Structural Geotechnical Report

IDOT PTB 199-013
Work Order #5
IL Route 68 at Salt Creek
Culvert Replacement
Cook County, Illinois

Prepared for:

Illinois Department of Transportation

Illinois Department of Transportation
Job No. D-94-079-21

Project Design Engineer:
Orion Engineers, LLC

Prepared by:

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July 24, 2023

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Mr. Lukas Janulis, SE, PE
Orion Engineers, PLLC
312 North May Street, Suite 100
Chicago, IL 60607

Structural Geotechnical Report
IDOT PTB 199-013 Work Order #5
IL Route 68 at Salt Creek
Cook County, IL
Job No. D-94-079-21

Dear Mr. Janulis:

Attached is a copy of the Geotechnical Report for the above referenced project. The report provides a brief description of the site investigation, site conditions, and geotechnical recommendations for the proposed improvements. The site investigation included advancing two (2) borings to a depth of 40 feet each at either end of the proposed culvert.

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

TABLE OF CONTENTS

Exhibits

Tables

Appendices

Structural Geotechnical Report
IDOT PTB 199-013 Work Order #5
IL Route 68 at Salt Creek
Culvert Replacement
Palatine, Illinois
Job No. D-94-079-21

1.0 INTRODUCTION

GSG Consultants, Inc. (GSG) completed a geotechnical investigation for the proposed design and installation of a new 61-foot-long culvert. The structure will be located along IL Route 68 near Salt Creek in Palatine, Illinois. The purpose of the investigation was to explore the subsurface conditions, to determine engineering properties of the subsurface soil, and develop design and construction recommendations for the proposed culvert. **Exhibit 1** shows the general project location.

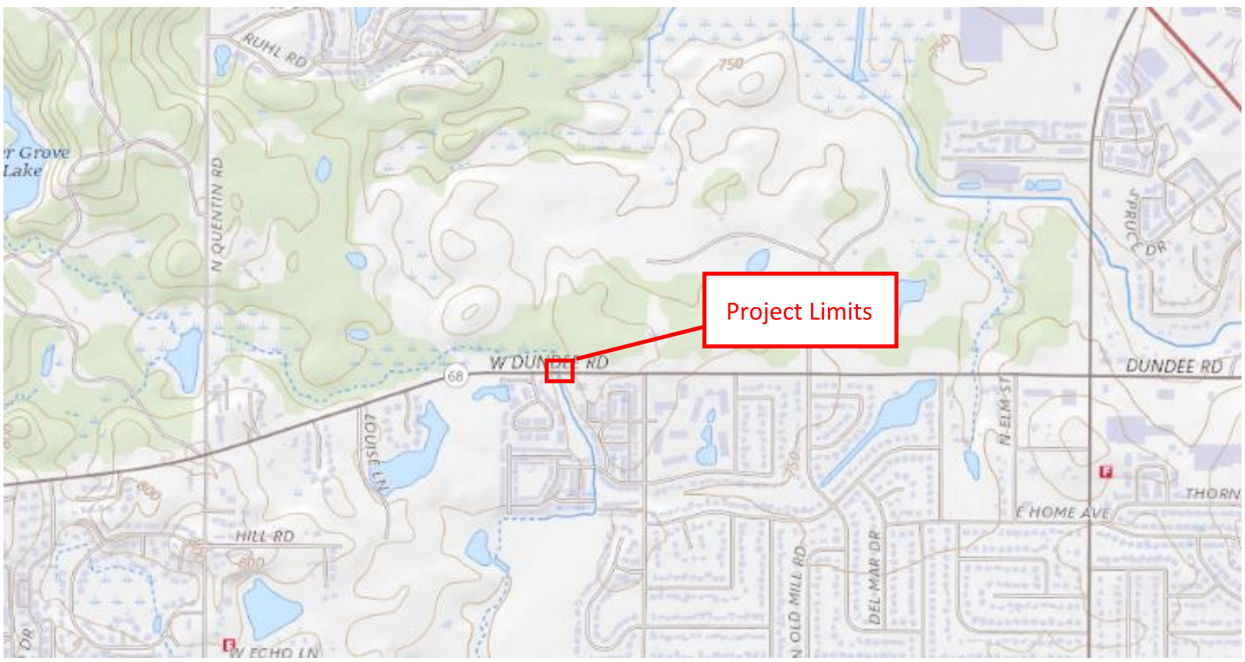

Exhibit 1: Project Location Map

1.1 Proposed Structure Information

Based on information provided by Orion Engineers, LLC. (Orion), the proposed project is to remove the existing culvert and install a new 61-foot-long, single cell concrete box culvert. The proposed culvert will have a height of 8 feet and a width of 12 feet, with a 1.17-foot embedment. Based on the most recent information provided by IDOT, the upstream and downstream invert elevations are 757.15 and 756.92 feet, respectively. Based on the proposed drawings provided by Orion, it is anticipated that the proposed improvements will be supported by shallow foundations.

