILTY SAND / SAND LOAM
TOPSOIL	SAND	ORGANIC SILTY CLAY
FILL: CLAY / SILTY CLAY	SILT / SILTY LOAM	BEDROCK

EXISTING GRADE- WEST LEXINGTON STREET

SGB-06

	N	Qu	MC%
5 inches of Asphalt 13 inches of Aggregate Base	0		
Light Brown, FILL: SAND	8	12	
Very Stiff Gray and Brown, SILTY CLAY (CL/ML)	7	3.12 B	13
	8	3.96 B	23
Very Stiff Gray, SILTY CLAY (CL/ML)	9	3.54 B	18
	10		

SGB-07

	N	Qu	MC%
4 inches of Asphalt 8.5 inches of Concrete 13 inches of Aggregate Base	0		
Brown, FILL: SAND	9		13
Stiff to Hard Gray and Brown, SILTY CLAY (CL/ML)	3	1.87 B	22
	5		
	14	5.21 B	17
Loose Gray, SAND (SP) Very Stiff Gray, SILTY CLAY (CL/ML)	8	2.5 B	19
	10		

3710+00 3710+25 3710+50 3710+75 3711+00 - 3713+00 3713+25 3713+50 3713+75 3714+00 3714+25

USER NAME = nnano	DESIGNED - DD	REVISED -	
	DRAWN - NN	REVISED -	
PLOT SCALE = 240.0000 ' / ft.	CHECKED - DE	REVISED -	
PLOT DATE = 2/12/2024	DATE - 01/11/2024	REVISED -	

GSG CONSULTANTS, INC.
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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IDOT PTB 204–014
PROPOSED ROADWAY LARAMIE AVENUE OVER I–290
BORING PROFILE

SCALE: AS NOTED | SHEET 3 OF 3 SHEETS | STA. 3710+00 TO STA. 3714+25

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	4	4
		CONTRACT NO. PTB 204-014		
		ILLINOIS	FED. AID PROJECT	

MODEL: Default
FILE NAME: T:\Illinois DOT\Gannett Fleming 204-014\Geotechnical\Exhibits\Roadway\DGN\IDOT PTB 204-014 Proposed Roadway Laramie Avenue over I-290-Profile-03.dgn

APPENDIX B

SOIL BORING LOGS

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 10/4/23

ROUTE FAI 290 **DESCRIPTION** Roadway Boring **LOGGED BY** DV

SECTION FAI 290 22 **LOCATION** , **SEC.** 16, **TWP.** 39N, **RNG.** 13E,
Latitude , **Longitude**

COUNTY Cook **DRILLING RIG** Mobile B-57 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-01
Station 1524+98.90
Offset 27.23ft LT
Ground Surface Elev. 607.80 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
11 inches of Asphalt 7 inches of Aggregate Base	606.88 606.30		1		
Dark Brown, Moist to Very Moist FILL: SILTY CLAY, trace gravel, organics			2 2	1.7 B	25
			WH		
		-5	3 2	1.5 B	22
			WH		
			WH 2	1.3 B	24
			1		
	598.30		5	1.3	23
Brown, Wet FILL: SAND, trace brick	597.80	-10	50/1"	B	
End of Boring					
		-15			
		-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 10/4/23

ROUTE FAI 290 **DESCRIPTION** Roadway Boring **LOGGED BY** DV

SECTION FAI 290 22 **LOCATION** , **SEC.** 16, **TWP.** 39N, **RNG.** 13E,

Latitude , **Longitude**

COUNTY Cook **DRILLING RIG** Mobile B-57 **HAMMER TYPE** Auto

DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-02
Station 1522+17.62
Offset 17.88ft RT
Ground Surface Elev. 608.14 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 604.6 ft ▼
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
6.5 inches of Asphalt 8 inches of Concrete 8 inches of Aggregate Base	607.60 606.94		3		
	606.26		2 2		20
Gray and Black, Moist to Wet FILL: GRAVEL		▼	2		
		-5	WH WH		9
	602.14		3		
Hard Brown, Moist SILTY CLAY, trace gravel (CL/ML)			5 8	5.4 B	18
			3		
	598.14	-10	7 7	5.0 S	19
End of Boring		-15			
		-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 10/9/23

ROUTE FAI 290 **DESCRIPTION** Roadway Boring **LOGGED BY** DV

SECTION FAI 290 22 **LOCATION** , **SEC.** 16, **TWP.** 39N, **RNG.** 13E,

Latitude , **Longitude**

COUNTY Cook **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 95.5

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-03
Station 1517+91.87
Offset 22.27ft LT
Ground Surface Elev. 607.47 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 606.5 ft ▼
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
4 inches of Asphalt	607.14				
6 inches of Concrete	606.64 ▼				
16 inches of Aggregate Base			33		
			13		18
	605.31		6		
Gray and Black, Moist FILL: SAND, trace gravel					
			3		
			2		6
		-5	1		
			4		
			2		6
			2		
	598.47		2		
Stiff			1	1.5	17
Brown, Moist			1	B	
SILTY CLAY, trace gravel (CL/ML)	597.47	-10			
End of Boring					
		-15			
		-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 10/4/23

