STRUCTURE GEOTECHNICAL REPORT
ELM STREET (IL 120) RETAINING WALLS NO. 4 to 6
CONTRACT 62U72
IL 31 FROM CHARLES MILLER ROAD (BULL VALLEY ROAD) TO IL 120
MCHENRY COUNTY, ILLINOIS

03/02/2026

Prepared for:

Patrick Engineering, Inc.

4970 Varsity Drive

Lisle, Illinois 60532

Prepared by:

INTERRA, INC.

600 Territorial Drive, Suite G, Bolingbrook, IL 60440

Phone: (630) 754-8700, Fax: (630) 754-8705

www.interraservices.com

Table of Contents

Section ***Page No.***

1.0 Introduction 1
2.0 Project Description and Scope 1
3.0 Field Exploration 2
4.0 Laboratory Testing 3
5.0 Subsurface Conditions 3
6.0 Analysis and Recommendations 5
7.0 Construction Considerations 7
8.0 Closure 7
References 8

Appendix A – Site Location Map, Borehole Location Plans and Profiles, Soil Boring Logs

STRUCTURE GEOTECHNICAL REPORT
ELM STREET (IL 120) RETAINING WALLS NO. 4 to 6
CONTRACT 62U72
IL 31 FROM CHARLES MILLER ROAD (BULL VALLEY ROAD) TO IL 120
MCHENRY COUNTY, ILLINOIS

1.0 INTRODUCTION

Interra, Inc. (INTERRA) was tasked by Patrick Engineering, Inc. based in Lisle, Illinois to conduct subsurface soil investigation and prepare the Structural Geotechnical Report (SGR) for the new retaining walls on Elm Street (IL 120) between IL 31 and Borden Street.

2.0 PROJECT DESCRIPTION AND SCOPE

The project sites are located in McHenry County, IL. The sites are within Nunda Township, defined as T44N R8E of the Third Principal Meridian. The retaining walls discussed in this in the City of McHenry. Details of the proposed retaining walls are presented in Table 1 below.

Table 1 – Details of Retaining Walls

Retaining Wall Number	Station	Offset	Proposed Wall Exposed Height (feet)	Proposed Wall Length (feet)	Proposed Bottom Elevation of Wall (feet)	Applicable Borings, Station
Elm Street Retaining Wall 4	297+83 to 298+72	52.83'R to 118'R	3.5	147	758.9	RW-ELM-01 (296+86), RW-ELM-02 (297+24)
Elm Street Retaining Wall 5	298+20 to 298+90	43'L	2.0	70	756.5	
Elm Street Retaining Wall 6	304+29 to 304+99.50	42'L	2.0	70.5	753.5	

INTERRA's scope of work included drilling the above mentioned two (2) geotechnical borings to the proposed depth, performing associated laboratory tests on collected soil samples; and preparation of Structure Geotechnical Report in accordance with IDOT Geotechnical Manual 2020.

2.1 Mining Activity

From the Illinois State Geological Survey (ISGS, 2021), McHenry County is not identified as coal producing area. Therefore, no past coal mining activities may have taken place at the project site.

2.2 Seismic Activity

USGS National Seismic Hazard Maps (AASHTO LRFD, Figure 3.10.2.1-1) indicate a Peak Ground Acceleration (PGA) of 4% of gravity, with a 7% probability of exceedance in 75 years. The project area has no active, major faults (Kolata, 2005).

3.0 FIELD EXPLORATION

Two (2) soil borings were planned for the proposed retaining walls. The locations of the borings are presented in the Borehole Location Plan in Appendix A. The Boreholes are as marked in the field by INTERRA and surveying subcontractor ORION Engineers, Inc. The location of the borings was adjusted as needed due to utility conflicts or accessibility issues. Any offset from marked location is given in parenthesis of location in the boring logs.

