Wang Engineering

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May 19, 2022

Mr. Bradly Hargett, P.E.
James J. Benes & Assoc., Inc.
950 Warrenville Road, Suite 101
Lisle, IL 60532

Re: Geotechnical Engineering Services
Retaining Wall
Illinois Route 7 (Southwest Highway) Improvements
Cook County, Illinois
D-91-124-19, Contract 62HB2
Wang No. 411-05-03

This letter report presents the results of Wang Engineering, Inc.'s (Wang) subsurface investigation, laboratory testing, geotechnical evaluations, and recommendations for the proposed retaining wall along Illinois Route 7 (SW Highway) in the Village of Orland Park, Illinois. The proposed retaining wall is part of the roadway improvements along Southwest Highway from the 131st Street to 135th Street. On the USGS Palos Park *Quadrangle 7.5 Minutes Series* map, the project site is located at NE1/4, Section 34, Tier 37 N, Range 12E of the Third Principal Meridian. A *Site Location Map* is presented as Exhibit 1.

Based on the Cross-Section drawings (Appendix D) and information provided by James J. Benes & Associates, Inc. (JJ Benes), we understand the proposed retaining wall along IL 7 is about 350 feet, between Station 112+50 and 116+00 with approximate offset of 75 feet to the right from proposed roadway centerline. The proposed will have a maximum retained height of 4 feet with front face slope of 1:2.5(V:H). A TSL plan was not yet available at the time of preparation of this report.

SUBSURFACE INVESTIGATION

The subsurface investigation consisted of seven retaining wall borings, designated as RW-01 to RW-06, and RW-02HA. The borings were drilled by Wang in February 15 to 23, 2022 The borings were drilled from elevations of 668.65 to 673.12 feet and were advanced to depths of 8 to 25 feet below ground surface (bgs). The as-drilled northings and eastings were acquired with a mapping-grade GPS unit. Stations, offsets, and elevations were provided by JJ Benes. Boring location data are presented in the *Boring Logs* (Appendix A) and the as-drilled boring locations are shown in the *Boring Location Plan* (Exhibit 2).

A track-mounted drilling rig, equipped with hollow stem augers, was used to advance and maintain open boreholes. Soil sampling was performed according to AASHTO T 206, "*Penetration Test and Split Barrel Sampling of Soils."* The soil was sampled at 2.5-foot intervals to the boring termination depths. A jackhammer driven geoprobe sampler was used in HA-series borings to continuously sample the soils. Soil samples collected from each sampling interval were placed in sealed jars and transported to the laboratory for further examination and laboratory testing.

Field boring logs, prepared and maintained by Wang geologists, include lithological descriptions, visual-manual soil (IDH Textural) classifications, results of Rimac and pocket penetrometer unconfined compressive strength tests, and results of Standard Penetration Tests (SPT) recorded as blows per 6 inches of penetration.

Groundwater levels were measured while drilling and upon completion of drilling. The boreholes were backfilled upon completion with soil cuttings and bentonite chips.

LABORATORY INVESTIGATION

The soil samples were tested in the laboratory for moisture content (AASHTO T265). Selected soil samples were tested for Atterberg limits (AASHTO T 89/90) and particle size (AASHTO T 88) analyses. Field visual descriptions of the soil samples were verified in the laboratory. Laboratory test results are shown in the *Boring Logs* (Appendix A) and in the *Laboratory Test Results* (Appendix B).

LITHOLOGICAL PROFILE

At the surface, the borings, drilled on the grass area at the top of slope, encountered 4 to 9 inches of silty clay loam topsoil. The borings drilled along the IL 7 roadway and shoulder encountered 14-inch asphalt over 6-inch concrete or 7 to 11 inches of sandy gravel. In descending order, the general lithologic succession encountered beneath the surface includes: 1) man-made ground (fill) and 2) medium stiff to very stiff clay to silty clay loam.

1) Man-made ground (fill)

Beneath the pavement, Borings RW-03, RW-05, and RW-06 encountered up to 5 feet of fill. The cohesive fill consists of hard clay loam to silty clay loam with unconfined compressive strength (Q_u) values of 5.5 to greater than 10.3 tsf and moisture content values of 15 and 16%.

