
STRUCTURAL GEOTECHNICAL REPORT (SGR)

IL-23 Over Unnamed Ditch

PTB No. 198-005, Task Order #2

Contract No.: 62H25

Marengo, McHenry County, IL

Prepared for:

**Garza Karhoff Engineering, LLC
120 N. LaSalle Street
Suite 1400
Chicago, Illinois 60602**

Prepared by:

**Geo Services, Inc.
805 Amherst Court
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JOB NO. 21003-A

**August 27th, 2021
Revised: September 15th, 2021
Revised: April 1st, 2022**



August 27th, 2021
Revised: September 15th, 2021
Revised: March 30th, 2022

Garza Karhoff Engineering, LLC
120 N. LaSalle St., Suite 1400
Chicago, IL 60602

Attn: Brenda Karhoff, S.E., P.E.

GSI Job No. 21003-A

Re: Structural Geotechnical Report (SGR)
IL-23 Culvert Over Unnamed Ditch
PTB No. 198-005, Task Order #2
Contract No.: 62H25
Marengo, IL

Dear Brenda:

The following structural geotechnical report (SGR) presents the geotechnical analysis and recommendations for the culvert removal and reconstructed over an unnamed ditch (Prop. SN 056-0344, Exist. 056-0200) at the intersection of IL-23 and 2nd Avenue in Marengo, IL. A total of four (4) soil borings were drilled at this intersection: two (2) culvert soil borings drilled to a depth of 40-ft (CB-01 and CB-02) and two (2) soil borings for the abutments on either side of the culverts, drilled to a depth of 30-ft (SGB-01 and SGB-02) were completed at the site by Geo Services, Inc. (GEO). Copies of these boring logs, laboratory test results and a location diagram are included in this report.

If there are any questions with regard to the information submitted in this report, or if we can be of further assistance to you in any way, please do not hesitate to contact us.

Very truly yours,

GEO SERVICES, INC.

Alexandra Weatherwax
Project Engineer

Andrew Ptak, P.E.
Principal Engineer



Handwritten signature and date: expires 11/30/23

enc.

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SECTION 01: INTRODUCTION

The following SGR presents the geotechnical analysis and recommendations for the culvert to be removed (existing culvert number: SN 056-0200) and proposed replacement (proposed culvert number: SN 056-0344) of the culvert crossing IL-23 (0.1-miles north of Illinois Route 176) over an unnamed drainage ditch in the Village of Marengo in McHenry County, IL. A total of four (4) soil borings were drilled: two (2) culvert soil borings (CB-01 and CB-02) and two (2) abutment soil borings (SGB-01, SGB-02) were completed at the site by Geo Services, Inc. (GEO) for the proposed replacement of the culvert. Copies of the boring logs and boring location diagrams are included in this report.

The project (along IL-23, stationing from 49+35.6 to 51+00.0) includes the removal of the existing culvert (SN 056-0200) which is a cast-in-place twin-cell 8-ft 10.5-in by 3-ft 1-in south barrel and 9-ft 5-in by 3-ft 1-in north barrel box culvert. The existing structure is 52-ft long and is currently in poor condition. The proposed replacement culvert is a double-cell 9.5-ft by 5.0-ft cast-in-place box culvert that is 60-ft in length. This new culvert will have wider openings for more hydraulic capacity. 10-ft length horizontal cantilever wingwalls will be used that are parallel to the barrel walls (see Appendix F for the approved TS&L, approved March 21, 2022, provided by GKE).

The proposed design structural loads nor the detailed measurement of the proposed or existing culvert were not provided by the designer. Garza Karhoff Engineering, LLC (GKE) did provide the assumed net applied service bearing pressure for the proposed cast-in-place double cell box culvert (SN 056-0344) as estimated to be on the order of 300-pounds per square foot (psf) (estimation per the structural engineer of GKE).

TABLE 1 – CULVERT SUMMARY

Culvert	Culvert Stationing	Boring No.	Proposed Culvert (ft)	Proposed Invert Elevation (ft)
IL-23 over Unnamed Ditch	STA 50+00.0	CB-01, CB-02, SGB-01 & SGB-02	9.5 x 5.0	799.7

SECTION 02: SUBSURFACE INVESTIGATION PROCEDURES

Boring locations were laid out in the field by GEO personnel at the proposed locations approved by GKE. Boring locations were finalized in the field by GEO personnel after review of accessibility and utility locations. The approximate as-drilled locations can be found in the Attachments.

The borings were performed on August 12th and 13th, 2021 with a CME truck-mounted drill rig and advanced by means of hollow stem auger drilling techniques to completion depths. Representative soil samples were obtained employing split spoon sampling procedures in accordance with AASHTO Method T-206. Samples obtained in the field were returned to our laboratory for further examination and testing.

Split spoon sampling involves driving a 2.0-inch outside diameter split-barrel sampler into the soil with a 140-pound weight falling freely through a distance of 30-in. Blow counts are recorded at 6-in intervals and the blow counts are shown on the boring logs. The number of blows required to advance the sampler the last 12-in is termed the Standard Penetration Resistance (N). The N value is an indication of the relative density of the soil.

The test procedures were performed in accordance with test procedures discussed in the IDOT Geotechnical Manual. All split-spoon samples obtained from the drilling operation were visually classified in the field. Cohesive samples were tested for unconfined compressive strength using an IDOT modified RIMAC test device and/or calibrated penetrometer in the field.

SECTION 03: LAB TESTING PROGRAM

The test procedures were performed in accordance with test procedures discussed in the IDOT Geotechnical Manual. All split-spoon samples obtained from the drilling operation were visually classified in the field. Cohesive samples were tested for unconfined compressive strength using an IDOT modified RIMAC test device and/or calibrated penetrometer in the field.

The soil testing program included performing water content, density and either unconfined compression and/or calibrated penetrometer tests on the cohesive samples recovered. Water content tests were performed on the non-cohesive samples recovered. These tests were performed upon representative portions of the samples obtained in the field. The results of the above testing, along with a visual classification of the material based upon both the Illinois textural classification and the AASHTO Soil Classification System, are indicated on the boring logs. The following table, **Table 2**, summarizing the laboratory results.

TABLE 2 – LAB TESTING RESULTS

Boring No.	Description of Soil Material	Test Depth (ft)	Moisture Content (%)	% Gravel	% Sand	% Silt/Clay
SGB-01	Well Graded Sand with Silt (SW-SM)	6.0 – 7.5	19	8.9	81.9	9.2
	Poorly Graded Sand (SP)	8.5 – 10.0	21	0.0	97.1	2.9
CB-01	Silty Clayey Sand (SC-SM)	6.0 – 7.5	17	11.9	75.6	12.4
CB-02	Poorly Graded Sand with Silt (SP-SM)	6.0 – 7.5	15	2.0	88.8	9.2
	Well Graded Sand with Silt (SW-SM)	8.5 – 10.0	22	7.3	80.9	11.7
SGB-02	Well-Graded Sand with Clay (SW-SC)	6.0 – 7.5	17	0.0	94.2	5.8

SECTION 04: SOIL CONDITIONS

Specific conditions encountered in the borings are indicated on the boring logs.

The two (2) culvert soil borings (CB-01 and CB-02) and two (2) abutment soil borings (SGB-01 and SGB-02) were drilled in the intersection of IL-23 (a.k.a. N. State Street) and 2nd Avenue. The abutment borings were drilled to a depth of 30-ft and the culvert borings were drilled to 40-ft below the existing ground surface.

In all soil borings, there is 2-in of asphalt and 1-in to 12-in of concrete at ground surface. On the westside of the IL-23 (soil borings SGB-01 and CB-02), the fill layer begins immediately below the asphalt and concrete. The fill layer, 4.6-ft to 5.25-ft thick, consisted of loose to very dense sand, gravel and stone and loose sandy clay loam. On the eastside of IL-23 (soil borings CB-01 and SGB-02), below the asphalt and concrete was a layer of crushed stone to a depth of 3-ft below the ground surface, an approximate thickness of 2-ft. For all soil borings, underlying soils at a depth of 5.5-ft below the existing grade to the termination of the soil borings are alternating layers of loose to medium dense sand, sandy loam and sand and gravel. These layers varied in thicknesses of 2.5-ft to 31.5-ft and N-values ranged from 2 to 32.

SECTION 05: GROUNDWATER TABLE CONDITIONS

Groundwater was encountered in only two (2) soil borings (SGB-01 and CB-01 – both on the northside of the culvert) at a depth 7-ft (elevation 799.1-ft) during and immediately after drilling. Based on the coloration changes of the soils from brown and gray to gray, we estimate the long-term water table to be at a depth of 8-ft to 10.5-ft, an average of 8.5-ft (elevation ranging from 795.6-ft to 798.3-ft, with an average of 797.6-ft) below existing roadway grade. There was a second, deeper depth of color change, again brown to gray to gray, noted as well in only two (2) soil borings (CB-01 and SGB-02, soil borings on the eastside of IL-23). Here the deeper color change depth was 23-ft to 25.5-ft, respectively (elevation of 783.1-ft to 780.7-ft, and an average of 781.9-ft).

Fluctuations in the amount of water accumulated and in the hydrostatic water table can be anticipated depending upon variations in precipitation and surface runoff and the water level of the culvert.

SECTION 06: SETTLEMENT ANALYSIS

6.1 Culvert

For settlement calculations, a net applied service bearing pressure (provided by GKE structural engineer) of 300-psf has been calculated at the proposed invert elevation (elevation at 799.7-ft for the length of the proposed replacement culvert) of the culvert (SN 056-0344).

Settlement is calculated to be less than 0.5-in and no remedial treatments are needed to be performed as the existing and proposed culvert will be in loose to medium dense granular material.

SECTION 07: FOUNDATION RECOMMENDATIONS

7.1 Culvert Foundation Recommendations

If any unsuitable soils are present, the unsuitable soils should be undercut to the depth encountered. Any over excavated areas should be backfilled to design grade with an approved granular material such as an IDOT gradation Porous Granular Embankment, subgrade (PGEs). The need for undercuts and extent of removal should be determined in the field by the geotechnical engineer. During excavation, any unsuitable or organic material should be removed and be replaced with suitable fill material.

Any undercutting, if applicable, should be performed in such a manner as to minimize disturbance to the undercut subgrade. Heavy equipment traffic directly on the subgrade

should be minimized. The actual extent of any undercut should be determined in the field at the time of construction by the geotechnical engineer.

Total settlement of the culvert situated on approved natural soils or properly compacted structural fill is estimated to be ½-in or less. To provide adequate frost protection, we recommend that footing foundations be situated at a minimum depth of 4-ft below final grade.

Backfill for structures should be in compliance with Section 502 of IDOT Standard Specifications for Roadway and Bridge Construction.

7.2 Wingwalls

The proposed wingwall shall be 10-ft in length and will utilize the horizontal cantilever wingwall that is the most economical type and will have a length of 10-ft. As this type of wingwall is supported by the barrel of the culvert rather than the foundation soils, feasibility is to be evaluated by the structural design team (GKE) rather than the geotechnical firm (GEO), as per the IODT Culvert Manual (Jan. 2017).

An active lateral earth pressure (undrained) of 40-psf per foot of depth (for level backfill) is recommended for the design of the temporary earth retention. The passive resistance should be based on the shear strength of the soil, which can be taken as ½ the unconfined strengths shown for the cohesive soils on the boring logs.