Prior to drilling, the drilling sub-contractor Geocon Professional Services (GEOCON) contacted the local one-call utility clearance service (JULIE) to clear underground utilities. The borings were drilled with a truck-mounted and ATV-mounted drill rigs. INTERRA's engineers, geologists or soils technicians were present during the drilling to collect and log the soil samples. The borings were drilled, and samples were collected in general accordance with the guidelines in the IDOT Geotechnical Manual. Soil sampling was performed per AASHTO T-206, "Penetration Test and Split Barrel Sampling of Soils". Soil sampling was performed at 2.5-foot intervals up to a depth of 30 feet, followed by 5-foot intervals. The soil samples were taken in conjunction with the Standard Penetration Test where a driving resistance to a standard 2" split-spoon samples indicate relative density of granular materials and consistency of cohesive soils.

Soil specimens from the borings were visually identified in accordance with the AASHTO

and IDOT textural classification systems. Also, unconfined compressive strength tests were performed on cohesive samples using an Illinois modified RIMAC tester. Cohesive samples that could not be tested with a RIMAC tester were tested with a pocket penetrometer to estimate the unconfined compressive strength. Water level readings were taken during drilling and immediately after completion of drilling. Delayed water level readings were also taken in selected borings when feasible.

4.0 LABORATORY TESTING

All laboratory testing was performed in accordance with IDOT and/or AASHTO standard methods for testing. Moisture content tests (AASHTO T 265) were performed for all soil samples.

Soil boring logs indicating the blow counts, moisture content and soil description have been prepared and included in Appendix A of this report.

5.0 SUBSURFACE CONDITIONS

Boring RW-ELM01 had 1.5 feet thick layer of sand and rock pieces at the surface. This was underlain by hard silty clay up to 10.0 feet depth. Boring was terminated at 10.0 feet.

RW-ELM02 encountered 6.0 inches of topsoil. This was followed by medium dense to loose sand and gravel up to 8.0 feet. This was underlain by hard silty clay up to the exploration depth of 10.0 feet.

Detailed stratification at the above-mentioned borings is provided in the boring logs.

Groundwater Information

Groundwater elevations are usually recorded during drilling, and immediately after completion of drilling. Long term water levels were also recorded 24 hours after drilling at selected borings when feasible. Ground water levels during drilling are presented in Table 2 for the borings. The boreholes were backfilled with auger cuttings and bentonite chips after checking the final ground water levels. Changes in water levels should be expected

due to seasonal variations and precipitation.

Table 2 –Ground Water Level Observations

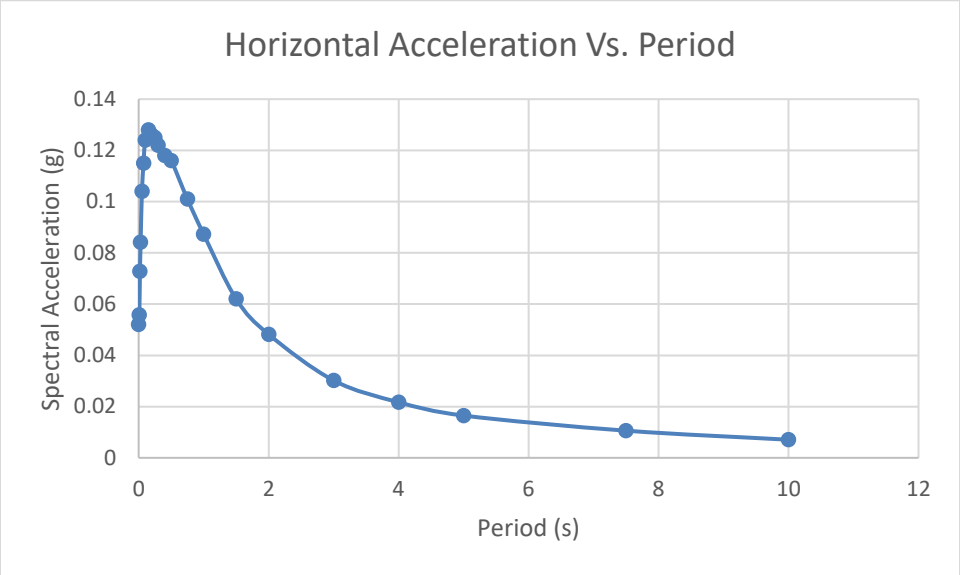
Boring Number	Surface Elevation (feet)	Boring depth (feet)	Depth of Groundwater During drilling (feet)	Depth of Groundwater Immediately after drilling (feet)	Delayed Groundwater Depth (feet)
RW-ELM01	761.1	10.0	Dry	Dry	NR
RW-ELM-02	759.9	10.0	Dry	Dry	NR

NR: Not Recorded

Seismic Considerations

The following seismic data is recommended in accordance with IDOT Seismic Manual and IDOT Geotechnical Manual.

