Structural Geotechnical Report

Proposed Retaining Wall #8
IDOT PTB 198-003
FAI-80 (I-80) over Des Plaines River Bridge
Will County, Illinois

Prepared for

Illinois Department of Transportation
Contract Number: D-91-204-19

Project Design Engineer Team
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Structural Geotechnical Report
Proposed Retaining Walls #8
FAI-80 (I-80) over Des Plaines River Bridge
Will County, IL
PTB 198-003

Dear Mr. Skaleski:

Attached is a copy of the Structural Geotechnical Report for the above referenced project. The report provides a description of the site investigation, site conditions, and foundation and construction recommendations. The site investigation for the proposed retaining wall #8 and ramp AA embankment construction included advancing ten (10) soil borings to depths of 20 to 53.5 feet.

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

Sincerely,

Matthew J Heron, P.E.
Project Engineer

Ala E Sassila, Ph.D., P.E.
Principal

GSG

TABLE OF CONTENTS

Exhibits

Tables

Appendices

Structural Geotechnical Report
Proposed Retaining Wall #8
FAI-80 (I-80) over Des Plaines River Bridge
Will County, Illinois
IDOT PTB 198-003

1.0 INTRODUCTION

GSG Consultants, Inc. (GSG) completed a geotechnical investigation for the proposed Retaining Wall #8 and associated Ramp AA embankment in the City of Joliet in Will County, 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 construction. **Exhibit 1** shows the general project location.

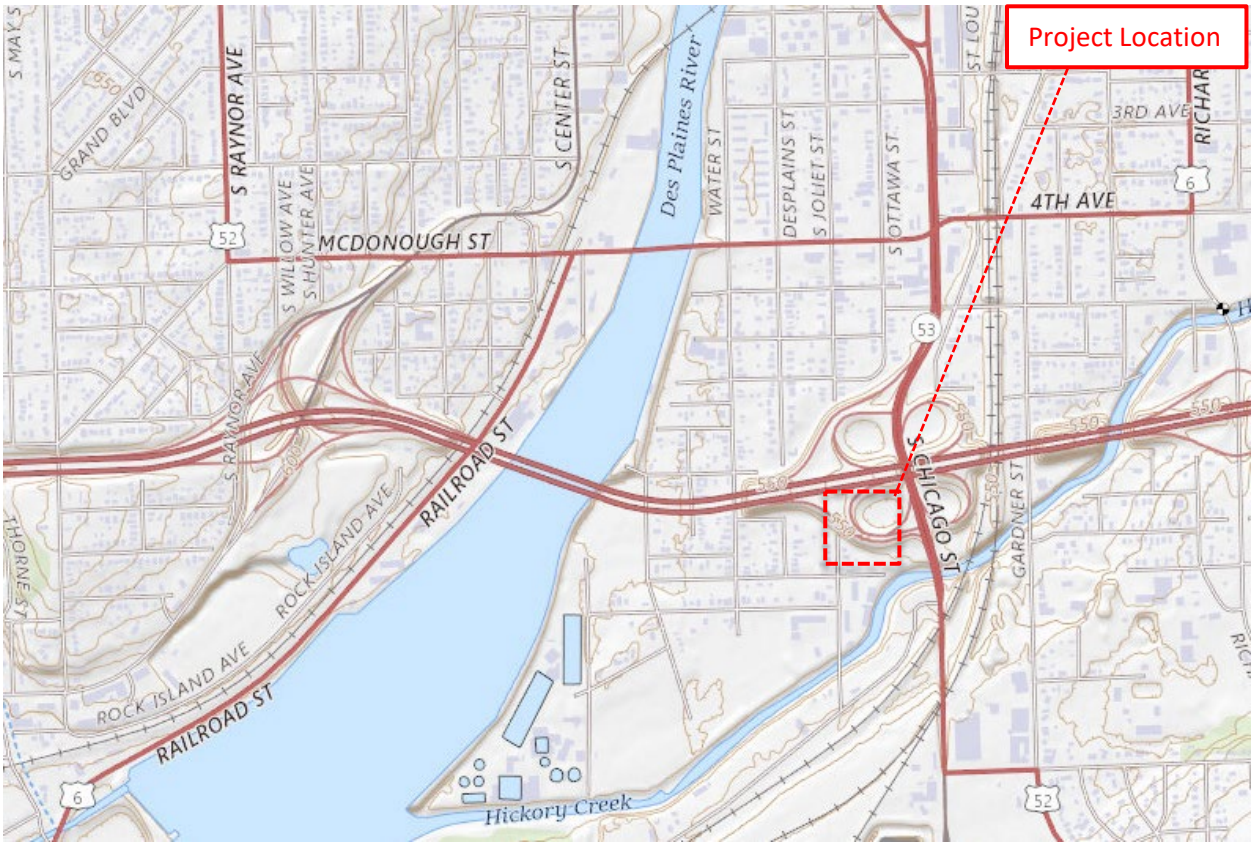


Exhibit 1 – Project Location Map
(Source: USGS Topographic Maps, usgs.gov)

1.1 Existing Retaining Wall Information

The overall proposed improvements at this location will include the realignment of the existing Chicago Street Exit Ramp to EB I-80 as part of the relocation of the Chicago Street bridge. The realignment of Ramp AA will require a retaining wall to separate the new embankment from Ramp A (EB-80 exit ramp). According to the proposed Phase 1 plan drawings provided, the proposed retaining wall will be in both a "cut" and "fill" section of the existing ramp embankment. **Exhibit 2a, 2b and 2c** shows the existing conditions where the proposed retaining wall and embankment will be constructed.

Exhibit 2a – Existing Chicago Street Exit Ramp to EB I-80, Looking East

Exhibit 2b – Existing Chicago Street Exit Ramp to EB I-80, Looking West

Exhibit 2c – Existing and Proposed Retaining Wall Location, Looking from Top

1.2 Proposed Retaining Wall Information

Based on the preliminary GPE Plan provided by WSP (dated 10/07/22), the proposed wall will be in a "cut" and "fill" section. It is anticipated that the proposed wall will consist of a soldier pile wall and have a maximum exposed height of approximately 15.0 feet. The proposed retaining wall will be approximately 514 feet in length along a portion of the realigned ramp between Sta. 7+40 and Sta. 12+25. The new retaining wall will be constructed to separate Ramp AA and Ramp A, due to the grade difference. Starting at Sta. 12+00, a new embankment will be constructed for Ramp AA to connect to the I-80 mainline. It is anticipated that the new embankment will be less than 10 feet in height.

Table 1 presents a summary of the proposed retaining wall and embankment.

Table 1 – Improvement Summary

Wall Name	* Wall Stations	Approximate Length (ft)	Maximum Anticipated Exposed Wall Height (ft)	Maximum Anticipated Embankment Height (ft)
Retaining Wall #8	Sta. 7+40 to Sta. 12+25	514	15.0	n/a
Ramp AA Embankment	Sta. 12+00 to Sta. 15+00	300	n/a	10

* Based on proposed Ramp AA Stationing

2.0 SITE SUBSURFACE CONDITIONS

This section describes the subsurface exploration program and laboratory testing program completed as part of this project. The proposed locations and depths of the soil borings were selected in accordance with IDOT requirements. The borings were completed in the field based on field conditions and accessibility.

2.1 Subsurface Exploration and Laboratory Testing

The site subsurface exploration for the proposed retaining wall structure was conducted between May 4 and June 17, 2022. The investigation included advancing ten (10) borings to depths of 20.0 to 53.5 feet. The locations of these soil borings were reviewed by WSP and adjusted in the field as necessary based on utilities and access. Elevations and as-drilled locations for the borings were gathered by GSG's field crew using GPS surveying equipment. The approximate as-drilled locations of the soil borings are shown on the Soil Boring Location Plan & Subsurface Profiles **(Appendix B)**. **Table 2** presents a summary of the borings used for the analyses.

Table 2 – Summary of Subsurface Exploration Borings

Boring ID	Station **	Offset (ft)	Northing	Easting	Depth (ft)	Surface Elevation (ft)
RWB-66	7+92.36	25.25 LT	1764314.625	1052995.002	42.0*	546.72
RWB-67	8+72.79	15.70 LT	1764313.88	1052914.01	33.5	546.06
RWB-68	9+47.55	11.93 LT	1764308.113	1052839.378	46.5*	548.11
RWB-69	10+21.84	18.45 LT	1764292.23	1052765.815	38.0	551.38
RWB-70	10+88.61	32.89 LT	1764288.99	1052685.791	47.5*	551.16
RWB-71	11+54.05	25.79 LT	1764336.67	1052625.379	32.0	551.17
RWB-72	12+29.54	22.11 LT	1764413.097	1052585.048	53.5*	549.43
SSB-38	12+77.35	20.92 LT	1764468.248	1052579.929	20.0	547.76
SSB-39	13+67.05	6.89 LT	1764554.225	1052625.206	20.0	549.31
SSB-40	14+62.05	18.89 LT	1764624.778	1052694.998	20.0	554.82

* Depth includes Bedrock Core (10 feet)

** Based on proposed Ramp AA Stationing

Copies of the Soil Boring Logs are provided in **Appendix C**.

The soil borings were drilled using truck mounted Diedrich D-50 (hammer efficiency 98%), CME-75 (hammer efficiency 91%) and Geoprobe 7822DT (hammer efficiency 92%) drill rigs, each

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 planned boring termination depths or auger refusal on bedrock. 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 where necessary to match the existing pavement.

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 and rock samples:

- Moisture content ASTM D2216 / AASHTO T-265
- Atterberg Limits – ASTM D4318 / AASHTO T-89 / AASHTO T-90
- Dry Unit Weight – ASTM D7263
- Unconfined Compression Strength on Rock ASTM D2938

The laboratory tests were performed in accordance with test procedures outlined in the most current 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 included in the Laboratory Test Results **(Appendix E)** and are also shown along with the field test results in the Soil Boring Logs **(Appendix C)**.

2.3 Subsurface Soil Conditions

This section provides a brief description of the soils encountered in the borings performed in the vicinity of the proposed retaining wall and embankment. 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.

The surface elevations of the borings ranged between 554.8 and 546.1 feet. Borings drilled off the shoulder of Ramp AA noted between 2 and 12 inches of topsoil; while borings trough the pavement noted 7 to 13 inches of asphalt. The borings then noted brown and gray silty clay fill to elevations between 549.2 and 541.7 feet. Below the fill materials, the borings encountered stiff to hard brown and gray silty clay to elevations between 544.8 and 533.2 feet, followed by gray stiff to hard silty clay and silty clay loam to elevations between 534.0 and 526.0. Below these silty clay layers, the borings encountered loose to very dense brown and gray sand to elevations between 519.0 and 506.0 feet and were terminated upon encountering bedrock. Cobbles were noted throughout the borings at various depths. The borings were terminated upon encountering practical auger refusal or split-spoon refusal on apparent bedrock between elevations 546.1 and 551.4 feet.

The brown and gray silty clay fill had unconfined compressive strengths ranging from 1.0 to 5.4 tsf, with an average strength of 2.4 tsf. The brown and gray silty clay had unconfined compressive strengths ranging from 1.4 to 6.4 tsf with an average strength of 3.2 tsf. The gray silty clay loam/silty clay had unconfined compressive strengths ranging from 1.0 to 5.2 tsf with an average strength of 2.7 tsf. The native sand has an SPT blow count (N) values ranging from 6 to 100 blows per foot (bpf) with an average value of 20 bpf.

2.4 Subsurface Bedrock Conditions

When bedrock was encountered, the extracted bedrock cores were visually inspected, classified and the Rock Quality Designation (RQD) was determined for borings RWB-66, RWB-68, RWB-70

and RWB-72 according to ASTM D 6032, "Standard Test Method for Determining Rock Quality Designation (RQD) of Rock Core" and as per the IDOT geotechnical manual by totaling all sections with a length in excess of four inches (4") and dividing it by the total length of the core run. The RQD is given a classification based upon the numeric value as indicated in **Table 3**. Photographs of the rock cores are included with the respective soil borings in **Appendix C**.

Table 3 - Rock Quality Designation

Rock Quality Designation	Descriptions
< 25%	Very Poor
25 – 50%	Poor
51 – 75%	Fair
76 – 90%	Good
91 – 100%	Excellent

Table 4 provides a summary of the RQD values and unconfined compressive strength values of the rock cores extracted during the site investigation.

Table 4 – Rock Core Summary and Classification

Boring Number	Core Run	Core Depth (feet)	Type of Rock	RQD (%)	RQD Classification	Depth (ft)/ Unconfined Compression Strength (psi)
RWB-66	1	32.0-42.0	Limestone	56.2	Fair	37.0 / 11,261
RWB-68	1	36.5-46.5	Limestone	51.2	Fair	43.5 / 18,300
RWB-70	1	37.5-47.5	Limestone	55.8	Fair	43.5 / 13,823
RWB-72	1	43.5-53.5	Limestone	61.7	Fair	45.5 / 18,516

The soil boring logs provide bedrock conditions encountered at each boring location. Limestone bedrock was encountered between 32.0 and 43.5 feet (Elev. 514.7 to 505.9 feet), where rock coring was performed. The bedrock cores consisted of limestone that was slightly weathered and slightly to heavily fractured. RQD values ranged from 51.5 to 61.7 percent: Fair based upon the values indicated in **Table 4**.

2.5 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 while drilling in boring RWB-72 at elevation 508.4 feet (41 feet below grade). Groundwater was not encountered during or immediately after drilling at the any of the remaining borings. 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 may be at elevations between 544.8 to 529.4 feet. Perched water may also be present within the 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 for the design of the proposed retaining wall and embankment based on the results of the field exploration, laboratory testing, and geotechnical analysis. Subsurface conditions between borings may vary from those encountered at the boring locations. If structure locations, loadings, or elevations are changed, we request that GSG be contacted so that we may re-evaluate our recommendations.

3.1 Embankment Settlement

It is anticipated that fill soils will be required to construct the proposed wall and embankment. Up to 5 feet of new fill may be required to construct the new retaining wall at station 11+00 to 12+50. Up to 10 feet of new fill is anticipated to construct the new embankment between Stations 12+00 to 15+00.

The embankment behind the proposed wall was evaluated with respect to settlement. Based on the proposed embankment heights of 5 to 10 feet, analyses were performed at the boring locations to evaluate the anticipated amount of total settlement. The maximum estimated settlement within the native cohesive and non-cohesive soils were calculated as shown in **Table 5.**

Table 5 – Anticipated Embankment Settlement

Structure Name	Structure Stations *	Embankment Height (ft)	Anticipated Total Settlement (inches)	Differential Settlement (%)
Retaining Wall #8	Sta. 7+40 to Sta. 12+25	5	0.8	<0.5
Ramp AA Embankment	Sta. 12+00 to Sta. 15+00	10	1.35	<0.5

* Based on proposed Ramp AA Stationing

3.2 Seismic Parameters

The seismic hazard for the site was analyzed per the IDOT Geotechnical Manual, IDOT Bridge Design Manual, and AASHTO LRFD Bridge Design 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 D. The Seismic Performance Zone (SPZ) was determined using Figure 2.3.10-2 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 the proposed structure. For this section of the project, the S_{DS} and the S_{D1} were determined using 2020 AASHTO Guide Specifications as shown in **Table 6**. Given the site location and materials encountered, the potential for liquefaction is minimal.

Table 6 – Seismic Parameters

Building Code Reference	PGA	S_{DS}	S_{D1}
2020 AASHTO Guide for LRFD Seismic Bridge Design	0.049g	0.167g	0.095g

4.0 GEOTECHNICAL WALL DESIGN RECOMMENDATIONS

This section provides retaining wall design parameters including recommendations on foundation type, bearing capacity, settlement, and lateral earth pressures. The foundations for the proposed retaining wall must provide sufficient support to resist the dead and live loads, as well as seismic loading.

4.1 Retaining Wall Type Recommendations

It is anticipated that the wall will primarily be in cut sections. There are various types of retaining walls that could be utilized for retaining earth embankments in fill areas or excavation slopes in cut areas. This section discusses several earth retaining structures that could be used for the proposed project. Based on the proposed grading, the proposed walls will be in a cut area, adjacent to the proposed roadway. Several typical wall types are described in the section below.

4.1.1 Sheet Pile Walls

Sheet pile walls are typically used in cut areas when continuous support must be provided to maintain existing structures or other adjacent facilities. Sheet piles are also used in wide trench excavations when the use of trench boxes becomes impractical. This type of wall can also be covered with CIP panels for aesthetics. The installation of sheet pile walls requires the use of specialty equipment to drive the piles into the ground. As the retaining walls will be in excess of 15 feet in height, tie-backs will likely be required for design.

4.1.2 Soldier Pile and Lagging Walls

Soldier pile and lagging walls are typically used in cut areas where the existing ground surface needs to be maintained during construction or when a near vertical excavation is needed. The wall may be constructed with driven steel piles or steel piles placed in drilled holes and backfilled with concrete. The depth of the soldier pile is normally estimated to be two times the wall exposed height.

4.1.3 Recommended Wall Type

Based on the proposed GPE plan and location of the wall within a predominantly cut area, a soldier pile wall may be considered for this project. Design plans indicate that the wall location would require cutting into the base of the existing embankment, but also filling to reach the proposed roadway subgrade.

GSG evaluated the global and external stability, and settlement to determine the suitability of the retaining wall for this section of the project. The wall section should be analyzed to determine that adequate factors of safety relative to sliding and overturning failure.

4.2 Retaining Wall Design Recommendations

The engineering analyses performed for evaluation of the retaining wall options followed the current AASHTO Load and Resistance Factor Design (LRFD) Methodology as required by IDOT. LRFD methodology incorporates the use of load factors and resistance factors to account for uncertainty in applied loads and load resistance of structure elements separately. The AASHTO LRFD Bridge Design Specifications outline load factors and combinations for various strength, extreme event, service, and fatigue limit states. Section 11, which outlines geotechnical criteria for retaining walls, of the AASHTO Specifications requires the evaluation of bearing resistance failure, lateral sliding, and overturning at the strength limit state and excessive vertical displacement, excessive lateral displacement, and overall stability at the service limit state. The selected wall should be also evaluated with respect to the collision load. **Table 7** outlines the load factors used in evaluation of the retaining wall in accordance with AASHTO Specification Tables 3.4.1-1 and 3.4.1-2.