Behind the headwall/wingwalls (if any), it is recommended that a lateral active earth pressure of 40-psf per foot of depth (for level backfill) be used above the water table assuming a free-draining granular backfill is utilized. For cohesive soils, a lateral active earth pressure of 55-psf per foot should be used. For non-yielding headwall/wingwalls with granular backfill, a lateral at-rest pressure of 50-psf per foot should be used (for level backfill), assuming proper drainage. Allowances should be made for any surcharge loads adjacent to the retaining structure. A proper drainage system should be provided for design of the retaining structure.

For the design of the box culvert with free draining granular backfill, the lateral pressure on the sidewalls should be based on an at-rest equivalent fluid pressure of 50-psf per foot of depth (for level backfill) for the height of the box culvert. The above pressures do not consider hydrostatic effects on the wall. Allowances should be made for any surcharge loads adjacent to the culvert.

SECTION 08: Construction Considerations

During excavation for the proposed improvements, movement of adjacent soils into the excavation should be prevented.

Where excavations for culvert or wing wall/retaining wall construction require a temporary earth retention system, temporary steel sheet piling may be utilized. The following tables present a tabulation of lateral soil parameters to be used for design of temporary soil retention for the proposed culvert.

As for this project, the replacement of the culvert will have a full closure and therefore traffic will be detoured and thus there will be no staging nor soil retention required.

SECTION 09: GENERAL QUALIFICATIONS

The analysis and recommendations presented in this report are based upon the data obtained from our soil borings performed at the indicated locations. This report does not reflect any variations that may occur between borings or across the site. In addition, the soil samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations. The nature and extent of such variations may not become evident until construction. If variations appear evident, it will be necessary to reevaluate the recommendations of the report. In addition, it is recommended that GEO be retained to perform construction observation and thereby provide a complete professional geotechnical engineering service through the observational method.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranties, either expressed or implied, are intended or made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer. Also note that GEO is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of the report's subsurface data or engineering analyses without the express written authorization of GEO.

APPENDIX A
GENERAL NOTES

GENERAL NOTES

CLASSIFICATION

American Association of State Highway & Transportation Officials (AASHTO) System used for soil classification.

Cohesionless Soils

<u>Relative Density</u>	<u>No. of Blows per foot N</u>
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	Over 50

TERMINOLOGY

Streaks are considered to be paper thick. **Lenses** are considered to be less than 2 inches thick. **Layers** are considered to be less than 6 inches thick. **Stratum** are considered to be greater than 6 inches thick.

Cohesive Soils

<u>Consistency</u>	<u>Unconfined Compressive Strength - qu (tsf)</u>
Very Soft	Less than 0.25
Soft	0.25 - 0.5
Medium Stiff	0.5 - 1.0
Stiff	1.0 - 2.0
Very Stiff	2.0 - 4.0
Hard	Over 4.0

DRILLING AND SAMPLING SYMBOLS

SS: Split Spoon 1-3/8" I.D., 2" O.D.	HS: Housel Sampler
ST: Shelby Tube 2" O.D., except where noted	WS: Wash Sample
AS: Auger Sample	FT: Fish Tail
DB: Diamond Bit - NX: BX: AX	RB: Rock Bit
CB: Carboloy Bit - NX: BX: AX	WO: Wash Out
OS: Osterberg Sampler	

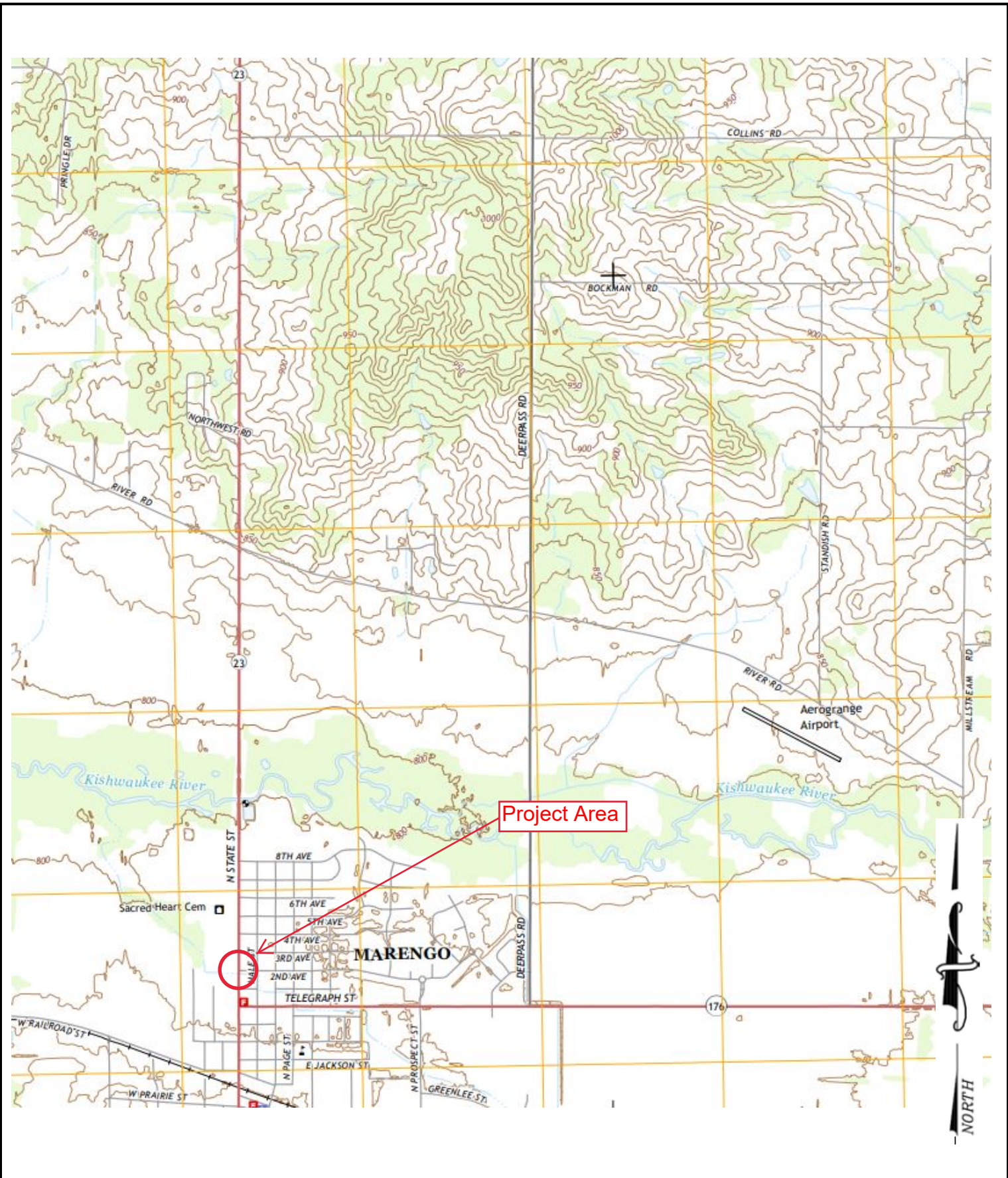
Standard "N" Penetration: Blows per foot of a 140 lb. hammer falling 30" on a 2" O.D. Split Spoon

WATER LEVEL MEASUREMENT SYMBOLS

WL: Water	WD: While Drilling
WCI: Wet Cave In	BCR: Before Casing Removal
DCI: Dry Cave In	ACR: After Casing Removal
WS: While sampling	AB: After Boring

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

APPENDIX B
SITE LOCATION MAP

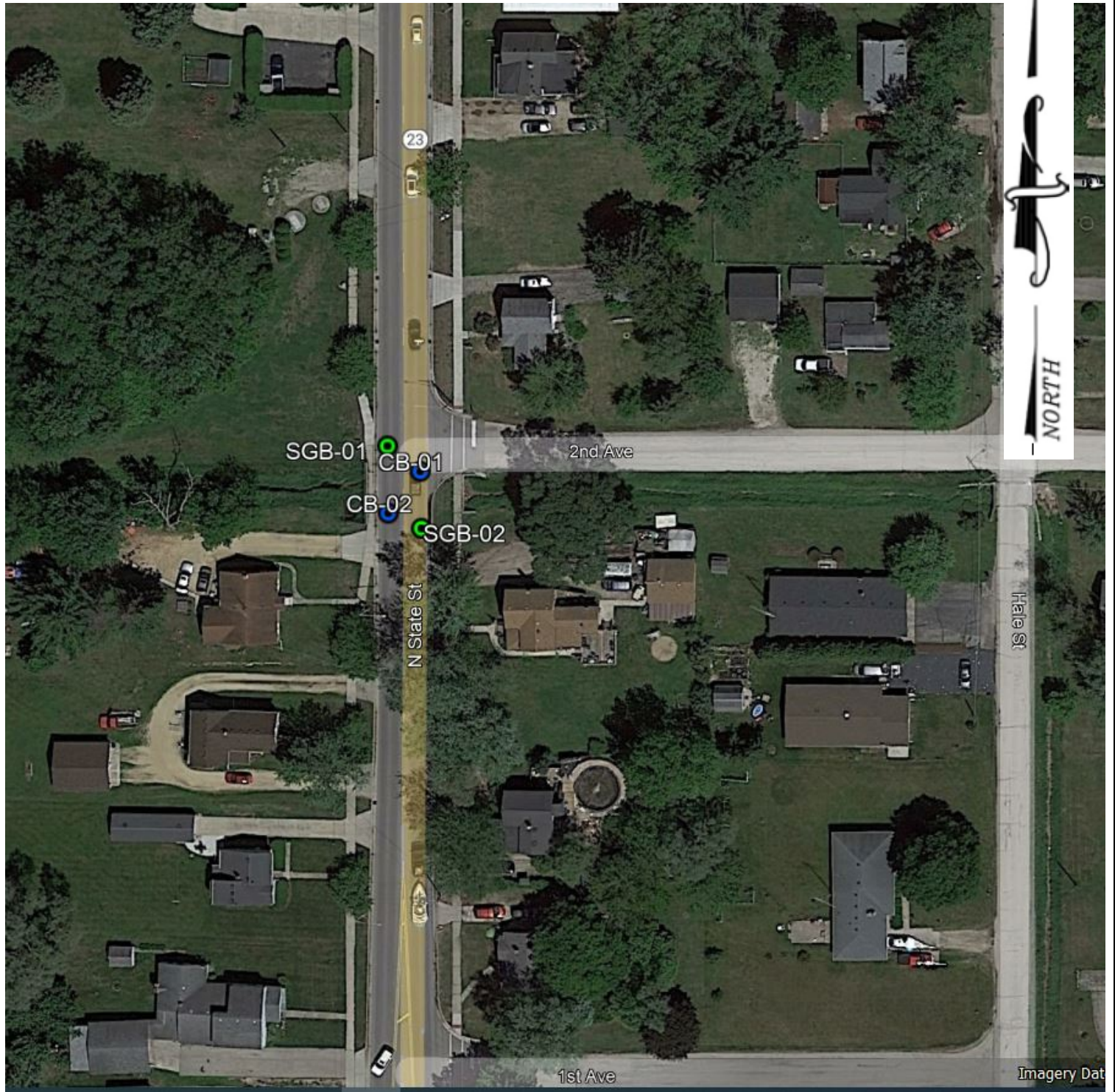


SITE LOCATION PLAN	
II-23 Over Unnamed Ditch PTB 198-005 TO#2 Marengo, McHenry County, Illinois	


Geo Services, Inc.
 Geotechnical, Environmental & Civil Engineering
 805 Amherst Court, Suite 204
 Naperville, Illinois 60565
 (630) 355-2838