2023 AASHTO Seismic Hazard
Soil Site Class: D
Latitude: 42.344597 deg. N, Longitude: 88.273288 deg. W
Performance Level: Operational
Seismic Performance Zone (SPZ): 1
Design Spectral Acceleration at a period of (T) of 1.0 sec, SD_1 : 0.087 g
Design Spectral Acceleration at a period of (T) of 0.2 sec, SD_S : 0.126 g
Vertical Acceleration =2/3* Horizontal Acceleration
Seismic Design Category (SDC): A
Weighted Average Shear Wave Velocity: 871 ft/sec
Soil Epoch: Pleistocene



Liquefaction Potential

According to IDOT Seismic Manual, no liquefaction analysis is required for SDC of A.

6.0 ANALYSIS AND RECOMMENDATIONS

Selection of a wall type depends on several factors such as soil conditions, feasibility, cost and control of top of wall deflections. Based on the proposed retaining wall geometry, a shallow bearing design is most applicable. Possible alternatives are CIP walls, modular block walls and segmental retaining walls. Because of the need to mount a railing on the wall, proposed exposed heights, durability concerns and the client's preference, CIP walls are recommended for all the locations covered in this report. As the subsurface investigations for the overall project area, in general, encountered several areas with weak foundation soils, an experienced geotechnical engineer or representative should verify the foundation soils within the proposed expansion areas for the wall and backfill.

If undercuts are needed during construction, the unsuitable soils should be removed and replaced with CA7 aggregate to approximately six inches above groundwater, if encountered. A woven geotextile fabric should be used above CA7 for ground stabilization (IDOT Section 1080.02). Additional lifts of embankment fill material should consist of inorganic approved material and should be placed and compacted to a

minimum of 95% Standard Proctor (AASHTO T-99) in accordance with IDOT SSRBC Sections 202, 205 and 301. The fill should extend at least one foot beyond the proposed footing limits and then by a width equivalent to the remedial treatment depth. To provide adequate frost protection, we recommend the wall foundation to be at a minimum of 3.5 feet below finish grade on a 6-inch-thick granular leveling pad.

Bearing Capacity Recommendations for Typical Shallow Bearing Walls

As shown in Table 1, the foundations of the three proposed walls were evaluated based on data obtained from the two borings located closest to the retaining walls within the project area. The proposed bottom elevations of the walls varied from 753.5 feet to 758.9 feet. Boring RW-ELM01 encountered hard clayey soils below 753.5 feet to 758.9 feet elevation. Boring RW-ELM-02 encountered medium dense to loose sand and gravel below 753.5 feet to 758.9 feet elevation. Groundwater was not encountered in both borings.

A factored bearing resistance of 2000 psf, which includes an LRFD Resistance Factor of 0.55, is recommended for the retaining walls.

Settlement

Based on the soil profile and the expected wall loads, settlement is estimated to be less than 1.0 inches.

Lateral Earth Pressures

Lateral earth pressure should be estimated using an equivalent fluid unit weight of soil of 40 pcf with a free draining level granular backfill material. Resistance to sliding may be calculated using a nominal sliding resistance of half of normal stress on the interface between the concrete block wall and the soil. The LRFD resistance factor for sliding should be taken as 0.90. Resistance offered by the passive pressures should be neglected. Lateral loads from traffic should be considered at a minimum surcharge pressure of 250 psf (2 feet of soil).

Stability Analyses

No stability analyses were conducted as all the walls have an exposed height of less than seven feet.

7.0 CONSTRUCTION CONSIDERATIONS

Construction monitoring shall be according the IDOT Standard Specifications, Special Provisions and Contract Plans. Local, State and Federal regulations and IDOT guidelines shall be followed for all excavations and construction. It should be noted that borings were offset from the wall location due to accessibility and utilities.