Table 7 - LRFD Load Factors for Retaining Wall Analyses

	Type of Load	Sliding and Eccentricity Strength	Bearing Resistance Strength I	Sliding and Eccentricity Extreme II	Bearing Resistance Extreme II	Settlement Service I
Load Factors for Vertical Loads	Dead Load of Structural Components (DC)	0.90	1.25	1.00	1.00	1.00
	Vertical Earth Pressure Load (EV)	1.00	1.35	1.00	1.00	1.00
	Earth Surcharge Load (ES)		1.50			
	Live Load Surcharge (LS)		1.75		0.50	1.00
Load Factors for Horizontal Loads	Horizontal Earth Pressure Load (EH) Active At-Rest AEP for anchored walls	1.50	 1.50 1.35 1.35	1.00	1.00	1.00
	Earth Surcharge (ES)	1.50	1.50			
	Live Load Surcharge (LS)	1.75	1.75	0.50	0.50	1.00
Load Factor for Vehicular Collision				1.00	1.00	

4.2.1 Lateral Earth Pressures and Loading

The wall should be designed to withstand earth and live lateral earth pressures. The lateral earth pressures on retaining walls depend on the type of wall (i.e. restrained or unrestrained), the type of backfill and the method of placement against the wall, and the magnitude of surcharge weight on the ground surface adjacent to the wall. The active earth pressure coefficient (Ka), and the passive earth pressure coefficient (Kp) were determined in accordance with AASHTO Section 3.11.5.3 and 3.11.5.4. **Table 8** present soil design properties for the retaining wall for the anticipated soil types at the site and provide recommended lateral soil modulus and soil strain parameters that can be used for laterally loaded pile analysis via the p-y curve method based on the encountered subsurface conditions. The long term (drained conditions) should be considered for design.

Table 8 – Lateral Soil Parameters - RWB-66 to RWB-72

Elevation Range (feet)	Soil Description	Long-term/Drained			Soil Parameters used in L-Pile		
		Active Earth Pressure Coefficient (K_a)	Passive Earth Pressure Coefficient (K_p)	At-Rest Earth Pressure Coefficient (K_o)	Coefficient of Lateral Modulus of Subgrade Reaction (k_{py}, pci)	Soil Strain (ε_{50})	Soil Type
	New Engineered Clay Fill	0.41	2.46	0.58	500	0.01	Stiff Clay w/o free water (Reese)
	New Engineered Granular Fill	0.33	3.00	0.50	90	N/A	Sand (Reese)
0.5 - 3.5 (549.0 - 545.5)	FILL: Brown and Gray Silty Clay	0.41	2.46	0.58	1,000	0.005	Stiff Clay w/o free water (Reese)
3.5 - 10.0 (545.5 - 539.0)	Stiff to Hard Brown and Gray Silty Clay	0.36	2.77	0.53	1,000	0.005	Stiff Clay w/o free water (Reese)
10.0 - 18.0 (539.0 - 531.0)	Stiff to Hard Gray Silty Clay / Silty Clay Loam	0.36	2.77	0.53	1,000	0.005	Stiff Clay w/o free water (Reese)
18.0 - 35.0 (531.0 - 514.0)	Medium Dense to Very Dense Light Brown Sand	0.22	4.60	0.36	60	N/A	Sand (Reese)
35.0 - 50.0 (514.0 - 499.0)	Gray Limestone	0.17	5.83	0.29	125	N/A	Limestone
23.0 - 26.0** (526.0 - 523.0) RWB-68 thru RWB-70	Medium Stiff to Stiff Brown and Gray Silty Clay Loam	0.41	2.46	0.58	100	0.01	Stiff Clay w/o free water (Reese)

*The initial p-y modulus, E_{py} , varies linearly with depth. To obtain E_{py} use the equation $E_{py} = k_{py} * z$, where k_{py} is the coefficient of lateral modulus of subgrade reaction given in the table and z is the distance from the surface to the center point of the layer in inches.

** Layer only noted in Boring RWB-68, RWB-69 and RWB-70

The estimated shear strength of the Rock Mass (Sm) was calculated based on equation 10.4.6.4-1 (AASHTO 2012), using the laboratory compressive strength data in **Table 4**, resulting in strengths ranging from 1,700 to 3,450 psi. These strengths are preliminary and the p-y curve method should be used for final analysis. Using an estimated friction angle for the rock mass of 45 degrees, gives a shear strength of the rock mass of 3.3 ksf. The passive resistance of vertical elements can be considered as 0.75 (LRFD-9, Table 11.5.7-1, 2020).

Traffic and other surcharge loads should be included in the retaining wall design as applicable. A live load surcharge shall be applied where vehicular load is expected to act on the surface of the

backfill within a distance equal to one-half the wall height behind the back face of the wall in accordance with AASHTO 3.11.6.4. The live load surcharge may be estimated as a uniform horizontal earth pressure due to an equivalent height (Heq) of soil. **Table 9** provides the equivalent heights of soils for vehicular loadings on retaining walls.

Table 9 - Equivalent Height of Soil for Vehicular Loading on Retaining Walls Parallel to Traffic

Retaining Wall Height (ft)	H_{eq} Distance from Wall Back face to Edge of Traffic	
	0 feet	1.0 feet or Further
5	5.0 feet	2.0 feet
10	3.5 feet	2.0 feet
≥20	2.0 feet	2.0 feet

Reference: AASHTO LRFD Table 3.11.6.4-2

The retaining wall design should include a drainage system to allow movement of any water behind the wall, and not allowing hydrostatic (seepage) pressures to develop in the active soil wedge behind the wall. This could be accomplished by placing a Geocomposite Wall Drain over the entire length of the back face of the wall connected to 6-inch diameter perforated drain pipe and backfilling a minimum of 2 feet of free draining materials, Porous Granular Embankment, as measured laterally from the back of the wall. The backfill should be placed in accordance with the IDOT SSRBC.

Heavy compaction equipment should not be allowed closer than five (5) feet to the retaining wall to prevent inducing high lateral earth pressures and causing wall yielding and/or other damage. The passive lateral earth pressure coefficient (Kp) from the upper 3.5 feet of level backfill at the toe of the wall should be neglected, unless the soil is confined or protected by a concrete slab or well drained pavement. The passive lateral earth pressure coefficient from the upper 3.5 feet of soil for a descending slope at the wall toe should also be neglected, regardless of any surface protection.

4.3 Soldier Pile and Lagging Retaining Wall

Soldier pile walls are generally constructed at 8 to 10-foot centers along the retaining wall alignment into the bearing stratum. The soldier piles could either be driven or drilled. Driving piles is normally less expensive but the designs are limited to H-pile and small W-sections, and may be limited based on cobbles and bedrock observed in the borings. Drilled soldier piles can utilize larger W-sections, built up plate sections or multiple W-sections. For drilled piles, the pile

will be placed into the hole and centered, and the annular space around each pile section will be filled with flowable grout. The lagging and piles should be designed based on structural analysis.

Resistance to lateral movement or overturning of the soldier pile is furnished by passive resistance of the soil below the depth of excavation. The design should include a structural evaluation of the pile section to meet applied shear and moment, and an evaluation of overturning to determine embedment depth and other design requirements. The walls shall be designed to withstand earth and live lateral earth pressures. The lateral earth pressures on retaining walls depend on the type of wall (i.e. restrained or unrestrained), the type of backfill and the method of placement against the wall, and the magnitude of surcharge weight on the ground surface adjacent to the wall. Soldier pile walls are considered flexible and such the earth loads may be calculated using active earth pressure for load above the design grade, and both active and passive earth pressures below the design grade. The active earth pressure coefficient (Ka), and the passive earth pressure coefficient (Kp) are shown in **Table 8**.

The simplified earth pressure distributions shown in the AASHTO Standard Specifications for Highway Bridges could be used for the wall design. **Table 8** also provides recommended lateral soil modulus and soil strain parameters that can be used for laterally loaded pile analysis via the p-y curve method based on the encountered subsurface conditions. The passive resistance in front of the wall should be ignored for the upper 3.5 feet due to excavation activities and frost-heave condition. Construction equipment surcharge loads should be added to the lateral earth pressure.

In order to limit wall deflections and provide additional resistance, the soldier pile and lagging retention system could be restrained with tie-back anchors. The soldier pile and lagging retention system restrained with tie-backs will be subjected to “trapezoidal” lateral soil pressures. For tall retaining walls, the “trapezoidal” pressure will result in greater lateral forces and moments compared to the cantilever design.

Soldier pile and lagging walls over 15 feet in height typically require additional lateral resistance to maintain stability and/or limit wall movements. This lateral resistance can be provided using ground anchors, buried deadmen or soil nails. For highway applications, anchored soldier pile walls are typically less than 33 feet in height due to excessive top of wall deflections, excessive soldier pile bending stresses, and high stresses at the wall-anchor connection. Anchor

terminology, minimum anchor length and embedment guidelines are shown in AASHTO Figure 11.9.1-1. Anchor spacing is controlled by many factors including anchor (or deadmen) capacity, temporary (unsupported) cut slope stability, subsurface obstructions in the anchorage zone, and the structural capacity of lagging or facing elements. Performance or proof testing shall be performed on every production anchor in accordance with the requirements in AASHTO Section 11.9.8.1. Excavation shall not proceed more than 3.0 feet below the level of ground anchors until the ground anchors have been accepted by the Engineer. Where backfill is placed behind an anchored wall, either above or around the unbonded length, special designs and construction specifications shall be provided to prevent anchor damage.

Arching of the soil between soldier piles can increase the effective width of a soldier pile up to 3 times for granular soil and 2 times for cohesion soils (Trenching and Shoring Manual, Section 6.2, 2011).

Piers drilled through soil and a nominal depth into bedrock should be designed on the basis of an allowable bearing pressure. Piers are normally drilled a nominal depth into the rock to ensure bearing entirely on competent rock and to extend the pier through the upper fractured zones of the rock. An increase in allowable bearing with embedment depth should be based on encountering more competent rock with depth.

For an unrestrained wall system, it is recommended to increase the embedment depth of the soldier pile by 1.2 (i.e. 20%) to account for rotation of the vertical wall elements (Trenching and Shoring Manual, Section 6.1, 2011).

4.4 Global Slope Stability

Based on the preliminary information provided by WSP, the retaining wall should be designed for external stability of the wall system. The parameters in **Table 11** were used to evaluate the proposed soldier pile wall in order to reach a minimum Factor of Safety of 1.5.

Table 11 – Soldier Pile Wall Description at Station 12+00

*Based on preliminary drawings provided

Description	Value
Maximum total retained height of retaining wall (H)*	17.0 feet
Minimum Embedment length below bottom of concrete facing to reach F.S. = 1.5*	2.0 feet
Minimum soldier pile bottom tip elevation(s) to reach F.S. of 1.5	533.0 feet

*Additional embedment may be required for lateral pressures and structural design of the wall system

The actual wall width, and total height of the wall should be based on structural analysis performed by a Licensed Structural Engineer in the State of Illinois.

Slide2 is a comprehensive slope stability analysis software used to evaluate the proposed wall for the project based on the limit equilibrium method. The proposed wall was analyzed based on the preliminary grading and the soils encountered while drilling. Circular failure analyses were evaluated using the simplified Bishops analyses methods for the proposed wall geometries. Based on the proposed geometry and the soil borings, global stability analyses were performed.

4.4.1 Global Slope Stability Results

Circular failure analyses were evaluated for both a short term (undrained) and long term (drained) condition based on the proposed geometry (**Tables 11**) for the proposed soldier pile wall. The analyses were performed at Station 10+50. The results of the analyses are shown in **Table 12**.

Table 12 – Retaining Wall Global Slope Stability Analyses Results

Analysis Exhibit	Location	Wall Type	Analysis Type	Factor of Safety	Minimum Factor of Safety
Exhibit 1	Station 10+50	Soldier Pile	Circular – Short Term	6.3	1.5
Exhibit 2			Circular – Long Term	1.9	1.5

Based on the analyses performed, the proposed retaining wall meets the minimum factor of safety of 1.5. Copies of the slope stability analyses are included in the Slope Stability Analyses Exhibits (**Appendix F**).

4.5 Drainage Recommendations

The wall design should include drainage system to prevent the buildup of hydrostatic forces behind the wall. This could be accomplished with the installation of drainage blankets, geocomposite drainage panels, or gravel drains behind the facing of the wall with outlet pipes below the facing to collect and remove surface water away from the face of the soldier pile wall. If weep holes are to be used, it is recommended that a geocomposite wall drain to be placed over the interlocks and area of the weep holes. If drainage is not provided, hydrostatic pressure should be included in the wall design and the horizontal earth pressure should be determined in accordance with AASHTO article 3.11.3.

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 (2022). Any deviation from the requirements in the manuals above should be approved by the design engineer.

5.1 Site Preparation

All trees, pavements, vegetation, landscaping, and surface topsoil should be cleared and removed from the vicinity of the proposed construction. Where possible, the engineer may require proof-rolling of the subgrade with a 35-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. Once the site has been properly prepared, at grade construction may proceed.

Foundation aggregate fill should not be placed upon wet or frozen subgrade soils. If the subgrade or structural fill becomes frozen, desiccated, wet, disturbed, softened, or loose, the affected materials should be scarified, dried and moisture conditioned, and compacted to the full depth of the affected area or the soils should be removed. Rainfall and runoff can soften soils and affect the load bearing capacity of the soils. All water entering the foundation excavation should be removed prior to placement of backfill materials above the wall bottom.

5.2 Existing Utilities and Structures

Based on the existing site conditions, utilities exist along the project corridor. Before proceeding with construction, all existing underground utility lines or structures that will interfere with construction should be completely relocated from the proposed construction areas. Where possible, existing utility lines that are to be abandoned in place should be removed and/or plugged with a minimum of 2 feet of cement grout. All excavations resulting from underground utilities or structure 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.

5.3 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. 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 (if needed) for all excavation activities.

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 Construction Manual (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. Should fill be placed during cool, wet seasons, the use of granular fill may be necessary since weather conditions will make compaction of cohesive soils more difficult.

5.5 Groundwater Management

Long term groundwater may be between elevations 544.8 to 529.4 feet. GSG does not anticipate that groundwater related issues occur during construction activity, however perched water may be encountered within 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.

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.

5.6 Temporary Sheeting, Soil Retention and Stage Construction

Temporary soil retention systems (TSRS) may be required for portions of the construction. Based on the soil profile, a cantilevered sheet pile system could be used. The sheet pile retaining system should be designed in accordance with the IDOT Bridge Design Manual, Section 3.13.1, Temporary Sheet Piling Design, Temporary Soil Retention Systems. The design of the TSRS is the responsibility of the contractor.

The IDOT Temporary Sheet Piling Design procedures include limitations if the required embedment depths fall below soil layers with a Qu value larger than 4.5 tsf or N-values larger than 45 blows or rock, because the sheet piling may not penetrate these layers. Refer to the soil boring logs for the elevations to the hard stratum. If adequate retained heights cannot be obtained using the IDOT Temporary Sheet Piling Design Guide, then a Temporary Soil Retention System shall be designed by the Contractor. The Temporary Soil Retention Systems should include surcharge loads from the excavated materials, construction equipment and truck traffic as necessary. The retention system should extend to a sufficient depth below excavation bottom to provide the required lateral passive resistance if the active case is used for the design. Embedment depths should be determined based on the principles of force and moment equilibrium. The retention system should be designed for at-rest condition if the adjacent railroad embankment cannot withstand the anticipated horizontal and vertical movements of the construction excavation.

The retention system shall be designed by an Illinois licensed structural engineer in accordance with the IDOT Bridge Design Manual. The design of the temporary soil retention system (TSRS)

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 (IDOT) and its Design Section Engineer consultant. The recommendations provided in the report are specific to the project described herein and are based on the information obtained at the soil boring locations within the proposed project area. The analyses have been performed and the recommendations provided in this report are based on subsurface conditions determined at the location of the borings. This report may 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
Preliminary GPE and Cross-sections

Benchmark: Iron Rod with Cap Sta. 67+63.19, 388.39' RT
N 1,764,330.037 and E 1,052,698.888
Elev.= 550.720
Existing Structures: None.
Traffic Control: Traffic will be detoured during construction.
No Salvage.