DRAWN BY	AGW
APPROVED BY	AJP
DATE	August 24, 2021
GSI JOB No.	21003-A
SCALE	NTS

APPENDIX C
BORING LOCATION DIAGRAM



BORING LOCATION PLAN
IL-23 Over Unnamed Ditch PTB 198-005, TO#2 Marengo, McHenry County, Illinois


Geo Services, Inc.
 Geotechnical, Environmental & Civil Engineering
 805 Amherst Court, Suite 204
 Naperville, Illinois 60565
 (630) 355-2838

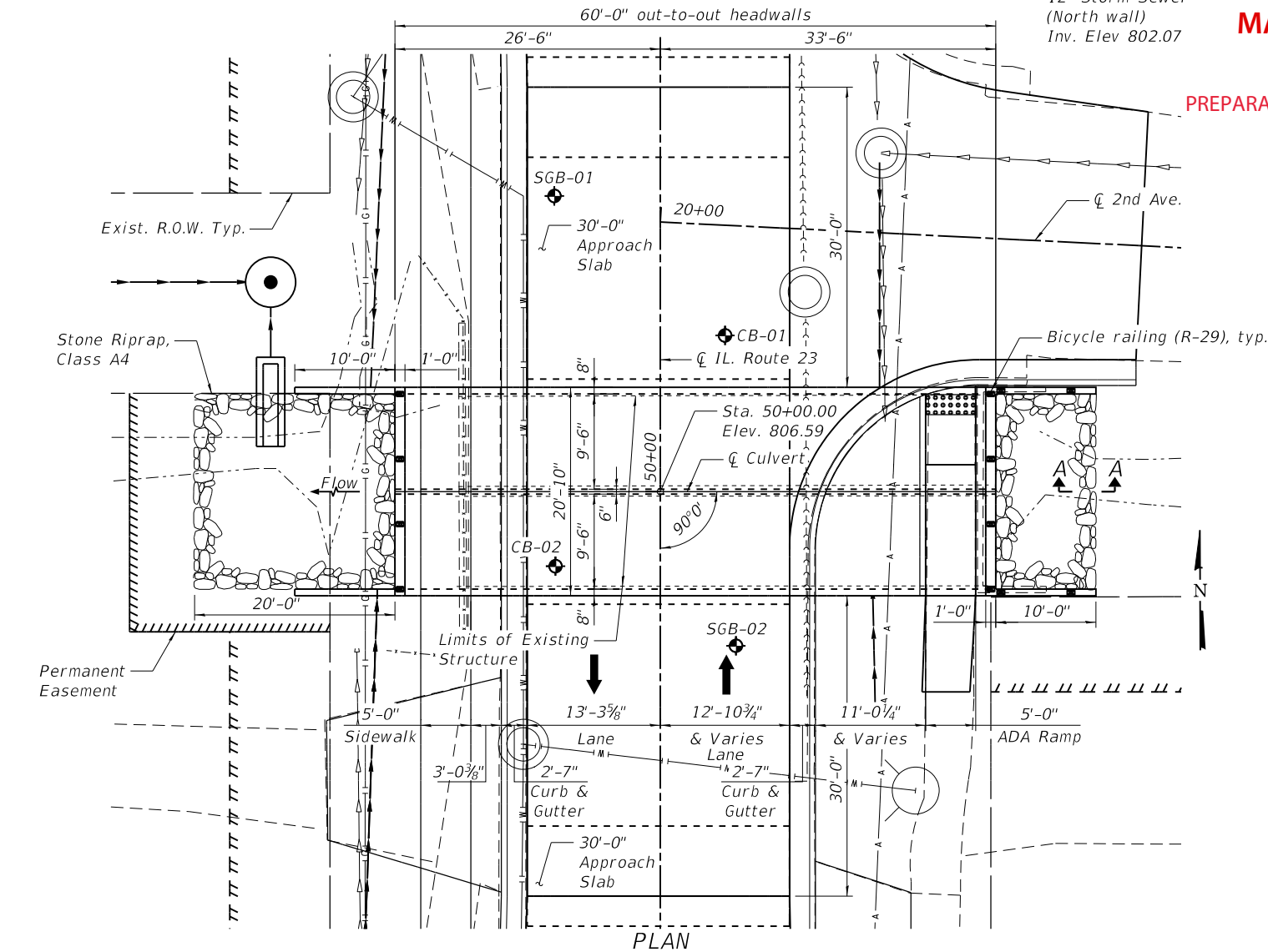
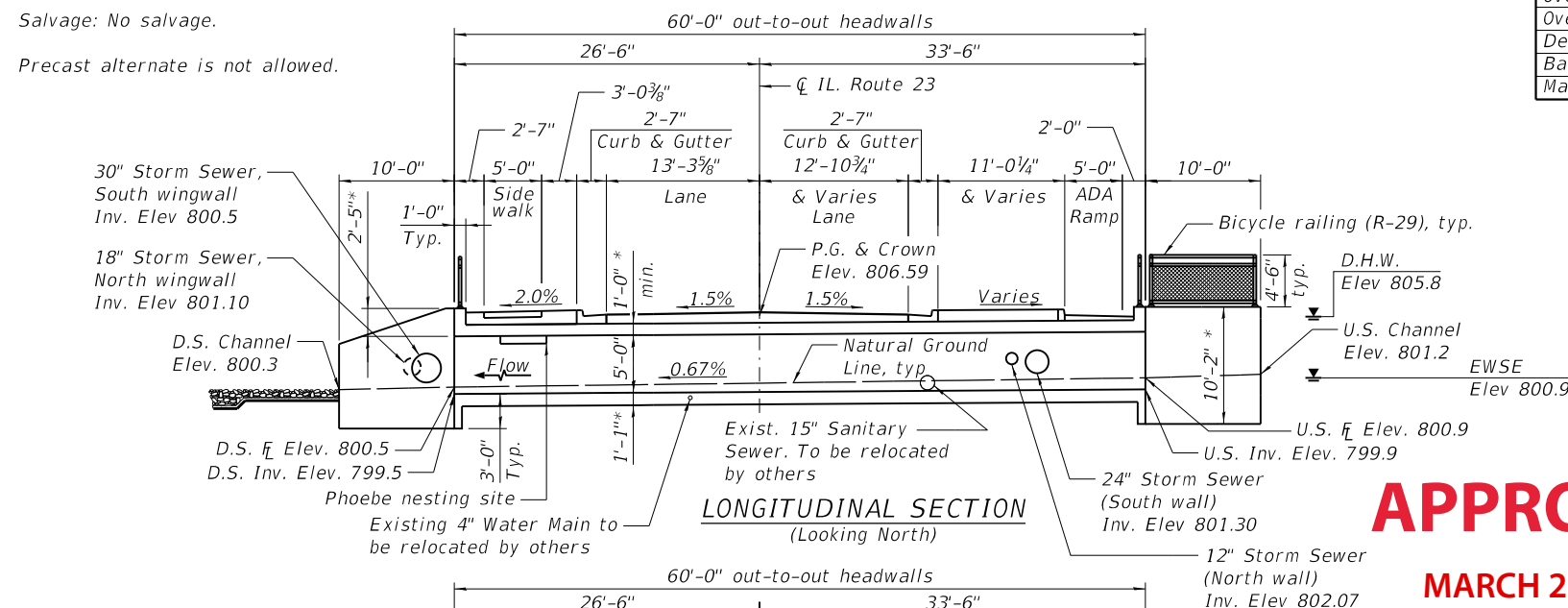
DRAWN BY	AGW
APPROVED BY	AJP
DATE	August 24, 2021
GSI JOB No.	21003-A
SCALE	NTS

Bench Mark: BM "16" - Chiseled square in Easterly concrete base of light pole West side of IL 23 ± 90' South of 2nd Ave. Elevation 806.805'.

Existing Structure: S.N. 056-0200 was originally constructed at an unknown time circa 1930 as a cast-in-place concrete, twin-cell box culvert 9'-0" wide, 3'-0" high (8'-10 1/2" x 3'-1" South barrel and 9'-5" x 3'-1" North barrel), and 52'-0" long. The existing structure is to be replaced with a cast-in-place double cell box culvert 9'-6" wide by 5'-0" high and 60'-0" long. The replacement will utilize a full closure and traffic detouring.

Salvage: No salvage.

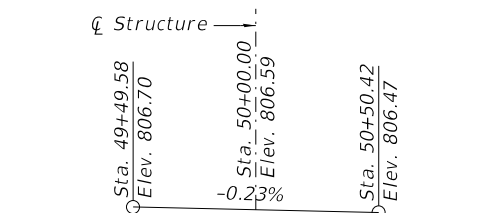
Precast alternate is not allowed.



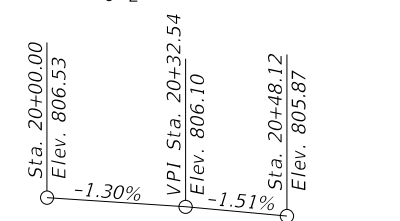
WATERWAY INFORMATION

Drainage Area = 5.3 Sq. Mi.		Existing Low Grade Elev. 806.4 @ Sta. 51+00		Proposed Low Grade Elev. 806.4 @ Sta. 51+00						
Flood	Freq. Yr.	Q C.F.S.	Opening Ft ²		Nat. H.W.E.		Head - Ft.		Headwater El.	
			Exist.	Prop.	Exist.	Prop.	Exist.	Prop.	Exist.	Prop.
Overtop Exist.	10	410	56.4	76	805.55	.89	.36	806.44	805.91	
Overtop Prop.	25	454	56.4	76	805.65	.94	.54	806.59	806.19	
Design	50	526	56.4	76	805.80	.93	.69	806.73	806.49	
Base	100	734	56.4	76	806.20	.76	.64	806.96	806.84	
Max. Calc.	500	919	56.4	76	806.47	.61	.52	807.08	806.99	

10-year Velocity through Existing Culvert = 7.3 ft/s
 10-year Velocity through Proposed Culvert = 5.4 ft/s



EXIST. & PROP. PROFILE GRADE
(Along CL IL. Route 23)



EXIST. & PROP. PROFILE GRADE
(Along CL 2nd. Ave.)

Note: Profile grade elevations based on existing survey. See Plan and Profile for additional information.