The new culvert is anticipated to be constructed with precast or cast-in-place concrete. Precast concrete is generally costlier to purchase but faster to install compared to cast-in-place concrete. Both options are feasible for this site.

1.2 Proposed Construction

The objective of this study was to explore and characterize the subsurface soil conditions to provide recommendations regarding the proposed improvements. The scope of this study includes the following:

1. Advance two (2) borings to a depth of 40 feet each in the area of the proposed culvert.
2. Perform a geotechnical laboratory testing program on selected representative soil samples obtained during the field investigation to evaluate relevant engineering parameters of the subsurface soils.
3. Perform engineering analysis and evaluation of the data collected during the field investigation and laboratory testing to develop geotechnical engineering design recommendations for the proposed improvements.

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 subsurface soil investigation was conducted on July 29, 2022, and included advancing two (2) soil borings near the proposed culvert location to a depth of 40 feet each. Boring CB-01 was completed through the westbound lane of IL Route 68 and boring CB-02 was completed through the eastbound lane of IL Route 68. The soil boring locations were selected by GSG based on the location plans provided by Orion and completed based on field conditions, utilities, and site accessibility. **Table 1** presents a list of the boring location information.

Table 1 – Summary of Subsurface Exploration Borings

Boring	Northing	Easting	Existing Ground Elevation (ft)	Depth (ft)
CB-01	1993496.511	1060721.106	768.1	40.0
CB-02	1993475.347	1060712.768	767.9	40.0

The existing ground surface elevations for the borings were based on the field survey performed by GSG using hand-held GPS equipment. The approximate locations of the soil borings are shown on the **Boring Location Plan (Appendix A)**.

The soil borings were drilled using a truck mounted CME-75 drill rig (hammer efficient 91%) and a truck mounted Diedrich D-50 drill rig (hammer efficiency 98%). Both rigs used 3¼-inch I.D. hollow stem augers and automatic hammers. 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 depth. 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 and hand penetrometer in accordance with IDOT procedures and requirements. Representative soil samples were collected from each sample interval, 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. The laboratory testing consisted of moisture content tests (ASTM D2216 / AASHTO T-265) on representative samples.

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 shown along with the field test results in the Soil Boring Log **(Appendix B)**.

2.3 Subsurface Soil Conditions

This section provides a brief description of the soils encountered in the boring performed. 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 log. The soil boring logs provide specific conditions encountered at the boring locations. The soil boring logs include soil descriptions, stratifications, penetration resistance, elevations, location of the samples, and laboratory test data. Unless otherwise noted, soil descriptions indicated on the boring logs are visual identifications. The stratifications shown on the boring logs represent the conditions only at the actual boring location and represent the approximate boundary between subsurface materials; however, the actual transition may be gradual.

Borings CB-01 and CB-02 were drilled through the roadway of IL Route 68 and each initially noted 6 inches of asphalt. Boring CB-02 also noted 2 inches of sand subbase below the asphalt. Beneath the pavement section, brown, black and gray silty clay fill materials were noted to depths of 11 to 11.5 feet (elevations 756.6 to 756.9 feet). In boring CB-01, a concrete slab was encountered from 10 to 11.5 feet. Cobbles were noted within the fill in CB-02 at a depth of about 3.5 feet. The fill materials in CB-02 between depths of 9 to 11 feet contained trace organic materials. The unconfined compressive strength of the clay fill ranged from 0.8 to 3.1 tsf. The moisture contents of the fill materials ranged from 17 to 37 percent.

Beneath the fill, a layer of very stiff, brown and gray silty clay was encountered to a depth of 21 feet (elevation 747.1 feet). Within this layer, in CB-01 a layer of medium stiff silty clay was encountered from 11.5 to 15.5 feet. The brown and gray silty clay soil was underlain by very stiff to hard gray silty clay to the boring termination depths of 40 feet.