* Measured along F.F. of Wall
** Pile Section, spacing, tip elevation, shaft diameter and embedment into bedrock to be determined during final design

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50) Soldier Piles

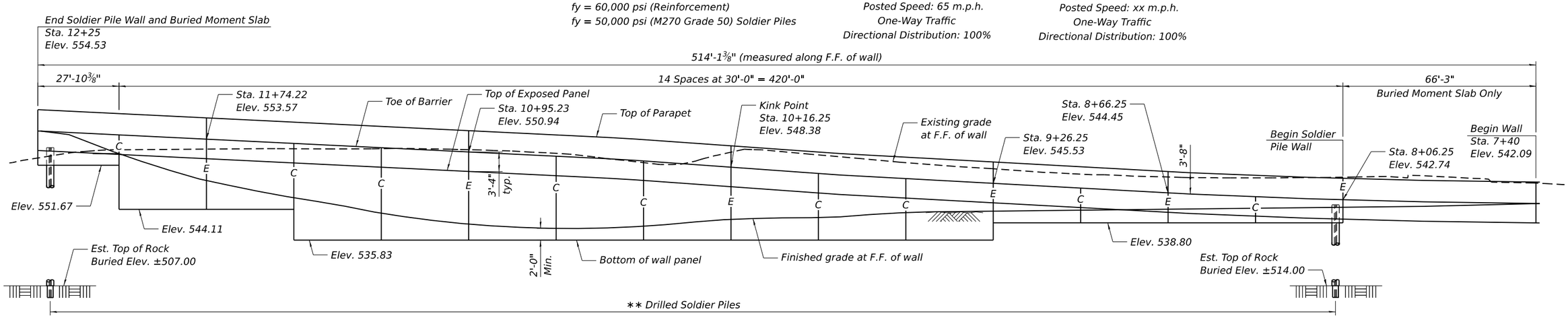
HIGHWAY CLASSIFICATION

I-80 EB
Functional Class: Interstate
ADT: 91,100 (2017); 133,500 (2040)
ADTT: 19,241 (2017); 28,169 (2040)
DHV: XXX
Design Speed: 70 m.p.h.
Posted Speed: 65 m.p.h.
One-Way Traffic
Directional Distribution: 100%

Chicago Street Ramp AA
Functional Class: Interstate
ADT: 6,600 (2017); 14,400 (2040)
ADTT: 2,470 (2017); 5,350 (2040)
DHV: XXX
Design Speed: xx m.p.h.
Posted Speed: xx m.p.h.
One-Way Traffic
Directional Distribution: 100%

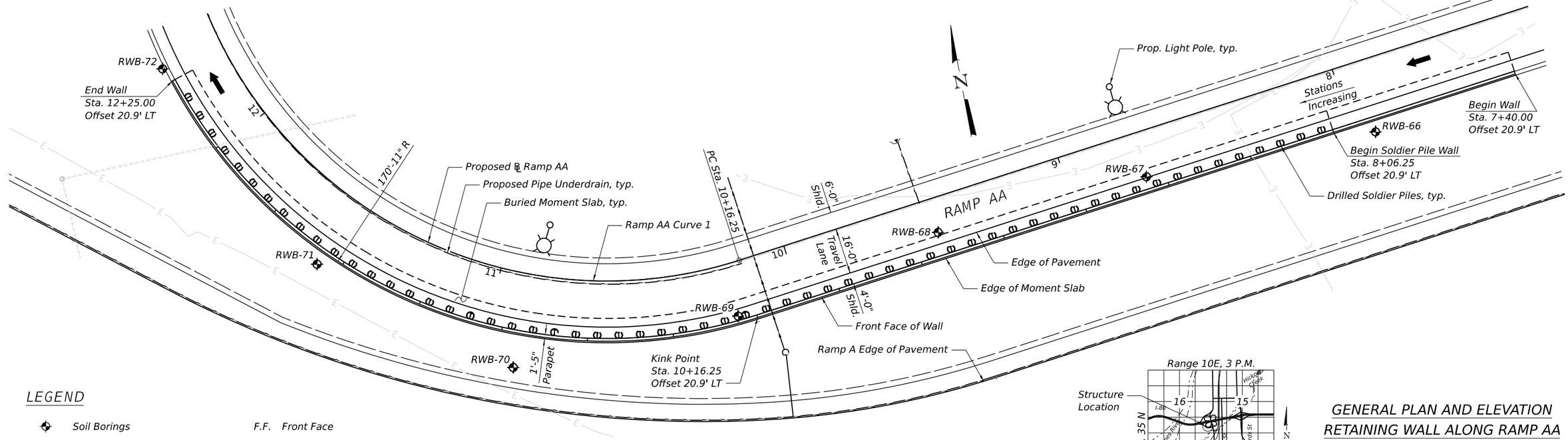
NOTES:

1. Stations and offsets are measured from the ℄ of Ramp AA to the front face of cast-in-place concrete facing.



ELEVATION

(Looking at Front Face of Wall)



PLAN

LEGEND

	Soil Borings	F.F.	Front Face
E E	Exist. Underground Electric	B.F.	Back Face
	Exist. Underground Sanitary Sewer	C	Construction Joint
	Prop. Pipe Underdrain	E	Expansion Joint
	Exist. ROW		

LOCATION SKETCH

GENERAL PLAN AND ELEVATION
RETAINING WALL ALONG RAMP AA
F.A.I. RTE. 80 - SEC 2017-057F
WILL COUNTY
STA. 7+40.00 TO STA. 12+25.00
STRUCTURE NO. 099-XXXX

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SEB
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STATE OF ILLINOIS
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GENERAL PLAN AND ELEVATION
STRUCTURE NO. 099-XXW8
SHEET 1 OF 2 SHEETS

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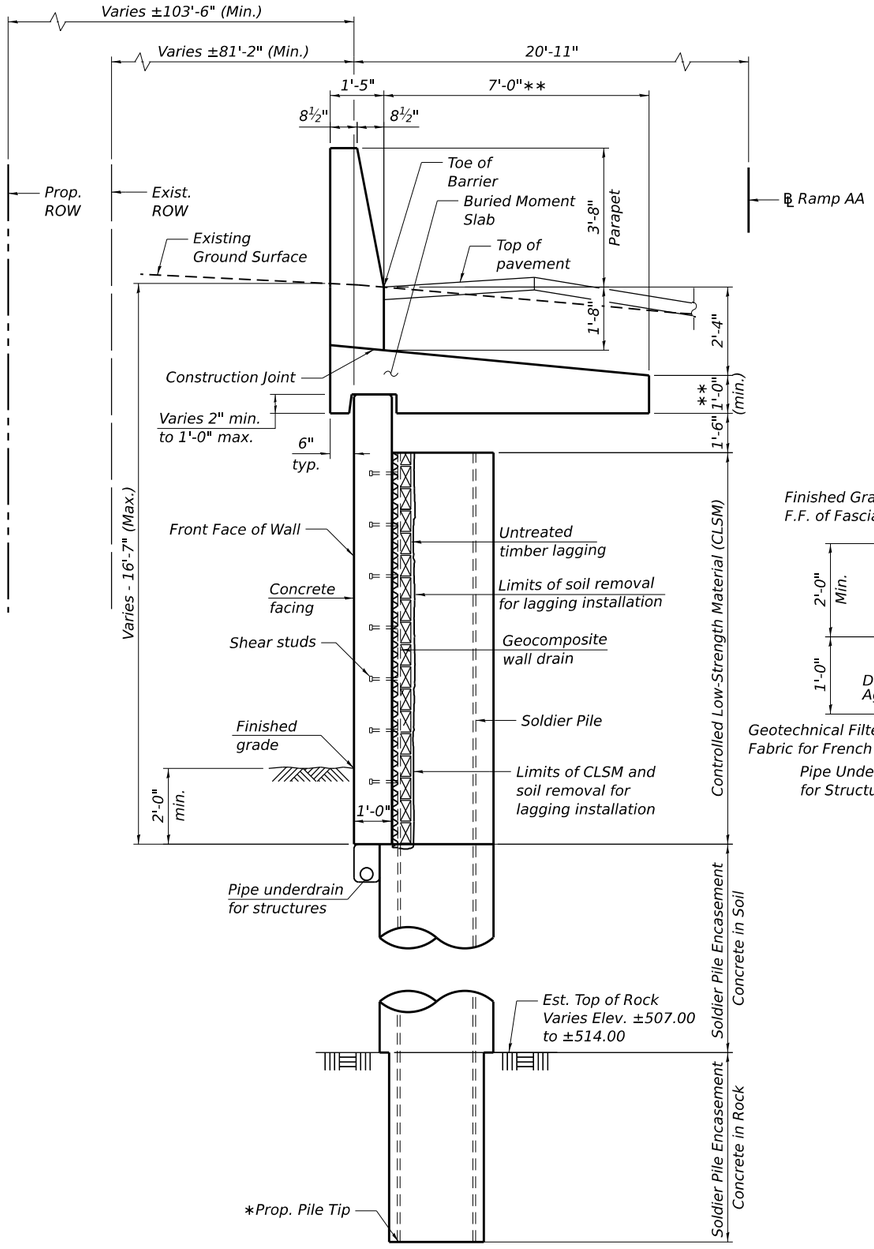
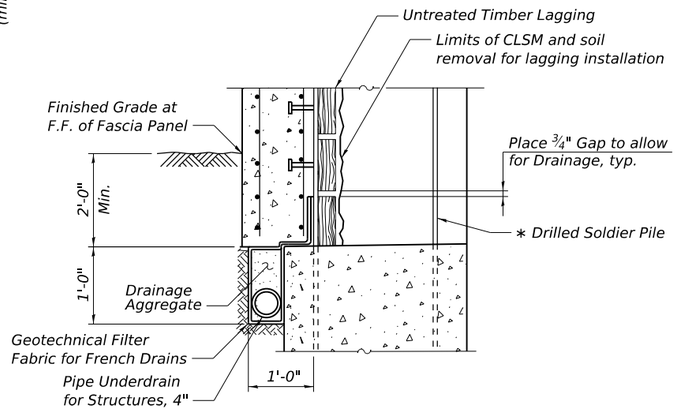
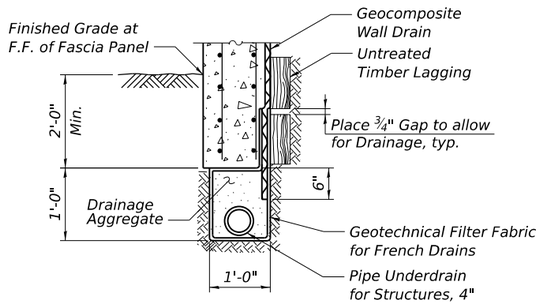


TYPICAL SECTION THRU SOLDIER PILE

(Looking West)



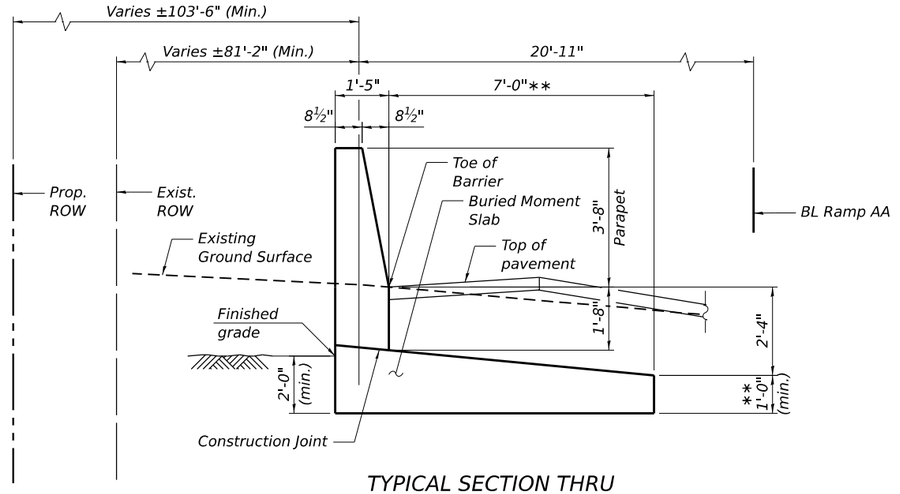
PIPE UNDERDRAIN DETAIL AT SOLDIER PILE



PIPE UNDERDRAIN DETAIL BETWEEN SOLDIER PILES

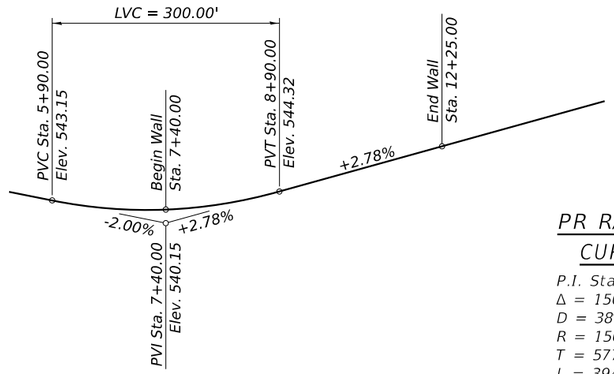
* Pile section, spacing, tip elevation, shaft diameter and embedment into bedrock to be determined during final design.

** Subject to change in Final Design.



TYPICAL SECTION THRU BURIED MOMENT SLAB

(Looking West)



RAMP AA PROFILE GRADE

(Along Prop. ℄ Ramp AA)

PR RAMP AA CURVE 1

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Δ = 150°52'29" (RT)
D = 38°11'50"
R = 150.00'
T = 577.40'
L = 394.99'
E = 446.57'
e = 6.0%
P.C. Sta. = 10+16.25
P.T. Sta. = 14+11.24

GENERAL DETAILS AND TYPICAL SECTION RETAINING WALL ALONG RAMP AA F.A.I. RTE. I-80 SECTION 2017-057F WILL COUNTY STA. 7+40.00 TO STA. 12+25.00 STRUCTURE NO. 099-XXW8

SEB
1111 BURLINGTON AVE., SUITE 111 • LISLE, IL 60532
(630) 641-9900

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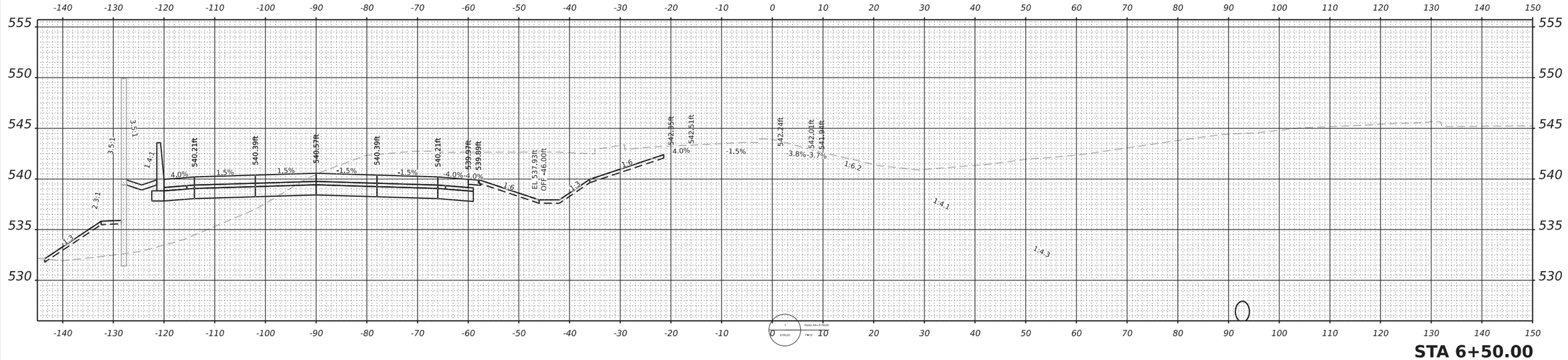

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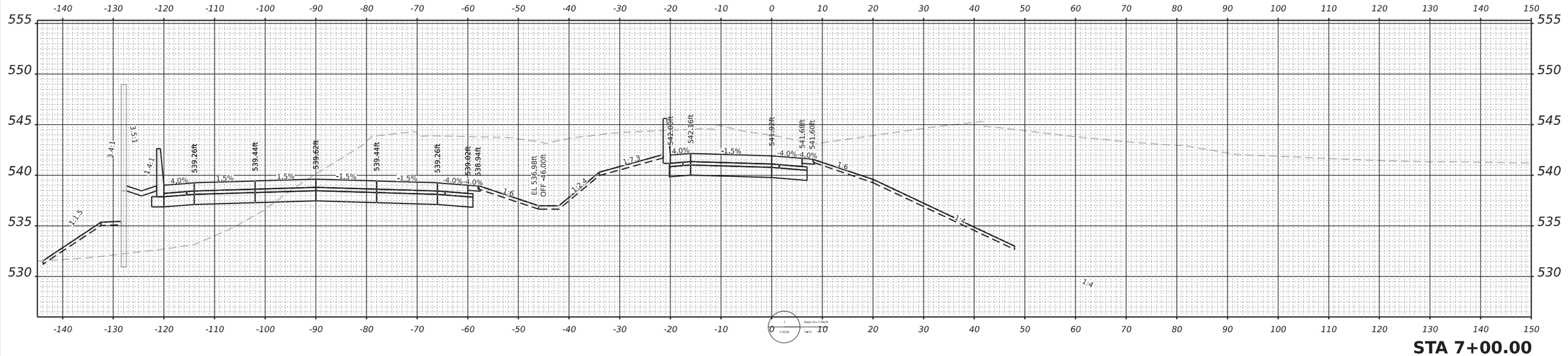

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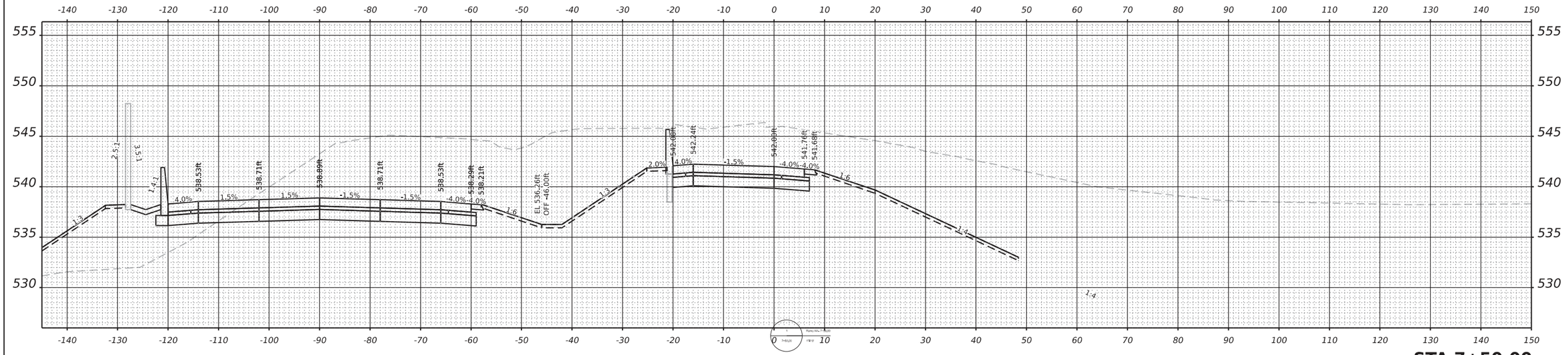

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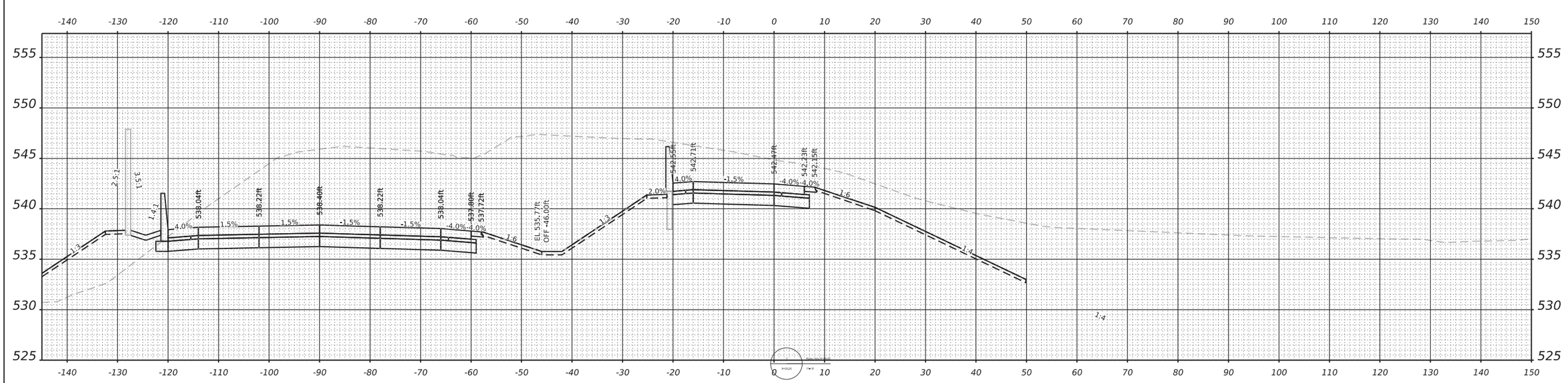