HIGHWAY CLASSIFICATION

F.A.P. Rte. 324 - IL. Rte. 23
 Functional Class: Other Principal Arterial
 ADT: 6,500 (2016); 8,600 (2040)
 ADTT: 825 (2016); 1,092 (2040)
 DHV: 650
 Design Speed: 35 m.p.h.
 Posted Speed: 35 m.p.h.
 Two-Way Traffic

DESIGN SPECIFICATIONS

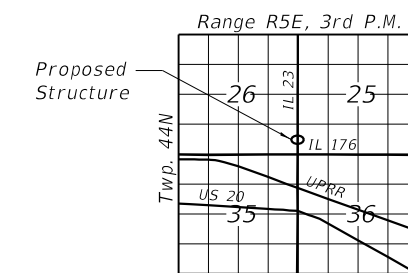
2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

DESIGN STRESSES

FIELD UNITS
 f'c = 3,500 psi (Culvert)
 f'c = 4,000 psi (Approach Slab)
 fy = 60,000 psi (Reinforcement)

LOADING HL-93

Allow 50#/sq.ft. for future wearing surface

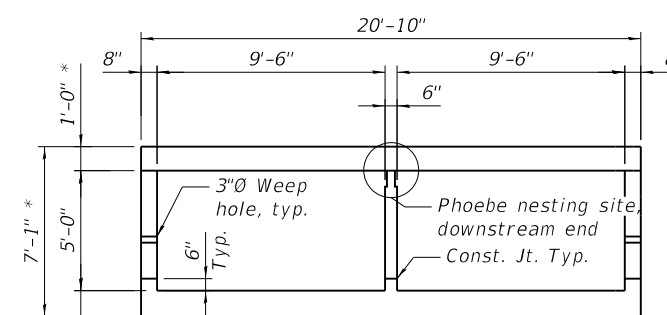


LOCATION SKETCH

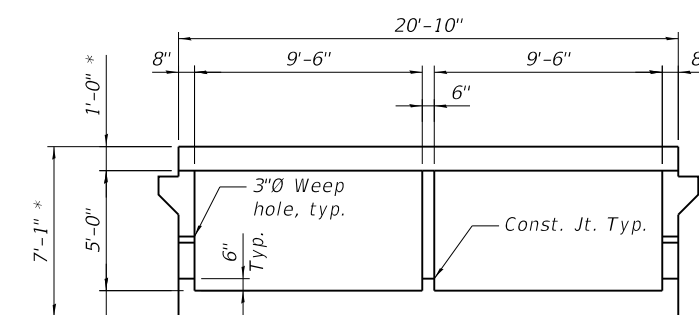
APPROVED

MARCH 21, 2022

AS A BASIS FOR
 PREPARATION OF DETAILED PLANS



SECTION THRU BARREL
(outside Roadway)



SECTION THRU BARREL
(at Roadway)

* Thickness is subject to refinement during final design.

LEGEND

- ▲— Ex. Aerial Lines
- Ex. Storm Sewer
- >>>— Ex. Underground Sanitary Sewer
- Ex. Underground Gas Line
- W— Ex. Underground Water
- — — Ex. ROW Line
- - - - - Fence
- - - - - Ditch Line
- ||||| Temp. Easement
- >— Prop. Storm Sewer

SECTION A-A

STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

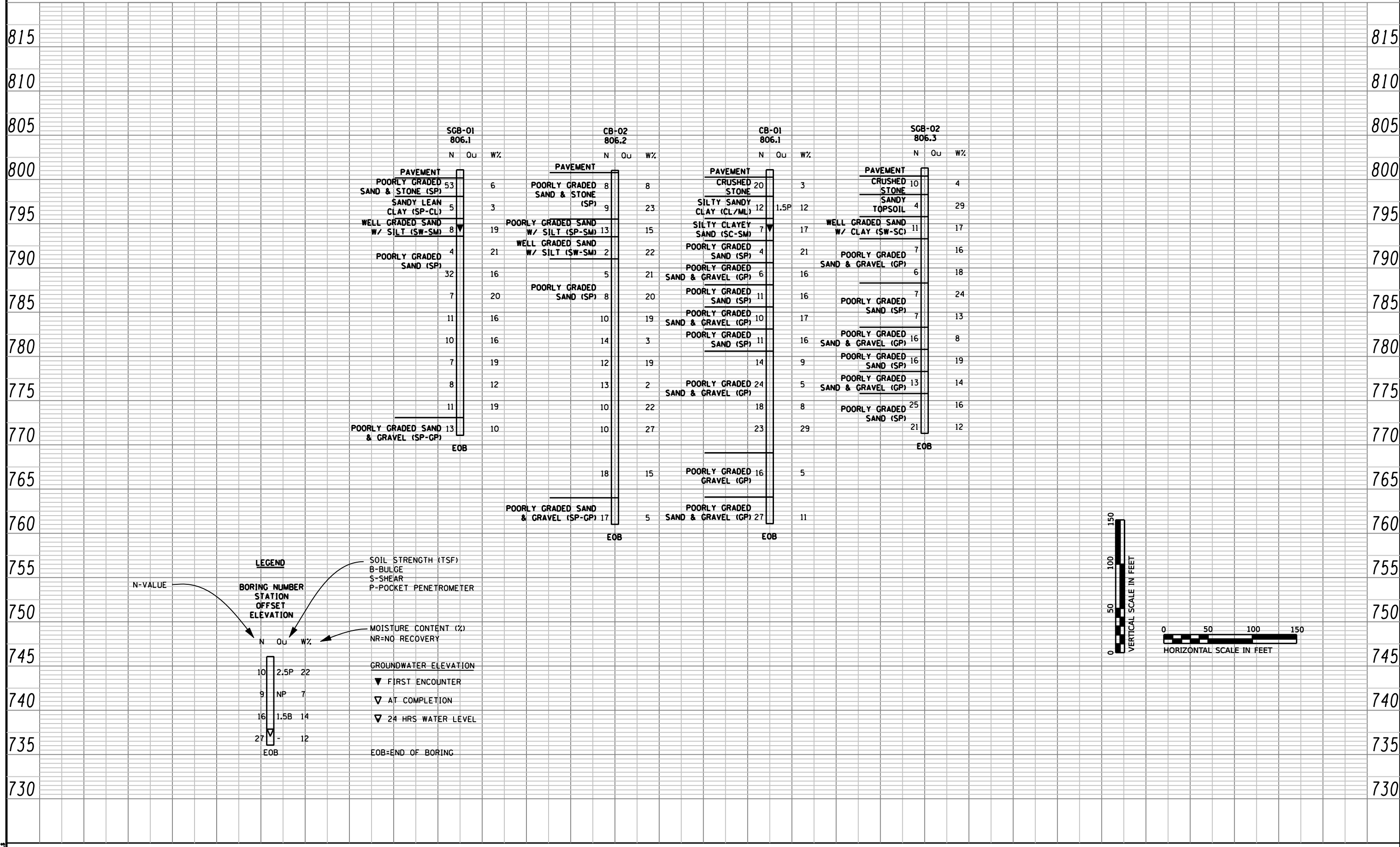
GENERAL PLAN & ELEVATION
 STRUCTURE NO. 056-0344

SHEET 1 OF 1 SHEETS

GENERAL PLAN & ELEVATION
 IL. 23 OVER DRAINAGE DITCH
 F.A.P. 324 SEC. 2018-091-CR
 MCHENRY COUNTY
 STATION 50+00
 STRUCTURE NO. 056-0344

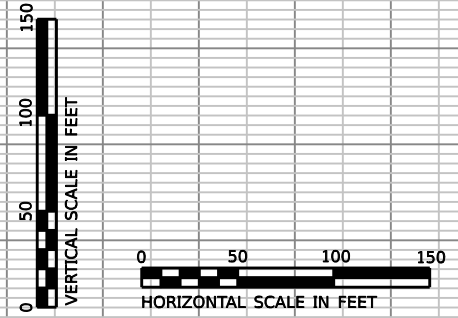
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
324	2018-091-CR	MCHENRY	17	13
CONTRACT NO. 62H25				
ILLINOIS FED. AID PROJECT				

USER NAME = SUSER\$	DESIGNED - EG	REVISED -
PLOT SCALE = \$SCALE\$	CHECKED - LM	REVISED -
PLOT DATE = \$DATES	DRAWN - EG	REVISED -
	CHECKED - LM	REVISED -



LEGEND

- N-VALUE
- BORING NUMBER
- STATION OFFSET
- ELEVATION
- SOIL STRENGTH (TSF)
 - B-BULGE
 - S-SHEAR
 - P-POCKET PENETROMETER
- MOISTURE CONTENT (%)
 - NR=NO RECOVERY
- GROUNDWATER ELEVATION
 - ▼ FIRST ENCOUNTER
 - ▽ AT COMPLETION
 - ▽ 24 HRS WATER LEVEL
- EOB-END OF BORING



APPENDIX D
SOIL BORING LOGS



SOIL BORING LOG

PROJECT IL-23/FAP 324/N. State Street

LOCATION IL-23 And 2nd Avenue, Merango, Il.

COUNTY McHenry **DRILLING METHOD** HSA/Rotary **HAMMER TYPE** CME Automatic

CLIENT Garza Karhoff Engineering, LLC	D E P T H (ft)	B L O W S (/6")	U C S (tsf)	M O I S T (%)	D I S T I N C T I V I T Y (pcf)	Surface Water Elev. n/a ft	S T R E A M (ft)	D E P T H (ft)	B L O W S (/6")	U C S (tsf)	M O I S T (%)	D I S T I N C T I V I T Y (pcf)
BORING NO. CB-01						Stream Bed Elev. n/a ft						
Northing 2036340						Groundwater Elev.:						
Easting 909766						First Encounter 799.1 ft ▼						
Ground Surface Elev. 806.1 ft						Upon Completion n/a ft						
						After n/a Hrs. n/a ft						

Z:\PROJECTS\2021\21003-A GARZA, WO #2 - IL 23 CULVERT OVER UNNAMED DITCH, MARENGO, IL\21003-A BORING LOGS\21003-A_LOG.GPJ 9/1/21

DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)	DISTINCTIVITY (pcf)	SOIL DESCRIPTION	DEPT (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)	DISTINCTIVITY (pcf)
804.9	6				2.0" ASPHALT, 8.0" CONCRETE	785.6				
	10		3		CRUSHED STONE-medium dense		6			
	10						7		9	
803.1							7			
	1				SILTY SANDY CLAY with Gravel-dark brown & spotted black-stiff (CL/ML)					
	2	1.50	12				10			
	10	P			becoming gray @ -23.0'		11		5	
	-5						13			
800.6						-25				
	3				SILTY CLAYEY SAND-dark gray-loose (SC-SM)					
	3		17				9			
	4						8		8	
	4						10			
798.1										
	1				POORLY GRADED SAND-brown-very loose (SP)					
	2		21				10			
	2						11		29	
	-10						12			
795.6						-30				
	2				POORLY GRADED SAND & GRAVEL-gray-loose (GP)					
	3		16							
	3					774.1				
793.1										
	4				POORLY GRADED SAND-brown-medium dense (SP)					
	5		16				10			
	6						8		5	
	-15						8			
790.6						-35				
	4				POORLY GRADED SAND & GRAVEL-brown & gray-medium dense (GP) Apparent Fill					
	4		17							
	6					769.1				
788.1										
	6				POORLY GRADED SAND-brown-medium dense (SP)					
	6		16				8			
	5						12		11	
	6				End Of Boring @ -40.0'. Boring backfilled with cuttings.		15			
-20						766.1	-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrator)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206), GP-Geoprobe Hand Auger
BBS, from 137 (Rev. 8-99)

SOIL BORING LOG

PROJECT IL-23/FAP 324/N. State Street

LOCATION IL-23 And 2nd Avenue, Merango, Il.