The unconfined compressive strength values of the native brown and gray silty clay ranged between 0.5 tsf and 3.33 tons per square foot (tsf), with most values greater than 1.5 tsf. The medium stiff silty clay layer encountered in CB-01 from 11.5 to 15.5 feet, had unconfined compressive strength values from 0.5 to 0.8 tsf. The unconfined compressive strength values of the gray silty clay ranged between 2.08 tsf and 5.41 tsf, with an average strength of 3.21 tsf.

2.4 Groundwater Conditions

Water levels were checked in the borings to determine the general groundwater conditions present at the site and were measured while drilling and after each boring was completed. Groundwater was not encountered during or after drilling activities at the soil boring location.

Based on the color change from brown to gray, it is anticipated that the long-term groundwater level for the site is 16 feet below grade (elevation 751.9 feet). Perched water may also be present within the existing fill materials or any confined sand seams. Water level readings were made in the borehole at times and under conditions shown on the boring log and stated in the text of this report. However, it should be noted that fluctuations in groundwater level may occur due to variations in rainfall, other climatic conditions, or other factors not evident at the time measurements were made and reported herein.

3.0 GEOTECHNICAL ANALYSIS

This section provides GSG's geotechnical analysis and recommendations for the design of the proposed improvements based on the results of the field exploration, laboratory testing, and geotechnical analysis. Subsurface conditions in unexplored locations may vary from those encountered at the boring location. If the structure location, loadings, or elevations are changed, we request that GSG be contacted so that we may re-evaluate our recommendations.

3.1 Soil Parameters for Design

GSG determined the geotechnical parameters to be used for the project design based on the results of the 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 standard penetration test (SPT) results for the fill and cohesionless soils and in-situ and laboratory test results for cohesive soils. Based on the field investigation data collected, generalized soil parameters for the soils for use in the design are presented in **Table 2.**

Table 2 – Summary of Soil Parameters

Depth / Elevation Range (feet)	Soil Description	In situ Unit Weight γ (pcf)	Undrained		Drained	
			Cohesion c (psf)	Friction Angle ϕ (°)	Cohesion c (psf)	Friction Angle ϕ (°)
	New Engineered Clay Fill	125	1,000	0	50	25
	New Engineered Granular Fill	125	0	30	0	30
1.0 – 11.5 (767.1-756.6)	Fill Brown, Black and Gray Silty Clay	138	2,100	0	210	28
11.5 – 21.0 (756.6-747.1)	Stiff to Very Stiff Brown and Gray Silty Clay	138	2,500	0	250	28
21.0 – 40.0 (747.1-728.1)	Very Stiff to Hard Gray Silty Clay	138	3,200	0	320	28
11.5 – 15.5 (756.6-752.1) ***CB-01 ONLY**	Medium Stiff Brown and Gray Silty Clay	124	650	0	65	26

3.2 Slope Stability

IDOT requires that slope stability analysis be performed in areas where the cut or fill heights will exceed 15 feet in height. Based on the preliminary design plan, the maximum cut height will be less than 15 feet; therefore, no slope stability analysis was required for this report.

3.3 Settlement

The existing roadway profile is approximately 10 feet higher than the new wingwall footings. The anticipated settlement at the wingwalls will be less than 0.5 inches based on an anticipated design bearing pressure of 3,000 psf.

3.4 Seismic Considerations

The seismic hazard for the site was analyzed per the IDOT Geotechnical Manual, IDOT Bridge Design Manual, and AASHTO LRFD Bridge Design Specifications. As per the Bridge Manual, seismic data is not typically needed for buried structures. Therefore, no additional analysis is warranted.

3.5 Scour Analysis

Scour analysis is not warranted for closed bottom box culvert per All Bridge Designers memo 14.2, dated November 7, 2014. Therefore, no additional scour analysis is warranted.

3.6 Organic Content

Soils that were encountered in the borings in which organic material was observed were noted on the boring logs by the field engineer. Traces of organic content were noted in the silty clay fill material at a depth of 9.0 to 11.0 feet below grade. Typically, soils with an organic content in excess of 10 percent are considered unsuitable to remain below proposed project areas. Based on the soil borings, it is not anticipated that highly organic soils will be encountered in subgrade soils for the proposed culvert extension.