2) Medium stiff to hard silty clay to silty clay loam

Beneath the fill or topsoil, the borings advanced through medium stiff clay, silty clay to silty clay loam interbedded with saturated, loose sand and silt. The unit has Q_u values of 0.3 to 5.33 tsf and moisture content values of 15 to 31%. Laboratory testing show liquid limit (L_L) values of 33 to 36% and plastic limit (P_L) values of 17 and 18%.

The interbedded loose sand and silt unit has thickness up to 5 feet and N values of 3 to 9 blows per foot with moisture content values of 13 to 26%.

GROUNDWATER CONDITIONS

Groundwater was observed while drilling in Borings at elevations of 654 to 663 feet (9.8 to 15.0 feet bgs). The groundwater was measured at depths of 10 and 25 feet bgs (643 and 663 feet) in Borings RW-01 and RW-04.

ANALYSIS AND RECOMMENDATIONS

Based on the cross-section drawings (Appendix D), the proposed wall will be a cut wall with front slope to 1:2.5(V:H). Generally, non-gravity (flexible) wall types such as a sheet pile or soldier pile type wall would be more suitable. Mechanically Stabilized Earth (MSE) and Reinforced Concrete Cantilever (RCC) would require large open cut excavations into the existing slope, temporary soil retention systems, and may impact the existing right of way. The construction of these wall types would likely also require more backfilling thus longer construction time. We recommend considering flexible walls such as sheet pile wall or soldier pile wall and lagging walls. Soldier piles could be driven or drilled and set.

Drilled soldier pile system should be designed for both lateral earth pressure and lateral deformation. The embedment depth in moment equilibrium for the wall sections should be designed in accordance with the AASHTO LRFD guidelines (AASHTO 2020).

We recommend the lateral earth pressure analysis should be performed for the wall in both short-term (undrained) and long-term (drained) conditions using the soil parameters in Tables 1 and 2. Elevations provided in tables are based on the average layer elevations across the soil profile and may vary from one boring location to another. The active and passive earth pressure coefficients are provided for straight slope of backfill behind the wall and a 1:2.5 (V:H) in front of the wall.

The design of the wall should ignore 3.0 feet of soil in front of the wall measured from the finished ground surface elevation in providing passive pressure due to excavations required for installation of concrete facing, drainage systems, and frost-heave conditions (IDOT 2012). In developing the design lateral pressure, the pressure due to any existing structures, roadway surcharge loading, and construction equipment surcharge loads should be added to the lateral earth pressure. Drainage behind the wall should be in accordance with IDOT guidelines (IDOT 2012). The water pressure should be added to the earth pressure if drainage is not provided. The wall design should consider the permanent groundwater at elevation of 663 feet.

Table 1: Undrained (Short-term) Geotechnical Parameters for Design of Flexible Wall
Ref Borings: RWB-01 to RWB-06, and RWB-02HA

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Undrained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle (°)	Active Pressure (straight)	Passive Pressure (1V:2.5H)
Stiff to Hard CLAY to SILTY CLAY LOAM Surface to EL 666 feet	120	2000	0	1.00	--
M Stiff to Stiff CLAY to SILTY CLAY LOAM EL 666 to 661 feet	120	800	0	1.00	1.00
Loose SAND/SILT EL 661 to 654 feet	53 (submerged)	0	29	0.35	1.87
Stiff to V Stiff CLAY to SILTY CLAY LOAM EL 654 to 644 feet (EOB)	58 (submerged)	1800	0	1.00	1.00

Table 2: Drained (Long-term) Geotechnical Parameters for Design of Flexible Wall
Ref Borings: RWB-01 to RWB-06, and RWB-02HA