COUNTY McHenry DRILLING METHOD HSA/Rotary HAMMER TYPE CME Automatic

CLIENT Garza Karhoff Engineering, LLC

BORING NO. SGB-01
 Northing 2036354
 Easting 909749
 Ground Surface Elev. 806.1 ft

DEPTH H S	B L O W S	U C S Qu	M O I S T %	D I S T R I B U T I O N P C F	Surface Water Elev. _____ n/a ft	Stream Bed Elev. _____ n/a ft	Groundwater Elev.:	DEPTH H S	B L O W S	U C S Qu	M O I S T %	D I S T R I B U T I O N P C F
					First Encounter _____ 799.1 ft ▼	Upon Completion _____ n/a ft	After n/a Hrs. _____ n/a ft					

Z:\PROJECTS\2021\121003-A GARZA, WO #2 - IL 23 CULVERT OVER UNNAMED DITCH, MARENGO, IL\21003-A BORING LOGS\21003-A_LOG.GPJ 9/1/21

2.0" ASPHALT, 9.0" CONCRETE												
805.2												
POORLY GRADED SAND, GRAVEL & STONE-brown & gray-dense (Fill) (SP)	30		6					6	4		19	
	41								3			
	12											
803.1												
SANDY CLAY LOAM-brown & black-loose (Fill) (SP-CL)	4		3					3	4		12	
	2								4			
	3								4			
	-5							-25				
800.6												
WELL GRADED SAND with SILT-brown-loose (SW-SM)	5		19					4	5		19	
	5								6			
	3											
798.6												
POORLY GRADED SAND-brown-very loose to dense (SP) becoming gray @ -8.0'	2		21					778.1	6		10	
	2								6			
	2								7			
	-10							776.1	-30			
	21		16									
	20											
	12											
	2		20									
	3											
	4											
	-15							-35				
	4		16									
	5											
	6											
	2		16									
	2											
	8											
	-20							-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), GP-Geoprobe Hand Auger
 BBS, from 137 (Rev. 8-99)

SOIL BORING LOG

PROJECT IL-23/FAP 324/N. State Street

LOCATION IL-23 And 2nd Avenue, Merango, Il.

COUNTY McHenry **DRILLING METHOD** HSA/Rotary **HAMMER TYPE** CME Automatic

DEPTH H S ft	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)	D I S T R I B U T I O N D E N S I T Y (pcf)	Surface Water Elev.	D E P T H ft	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)	D I S T R I B U T I O N D E N S I T Y (pcf)
					ft					
					n/a					
					n/a					
					Dry to -10.0'					
					n/a					
					n/a					
					n/a					
805.4						785.8				
	6						8			
	6	4					8		19	
	4						8			
803.3						783.3				
	2						6			
	2	29					7		14	
	2						6			
	-5						-25			
800.8						780.8				
	4						10			
	5	17					11		16	
	6						14			
798.3										
	2						9			
	3	16					10		12	
	4						11			
	-10					776.3	-30			
	2									
	3	18								
	3									
793.3										
	2									
	3	24								
	4									
	-15						-35			
	4									
	4	13								
	3									
788.3										
	7									
	8	8								
	8									
	-20						-40			

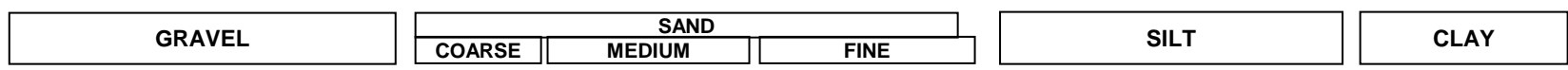
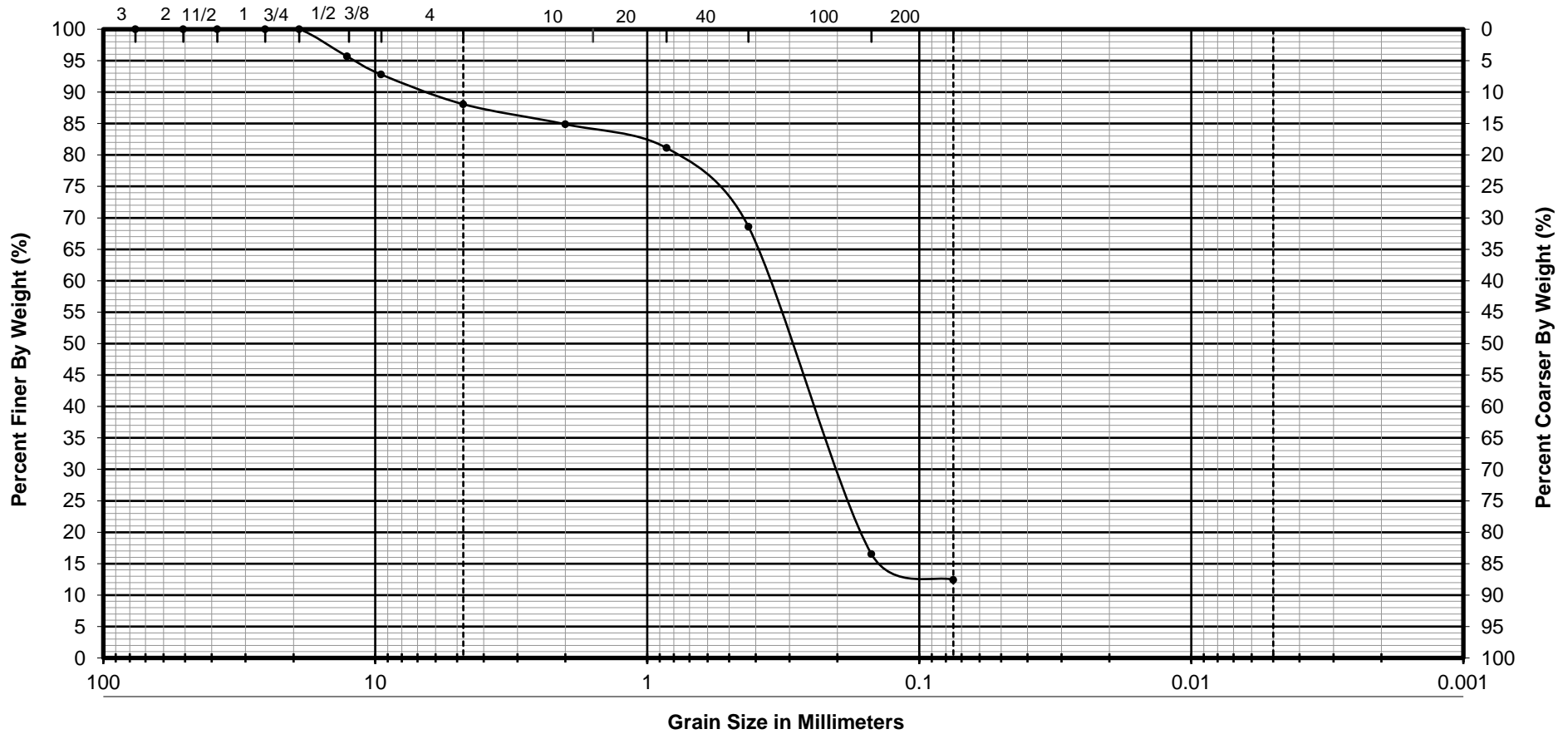
Z:\PROJECTS\2021\21003-A GARZA, WO #2 - IL 23 CULVERT OVER UNNAMED DITCH, MARENGO, IL\21003-A BORING LOGS\21003-A_LOG.GPJ 9/1/21


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), GP-Geoprobe Hand Auger
 BBS, from 137 (Rev. 8-99)

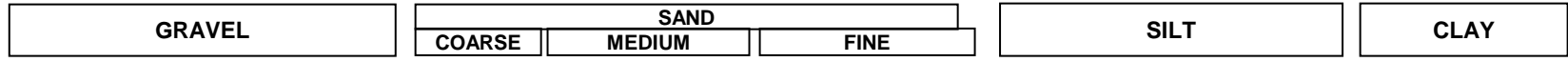
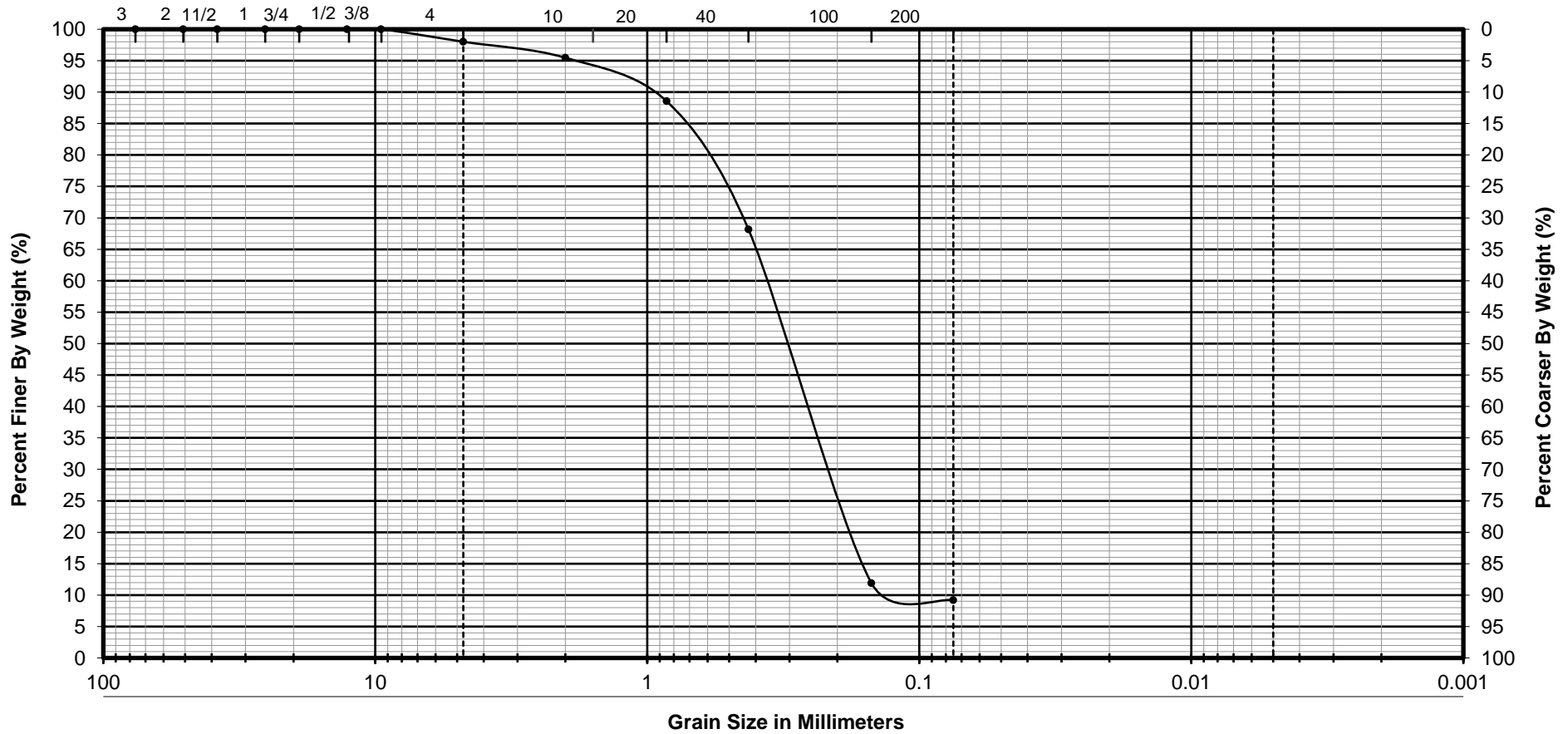
APPENDIX E