4.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

This section provides the results of GSG's geotechnical evaluation of the existing foundation system and design recommendations in accordance with the most current AASHTO LRFD 9th Edition (2020) and IDOT Geotechnical Manual (2020). The foundations for the proposed culvert must provide sufficient support to resist the dead and live loads.

4.1 Bearing Resistance

GSG evaluated the soils at the approximate bearing grade elevation of 755.75 to 756.0 feet (1'2" below the invert elevations) for the proposed culvert. The recommendations in this report are based on the preliminary plan drawings provided by Orion. For the design of the foundations for the culvert and headwall, the total live load, impact loads, and dead loads, including the load of the overburden soils, should be considered. Design should be completed in accordance with the design hydraulics report and the IDOT Culvert Manual (2017).

The subsurface investigation noted low strength and high moisture content silty clay fill material at the assumed bearing elevation. Bearing resistance shall be evaluated at the strength limit state using load factors and factored bearing resistance. The bearing resistance factor, ϕ_b, for shallow foundations in clay and sand is 0.50, per AASHTO Table 10.5.5.2.2.1. The bearing resistance shall be checked for the extreme limit state with a resistance factor of 1.0. **Table 3** presents the recommended bearing resistance of suitable materials to support the proposed culvert extension.

A foundation system consisting of shallow spread footings could be used to support the proposed culvert and headwall and should be placed at a minimum depth of 3 feet below grade for Type L walls or 4 feet below finished grade for Type T Walls (in accordance with IDOT Culvert manual), for frost protection.

Table 3 – Recommended Bearing Resistance

Approximate Bearing Elevation (feet)	Nominal Bearing Resistance (ksf)	Factored Bearing Resistance (ksf)	Bearing Resistance for 1-inch Settlement Service Limit (ksf)
755.75 to 756.0	5.3	2.4	2.4

The subgrade soils at bearing grade should be evaluated per the guidelines provided in Section 8.9 of the IDOT Geotechnical Manual (2020) for suitability/workability prior to placing any portion of the proposed culvert. Based on the subsurface soil conditions, GSG anticipates undercuts will be necessary to reach suitable bearing soils at the bottom of the culvert as shown in **Table 4**.

Table 4 – Recommended Undercuts

Boring ID	Invert Elevation (ft)	Depth of Undercut Below Invert Elevation (ft)	Recommended Undercut Elevation (ft)	Comments
CB-01	757.15	4.5	752.65	Existing Fill/Concrete Slabs
CB-02	756.92	0	N/A	Suitable Very Stiff Silty Clay

4.2 Lateral Load Resistance

The culvert headwall will be subject to uneven loading and should be evaluated for anticipated lateral loads. Lateral earth pressures for permanent underground structures will be dependent on the type of backfill used, whether it is in a drained or undrained state, as well as loading conditions. The proposed culvert should be designed using the at-rest earth pressure coefficients provided in **Table 4.**

The lateral earth pressures for the headwalls should be designed per the guidance provided in Section 4 of the IDOT Culvert Manual (2017). Wall sections that are independent of the culvert should be designed using the Rankine active earth pressure coefficient, K_a. Headwalls that are fixed to the culvert to resist movement should be designed using an at-rest earth pressure coefficient. Lateral design parameters for use in the design are provided in **Table 5**.

Table 5 – Lateral Load Resistance Soil Parameters

Depth / Elevation Range (feet)	Soil Description	Unit Weight γ	Friction Angle ϕ	Active Earth Pressure Coefficient (K_a)	Passive Earth Pressure Coefficient (K_p)	At-Rest Earth Pressure Coefficient (K_o)
	New Engineered Clay Fill	125	20	0.41	2.46	0.58
	New Engineered Granular Fill	125	30	0.33	3	0.5
1.0 – 11.5 (767.1-756.6)	Fill Brown, Black and Gray Silty Clay	138	28	0.36	2.77	0.53
11.5 – 21.0 (756.6-747.1)	Very Stiff Brown and Gray Silty Clay	138	28	0.36	2.77	0.53
21.0 – 40.0 (747.1-728.1)	Very Stiff to Hard Gray Silty Clay	138	28	0.36	2.77	0.53
11.5 – 15.5 (756.6-752.1) ***CB-01 ONLY**	Medium Stiff Brown and Gray Silty Clay	124	26	0.41	2.46	0.58

4.3 Drainage Recommendations

The headwalls should be designed to prevent the buildup of hydrostatic forces. This can be done with the construction of a base drain and back drain to collect and remove surface water away from the face of the retaining wall. Geocomposite Wall Drain or open grade stone with a geotextile fabric system should be placed over the entire length of the back face of the wall. If a drain cannot be installed behind the wall, hydrostatic pressures should be accounted for with the lateral design of the headwall.