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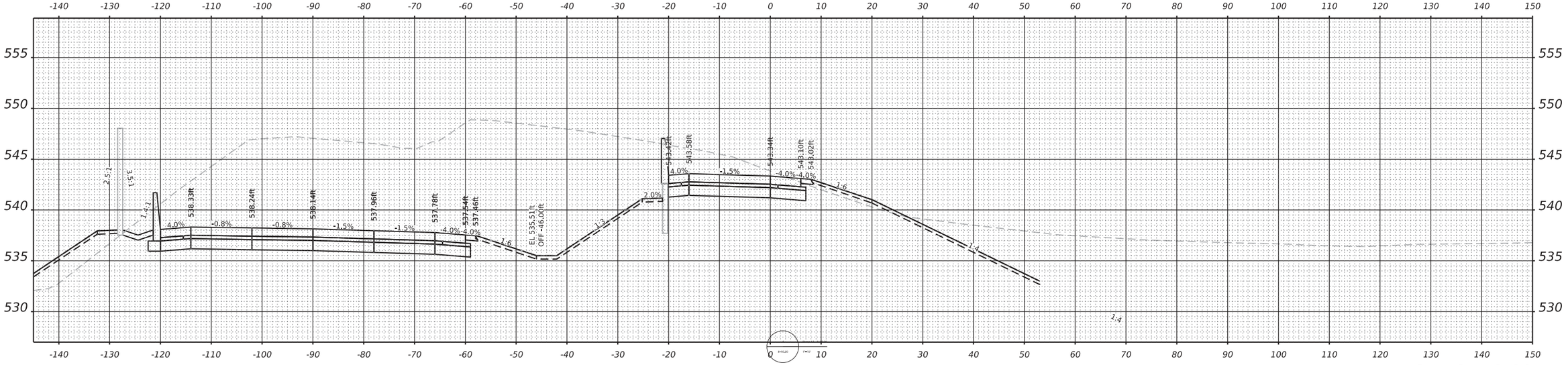

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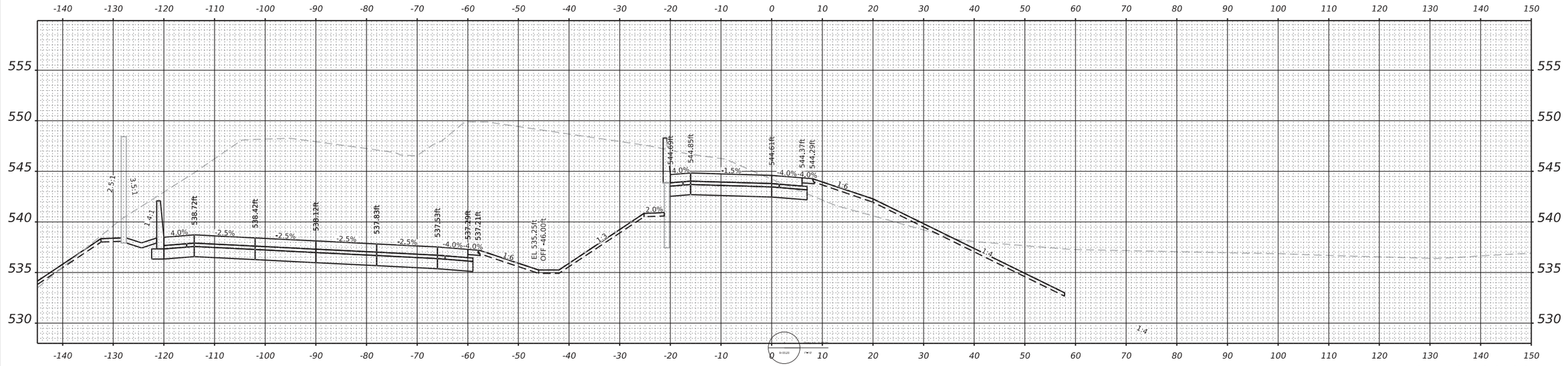

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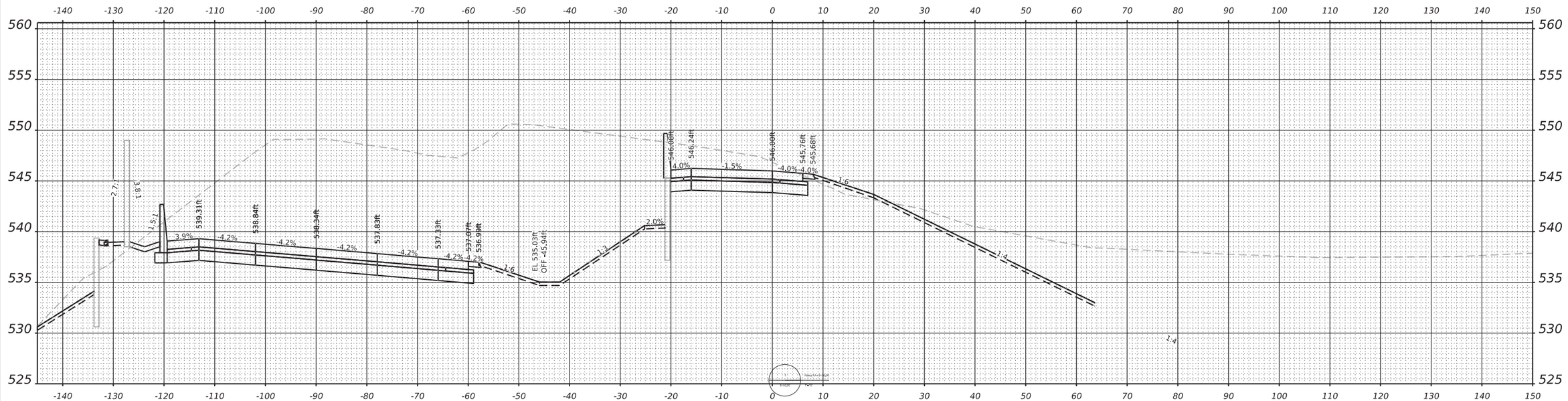

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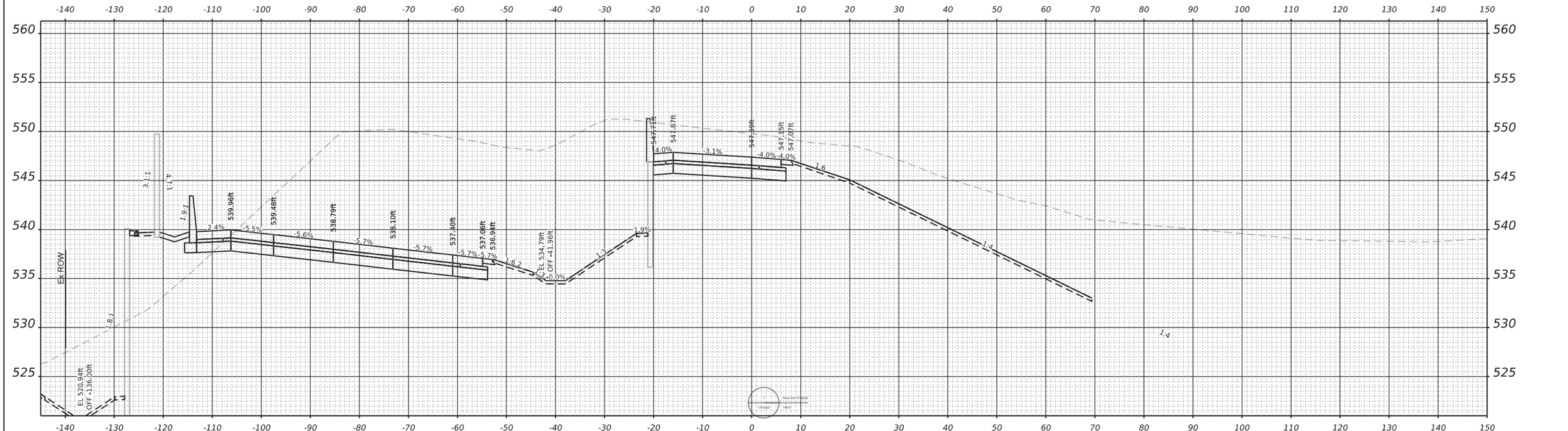

STA 10+00.00

ORIGINAL SURVEY	BY	DATE
SURVEYED		
PLOTTED		
TEMPLATE		
ANGLES		
NOTE BOOK	AREAS CHECKED	
NO.		

FINAL SURVEY	BY	DATE
SURVEYED		
PLOTTED		
TEMPLATE		
ANGLES		
NOTE BOOK	AREAS CHECKED	
NO.		

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	DRAWN -	REVISED -	
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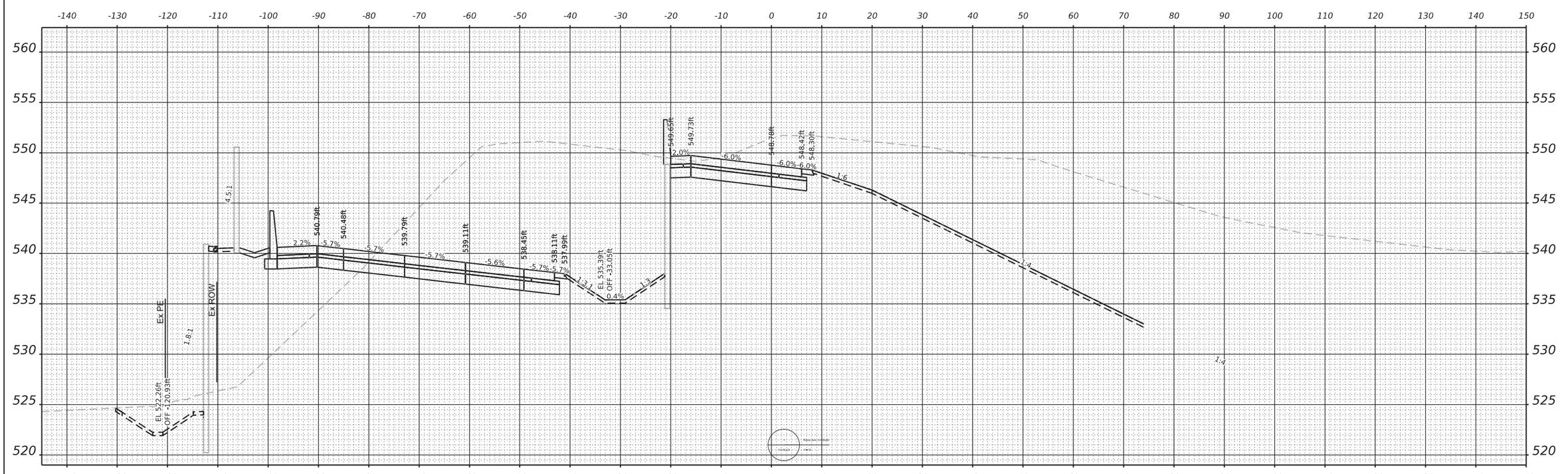
PLOT DATE = 9/30/2022	DATE -	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEETTITLELINE1
SHEETTITLELINE2

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

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



STA 10+50.00

USER NAME = bahenrichs	DESIGNED -	REVISED -	**STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION**	SHEETTITLELINE1 SHEETTITLELINE2	F.A.P. RTE. / SECTION / COUNTY / TOTAL SHEETS / SHEET NO.
	DRAWN -	REVISED -			ROUTE / SECTION / COUNTY 1 / 1
PLOT SCALE = 0.16666685 ' / in.	CHECKED -	REVISED -			CONTRACT NO.
PLOT DATE = 9/30/2022	DATE -	REVISED -		SCALE: SCALE / SHEET 0 OF 1 SHEETS / STA.	ILLINOIS / FED. AID PROJECT

FINAL SURVEY — NOTE BOOK — NO. — SURVEYED — PLOTTED — TEMPLATE — AREAS — AREAS CHECKED — BY — DATE

ORIGINAL SURVEY — NOTE BOOK — NO. — SURVEYED — PLOTTED — TEMPLATE — AREAS — AREAS CHECKED — BY — DATE

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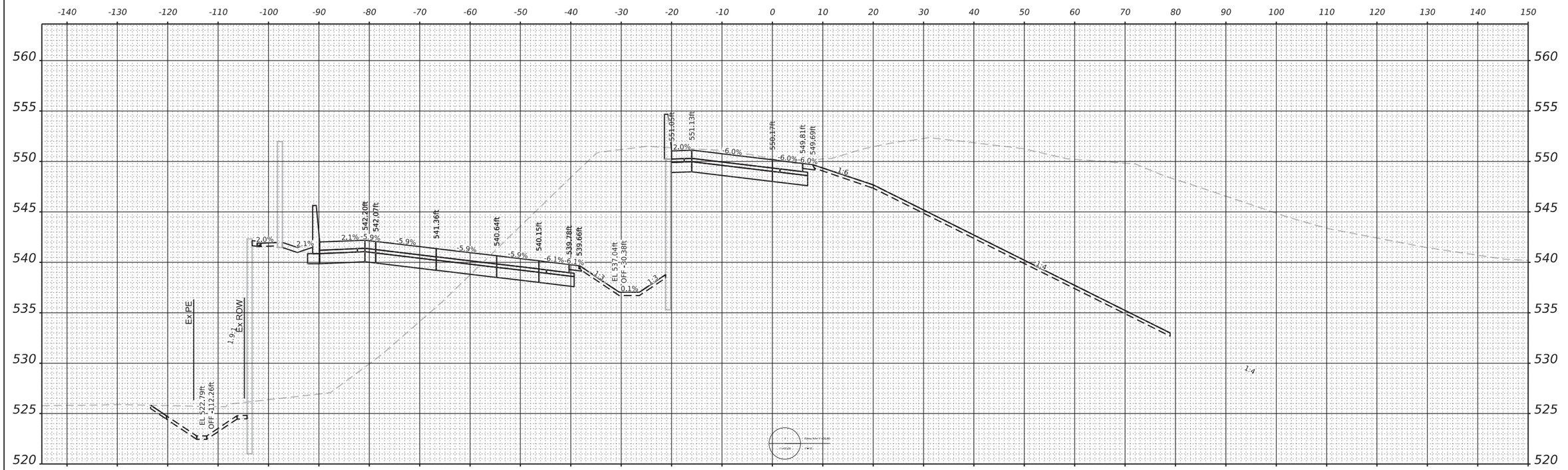

USER NAME = bahenrichs	DESIGNED -	REVISED -	**STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION**
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PLOT DATE = 9/30/2022	DATE -	REVISED -	

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

ORIGINAL SURVEY		BY	DATE
NOTE BOOK	SURVEYED		
NO.	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		

FINAL SURVEY		BY	DATE
NOTE BOOK	SURVEYED		
NO.	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		

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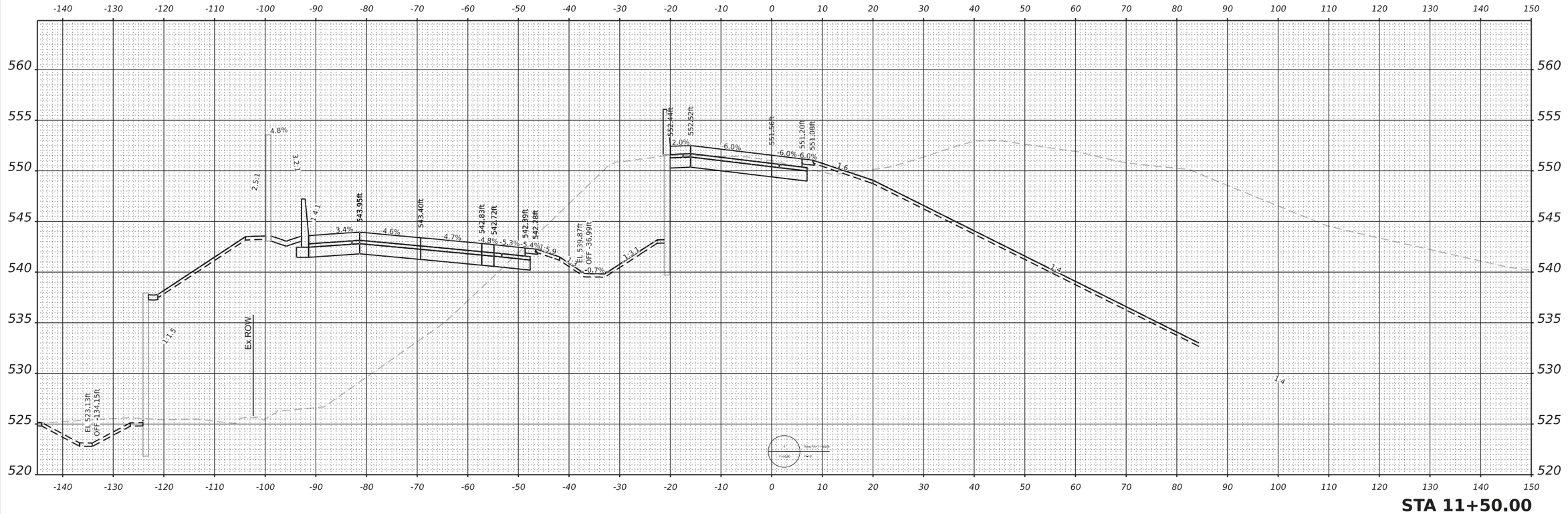

STA 11+50.00

USER NAME = bahenrichs	DESIGNED -	REVISED -	**STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION**	SHEETTITLELINE1 SHEETTITLELINE2	F.A.P. RTE. / SECTION / COUNTY / TOTAL SHEETS / SHEET NO.
	DRAWN -	REVISED -			ROUTE / SECTION / COUNTY / 1 / 1
PLOT SCALE = 0.16666685 ' / in.	CHECKED -	REVISED -			CONTRACT NO.
PLOT DATE = 9/30/2022	DATE -	REVISED -		SCALE: SCALE / SHEET 0 OF 1 SHEETS / STA.	ILLINOIS / FED. AID PROJECT