The existing force main near the proposed retaining wall RW-03 is expected to remain in place. The force main is approximately 7 feet west of the wall at the north end and approximately 7 feet east of the wall at the south end. The force main location is expected to be approximately 6 feet (clear distance) below the wall foundation where the force main crosses below the wall (approximate station 181+26). The exposed height of wall at station 181+26 is expected to be approximately 3.5 feet. Considering the elevation of the pipe and the maximum retained height where the pipe is closest to the wall, we do not anticipate the existing force main to interfere with the construction of the wall.

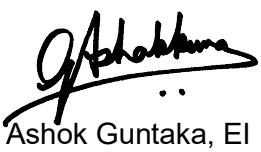
8.0 CLOSURE

The analysis and recommendations submitted in this report are based upon the data obtained from the soil boreholes performed at the locations indicated on the Borehole Location Plan, project information provided to INTERRA and from any other information discussed in this report. This report does not reflect any variations that may occur between these boreholes. In performing subsurface explorations, specific information is obtained at specific locations at specific times. It is a well-known fact that variations in soil and rock conditions exist on most sites between borehole locations. Also, groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If project characteristics change or if variations in the subsurface conditions appear evident, it will be necessary for a re-evaluation of the recommendations of this report.

We appreciate the opportunity to be of service to you. Should you need additional information or clarifications, please call us at (630) 754-8700.

Yours truly,

INTERRA, INC.



Ashok Guntaka, EI
Project Engineer

Reshma Chirakkara, Ph.D.
Staff Engineer

Sanjeev Bandi, Ph.D., PE
Project Manager

Sudhakar “Rao” Doppalapudi, P.E.
QC/QA Reviewer

REFERENCES

AASHTO 2024, LRFD Bridge Design Specifications, 9th Edition 2020, American Association of State Highway and Transportation Officials, Washington, DC.

IDOT 2020, Geotechnical Manual, Illinois Department of Transportation.

IDOT 2022, Standard Specifications for Road and Bridge Construction. Illinois Department of Transportation.

IDOT 2025, Seismic Manual, Illinois Department of Transportation.

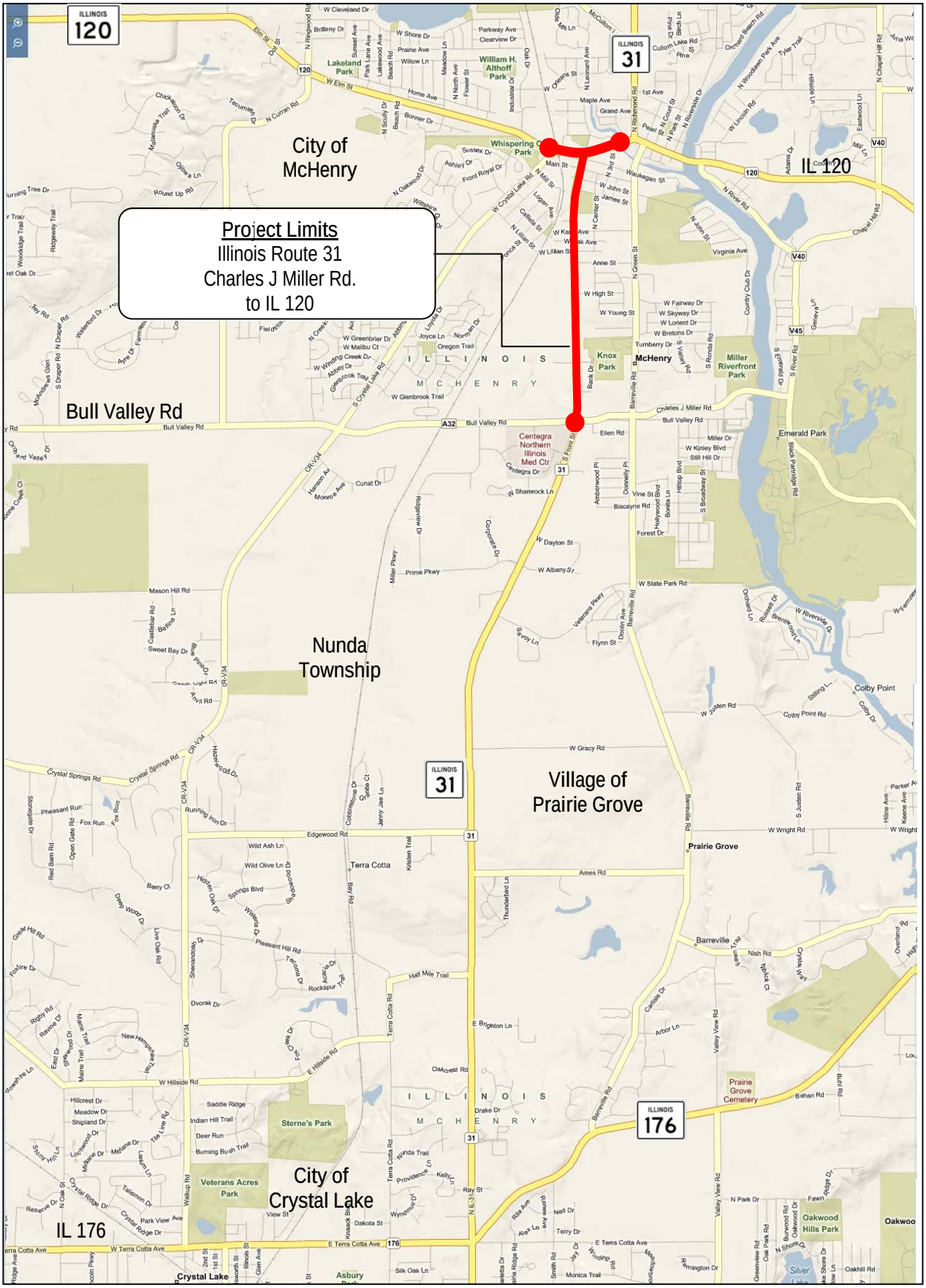
Coduto, Donald P., 1994, Foundation Design, Prentice Hall, Inc.