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

Any pavement materials or topsoil encountered during construction should be stripped and stockpiled as per Section 211.03 of the IDOT Standard Specifications for Road and Bridge Construction (SSRBC). The topsoil should be separated from other materials being stockpiled onsite for reuse or haul-off. Stripping of any trees, brush, vegetation, and topsoil may also be necessary at the proposed improvement location. It should be noted that a concrete slab was encountered approximately 10 feet below the ground surface at boring CB-01 that will likely require additional removal during construction.

5.2 Scour Considerations

To help prevent local erosion, it is recommended to place stone riprap at the end of the culvert. This will help prevent sediments from entering and accumulating in the culvert, reduce long term maintenance, and provide protection to the streambed at the interface.

5.3 Site Excavation

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 to provide a 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. In accordance with OSHA Regulation 29 CFR 1926 Subpart P Appendix B, the maximum allowable slopes for excavations less than 20 feet should be completed per the OSHA Excavation Slopes shown in **Table 6**. Excavations made in layered soil systems shall use the maximum allowable slope for each layer as prescribed in the OSHA Regulation. Excavations greater than 20 feet deep should be designed by a registered professional engineer; any shoring or bracing systems should be designed by a licensed structural engineer.

Table 6 – OSHA Excavation Slopes

Soil or Rock Type	Maximum Allowable Slope (H:V) for less than 20 feet
Stable Rock	Vertical (90°)
Type A	¾:1 (53 °)
Type B	1:1 (45 °)
Type C	1 ½:1 (34 °)

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. Surcharge loads from the excavated materials, construction equipment, and vehicles should be included in the design of the excavation system. Excavation near existing structures and underground utilities should be performed with extreme care to avoid undermining existing structures.

If water seepage occurs during excavation or where wet conditions are encountered such that the water cannot be removed with conventional sumping, GSG recommends 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 to 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 consisting of granular materials such as IDOT CA-6.

5.4 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 IDOT SSRBC (2022). 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 Construction Manual. Earth-moving operations should be avoided during excessively cold or wet weather to avoid freezing of softening subgrade soils. All backfill materials around the culvert must be pre-approved by the site engineer. Backfill materials for undercut areas beneath the culvert should be placed in 8 inches loose lifts and should be compacted to 95% of the maximum dry density as determined by AASTHO T-180, Modified Proctor Method.

5.5 Groundwater Management

The long-term groundwater is anticipated to be 16 feet below grade (elevation 751.9 feet). Due to the overall cohesive nature of the site, GSG does not anticipate significant groundwater related issues during construction, however excavations may be impacted by the creek level at time of construction. Perched water may also be encountered in the existing fill materials. 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.

5.6 Temporary Soil Retention

Based on the presence of some cobbles and a concrete slab, temporary sheet piling may not be feasible. A Temporary Soil Retention System (TSRS) should be used for any excavations. The TSRS should be designed in accordance with the IDOT Bridge Design Manual, Section 3.13.1, Temporary Sheet Piling Design, Temporary Soil Retention Systems, and Braced Excavations and the IDOT Design Guide. The design of the temporary earth retention system is the responsibility of the contractor. The contractor should submit the TSRS plans to the structural design team for review prior to commencing construction of the TSRS.

6.0 LIMITATIONS

This report has been prepared for the exclusive use of the Illinois Department of Transportation and its consultant team. The recommendations provided in the report are specific to the project described herein and are based on the information obtained from the soil boring location within the proposed project limits. The analyses have been performed and the recommendations have been provided in this report are based on subsurface conditions determined at the location of the boring. This report may not reflect all variations that may occur outside the boring location 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

FILE NAME = T:\Illinois DOT\Orion Engineers_199-013\Work Order #5 - IL 68 at Salt Creek\Geotechnical\Exhibits\DGNs\DD-IL-68 at Salt Creek Boring Location Plan 08172022.dgn
PEN TABLE = X:\Clients\Tollway\WorkSpace\tables\pen\gsg mono.tbl
PLOT DATE = 8/17/2022
TIME = 11:06:48 AM
SHEET SIZE = 17x11 (in.)
PLOT SCALE = 100.0000 sf / in.
USER NAME = ddimaggio