FINAL SURVEY — NOTE BOOK — NO. — SURVEYED — PLOTTED — TEMPLATE — AREAS — AREAS CHECKED — BY — DATE

ORIGINAL SURVEY — NOTE BOOK — NO. — SURVEYED — PLOTTED — TEMPLATE — AREAS — AREAS CHECKED — BY — DATE

MODEL: Ramp AA - 11+50.00 [Sheet]
FILE NAME: D162f94-mod-XS-Ramp AA.dgn

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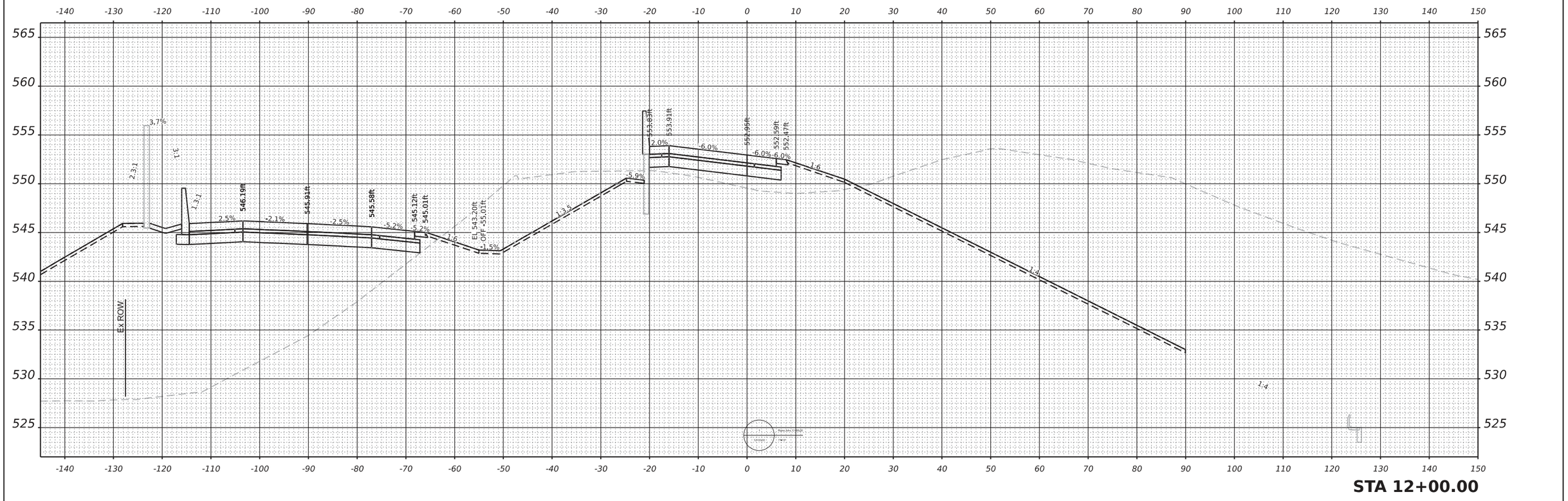
	PLOTTED	
	TEMPLATE	
	AREAS	
	AREAS CHECKED	

BY	DATE



ORIGINAL SURVEY	NOTE BOOK	NO.
FINAL SURVEY	SURVEYED	
	PLOTTED	
	TEMPLATE	
	AREAS	
	AREAS CHECKED	

BY	DATE

MODEL: Ramp AA - 12+00.00 (Sheet)
FILE NAME: D162f94-mod-XS-Ramp AA.dgn

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	DRAWN -	REVISED -	
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PLOT DATE = 9/30/2022	DATE -	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

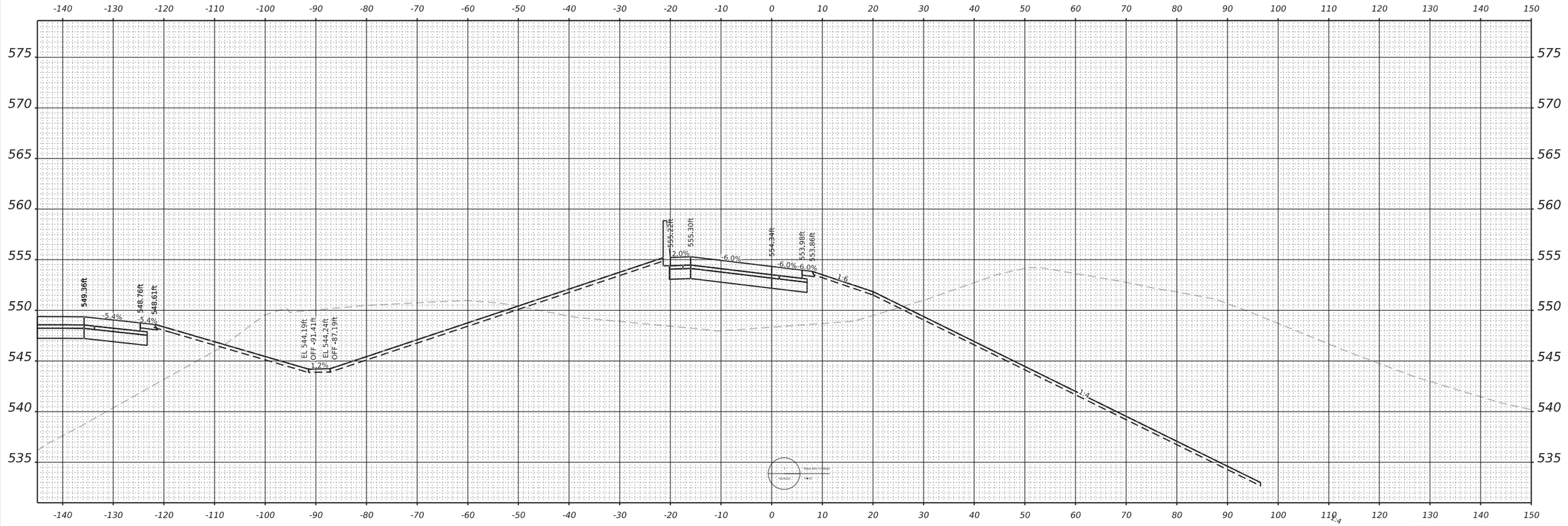
SHEETTITLELINE1
SHEETTITLELINE2

SCALE: SCALE	SHEET 0	OF 1	SHEETS	STA.

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

ORIGINAL SURVEY	NOTE BOOK	NO.
FINAL SURVEY		

DATE	BY	
		SURVEYED
		PLOTTED
		TEMPLATE
		AREAS
		AREAS CHECKED



STA 12+50.00

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PLOT DATE = 9/30/2022	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEETTITLELINE1
SHEETTITLELINE2

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

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

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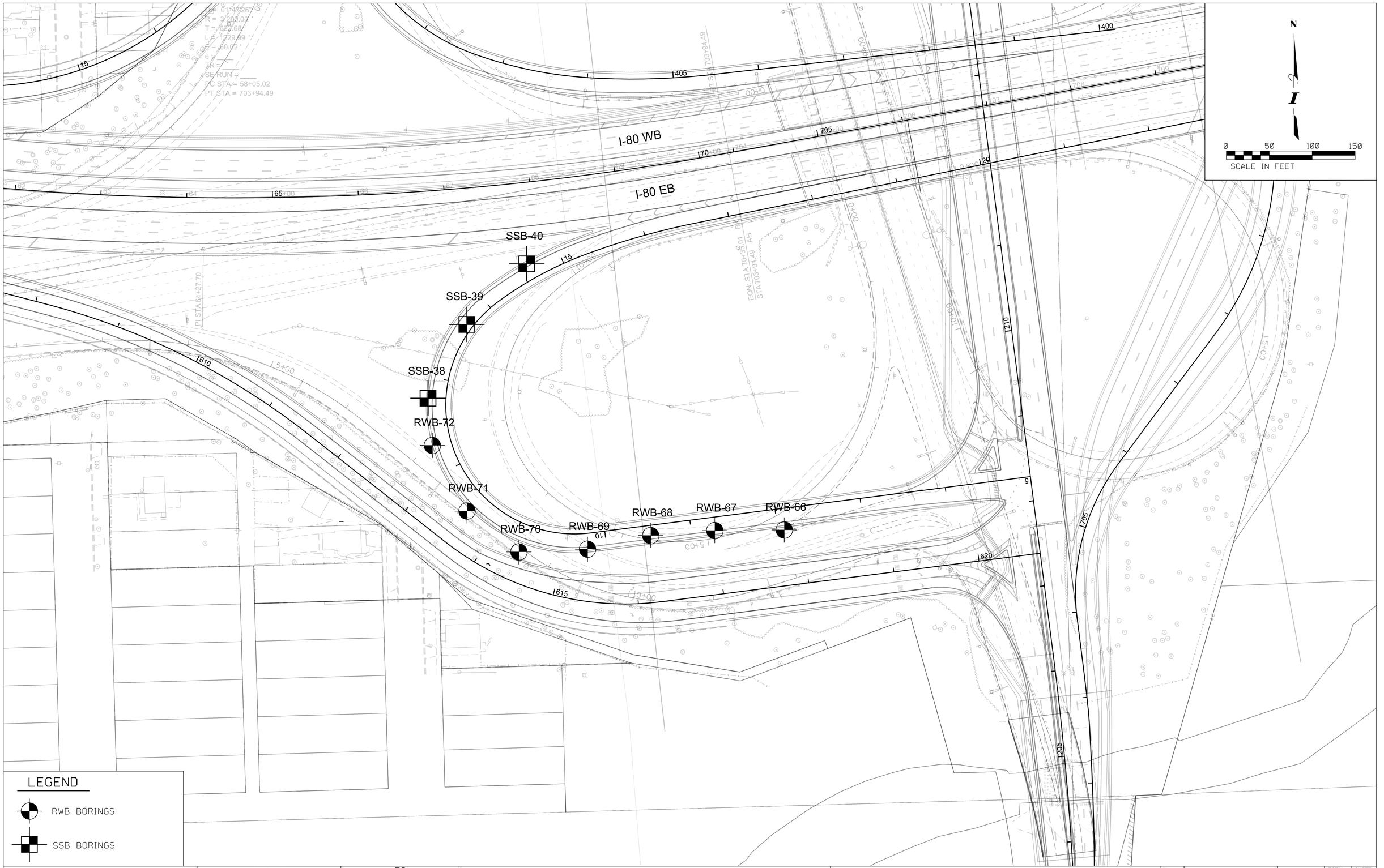
Appendix B

Soil Boring Location Plan and Subsurface Profile



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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 -	ES
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PLOT SCALE	= $SCALE$	CHECKED -	DE
PLOT DATE	= $DATE$	DATE -	06/10/2022

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

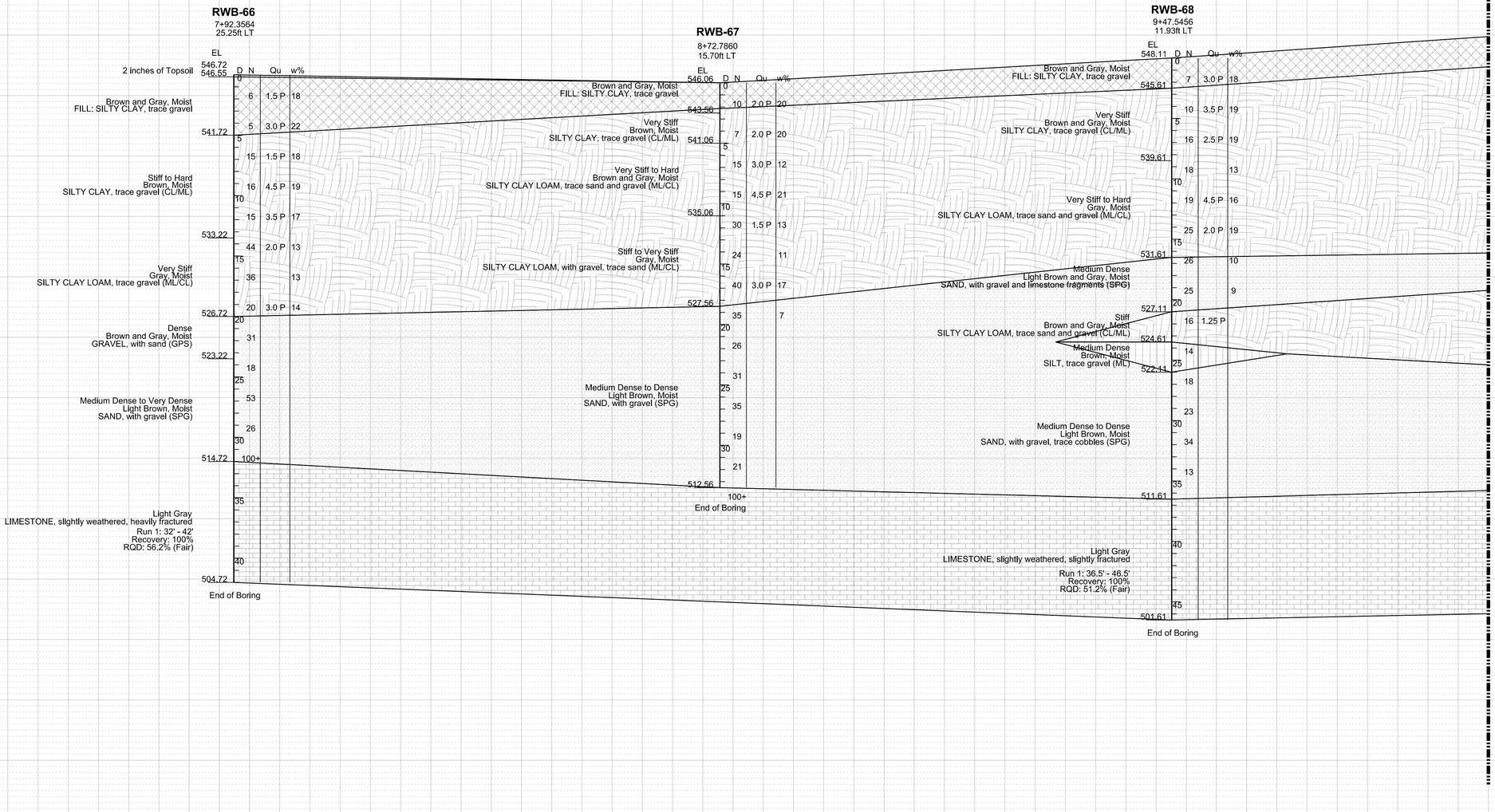
RETAINING WALL NO. 8 - RAMP AA
SOIL BORING LOCATION PLAN
JOLIET, ILLINOIS

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

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	4	1
		CONTRACT NO. PTB-198-003		
	ILLINOIS	FED. AID PROJECT		

LEGEND

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



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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	-	ES	
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PLOT SCALE	= $SCALE$	CHECKED	-	DE	
PLOT DATE	= $DATE$	DATE	-	06/10/2022	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

RETAINING WALL NO. 8 - RAMP AA
SOIL BORING PROFILE
SCALE: AS NOTED | SHEET 1 OF 3 SHEETS | STA. 7+50 | TO STA. 10+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	4	2
		CONTRACT NO. PTB- 198-003		
	ILLINOIS	FED. AID PROJECT		

LEGEND

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

MATCH LINE STA.: 10+00

MATCH LINE STA.: 12+50

RWB-69
10+21.8430
18.45ft LT

EL 551.38

D	N	Qu	w%	
0				
	4	1.0 P	11	Brown and Gray, Moist FILL: SILTY CLAY, trace gravel
548.88				
5	6	2.5 P	18	
	17	4.5 P	18	
	16	4.5 P	18	
10	16	3.5 P	21	Very Stiff to Hard Brown, Moist SILTY CLAY, trace gravel (CL/ML)
	16	4.5 P	17	
15	28	4.5 P	18	
532.88				
	100+		12	Very Dense Light Brown, Moist SAND, with gravel (SPG)
20				
530.38				
	46	3.5 P		Very Stiff Dark Brown, Moist SILTY CLAY, trace sand and gravel (CL/ML)
527.88	19	2.5 P		
25				
	11	2.5 P		Very Stiff Dark Brown, Moist SILTY CLAY LOAM (CL/ML)
522.88				
	30			
30	30			
	37			Medium Dense to Dense Light Brown, Moist SAND, with gravel (SPG)
	24			
35	35			
	21			
513.38				

End of Boring

RWB-70
10+88.6135
32.89ft LT

EL 551.16

D	N	Qu	w%	
0				13 Inches of Asphalt
550.08				
	8	2.92 B	18	Brown and Gray, Moist FILL: SILTY CLAY, trace gravel
549.16				
5	8	2.50 B	21	
	8	3,5 P	18	Very Stiff Brown, Moist SILTY CLAY, trace gravel (CL/ML)
	9	2.50 B	20	
10	14	3.0 P	16	Very Stiff Gray, Moist SILTY CLAY, trace gravel (CL/ML)
540.16				
537.66				
15	17	4.5 P	16	Very Stiff Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL)
	18	1.25 P	15	
532.66				
	17	7.29 B	20	Hard Brown, Moist SILTY CLAY, trace gravel (CL/ML)
20				
530.16				
	15			Medium Dense Dark Brown and Gray, Moist SAND, with gravel, trace clay (SPG)
527.66				
	7	1.5 P		Stiff Black and Brown, Moist SILTY CLAY LOAM, with gravel (CL/ML)
525.16				
25	34			
	29			
30	30			Loose to Very Dense Light Brown, Moist SAND, with gravel (SPG)
	18			
	10			
35	35			
	100+			
513.66				
	40			Light Gray LIMESTONE, slightly weathered, slightly fractured Run 1: 37.5' - 47.5' Recovery: 100% RQD: 55.8% (Fair)
45				
503.66				

End of Boring

RWB-71
11+54.0529
25.79ft LT

EL 551.17

D	N	Qu	w%	
0				13 inches of Asphalt
550.08				
	9	5.41 B	18	Brown and Gray, Moist FILL: SILTY CLAY, trace gravel
547.17				
5	7	3.33 B	19	
	14	6.46 B	20	Very Stiff to Hard Brown and Gray, Moist SILTY CLAY, trace gravel (CL/ML)
	14	4.17 B	19	
10	10	1.25 B	18	
540.17				
	14	2.71 B	14	Stiff to Hard Gray, Moist SILTY CLAY, trace gravel (CL/ML)
15	17	5.21 B	19	
532.67				
	20	2.0 P	18	Very Stiff Gray, Moist SILTY CLAY LOAM, trace sand (ML/CL)
530.17				
20	100+			Very Dense Dark Brown, Moist SAND, with gravel, trace clay (SPG)
527.67				
	17			
25	25			Medium Dense Brown, Moist SAND and GRAVEL, with clay (SPG)
	18			
522.67				
	51			
	30			Dense Light Brown and Gray, Moist SAND, trace gravel (SP)
519.17	100+			