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Drained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle (°)	Active Pressure (straight)	Passive Pressure (1V:2.5H)
Stiff to Hard CLAY to SILTY CLAY LOAM Surface to EL 666 feet	120	100	30	0.33	--
M Stiff to Stiff CLAY to SILTY CLAY LOAM EL 666 to 661 feet	120	0	29	0.35	1.87
Loose SAND/SILT EL 661 to 654 feet	53 (submerged)	0	29	0.35	1.87
Stiff to V Stiff CLAY to SILTY CLAY LOAM EL 654 to 644 feet (EOB)	58 (submerged)	100	30	0.33	1.98

The lateral deformation of the wall should be designed for movement and moment fixity at the base of the pile. The roadway, utilities, and any nearby structures should not be impacted by the lateral movement of the wall. The evaluations should be performed using the recommended soil parameters shown in Table 3, via the p-y curve (COM624) method. Elevations provided in Table 3 is based on the average layer elevations across the profile and may vary from one boring location to another.

Table 3: Recommended Geotechnical Parameters for Lateral Load Analysis for Flexible Walls
Ref Borings: RWB-01 to RWB-06, and RWB-02HA

Soil Description Average Elevation (feet)	Unit Weight γ (pcf)	Undrained Shear Strength c_u (psf)	Estimated Friction Angle Φ (°)	Estimated Lateral Soil Modulus Parameter k (pci)	Estimated Soil Strain Parameter ε_{50} (%)
Stiff to Hard CLAY to SILTY CLAY LOAM Surface to EL 666 feet	120	2000	0	500	0.5
M Stiff to Stiff CLAY to SILTY CLAY LOAM EL 666 to 661 feet	120	800	0	100	0.7
Loose SAND/SILT EL 661 to 654 feet	53 (submerged)	0	29	30	--
Stiff to V Stiff CLAY to SILTY CLAY LOAM EL 654 to 644 feet (EOB)	58 (submerged)	1800	0	500	0.5

The global stability of the proposed wall was analyzed based on the soil profile described in Section 3.1 and the information provided in the GPE and cross-section drawing. The stability was analyzed at the critical section near Station 115+00 where the maximum exposed height of 4 feet. The minimum required factor of safety (FOS) is 1.7 in both short-term (undrained) and long-term (drained) conditions (IDOT 2020).

Details of the global stability analysis with critical failure surfaces and results are presented in Appendix C. We estimate the wall will have an adequate FOS of 2.8 (Appendix C-1) in the undrained condition with 4 feet pile embedment. Global stability evaluations were performed to estimate the minimum pile tip elevation required to achieve an FOS of 1.7 in the drained condition as shown in Table 4. It should be noted that typically, the lateral earth pressure and deformation analyses will determine the minimum embedment depth for cantilevered pile wall. Therefore, the designer should perform other analyses including lateral earth pressure and deflection analyses to determine the required design pile embedment.

Table 4: Results of Global Stability Analysis

Station	Reference Boring(s)	Retained Wall Height (feet)	Short-term (Undrained) Condition		Long-term (Drained) Condition	
			FOS	Tip Elevation (feet)	FOS	Tip Elevation (feet)
115+00	RWB-02 to RWB-06	4.0	2.80 (Appendix C-1)	667.0	1.75 (Appendix C-2)	662.0

The wall should be constructed according to the current IDOT Standard Specifications for Road and Bridge Construction (2022).