Appendix A

Site Location Map

Borehole Location Plans and Profiles

Soil Boring Logs



Legend

Project Limits

SITE LOCATION MAP

Illinois Route 31 Phase II Study
Illinois Route 176 to Illinois Route 120
McHenry County

N

BORING LOCATION PLANS AND SOIL PROFILES

IL 31
FROM IL 176 TO IL 120
MCHENRY COUNTY, ILLINOIS

PREPARED FOR:

PATRICK ENGINEERING, INC
4970 VARSITY DRIVE
LISLE, IL 60532

PREPARED BY:

INTERRA, INC.
600 TERRITORIAL DRIVE, SUITE G
BOLINGBROOK, IL 60440

MAY 10, 2024
INTERRA PROJECT 9012

LEGEND:

Soil Boring

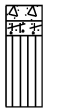
Approximate Area
of Ground Improvement

Borehole Data

SGB-01
886.95 ft
124+58, 43ft RT

Borehole Number
Elevation
Station, Offset

N Qu MC



Borehole Lithology

N - N Value, (blw/12 in)
Qu - UC Strength, (tsf)
MC - Moisture Content, (%)

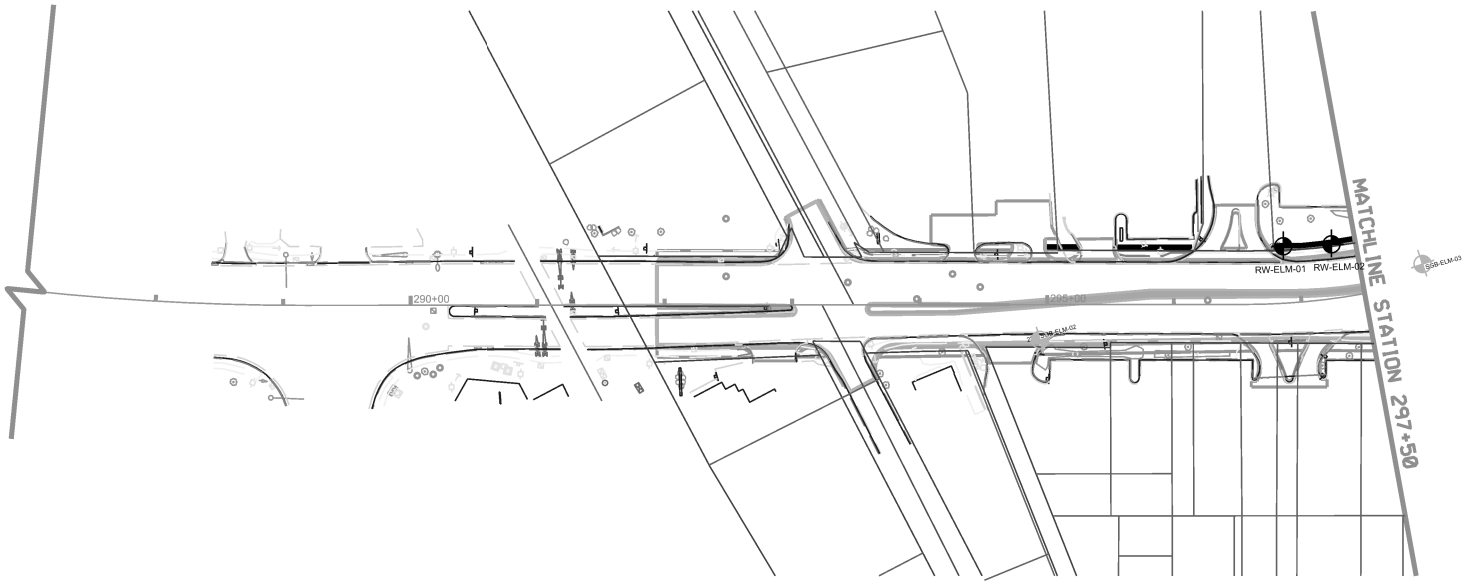
Groundwater Elevation
at First Encounter