ROUTE FAI 290 **DESCRIPTION** Roadway Boring **LOGGED BY** DV

SECTION FAI 290 22 **LOCATION** , **SEC.** 16, **TWP.** 39N, **RNG.** 13E,
Latitude , **Longitude**

COUNTY Cook **DRILLING RIG** Mobile B-57 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-04
Station 1522+15.38
Offset 181.21ft LT
Ground Surface Elev. 607.94 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
10 inches of Asphalt 6 inches of Aggregate Base	607.11 606.61		2		
Brown and Gray, Moist to Very Moist FILL: SILTY CLAY, trace gravel, organics, brick			3 3	3.1 B	23
			1		
		-5	1 2	2.9 B	26
			2		
	600.94		5 5	4.2 B	17
Stiff Brown, Moist SILTY CLAY, trace gravel (CL/ML)			10		
	597.94	-10	15 50/3"	1.3 P	17
End of Boring		-15			
		-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 10/4/23

ROUTE FAI 290 **DESCRIPTION** Roadway Boring **LOGGED BY** DV

SECTION FAI 290 22 **LOCATION** , **SEC.** 16, **TWP.** 39N, **RNG.** 13E,

Latitude , **Longitude**

COUNTY Cook **DRILLING RIG** Mobile B-57 **HAMMER TYPE** Auto

DRILLING METHOD HSA **HAMMER EFF (%)** 89.0

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-05
Station 1522+17.62
Offset 167.31ft RT
Ground Surface Elev. 607.82 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter None ft
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
4 inches of Asphalt 8 inches of Concrete	607.49 606.82				
Dark Brown and Brown, Moist FILL: SILTY CLAY, trace gravel, sand			4 4 5	2.1 B	21
	604.32		3		
Very Stiff Brown and Gray, Moist SILTY CLAY, trace gravel (CL/ML)		-5	4 5	3.8 B	21
	601.82		3		
Hard Brown, Moist SILTY CLAY, trace gravel (CL/ML)			5 7	5.2 B	20
	598.82		2		
Very Stiff Gray, Moist SILTY CLAY, trace gravel (CL/ML)	597.82	-10	4 5	3.3 B	18
End of Boring		-15			
		-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 10/9/23

ROUTE FAI 290 **DESCRIPTION** Roadway Boring **LOGGED BY** DV

SECTION FAI 290 22 **LOCATION** , **SEC.** 16, **TWP.** 39N, **RNG.** 13E,

COUNTY Cook **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 95.5
Latitude , **Longitude**

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-06
Station 1518+66.99
Offset 186.24ft LT
Ground Surface Elev. 607.54 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 604.0 ft ▼
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
5 inches of Asphalt	607.12				
13 inches of Aggregate Base	606.04		5		
Light Brown, Moist FILL: SAND			4 4		12
	603.54	▼	2		
Very Stiff Gray and Brown, Moist SILTY CLAY, trace gravel (CL/ML)	601.54	-5	3 4	3.1 B	13
Very Stiff Gray, Moist SILTY CLAY, trace gravel (CL/ML)			3		
			4 4	4.0 B	23
			3		
	597.54	-10	4 5	3.5 B	18
End of Boring		-15			
		-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 10/9/23

ROUTE FAI 290 **DESCRIPTION** Roadway Boring **LOGGED BY** DV

SECTION FAI 290 22 **LOCATION** , **SEC.** 16, **TWP.** 39N, **RNG.** 13E,

Latitude , **Longitude**

COUNTY Cook **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto

DRILLING METHOD HSA **HAMMER EFF (%)** 95.5

STRUCT. NO. N/A
Station N/A

BORING NO. SGB-07
Station 1518+64.30
Offset 142.61ft RT
Ground Surface Elev. 607.16 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 603.7 ft ▼
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
4 inches of Asphalt 8.5 inches of Concrete 13 inches of Aggregate Base	606.83 606.12		4		
			4 5		13
	605.04				
Brown, Moist FILL: SAND, with gravel	604.66				
Stiff to Hard Gray and Brown, Moist SILTY CLAY, trace gravel (CL/ML)		▼	1		
			2 1	1.9 B	22
		-5			
			5		
			6 8	5.2 B	17
	598.66				
Loose Gray, Wet SAND, trace gravel (SP)			4		
	597.66		4 4	2.5 B	19
Very Stiff Gray, Moist SILTY CLAY, trace gravel (CL/ML)	597.16	-10			
End of Boring					
		-15			
		-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

APPENDIX C

LABORATORY TEST

RESULTS

GSG CONSULTANTS, INC.

735 Remington Road
Schaumburg, IL 60173
Tel: 630.994.2600
www.gsg-consultants.com

Table D-3 – Organic Content

Boring ID	Sample Depth (ft)	Organic Content (%)
SGB-01	3.5-5.0	4.3
SGB-04	3.5-5.0	3.8