End of Boring

RWB-72
12+29.5420
22.11ft LT

EL 549.43

D	N	Qu	w%	
0				7 inches of Topsoil
548.35				
	11	2.50 B	20	Brown, Moist FILL: SILTY CLAY, trace gravel
545.93				
5	12	3.12 B	23	
	7	1.46 B	22	Stiff to Very Stiff Brown, Moist SILTY CLAY (CL/ML)
	15	2.25 P	17	
10	20		16	Medium Dense Gray, Moist SILT (ML)
538.43				
536.43				
	17	2.08 B	15	Very Stiff Brown and Gray, Moist SILTY CLAY, trace sand (CL/ML)
15	17	2.08 B	16	
	36	2.5 P	15	
20	39	2.5 P		
	16			
25	25			
	12			
	9			Loose to Medium Dense Brown, Moist SAND, with gravel, trace cobbles (SPG)
	30			
	6			
	7			
35	35			
	9			
510.93				
	10			Loose to Very Dense Light Brown and Black, Moist SAND, with gravel, trace cobbles (SPG)
	40			
506.93	19			Very Dense Gray, Moist GRAVEL (GP)
505.93				
	100+			
45				
				Light Gray LIMESTONE, slightly weathered, moderately fractured Run 1: 43.5' - 53.5' Recovery: 100% RQD: 61.7% (Fair)
50				
495.93				

End of Boring

10+00 10+25 10+50 10+75 11+00 11+25 11+50 11+75 12+00 12+25 12+50

575 570 565 560 555 550 545 540 535 530 525 520 515 510 505 500 495 490

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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 -	ES
SHEET SIZE	= $SHEETSIZE$	DRAWN -	NN
PLOT SCALE	= $SCALE$	CHECKED -	DE
PLOT DATE	= $DATE$	DATE -	06/10/2022

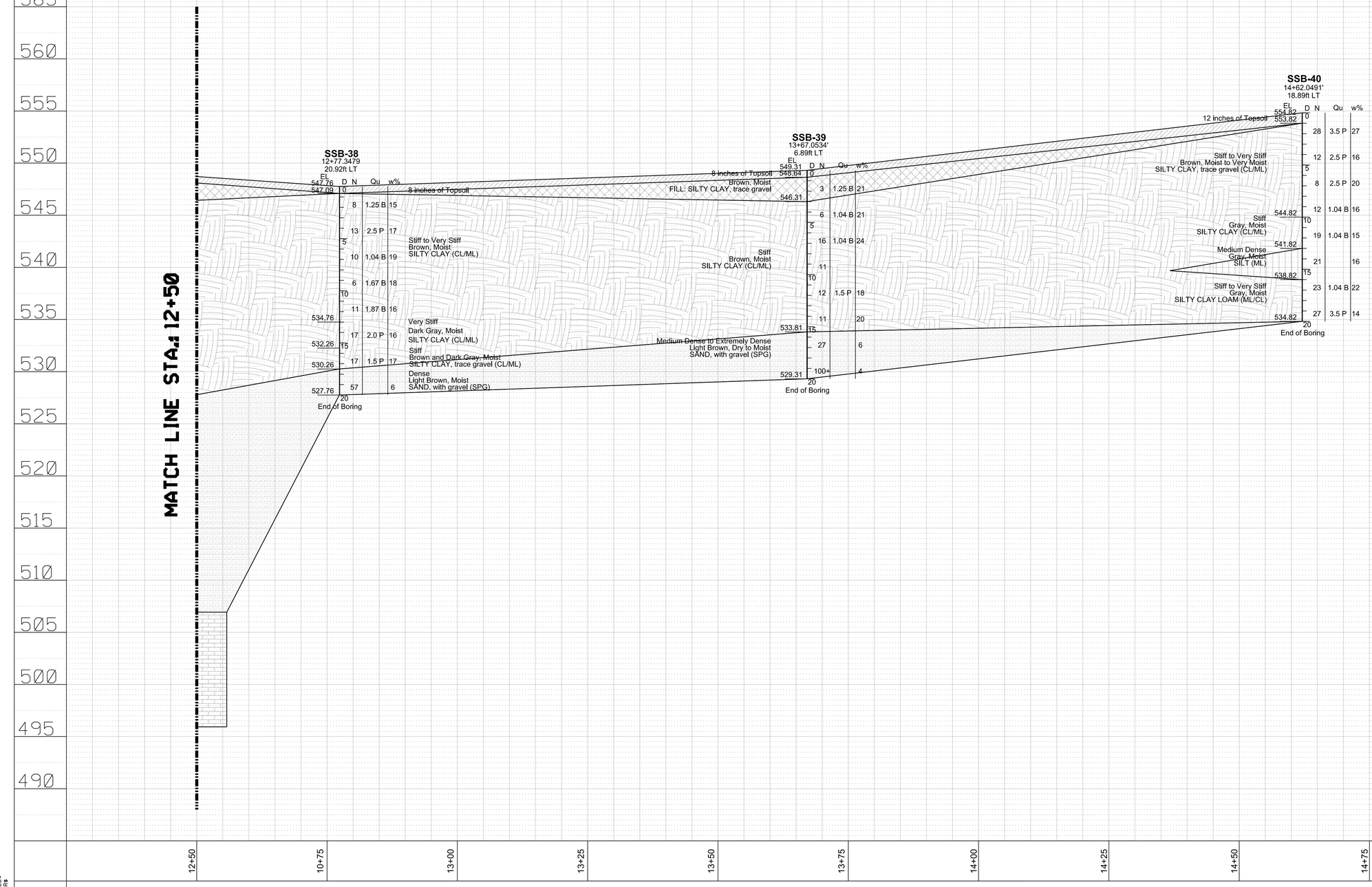
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

RETAINING WALL NO. 8 - RAMP AA
SOIL BORING PROFILE
SCALE: AS NOTED | SHEET 2 OF 3 SHEETS | STA. 10+00 | TO STA. 12+50

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	4	3
		CONTRACT NO. PTB- 198-003		
		ILLINOIS	FED. AID PROJECT	

LEGEND

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



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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 -	ES
SHEET SIZE	= $SHEETSIZE$	DRAWN -	NN
PLOT SCALE	= $SCALE$	CHECKED -	DE
PLOT DATE	= $DATE$	DATE -	06/10/2022

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

RETAINING WALL NO. 8 - RAMP AA
SOIL BORING PROFILE

SCALE: AS NOTED | SHEET 3 OF 3 SHEETS | STA. 12+50 | TO STA. 15+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		WILL	4	4
		CONTRACT NO. PTB- 198-003		
	ILLINOIS	FED. AID PROJECT		

Appendix C
Soil Boring Logs

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

SOIL BORING LOG

Date 6/13/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,

Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO.
Station

BORING NO. RWB-66
Station 7+92.3564
Offset 25.25ft LT
Ground Surface Elev. 546.72 ft

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

Groundwater Elev.:
First Encounter Dry ft
Upon Completion N/A ft
After Hrs. N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				2 inches of Topsoil 546.55
	2			Brown and Gray, Moist FILL: SILTY CLAY, trace gravel
	2 4	1.5 P	18	
	1			
	2 3	3.0 P	22	
-5				541.72
	4			Stiff to Hard Brown, Moist SILTY CLAY, trace gravel (CL)
	6 9	1.5 P	18	
	3			
	7 9	4.5 P	19	
-10				
	4			
	6 9	3.5 P	17	
				533.22
	7			Very Stiff Gray, Moist SILTY CLAY LOAM, trace gravel (ML/CL)
	14 30	2.0 P	13	
-15				
	10			
	14 22		13	Sand and gravel seam at 17.0 feet
	6			
	8 12	3.0 P	14	
-20				526.72

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Dense Brown and Gray, Moist GRAVEL, with sand (GPS) Cobbles at 21.0 feet
	19			
	15 16		8	
				523.22
	6			Medium Dense to Very Dense Light Brown, Moist SAND, with gravel (SPG)
	9 9		13	
-25				
	20			Cobbles at 26.0 feet
	28 25		7	
	5			
	10 16		7	
-30				
	50/6"			
			5	514.72 Split Spoon Refusal at 32.0 feet
				Light Gray LIMESTONE, slightly weathered, heavily fractured Run 1: 32' - 42' Recovery: 100% RQD: 56.2% (Fair)
-35				
-40				

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 6/13/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
Latitude , **Longitude**
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO.
Station

BORING NO. RWB-66
Station 7+92.3564
Offset 25.25ft LT
Ground Surface Elev. 546.72 **ft**

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
504.72			
End of Boring			
-45			
-50			
-55			
-60			

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

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

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)

Retaining Wall #8
Boring Number: RWB-66, Run 1

Top

Depth = 32.0 ft
Elev. = 514.7 ft

Depth = 42.0 ft
Elev. = 504.7 ft

Bottom

Boring No.	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description	Depth (ft)/ Unconfined Compression Strength (psi)
RWB-66	32.0' – 42.0'	100.0	56.2	Fair	Gray Limestone Slightly Weathered, Heavily Fractured	37.0 / 11,261

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

SOIL BORING LOG

Date 6/14/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98
Latitude , **Longitude**

STRUCT. NO.
Station

BORING NO. RWB-67
Station 8+72.7860
Offset 15.70ft LT
Ground Surface Elev. 546.06 **ft**

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

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	3			Brown and Gray, Moist FILL: SILTY CLAY, trace gravel
	3 7	2.0 P	20	
543.56				
	2			Very Stiff Brown, Moist SILTY CLAY, trace gravel (CL/ML)
	2 5	2.0 P	20	
541.06 -5				
	4			Very Stiff to Hard Brown and Gray, Moist SILTY CLAY LOAM, trace sand and gravel (ML/CL)
	7 8	3.0 P	12	
	3			
	7 8	4.5 P	21	
-10				
535.06				
	6			Stiff to Very Stiff Gray, Moist SILTY CLAY LOAM, with gravel, trace sand (ML/CL) Sand seam at 12 feet
	12 18	1.5 P	13	
	9			
	12 12		11	
-15				
	4			
	18 22	3.0 P	17	
527.56				
	27			Medium Dense to Dense Light Brown, Moist SAND, with gravel (SPG)
	15 20		7	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	33			Medium Dense to Dense Light Brown, Moist SAND, with gravel (SPG) *(continued)*
	13 13		5	Cobbles at 21 feet
	35			Cobbles at 23.5 feet
	22 9		6	
-25				
	13			
	12 23		8	
	7			Cobbles at 28.5 feet
	11 8		9	
-30				
	9			
	10 11		7	
512.56				
	50/2"			Auger refusal at 33.5 feet End of Boring
			NR	
-35				
-40				

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 6/14/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO.
Station

BORING NO. RWB-68
Station 9+47.5456
Offset 11.93ft LT
Ground Surface Elev. 548.11 ft

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

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Brown and Gray, Moist
				FILL: SILTY CLAY, trace gravel
	2			
	3	3.0	18	
	4	P		
545.61				
				Very Stiff
				Brown and Gray, Moist
	3			SILTY CLAY, trace gravel (CL)
	4	3.5	19	
-5	6	P		
	3			
	8	2.5	19	
	8	P		
539.61				
	4			Very Stiff to Hard
	8		13	Gray, Moist
-10	10			SILTY CLAY LOAM, trace sand and gravel (ML/CL)
				Sand seam at 9 feet
	3			
	8	4.5	16	
	11	P		
	6			
	10	2.0	19	
-15	15	P		
	7			
531.61				
	13		10	Medium Dense
	13			Light Brown and Gray, Moist
				SAND, with gravel and limestone fragments (SPG)
	13			
	11		9	
-20	14			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
527.11				
	6			Stiff
	6	1.3	25	Brown and Gray, Very Moist
	10	P		SILTY CLAY LOAM, trace sand and gravel (CL/ML)
524.61				
	4			Medium Dense
	6		29	Brown, Very Moist
-25	8			SILT, trace gravel (ML)
522.11				
	9			Medium Dense to Dense
	9		11	Light Brown, Moist
	9			SAND, with gravel, trace cobbles (SPG)
	10			
	14		10	
-30	9			
	6			
	25		10	
	9			
	9			
	7		9	
-35	6			
511.61				Auger refusal at 36.5 feet
				Light Gray
				LIMESTONE, slightly weathered, slightly fractured
				Run 1: 36.5' - 46.5'
				Recovery: 100%
				RQD: 51.2% (Fair)
-40				

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 6/14/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
Latitude , **Longitude**
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO.
Station

BORING NO. RWB-68
Station 9+47.5456
Offset 11.93ft LT
Ground Surface Elev. 548.11 **ft**

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

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

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Light Gray LIMESTONE, slightly weathered, slightly fractured Run 1: 36.5' - 46.5' Recovery: 100% RQD: 51.2% (Fair) *(continued)*	-45			
501.61 End of Boring	-50 -55 -60			

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)

Retaining Wall #8
Boring Number: RWB-68, Run 1

Top

Depth = 36.5 ft
Elev. = 511.6 ft

Depth = 46.5 ft
Elev. = 501.6 ft

Bottom

Boring No.	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description	Depth (ft)/ Unconfined Compression Strength (psi)
RWB-68	36.5’ – 46.5’	100.0	51.2	Fair	Light Gray Limestone Slightly Weathered, Slightly Fractured	43.5 / 18,300

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

SOIL BORING LOG

Date 6/17/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** DD

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** CME-75 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 91

STRUCT. NO.
Station

BORING NO. RWB-69
Station 10+21.8430
Offset 18.45ft LT
Ground Surface Elev. 551.38 ft

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

Groundwater Elev.:
First Encounter Dry ft
Upon Completion N/A ft
After Hrs. N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Brown and Gray, Moist
				FILL: SILTY CLAY, trace gravel
	2			
	2	1.0	11	
	2	P		
548.88				
				Very Stiff to Hard
				Brown, Moist
				SILTY CLAY, trace gravel
				(CL/ML)
	2			
	2	2.5	18	
-5	4	P		
	5			
	8	4.5	18	
	9	P		
	3			
	6	4.5	18	
-10	10	P		
	4			
	6	3.5	21	
	10	P		
	6			
	8	4.5	17	
-15	8	P		
	3			
	8	4.5	18	
	20	P		
532.88				
				Very Dense
				Light Brown, Moist
				SAND, with gravel (SPG)
	42			
	50/4"		12	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
530.38				
	4			Very Stiff
	17	3.5	19	Dark Brown, Moist
	29	P		SILTY CLAY, trace sand and
				gravel (CL/ML)
527.88				
	4			Very Stiff
	10	2.5	12	Dark Brown, Moist
-25	9	P		SILTY CLAY LOAM (CL/ML)
	4			
	5	2.5	11	
	6	P		
522.88				
	11			Medium Dense to Dense
	16		7	Light Brown, Moist
-30	14			SAND, with gravel (SPG)
	11			
	12		7	
	25			
	8			Cobbles at 33.5 feet
	10		9	
-35	14			
	8			
	10		8	
	11			
513.38				
				Auger refusal at 38.0 feet
				End of Boring
-40				

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 6/15/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO.
Station

BORING NO. RWB-70
Station 10+88.6135
Offset 32.89ft LT
Ground Surface Elev. 551.16 ft

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

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				13 inches of Asphalt
				550.08
	2			Brown and Gray, Moist
	3	2.9	18	FILL: SILTY CLAY, trace gravel
	5	B		549.16
				Very Stiff
				Brown, Moist
				SILTY CLAY, trace gravel
				(CL/ML)
	2			
	3	2.5	21	
-5	5	B		
	3			
	4	3.5	18	
	4	P		
	3			
	4	2.5	20	
-10	5	B		
				540.16
	4			Very Stiff
	6	3.0	16	Gray, Moist
	8	P		SILTY CLAY, trace gravel
				(CL/ML)
				537.66
	4			Very Stiff
	8	4.5	16	Gray, Moist
-15	9	P		SILTY CLAY LOAM, trace gravel
				(ML/CL)
	5			
	8	1.3	15	
	10	P		
				532.66
	6			
	7	7.3	20	
-20	10	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Hard
				Brown, Moist
				530.16
	6			SILTY CLAY, trace gravel
	6		11	(CL/ML) *(continued)*
	9			Medium Dense
				Dark Brown and Gray, Moist
				SAND, with gravel, trace clay
				(SPG)
	5			527.66
	3	1.5	19	Stiff
-25	4	P		Black and Brown, Moist
				SILTY CLAY LOAM, with gravel
				(CL/ML)
				525.16
	6			Loose to Very Dense
	17		9	Light Brown, Moist
	17			SAND, with gravel (SPG)
	42			
	14		6	
-30	15			
	36			
	9		10	
	9			
	4			
	4		12	
-35	6			
	8			
	14		9	
	50/1"			
				513.66
				Split Spoon Refusal at 37.5 feet
-40				

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 6/15/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,

COUNTY Will **DRILLING RIG** Diedrich D-50 **HAMMER TYPE** Auto
Latitude , **Longitude**
DRILLING METHOD HSA **HAMMER EFF (%)** 98

STRUCT. NO.
Station

BORING NO. RWB-70
Station 10+88.6135
Offset 32.89ft LT
Ground Surface Elev. 551.16 **ft**

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)

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

Groundwater Elev.:
First Encounter Dry **ft**
Upon Completion N/A **ft**
After _____ **Hrs.** N/A **ft**

Light Gray
LIMESTONE, slightly weathered, slightly fractured

Run 1: 37.5' - 47.5'
Recovery: 100%
RQD: 55.8% (Fair) *(continued)*

-45

503.66
End of Boring

-50

-55

-60

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)

Retaining Wall #8
Boring Number: RWB-70, Run 1

Top

Depth = 37.5 ft
Elev. = 513.7 ft

Depth = 47.5 ft
Elev. = 503.7 ft

Bottom

Boring No.	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description	Depth (ft)/ Unconfined Compression Strength (psi)
RWB-70	37.5' – 47.5'	100.0	55.8	Fair	Light Gray Limestone Slightly Weathered, Slightly Fractured	43.5 / 13,823

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

SOIL BORING LOG

Date 6/16/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** CME-75 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 91

STRUCT. NO.
Station

BORING NO. RWB-71
Station 11+54.0529
Offset 25.79ft LT
Ground Surface Elev. 551.17 ft