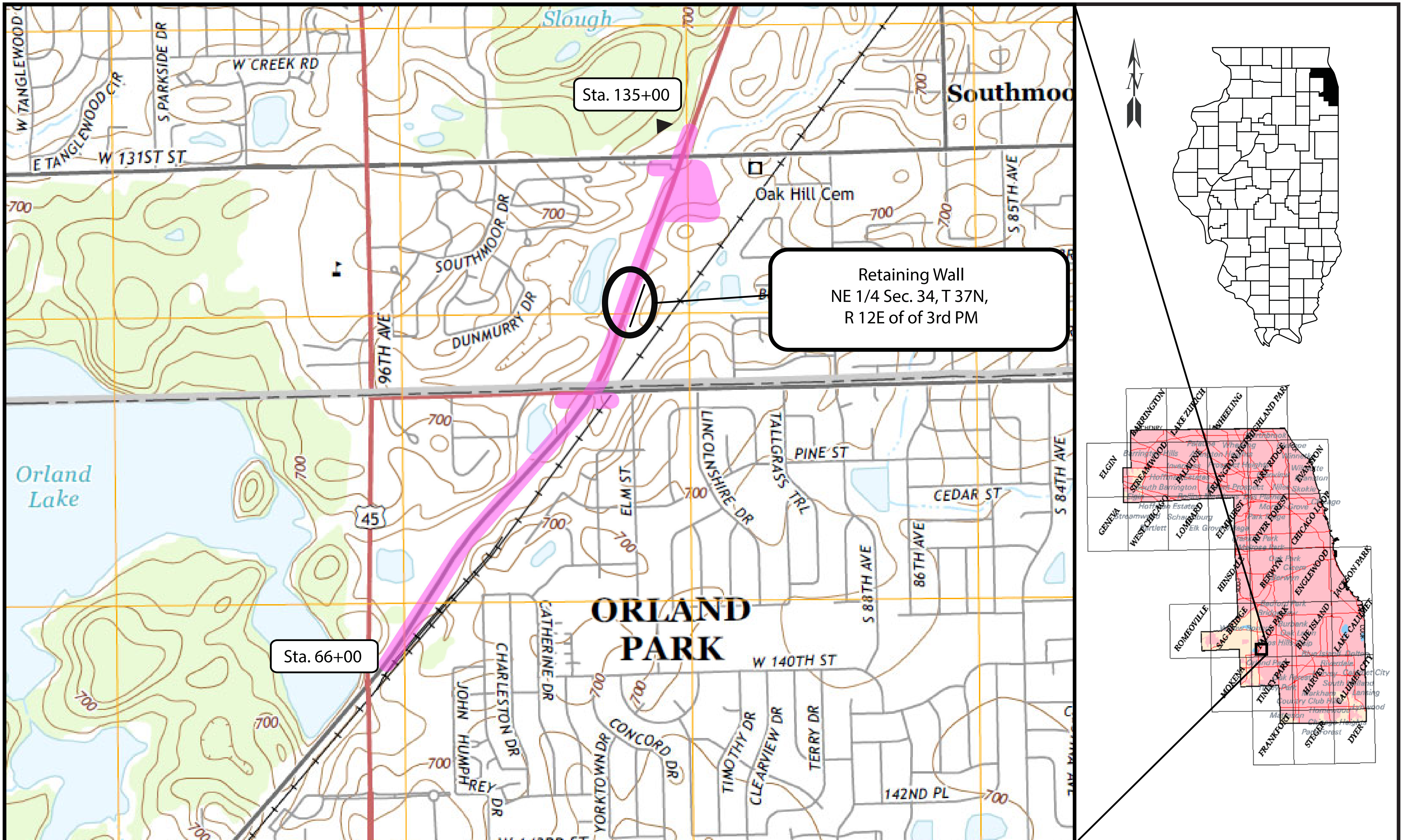
If you have any questions or for further discussion, please contact us at (630) 953-9928.

Sincerely,

WANG ENGINEERING, INC.

Met W. Seyhun, P.E.
Senior Project Manager

Nesam S. Balakumaran, P.Eng.
Project Geotechnical Engineer



0 0.25 0.5 1.0 Mile

Contours are 10 feet intervals

Modified after USGS (2015)

SITE LOCATION MAP: RETAINING WALL, IL ROUTE 7 (SOUTHWEST HIGHWAY) COOK COUNTY, ILLINOIS		
SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: E. Yim CHECKED BY: NSB
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR JAMES J. BENES & ASSOCIATES, INC.		411-05-01

0 100 200 Feet

Legend

Boring Location

BORING LOCATION PLAN: IL ROUTE 7 / SOUTHWEST HIGHWAY SUPPLEMENT 2; COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: J. Bensen CHECKED BY: M. Seyhun