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USER NAME = ddimaggio		DESIGNED -	DD
SHEET SIZE = 17x11 (in.)		DRAWN -	DD
PLOT SCALE = 100.0000 sf / in.		CHECKED -	DE
PLOT DATE = 8/17/2022		DATE -	08/17/2022

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CONTRACT NO. 199-013

IL 68 AT SALT CREEK
BORING LOCATION PLAN

SCALE: **AS NOTED** | SHEET 1 OF 1 SHEETS | STA. | TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		COOK	1	1
		CONTRACT NO. **199-013**		
	ILLINOIS	FED. AID PROJECT		

APPENDIX B

SOIL BORING LOGS

Illinois Department of Transportation
Division of Highways
GSG

SOIL BORING LOG

Date 7/29/22

ROUTE Illinois Route 68 **DESCRIPTION** Culvert and Retaining Walls **LOGGED BY** AA

SECTION ______ **LOCATION** IL 68 at Salt Creek, **SEC.** , **TWP.** , **RNG.** , **Latitude** , **Longitude**

COUNTY Cook **DRILLING RIG** D50 Blue **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO. 016-2302
Station ______

BORING NO. CB-01
Station 25+50.73
Offset 17.70ft LT
Ground Surface Elev. 768.15 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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
6 inches of Asphalt	767.65				
Brown and Black, Moist FILL: SILTY CLAY, trace asphalt, trace gravel, trace sand			3 / 4 / 4	1.8 P	17
		-5	2 / 3 / 4	2.5 P	21
	761.15		2 / 2 / 3	2.5 P	18
Brown and Dark Gray, Moist to Very Moist FILL: SILTY CLAY, trace gravel, sand		-10	8/4" / - / -		37
Concrete Slab encountered at 10 feet	756.65				
Medium Stiff Gray and Brown, Very Moist SILTY CLAY, trace gravel (CL/ML)			1 / 1 / 2	0.5 P	31
		-15	1 / 2 / 4	0.8 B	27
	752.65				
Stiff to Very Stiff Gray and Brown, Moist SILTY CLAY, trace gravel (CL/ML)			3 / 4 / 5	1.7 B	21
		-20	3 / 3 / 5	2.7 B	22
	747.15				
Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			3 / 4 / 8	2.1 B	22
		-25	5 / 5 / 9		16
			4 / 7 / 9	5.4 B	17
		-30	6 / 9 / 12	2.7 B	17
			4 / 6 / 8	2.3 B	22
		-35	8 / 7 / 11	2.5 B	14
			5 / 6 / 9	1.5 B	21
	728.15	-40	3 / 5 / 9	3.1 B	20

End of Boring

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

SOIL BORING LOG

Date 7/28/22

ROUTE Illinois Route 68 **DESCRIPTION** Culvert and Retaining Walls **LOGGED BY** AA

SECTION **LOCATION** IL 68 at Salt Creek, **SEC.** , **TWP.** , **RNG.** , **Latitude** , **Longitude**

COUNTY Cook **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 016-2302
Station

BORING NO. CB-02
Station 25+42.34
Offset 3.44ft RT
Ground Surface Elev. 767.94 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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
6 inches of Asphalt	767.44				
2 inches of Sand	~~767.28~~				
Black and Brown, Moist to Very Moist FILL: SILTY CLAY, trace gravel, little sand			3 4 5	3.1 B	22
Cobbles at 3.5 feet		-5	2 2 3	1.5 B	29
			1 3 5	1.5 B	29
	758.94		1		
Dark Gray, Very Moist FILL: SILTY CLAY, trace organics, trace gravel, trace sand		-10	2 4	0.8 B	29
	756.94				
Very Stiff Brown and Gray, Moist SILTY CLAY, trace gravel (CL/ML)			2 3 5	3.3 B	23
		-15	2 4 5	2.3 B	20
	751.94				
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)			2 3 5	2.3 B	20
		-20	2 3 5	2.5 B	18

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML) *(continued)*			3 4 7	3.1 B	17
		-25	3 5 8	4.0 B	17
			3 4 7	2.7 B	17
		-30	3 4 6	2.1 B	19
			4 8 9	4.0 B	16
		-35	5 7 10	5.2 B	14
			3 6 9	4.4 B	18
Cobbles at 39.5 feet	727.94	-40	4 7 8	3.1 B	20

End of Boring

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)