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

Groundwater Elev.:
First Encounter Dry ft
Upon Completion N/A ft
After Hrs. N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				13 inches of Asphalt
				550.08
	5			Brown and Gray, Moist
	4	5.4	18	FILL: SILTY CLAY, trace gravel
	5	B		
	2			547.17
	4	3.3	19	Very Stiff to Hard
-5	3	B		Brown and Gray, Moist
				SILTY CLAY, trace gravel
				(CL/ML)
	4			
	6	6.5	20	
	8	B		
	4			
	7	4.2	19	
-10	7	B		
				540.17
	3			Stiff to Hard
	3	1.3	18	Gray, Moist
	7	B		SILTY CLAY, trace gravel
				(CL/ML)
	3			
	6	2.7	14	
-15	8	B		
	5			
	6	5.2	19	
	11	B		
				532.67
	8			
	8	2.0	18	
-20	12	P		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Very Stiff
				Gray, Moist
				530.17
	50/6"			SILTY CLAY LOAM, trace sand (ML/CL) *(continued)*
			8	Very Dense
				Dark Brown, Moist
				SAND, with gravel, trace clay
				(SPG)
				527.67
	31			Medium Dense
	11		9	Brown, Moist
-25	6			SAND and GRAVEL, with clay
				(SPG)
				Cobbles at 23.5 to 27.5 feet
	10			
	7		6	
	11			
				522.67
	5			Dense
	23		19	Light Brown and Gray, Moist to
-30	28			Wet
				SAND, trace gravel (SP)
	50/3"			Clay seam at 31.0 feet
			6	519.17
				Split Spoon Refusal at 32.0 feet
				End of Boring
-35				
-40				

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 6/16/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** CME-75 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 91

STRUCT. NO.
Station

BORING NO. RWB-72
Station 12+29.5420
Offset 22.11ft LT
Ground Surface Elev. 549.43 ft

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

Groundwater Elev.:
First Encounter 508.4 ft ▼
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				7 inches of Topsoil
548.85				
	3			Brown, Moist FILL: SILTY CLAY, trace gravel
	4 7	2.5 B	20	
545.93				
	3			Stiff to Very Stiff Brown, Moist SILTY CLAY (CL)
-5	5 7	3.1 B	23	
	3			
	3 4	1.5 B	22	
	6			
-10	7 8	2.3 P	17	
538.43				
	3			Medium Dense Gray, Moist SILT (ML)
	7 13		16	
536.43				
	4			Very Stiff Brown and Gray, Moist to Very Moist SILTY CLAY, trace sand (CL/ML)
-15	7 10	2.1 B	15	
	3			
	6 11	2.1 B	16	Cobbles at 16.5 feet
	8			
-20	13 23	2.5 P	15	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	4			Very Stiff Brown and Gray, Moist to Very Moist SILTY CLAY, trace sand (CL/ML) *(continued)*
	12 27	2.5 P	28	Cobbles at 21 feet
525.93				
	8			Loose to Medium Dense Brown, Dry to Moist SAND, with gravel, trace cobbles (SPG)
	9 7		7	
-25				
	6			
	6 6		11	
	4			
	4 5		2	
-30				
	4			
	2 4		8	
-35				
	6			
	4 3		9	
	9			
	6 3		6	
510.93				
	5			
	3 7		13	
-40				

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 6/16/22

ROUTE I-80 **DESCRIPTION** Retaining Wall No. 8 - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** CME-75 **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 91

STRUCT. NO.
Station

BORING NO. RWB-72
Station 12+29.5420
Offset 22.11ft LT
Ground Surface Elev. 549.43 ft

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

Groundwater Elev.:
First Encounter 508.4 ft ▼
Upon Completion N/A ft
After ____ **Hrs.** N/A ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Loose to Very Dense Light Brown and Black, Moist SAND, with gravel, trace cobbles (SPG) *(continued)*	▼	4		
Clay seam from 41 to 42.5 feet		8 11		11
506.93				
Very Dense Gray, Moist GRAVEL (GP)		50/2"		
505.93 Split Spoon Refusal at 43.5 feet				10
Light Gray LIMESTONE, slightly weathered, moderately fractured	-45			
Run 1: 43.5' - 53.5' Recovery: 100% RQD: 61.7% (Fair)	-50			
495.93				
End of Boring	-55			
	-60			

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)

Boring Number: RWB-72, Run 1

Top

Depth = 43.5 ft
Elev. = 505.9 ft

Depth = 53.5 ft
Elev. = 495.9 ft

Bottom

Boring No.	Depth (ft)	Recovery (%)	RQD (%)	RQD Classification	Description	Depth (ft)/ Unconfined Compression Strength (psi)
RWB-72	43.5' – 53.5'	100.0	61.7	Fair	Light Gray Limestone Slightly Weathered, Moderately Fractured	45.5 / 18,516

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

SOIL BORING LOG

Date 5/10/22

ROUTE I-80 **DESCRIPTION** Embankment - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Geoprobe 7822DT **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 92

STRUCT. NO.
Station

BORING NO. SSB-38
Station 12+77.3479
Offset 20.92ft LT
Ground Surface Elev. 547.76 **ft**

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

Groundwater Elev.:
First Encounter Dry **ft**
Upon Completion N/A **ft**
After _____ **Hrs.** N/A **ft**

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
8 inches of Topsoil 547.09				
Stiff to Very Stiff Brown, Moist SILTY CLAY (CL/ML)		2		
		3 5	1.3 B	15
Cobbles at 3.5 feet		3		
	-5	7 6	2.5 P	17
		2		
		4 6	1.0 B	19
		2		
	-10	2 4	1.7 B	18
		2		
		4 7	1.9 B	16
534.76				
Very Stiff Dark Gray, Moist SILTY CLAY (CL/ML) Cobbles at 13.5 feet		7		
	-15	8 9	2.0 P	16
532.26				
Stiff Brown and Dark Gray, Moist SILTY CLAY, trace gravel (CL/ML)		10		
Cobbles at 16.5 feet 530.26		7 10	1.5 P	17
Dense Light Brown, Moist SAND, with gravel (SPG)		22		
Cobbles at 17.5 feet		24 33		6
527.76	-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)

Illinois Department of Transportation

Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 5/10/22

ROUTE I-80 **DESCRIPTION** Embankment - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Geoprobe 7822DT **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 92

STRUCT. NO.
Station

BORING NO. SSB-39
Station 13+67.0534'
Offset 6.89ft LT
Ground Surface Elev. 549.31 ft

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

Groundwater Elev.:
First Encounter Dry ft
Upon Completion N/A ft
After Hrs. N/A ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
8 inches of Topsoil				
548.64				
Brown, Moist FILL: SILTY CLAY, trace gravel		1		
		1 2	1.3 B	21
546.31				
Stiff Brown, Moist SILTY CLAY (CL/ML)		1		
		3 3	1.0 B	21
	-5			
		3		
Cobbles at 6.5 feet		5 11	1.0 B	24
No recovery at 8.5 feet		2		
		5 6		NR
	-10			
		3		
Cobbles at 11.5 feet		4 8	1.5 P	18
Low recovery at 13.5 feet		3		
		4 7		20
	-15			
533.81				
Medium Dense to Extremely Dense Light Brown, Dry to Moist SAND, with gravel (SPG)		9		
		14 13		6
Cobbles at 18.5 feet		20		
		32		4
529.31	-20	50/5.5"		

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)

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

SOIL BORING LOG

Date 5/10/22

ROUTE I-80 **DESCRIPTION** Embankment - Ramp AA **LOGGED BY** KA

SECTION I-80 over Des Plaines River **LOCATION** , **SEC.** 16, **TWP.** 35 N, **RNG.** 10 E,
Latitude , **Longitude**

COUNTY Will **DRILLING RIG** Geoprobe 7822DT **HAMMER TYPE** Auto
DRILLING METHOD HSA **HAMMER EFF (%)** 92

STRUCT. NO.
Station

BORING NO. SSB-40
Station 14+62.0491'
Offset 18.89ft LT
Ground Surface Elev. 554.82 **ft**

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

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

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
12 inches of Topsoil				
553.82				
Stiff to Very Stiff		4		
Brown, Moist to Very Moist		12	3.5	27
SILTY CLAY, trace gravel		16	P	
(CL/ML)				
		3		
	-5	5	2.5	16
		7	P	
		1		
		3	2.5	20
		5	P	
		3		
		5	1.0	16
544.82	-10	7	B	
Stiff				
Gray, Moist				
SILTY CLAY (CL/ML)		3		
		4	1.0	15
		15	B	
541.82				
Medium Dense		4		
Gray, Moist				
SILT (ML)		9		16
Cobbles at 13.5 feet	-15	12		
538.82				
Stiff to Very Stiff		4		
Gray, Moist		8	1.0	22
SILTY CLAY LOAM (ML/CL)		15	B	
Cobbles at 16.5 feet				
		9		
		11	3.5	14
534.82	-20	16	P	

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)

Appendix D
Soil Parameter Tables

Table a – Summary of Soil Parameters

Retaining Wall #8 (RWB-66 through RWB-72)

Depth Range (Elevation CCD, 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	100	25
	New Engineered Granular Fill	125	0	30	0	30
0.5 - 3.5 (549.0 - 545.5)	FILL: Brown and Gray Silty Clay	138	2,400	0	240	25
3.5 - 10.0 (545.5 - 539.0)	Stiff to Hard Brown and Gray Silty Clay	138	3,200	0	320	28
10.0 - 18.0 (539.0 - 531.0)	Stiff to Hard Gray Silty Clay / Silty Clay Loam	138	2,700	0	270	28
18.0 - 35.0 (531.0 - 514.0)	Medium Dense to Very Dense Light Brown Sand	126	0	40	0	40
35.0 - 50.0 (514.0 - 499.0)	Gray Limestone	150	0	45	0	45
23.0 - 26.0* (526.0 - 523.0)	Medium Stiff to Stiff Brown and Gray Silty Clay Loam	126	750	0	75	25

* Layer only noted in Borings RWB-68, RWB-69 and RWB-70

Table b – Summary of Soil Parameters

Embankment Ramp AA (SSB-38 through SSB-40)

Depth Range (Elevation CCD, 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	100	25
	New Engineered Granular Fill	125	0	30	0	30
0.5 - 3.5 (549.0 - 545.5)	FILL: Brown Silty Clay	132	1,200	0	120	25
3.5 - 10.0 (545.5 - 539.0)	Stiff to Very Stiff Brown Silty Clay	137	1,800	0	180	28
10.0 - 18.0 (539.0 - 531.0)	Stiff to Very Stiff Gray Silty Clay / Silty Clay Loam	133	1,300	0	130	28
18.0 - 20.0 (531.0 - 529.0)	Medium Dense to Extremely Dense Light Brown Sand	135	0	42	0	42

Appendix E
Laboratory Test Results

GSG CONSULTANTS, INC.

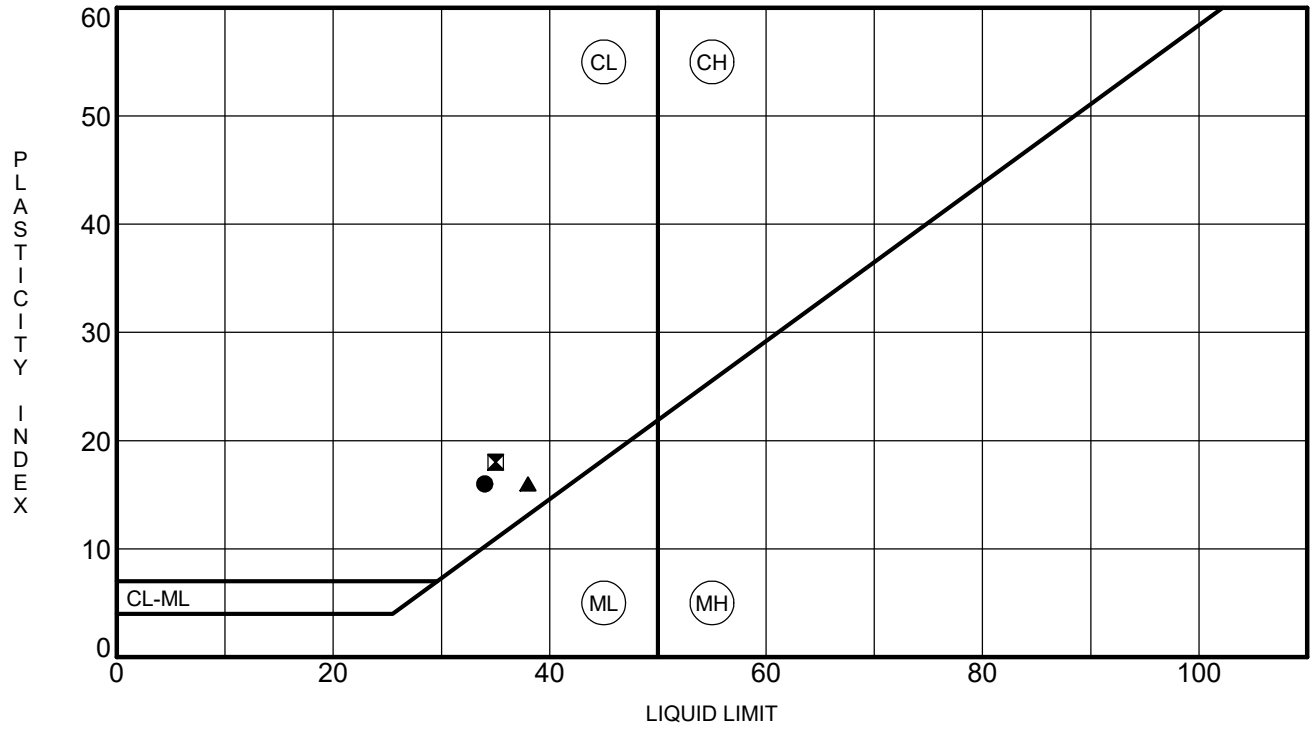
735 Remington Road
Schaumburg, IL 60173
Tel: 630.994.2600
www.gsg-consultants.com

Table D-1 – Atterberg Limits

Boring ID	Sample Depth (ft)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Soil Classification
RWB-66	11-12.5	34.0	18.0	15.0	CL
RWB-68	3.5-5	35.0	17.0	18.0	CL
RWB-72	6-7.5	38.0	22.0	16.0	CL

Table D-2 – Dry Unit Weight

Boring ID	Sample Depth (ft)	Dry Unit Weight (pcf)	Wet Unit Weight (pcf)
RWB-67	11-12.5	120.2	138.3
RWB-69	3.5-5	109.2	128.8
RWB-71	6-7.5	106.9	122.1



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**RWB-66**	**11.00**	**34.0**	**18.0**	**16.0**		
⧓	**RWB-68**	**3.50**	**35.0**	**17.0**	**18.0**		
▲	**RWB-72**	**6.00**	**38.0**	**22.0**	**16.0**		

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Tel: 630.994.2600, www.gsg-consultants.com

ATTERBERG LIMITS' RESULTS

Route: I-80

Section: I-80 over Des Plaines River

County: Will

Compressive Strength of Rock by ASTM D7012 - Method C

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

Project Name:	WSP_198-003 I-80		Project No:	21-007	
Boring ID:	RWB 66		Bulk/Prep		MC/CS
Sample Depth (ft):	37-38.5		Tester:	MB	Tester: MB
Lithological Description:			Date:	06/15/22	Date: 06/15/22
Formation Name:		Load Direction:	VERTICAL		Angle Drilled: VERTICAL
Appearance (e.g. cracks, shearing, spalling):					

Bulk Density Determination

	1	2	3	Average
Height, *in.*	4.9385	4.9435	4.9395	4.9405
Diameter, *in.*	1.9855	1.9770	1.9755	1.9793

Specimen Mass, *g*	652.5	Ratio (2.0-2.5)	
Bulk Density, *pcf*	163.5	2.50	

Moisture Condition - D2216

Container ID	
container, *g*	226.4
container + wet rock, *g*	801.5
container + dry soil, *g*	792.8
moisture content, *w%*	1.5

Preparation Check	Yes	No	Reason/Readings If No:
Ends Flat within 0.02 mm prior to capping?	X		
Ends perpendicular to side within 0.25 degrees?	X		
Ends parallel to each other within 0.25 degrees?	X		

Axial Loading

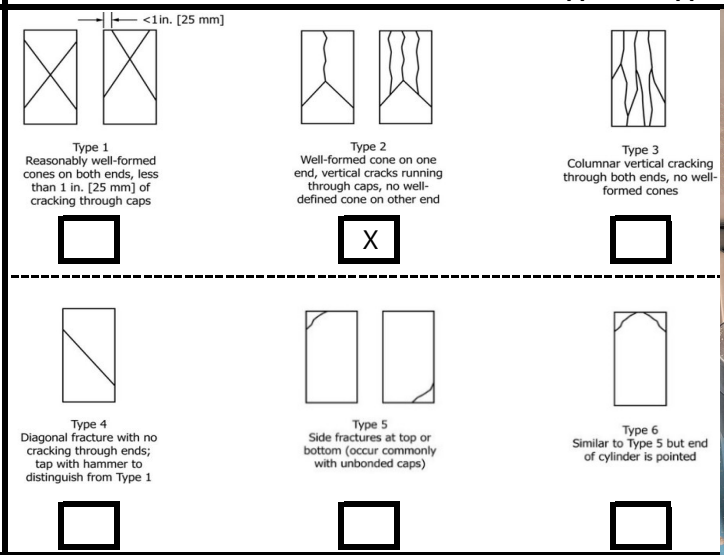
Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	2 min 25 sec
Load @ Failure, *lbf*	34,650
Uniaxial Compressive Strength, *psi*	11,261

Remarks

Best efforts have been made for the specimen to meet the required tolerances of D4543. See IH3 Procedure for efforts made.