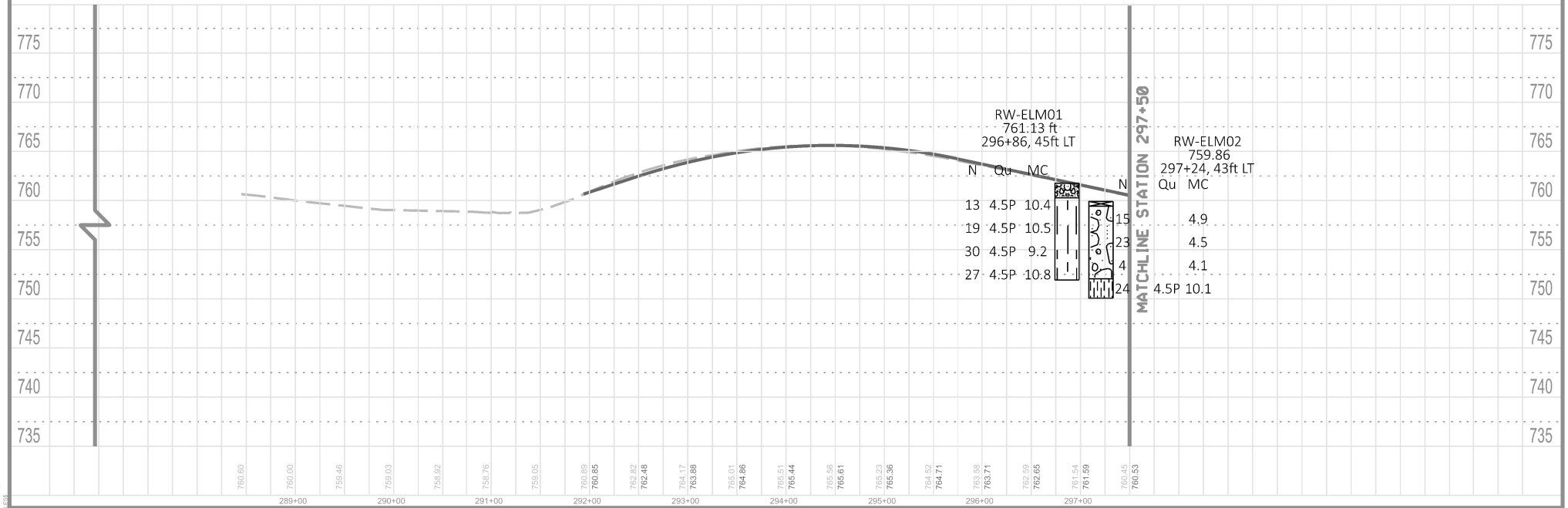
Groundwater Elevation
Upon Completion

Groundwater Elevation
After ____ Hours

Lithology Graphics

Topsoil	Organic silt or clay
Pavement	Clay
Concrete	Silty Clay, Silty Clay Loam
Fill (made ground)	Clay Loam
Crushed stone	Loam
Sand, Sandy Loam	Silt, Silty Loam
Coarse Sand	Peat
Gravelly Sand, Sandy Gravel	No Recovery
Gravel, Rock Aggregate	Rock Core





USER NAME = $USER$	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
	DRAWN -	REVISED -	ILLINOIS ROUTE 31 BORING PLAN AND PROFILE
PLOT SCALE = $SCALE$	CHECKED -	REVISED -	SCALE: SHEET OF SHEETS STA. TO STA.
PLOT DATE = $DATE$	DATE - CHKDATE	REVISED -	F.A. RTE. SECTION COUNTY TOTAL SHEETS SHEET NO. CONTRACT NO. ILLINOIS FED. AID PROJECT

PLAN: SURVEYED, PLOTTED, DRAWN, CHECKED, ALIGNMENT, RT. OF WAY, CHECKED, CAD FILE NAME, NOTE BOOK, NO., BY, DATE

PROFILE: SURVEYED, PLOTTED, DRAWN, CHECKED, ALIGNMENT, B.M. NOTED, STRUCTURE NO.RTE NO.RTE, NOTE BOOK, NO., BY, DATE

MODEL: $MODELNAME$
FILE NAME: $FILE$

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 12/22/21

ROUTE IL 31 **DESCRIPTION** Retaining Wall ELM-01 **LOGGED BY** Atul Kumar

SECTION IL 120 to IL 176 PTB 195-015 **LOCATION** 2068192.0193,1000160.5037 (offset 5' W)

COUNTY Mc Henry **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** D50 Auto (93% efficiency)

STRUCT. NO. Retaining Wall ELM-01
Station 296+86

BORING NO. RW-ELM01
Station 296+86
Offset 45.00ft LT