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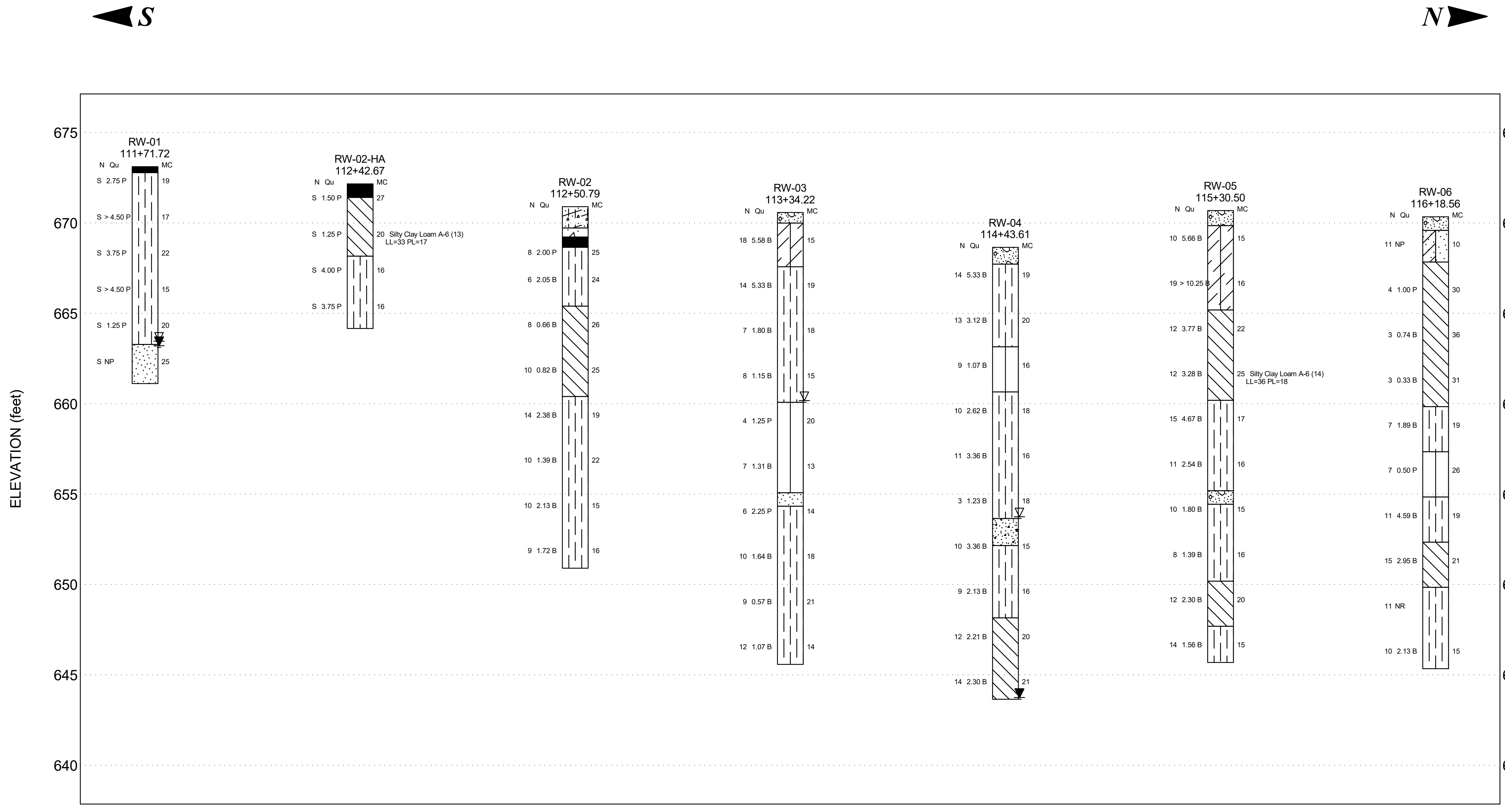
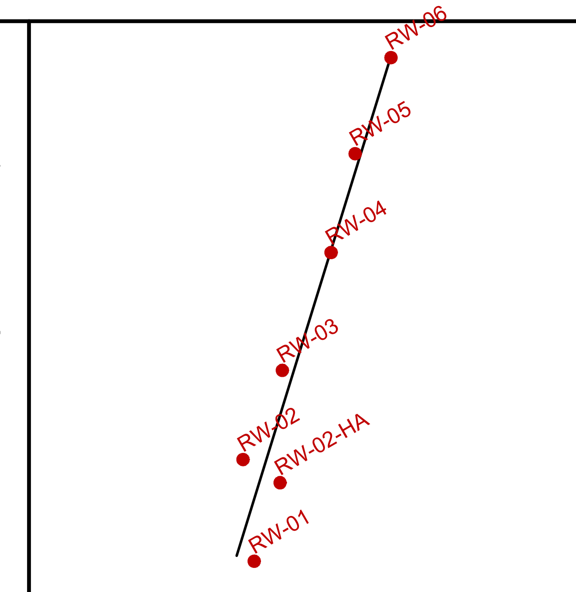
FOR JAMES J. BENES & ASSOCIATES | 411-05-03