GOETECHNICAL

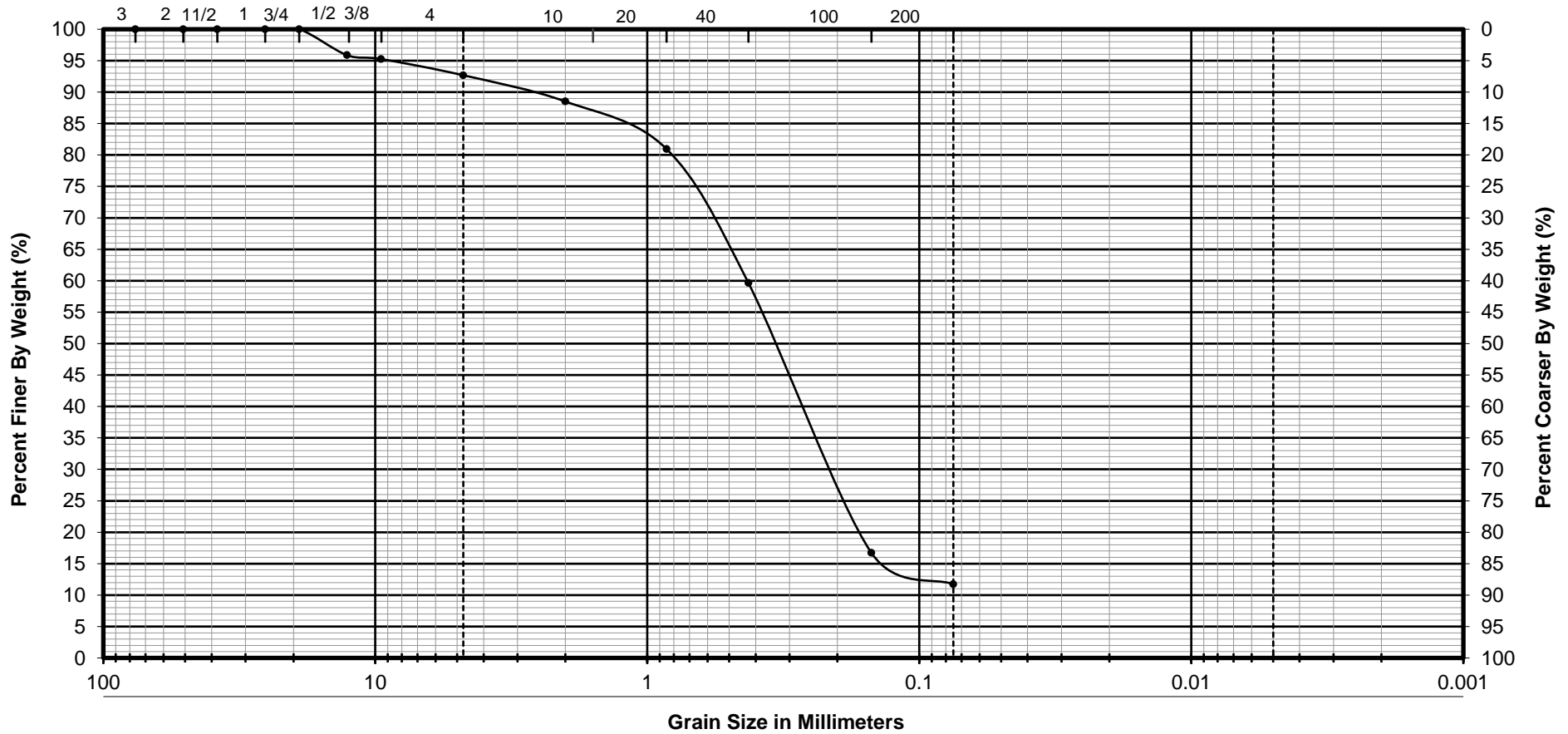
LAB TEST RESULTS




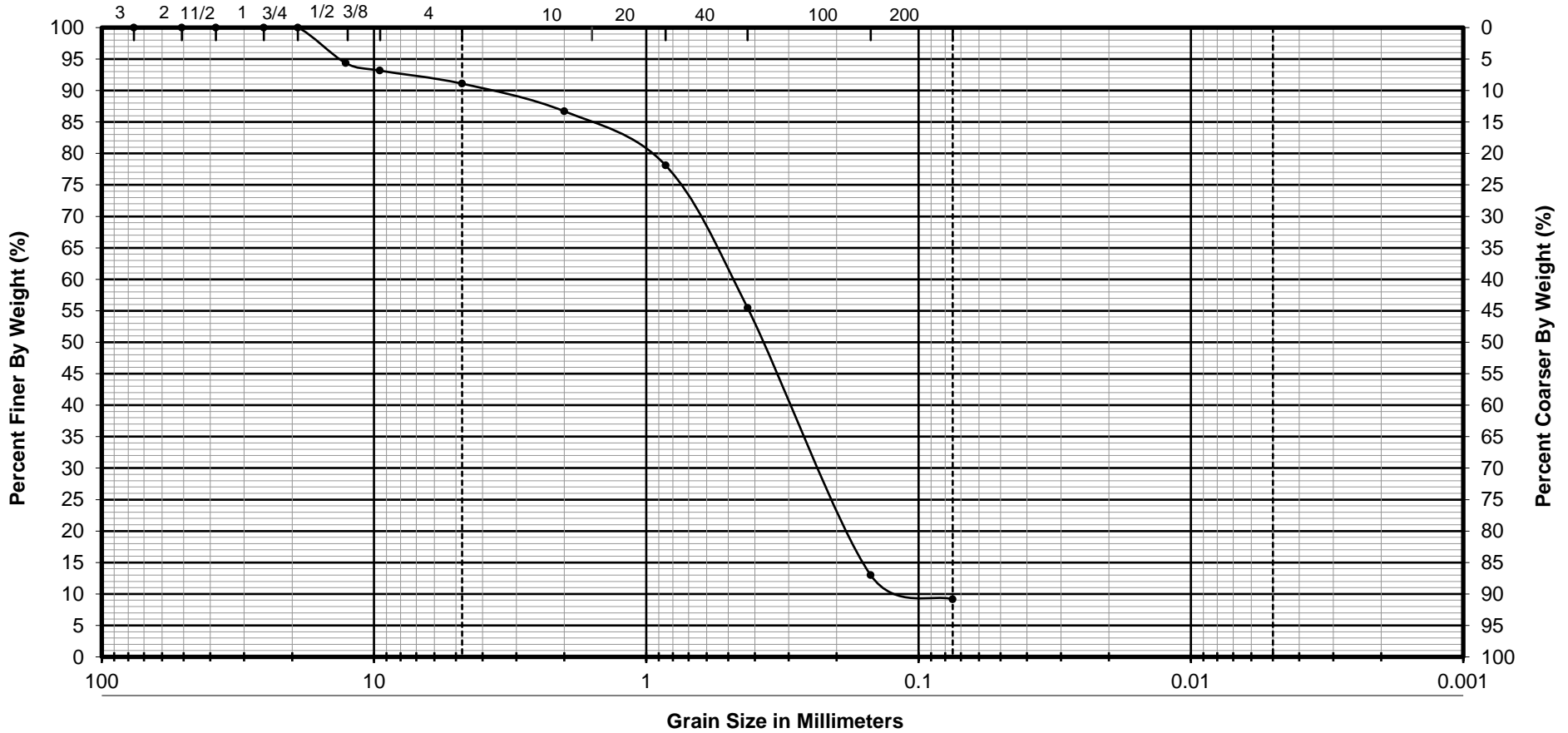
Boring No.	CB-01	CLASSIFICATION-ASTM D 2487	GRAIN SIZE ANALYSIS-ASTM C117/C136	
Sample No.	4	SILTY CLAYEY SAND (SC-SM)	IL-23/FAP 324/N. State Street IL-23 And 2nd Avenue, Merango, IL.	
Depth	6.0'-7.5'	dark gray	 Geo Services, Inc. Geotechnical, Environmental and Civil Engineering <small>An MBE - DBE Firm</small> 1235 E. Davis St., Arlington Heights, IL 60005 Phone 847-253-3845 • Fax 847-253-0482	
Test By	MT	% Gravel		11.9
Date	8/24/21	% Sand		75.6
Reviewed By	AT	% Silt/Clay		12.4
Job No	21003-A			




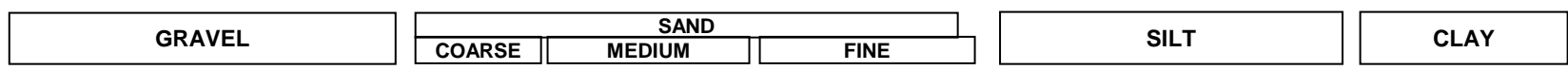
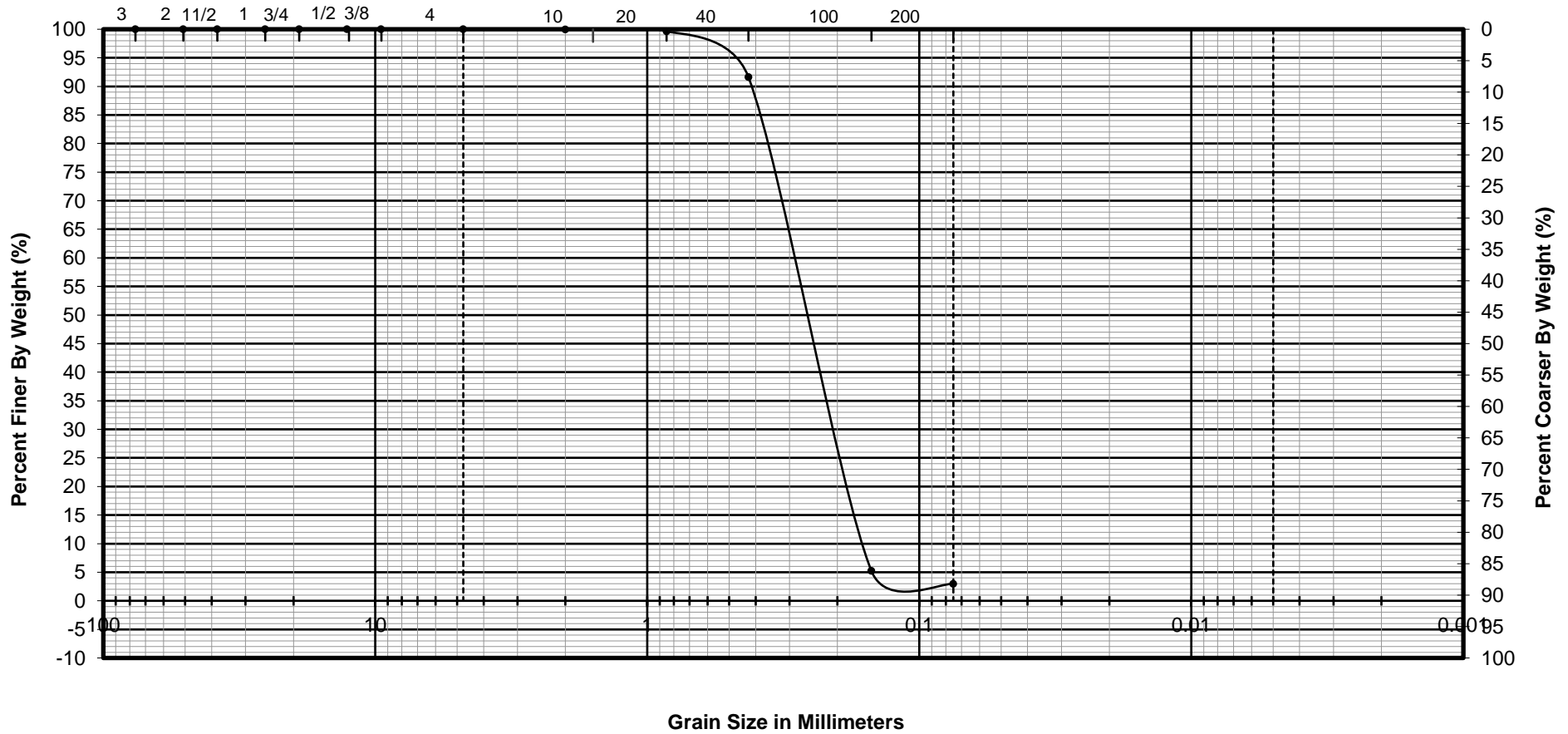
Boring No.	CB-02	CLASSIFICATION-ASTM D 2487	GRAIN SIZE ANALYSIS-ASTM C117/C136	
Sample No.	4	POORLY GRADED SAND with SILT (SP-SM)	IL-23/FAP 324/N. State Street IL-23 And 2nd Avenue, Merango, IL.	
Depth	6.0'-7.5'	brown	 Geo Services, Inc. Geotechnical, Environmental and Civil Engineering <small>An MBE - DBE Firm</small>	
Test By	MT	Cu		2
Date	8/24/21	Cc		1
Reviewed By	AT	% Gravel		2.0
Job No	21003-A	% Sand		88.8
		% Silt/Clay	9.2	
			1235 E. Davis St., Arlington Heights, IL 60005 Phone 847-253-3845 • Fax 847-253-0482	