After Preparation

After Break (check applicable appearance)



Form ID	TF-RCS	Reviewed By	DE
Revision Date	10/21/2021	Review Date	06/22/22

Compressive Strength of Rock by ASTM D7012 - Method C

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

Project Name:	WSP_198-003 I-80		Project No:	21-2007	
Boring ID:	RWB-68		Bulk/Prep		MC/CS
Sample Depth (ft):	43.5		Tester:	MB	Tester: MB
Lithological Description:	lime stone		Date:	06/20/22	Date: 06/20/22
Formation Name:		Load Direction:	vertical	Angle Drilled:	vertical

Appearance (e.g. cracks, shearing, spalling):

Bulk Density Determination

	1	2	3	Average
Height, *in.*	4.4355	4.4355	4.4390	4.4367
Diameter, *in.*	1.9735	1.9735	1.9750	1.9740

Specimen Mass, *g*	606.7	Ratio (2.0-2.5)	
Bulk Density, *pcf*	170.2	2.25	

Moisture Condition - D2216

Container ID	
container, *g*	226.4
container + wet rock, *g*	691.0
container + dry soil, *g*	685.3
moisture content, *w%*	1.2

Preparation Check	Yes	No	Reason/Readings If No:
Ends Flat within 0.02 mm prior to capping?	X		
Ends perpendicular to side within 0.25 degrees?	X		
Ends parallel to each other within 0.25 degrees?	X		

Axial Loading

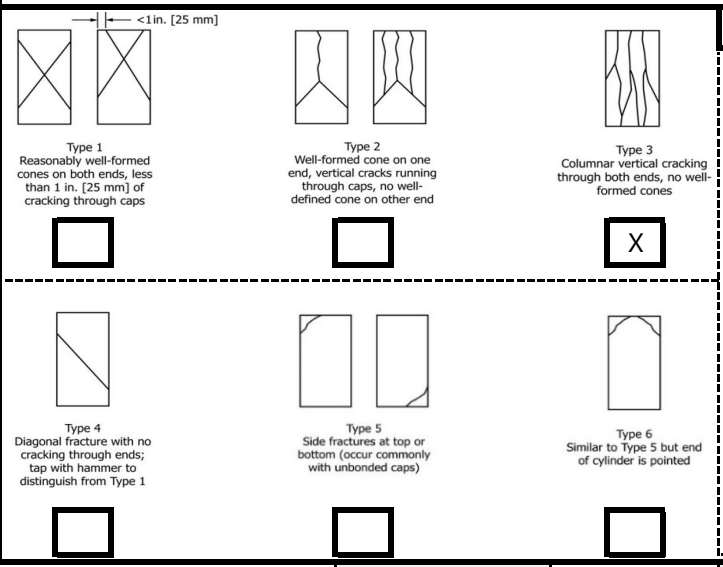
Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	3 min 53 sec
Load @ Failure, *lbf*	56,006
Uniaxial Compressive Strength, *psi*	18,300

Remarks

Best efforts have been made for the specimen to meet the required tolerances of D4543. See IH3 Procedure for efforts made.

After Preparation

After Break (check applicable appearance)



Form ID	TF-RCS	Reviewed By	
Revision Date	10/21/2021	Review Date	

Compressive Strength of Rock by ASTM D7012 - Method C

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

Project Name:	WSP_198-003 I-80		Project No:	21-2007	
Boring ID:	RWB-70		Bulk/Prep		MC/CS
Sample Depth (ft):	43.5		Tester:	MB	Tester: MB
Lithological Description:	lime stone		Date:	06/20/22	Date: 06/20/22
Formation Name:		Load Direction:	vertical	Angle Drilled:	vertical

Appearance (e.g. cracks, shearing, spalling):

Bulk Density Determination

	1	2	3	Average
Height, *in.*	4.7420	4.7315	4.7370	4.7368
Diameter, *in.*	1.9830	1.9765	1.9765	1.9787

Specimen Mass, *g*	645.4	Ratio (2.0-2.5)	
Bulk Density, *pcf*	168.8	2.39	

Moisture Condition - D2216

Container ID	
container, *g*	226.6
container + wet rock, *g*	801.4
container + dry soil, *g*	793.3
moisture content, *w%*	1.4

Preparation Check

	Yes	No	Reason/Readings If No:
Ends Flat within 0.02 mm prior to capping?	X		
Ends perpendicular to side within 0.25 degrees?	X		
Ends parallel to each other within 0.25 degrees?	X		

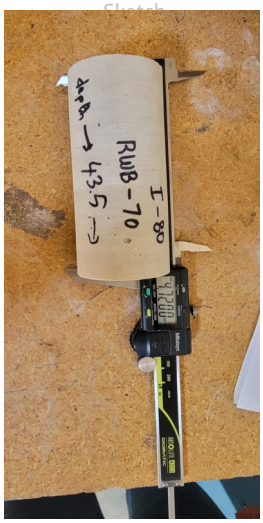
Axial Loading

Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	2 min 54 sec
Load @ Failure, *lbf*	42,501
Uniaxial Compressive Strength, *psi*	13,823

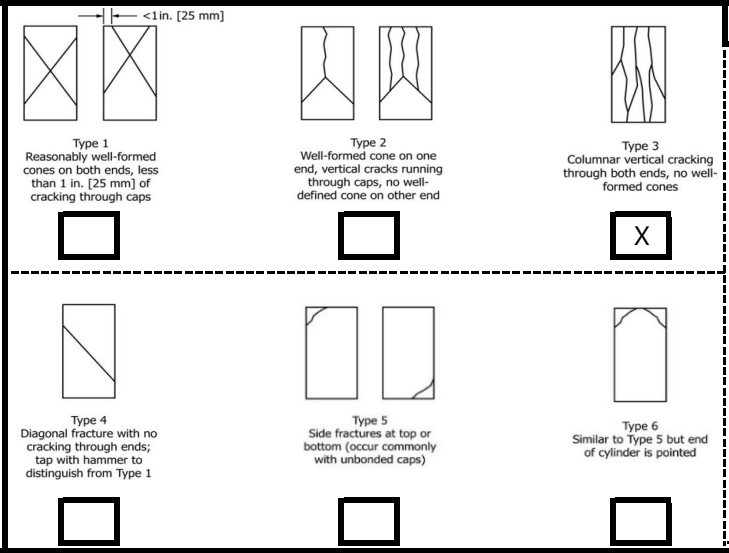
Remarks

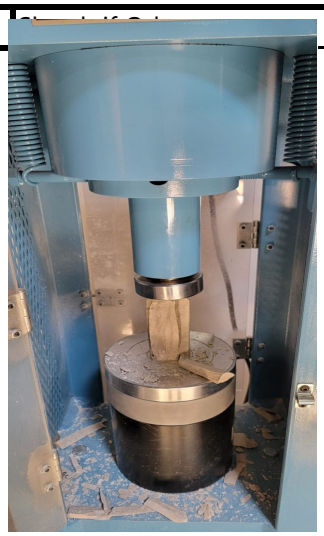
Best efforts have been made for the specimen to meet the required tolerances of D4543. See IH3 Procedure for efforts made.

After Preparation



After Break (check applicable appearance)





Form ID	TF-RCS	Reviewed By	
Revision Date	10/21/2021	Review Date	

Compressive Strength of Rock by ASTM D7012 - Method C

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

Project Name:	WSP_198-003 I-80		Project No:	21-2007	
Boring ID:	RWB-72		Bulk/Prep		MC/CS
Sample Depth (ft):	45.5		Tester:	MB	Tester: MB
Lithological Description:	lime stone		Date:	06/20/22	Date: 06/20/22
Formation Name:		Load Direction:	vertical	Angle Drilled:	vertical

Appearance (e.g. cracks, shearing, spalling):

Bulk Density Determination

	1	2	3	Average
Height, *in.*	4.7230	4.7205	4.7255	4.7230
Diameter, *in.*	1.9870	1.9920	1.9935	1.9908

Specimen Mass, *g*	645.8	Ratio (2.0-2.5)	
Bulk Density, *pcf*	167.4	2.37	

Moisture Condition - D2216

Container ID	
container, *g*	226.8
container + wet rock, *g*	816.6
container + dry soil, *g*	802.8
moisture content, *w%*	2.4

Preparation Check	Yes	No	Reason/Readings If No:
Ends Flat within 0.02 mm prior to capping?	X		
Ends perpendicular to side within 0.25 degrees?	X		
Ends parallel to each other within 0.25 degrees?	X		

Axial Loading

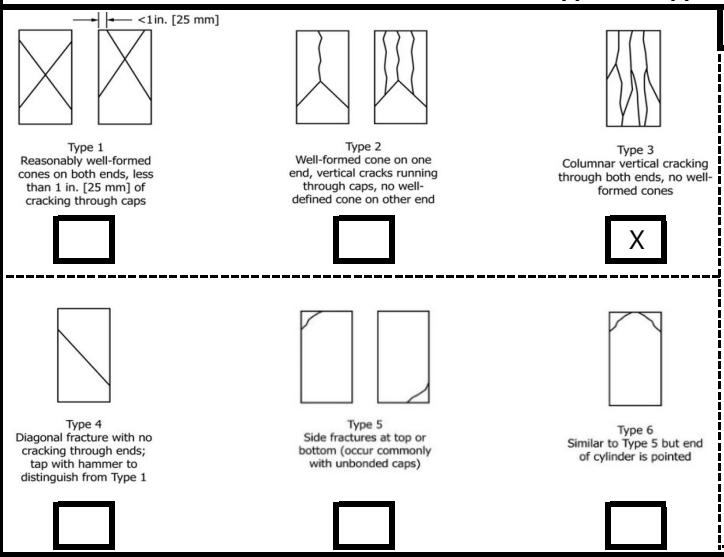
Seating Load (≤1000 psi)	1000
Rate of Loading (73-145 psi/s)	75
Time to Failure (2-15 min)	4 min 2 sec
Load @ Failure, *lbf*	57,636
Uniaxial Compressive Strength, *psi*	18,516

Remarks

Best efforts have been made for the specimen to meet the required tolerances of D4543. See IH3 Procedure for efforts made.

After Preparation

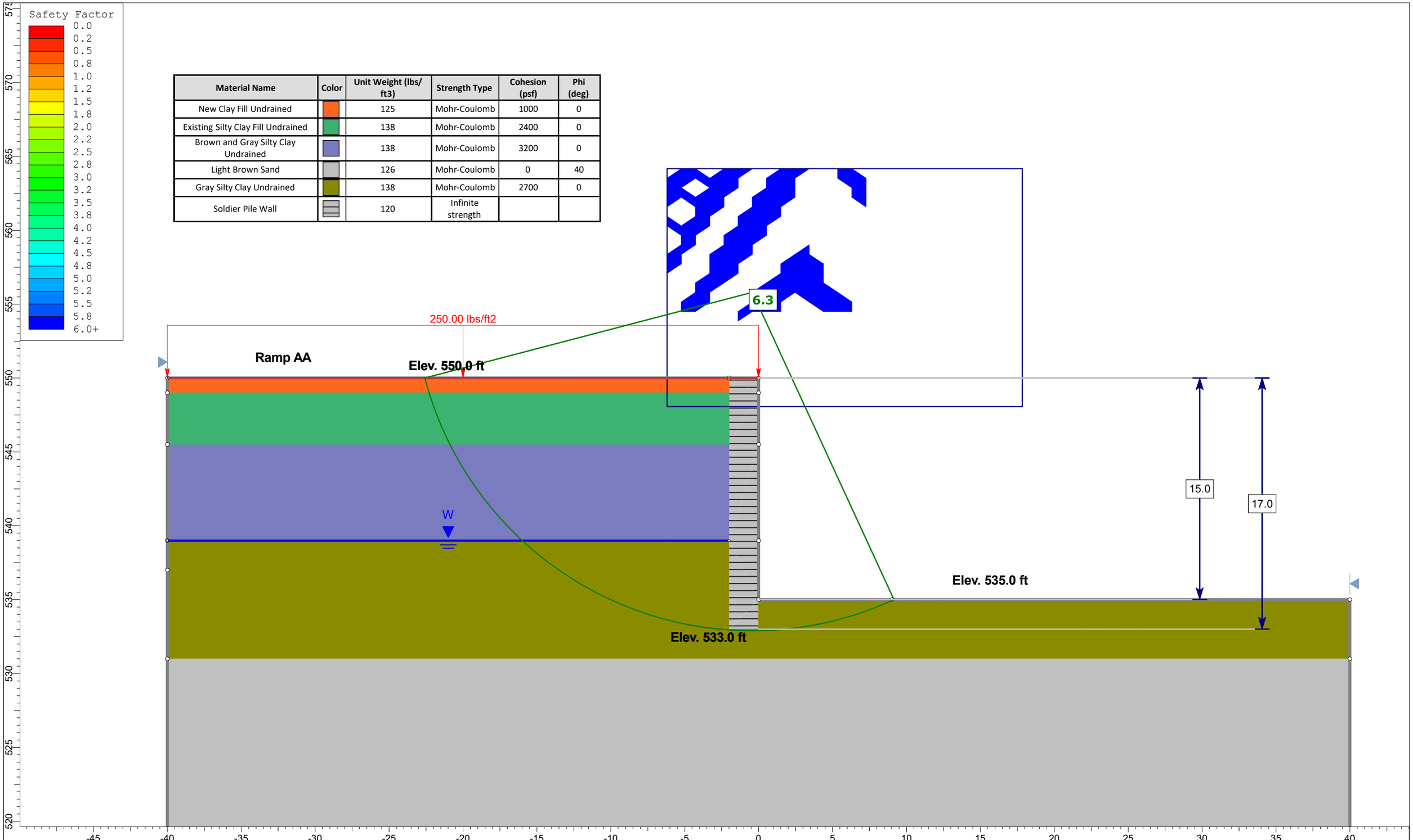
After Break (check applicable appearance)



Form ID	TF-RCS	Reviewed By	
Revision Date	10/21/2021	Review Date	

Appendix F
Slope Stability Analysis Exhibits

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
New Clay Fill Undrained		125	Mohr-Coulomb	1000	0
Existing Silty Clay Fill Undrained		138	Mohr-Coulomb	2400	0
Brown and Gray Silty Clay Undrained		138	Mohr-Coulomb	3200	0
Light Brown Sand		126	Mohr-Coulomb	0	40
Gray Silty Clay Undrained		138	Mohr-Coulomb	2700	0
Soldier Pile Wall		120	Infinite strength		



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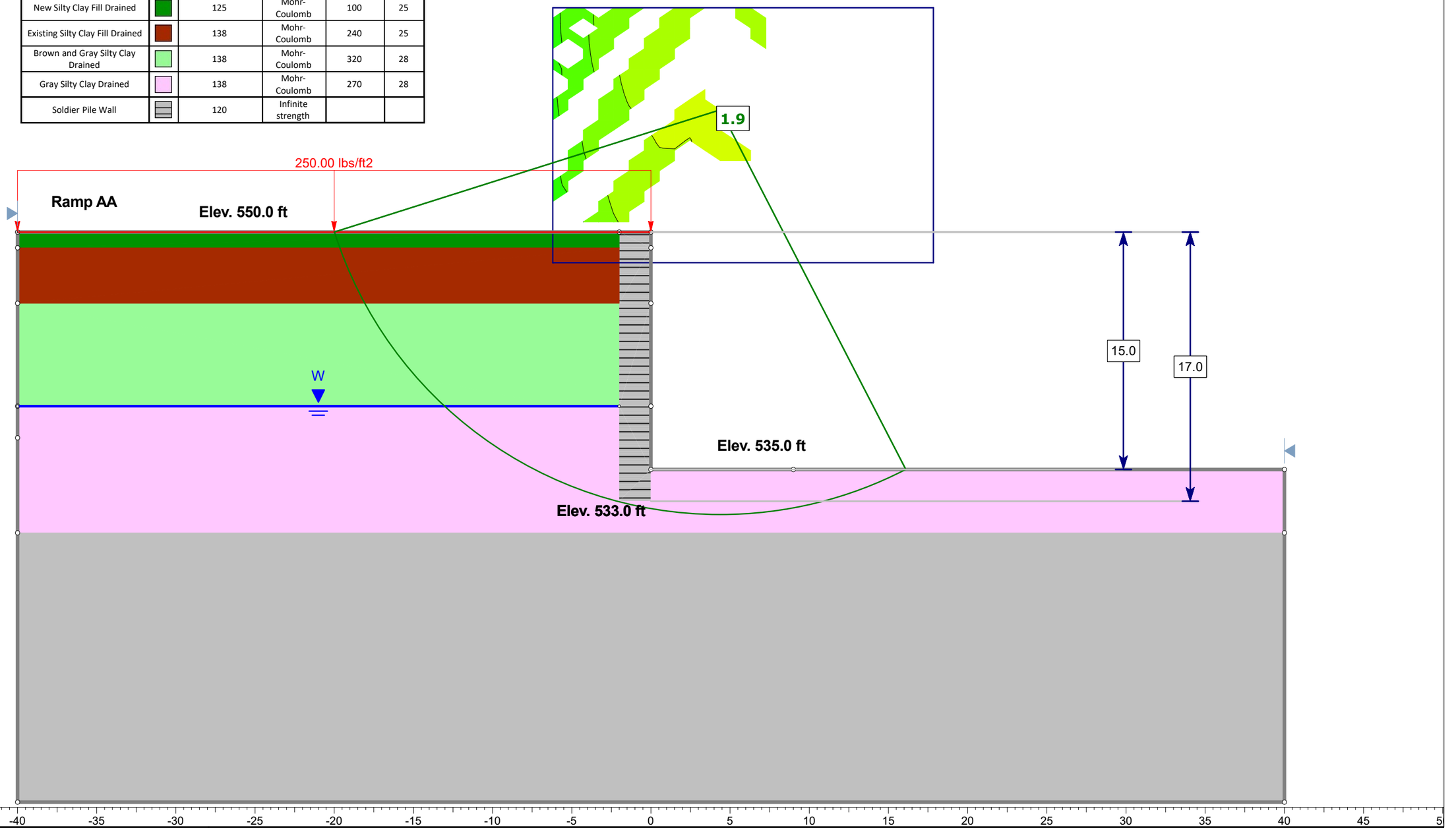
Tel: 630.994.2600, www.gsg-consultants.com

SLIDEINTERPRET 9.018

Project	I-80: IDOT PTB 198-003 - Retaining Wall #8 - Station 10+50		
Analysis Description	Exhibit 1 - Circular Failure Short Term		
Drawn By	ES	*Company*	GSG Consultants, Inc.
Date	10/20/2022	*File Name*	Soldier Pile 10+50_v1.slmd

Safety Factor
0.0
0.2
0.5
0.8
1.0
1.2
1.5
1.8
2.0
2.2
2.5
2.8
3.0
3.2
3.5
3.8
4.0
4.2
4.5
4.8
5.0
5.2
5.5
5.8
6.0+

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Light Brown Sand		126	Mohr-Coulomb	0	40
New Silty Clay Fill Drained		125	Mohr-Coulomb	100	25
Existing Silty Clay Fill Drained		138	Mohr-Coulomb	240	25
Brown and Gray Silty Clay Drained		138	Mohr-Coulomb	320	28
Gray Silty Clay Drained		138	Mohr-Coulomb	270	28
Soldier Pile Wall		120	Infinite strength		



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Tel: 630.994.2600, www.gsg-consultants.com

SLIDEINTERPRET 9.018

Project	I-80: IDOT PTB 198-003 - Retaining Wall #8 - Station 10+50		
Analysis Description	Exhibit 2 - Circular Failure Long Term		
Drawn By	ES	Company	GSG Consultants, Inc.
Date	10/20/2022	File Name	Soldier Pile 10+50_v1.slmd