Ground Surface Elev. 761.13 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ **Hrs.** Filled ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium dense, brown SAND AND ROCK PIECES. Moist.		7		
759.63				
Hard, brown SILTY CLAY. Moist.		6 7	4.5 P	10.4
758.13		7		
Hard, brown, SILTY CLAY, little gravel. Moist.		8		10.5
	-5	11	4.5 P	
755.63		12		
Hard, brown SILTY CLAY, trace gravel. Moist.		14 16	4.5 P	9.2
		11		
		11		10.8
751.13	-10	16	4.5 P	
End of boring @ 10'.	-15			
	-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 12/22/21

ROUTE IL 31 **DESCRIPTION** Retaining Wall ELM-02 **LOGGED BY** Atul Kumar

SECTION IL 120 to IL 176 PTB 195-015 **LOCATION** 2068183.7396,1000197.4296 (offset 5' W)

COUNTY Mc Henry **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** D50 Auto (93% efficiency)

STRUCT. NO. Retaining Wall ELM-02
Station 297+24

BORING NO. RW-ELM02
Station 297+24
Offset 43.00ft LT
Ground Surface Elev. 759.86 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ **Hrs.** Filled ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL (6") 759.36
	10			Medium dense, brown SAND AND GRAVEL. Moist.
	7 8		4.9	
				756.86
	9			Medium dense, brown SAND AND GRAVEL, some rock pieces. Moist.
-5	11 12		4.5	
				754.36
	2			Loose, brown SAND AND GRAVEL. Moist.
	2 2		4.1	
				751.86
	8			Hard, brown SILTY CLAY, trace gravel. Moist.
	12		10.1	
-10	12	4.5 P		749.86
				End of boring @ 10'.
-15				
-20				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)