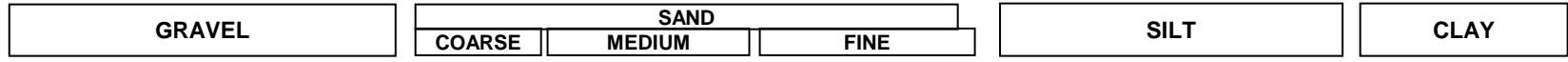
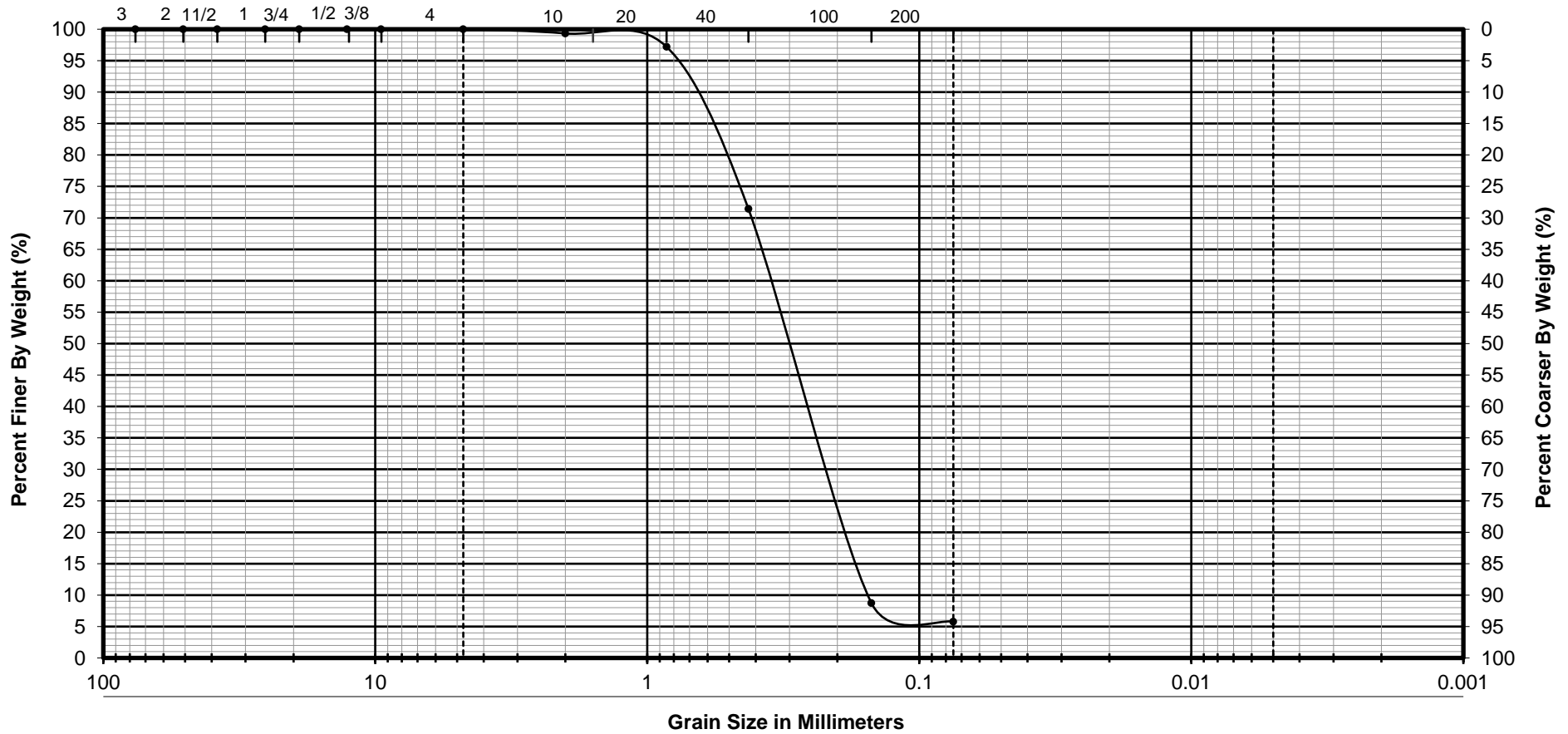
Boring No.	CB-02	CLASSIFICATION-ASTM D 2487	GRAIN SIZE ANALYSIS-ASTM C117/C136	
Sample No.	5	WELL-GRADED SAND with SILT (SW-SM)	IL-23/FAP 324/N. State Street IL-23 And 2nd Avenue, Merango, IL.	
Depth	8.5'-10.0'	brown/gray	 Geo Services, Inc. Geotechnical, Environmental and Civil Engineering <small>An MBE - DBE Firm</small>	
Test By	MT	Cu		6
Date	8/24/21	Cc		2
Reviewed By	AT	% Gravel		7.3
Job No	21003-A	% Sand		80.9
		% Silt/Clay	11.7	
			1235 E. Davis St., Arlington Heights, IL 60005 Phone 847-253-3845 • Fax 847-253-0482	




Boring No.	SGB-01	CLASSIFICATION-ASTM D 2487	GRAIN SIZE ANALYSIS-ASTM C117/C136	
Sample No.	4	WELL-GRADED SAND with SILT (SW-SM)	IL-23/FAP 324/N. State Street IL-23 And 2nd Avenue, Merango, IL.	
Depth	6.0'-7.5'	brown	 Geo Services, Inc. <small>Geotechnical, Environmental and Civil Engineering An MBE - DBE Firm</small>	
Test By	MT	Cu		6
Date	8/24/21	Cc		2
Reviewed By	AT	% Gravel		8.9
Job No	21003-A	% Sand		81.9
		% Silt/Clay	9.2	
			1235 E. Davis St., Arlington Heights, IL 60005 Phone 847-253-3845 • Fax 847-253-0482	



Boring No.	SGB-01	CLASSIFICATION-ASTM D 2487	GRAIN SIZE ANALYSIS-ASTM C117/C136
Sample No.	5	POORLY GRADED SAND (SP)	IL-23/FAP 324/N. State Street IL-23 And 2nd Avenue, Merango, IL.  Geo Services, Inc. <small>Geotechnical, Environmental and Civil Engineering An MBE - DBE Firm</small> 1235 E. Davis St., Arlington Heights, IL 60005 Phone 847-253-3845 • Fax 847-253-0482
Depth	8.5'-10.0'	gray	
Test By	MT	Cu 2	
Date	8/24/21	Cc 1	
Reviewed By	AT	% Gravel 0.0	
Job No	21003-A	% Sand 97.1	
		% Silt/Clay 2.9	



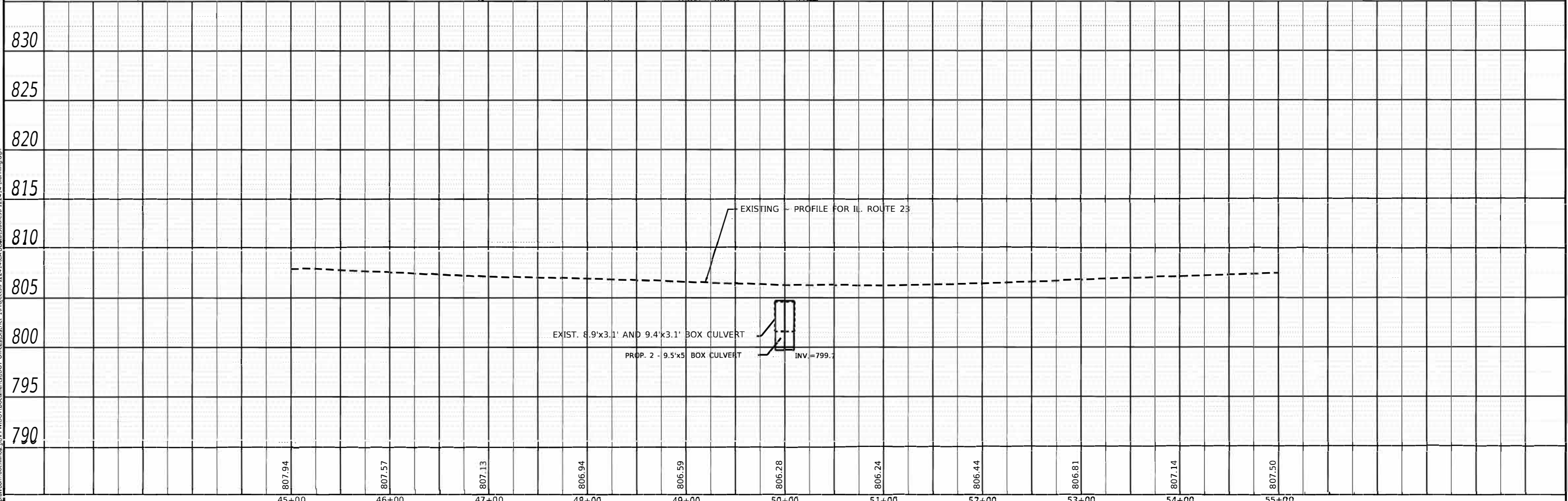
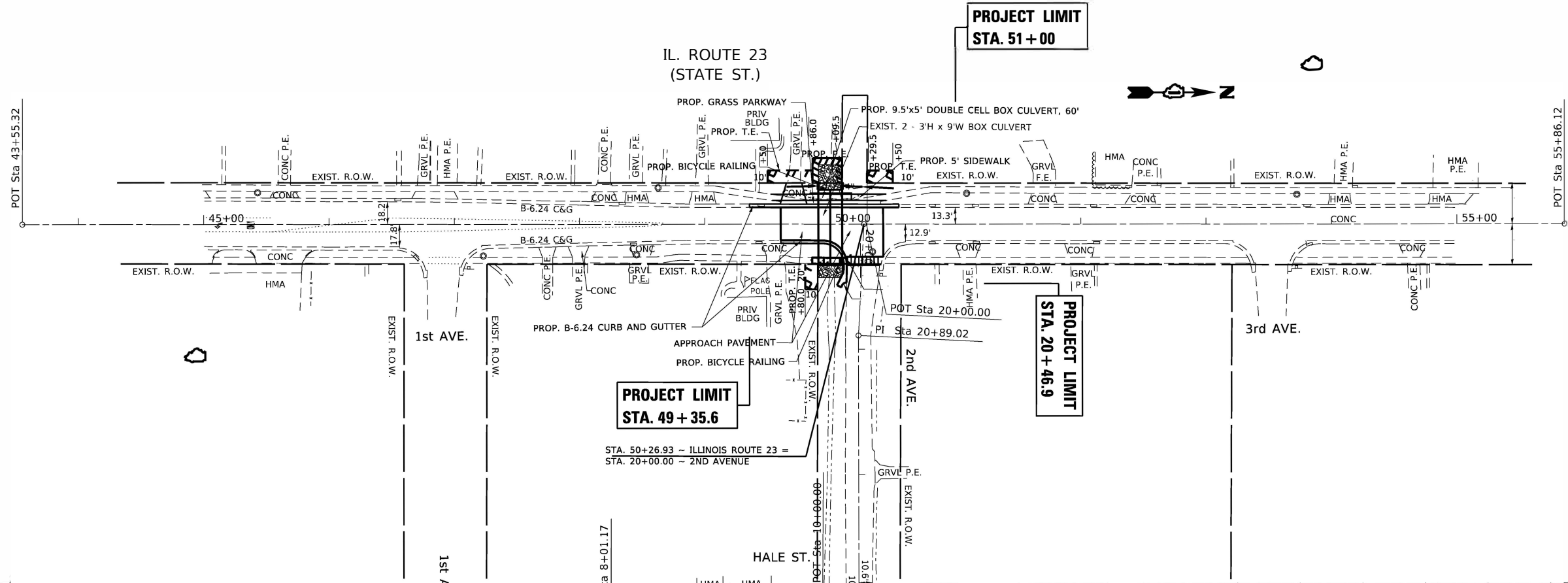
Boring No.	SGB-02	CLASSIFICATION-ASTM D 2487	GRAIN SIZE ANALYSIS-ASTM C117/C136
Sample No.	4	WELL-GRADED SAND with CLAY (SW-SC)	<p>IL-23/FAP 324/N. State Street IL-23 And 2nd Avenue, Merango, IL.</p>  <p>Geo Services, Inc. Geotechnical, Environmental and Civil Engineering An MBE - DBE Firm</p> <p>1235 E. Davis St., Arlington Heights, IL 60005 Phone 847-253-3845 • Fax 847-253-0482</p>
Depth	6.0'-7.5'	dark brown	
Test By	MT	Cu 12	
Date	8/24/21	Cc 0	
Reviewed By	AT	% Gravel 0.0	
Job No	21003-A	% Sand 94.2	
		% Silt/Clay 5.8	

APPENDIX F
APPROVED TS&L AND SUBSURFACE
PROFILE

PLAN	SURVEYED	DATE
	PLOTTED	
	NOTED	
	BY	
	NO.	

PROFILE	SURVEYED	DATE
	PLOTTED	
	NOTED	
	BY	
	NO.	

MODEL: Default
FILE NAME: pw\amcom.dwt\illinois.gov\PWIDOT\Documents\DOT Office\dist\ct 1\Project\172214\CA\Drawings\Profiles\172214_ahleming.dgn



USER NAME =	Aurmm	DESIGNED -	REVISED -
		DRAWN -	REVISED -
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PLOT DATE =	6/5/2019	DATE -	REVISED -

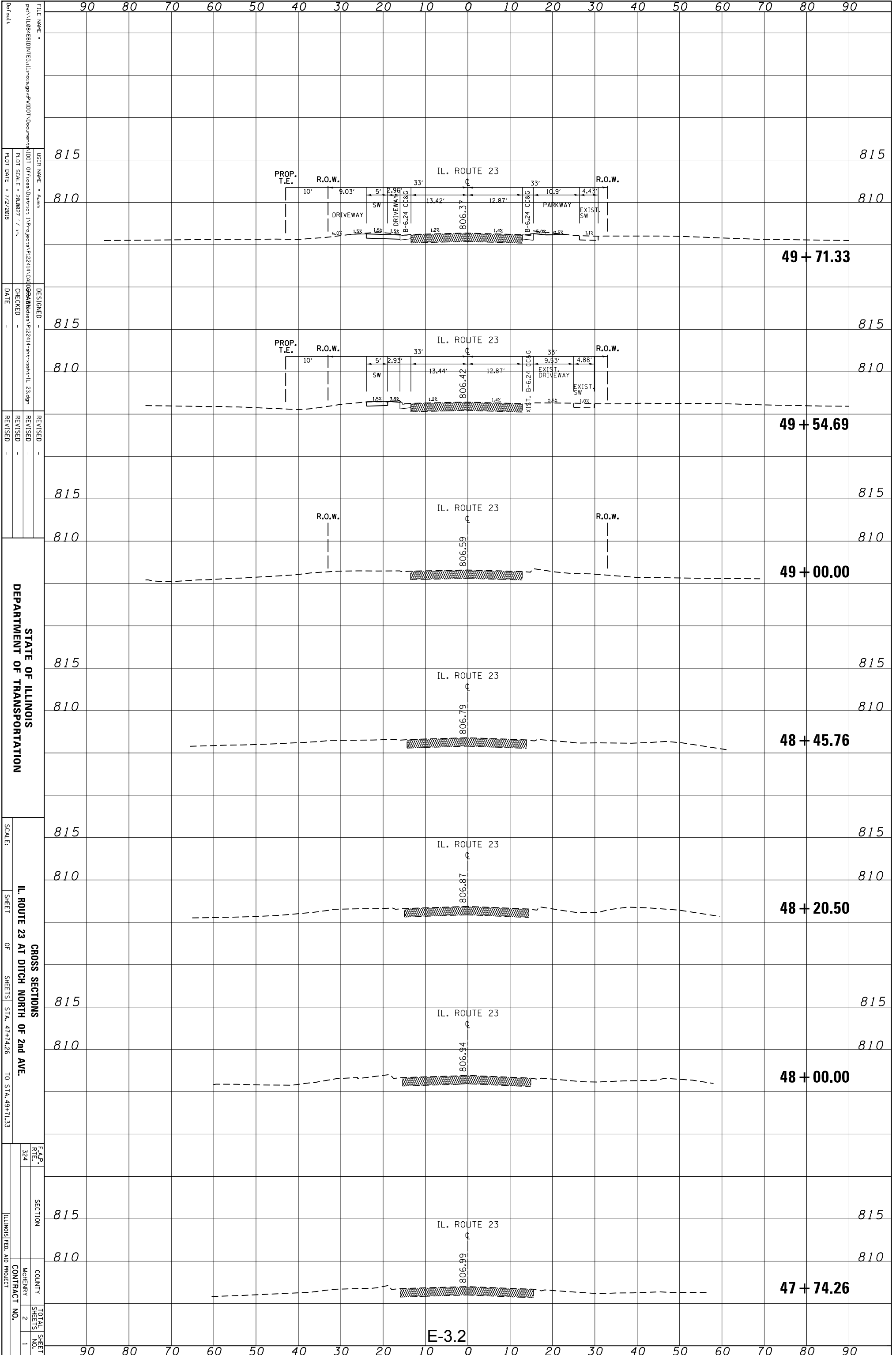
**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**IL ROUTE 23 OVER DITCH, 0.1 MILES NO IL 176
PLAN AND PROFILE SHEETS**

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

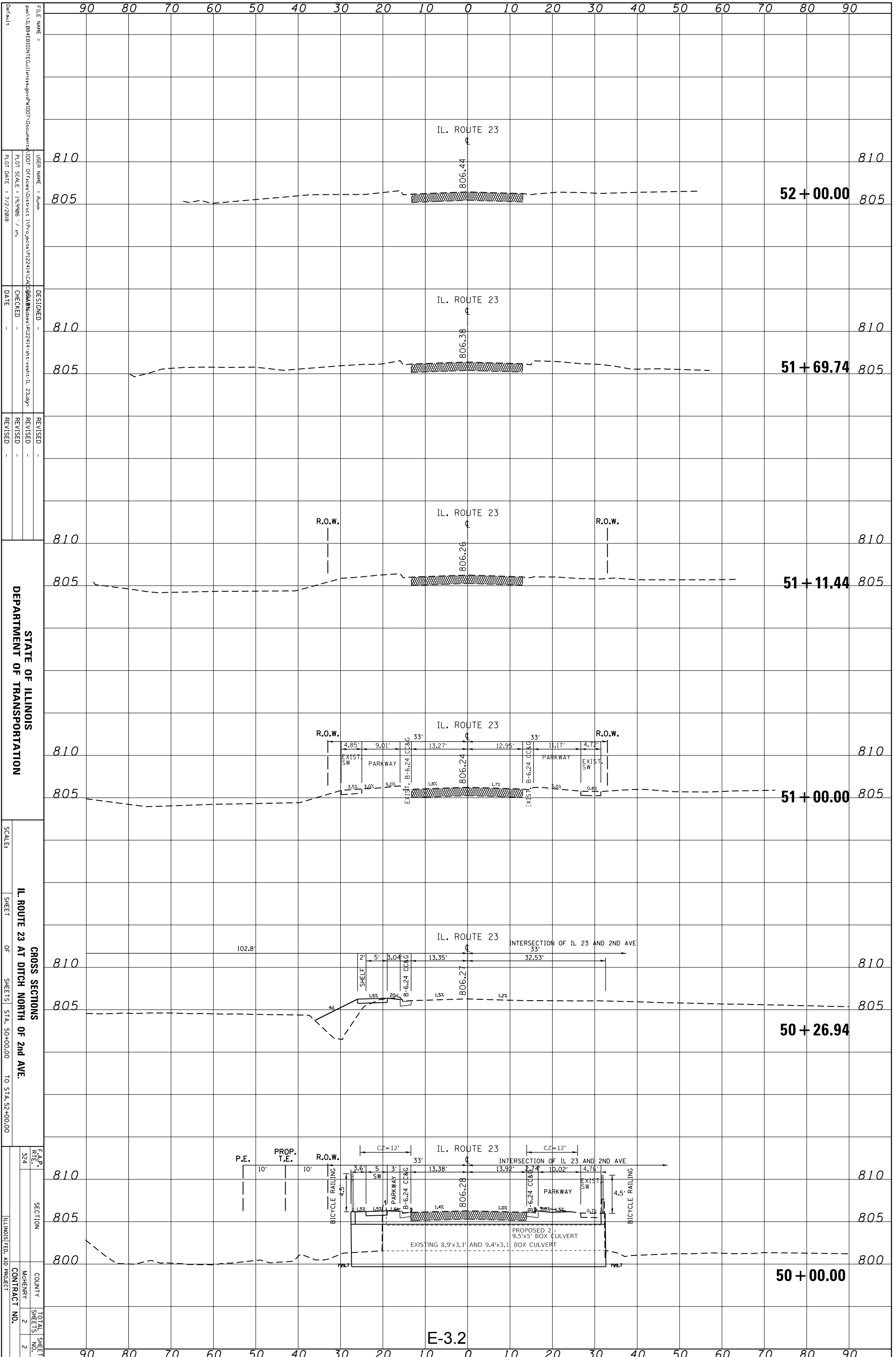
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NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		

FINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		



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

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



FILE NAME =
 USER NAME =
 PLOT SCALE =
 PLOT DATE =

DESIGNED
 CHECKED
 DATE

REVISOR
 REVISION
 DATE

STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

SCALE:
 SHEET
 OF SHEETS
 STA. 50+00.00 TO STA. 52+00.00

CROSS SECTIONS
 IL. ROUTE 23 AT DITCH NORTH OF 2ND AVE.

F.A.P. RITE 324 SECTION
 COUNTY
 CONTRACT NO.

TOTAL SHEETS
 SHEETS NO.

E-3.2