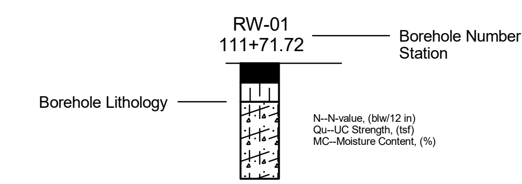


DISTANCE ALONG PROFILE (feet)



Site Map Scale 1 inch equals 165 feet

Explanation:



Water Level Reading at time of drilling.

Water Level Reading 24-hr after drilling or at end of drilling

Horizontal Scale (feet)

Vertical Exaggeration: 6.5x

Lithology Graphics

- Topsoil
- Concrete
- IDH Silt, Silty Loam
- IDH Silty Clay, Silty Clay Loam
- IDH Clay
- Coarse sand
- IDH Sand, Sandy Loam
- Gravelly sand, sandy gravel
- IDH Loam
- Pavement
- IDH Clay Loam

Terracon

Soil Profile
Retaining Wall

WEI SINCE 1982

IL Route 7 from 131st Street to 135th Street
Cook County, IL

JOB NUMBER	PLATE NUMBER
411-05-03	EXHIBIT 3

APPENDIX A

Wang Engineering
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BORING LOG RW-01

WEI Job No.: 411-05-03

Client: **James J. Benes & Associates**
Project: **IL Route 7 from 131st Street to 135th Street**
Location: **Cook County, IL**

Datum: NAVD 88
Elevation: 673.12 ft
North: 1814539.34 ft
East: 1118229.75 ft
Station: 111+71.72
Offset: 67.52' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	672.8	Very soft, black organic SILTY CLAY LOAM; damp --TOPSOIL--						
		Stiff to hard, brown and gray SILTY CLAY; damp			1	PUSH	2.75 P	19
					2	PUSH	> 4.50 P	17
		--wet tube--	5		3	PUSH	3.75 P	22
					4	PUSH	> 4.50 P	15
					5	PUSH	1.25 P	20
	663.3	Gray coarse SAND; wet to saturated	10		6	PUSH	NP	25
	661.1	Boring terminated at 12.00 ft						
			15					
			20					

GENERAL NOTES

Begin Drilling **02-23-2022** Complete Drilling **02-23-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **Geoprobe HA**
Driller **A&T** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **1.0" ID pneumatic hammer; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **9.75 ft**
At Completion of Drilling ▼ **10.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG RW-02

WEI Job No.: 411-05-03

Client: **James J. Benes & Associates**
Project: **IL Route 7 from 131st Street to 135th Street**
Location: **Cook County, IL**

Datum: NAVD 88
Elevation: 670.90 ft
North: 1814626.70 ft
East: 1118220.12 ft
Station: 112+50.79
Offset: 29.16' RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	14-inch thick ASPHALT --PAVEMENT--					
669.7						
669.2	6-inch thick CONCRETE --PAVEMENT--					
668.7	(1.0P) Stiff, black SILTY CLAY, trace organic matter; damp --Buried TOPSOIL--		1	5 4 4	2.00 P	25
	Very stiff, brown and gray SILTY CLAY; damp --RDR 2--		2	5 3 3	2.05 B	24
		5				
665.4	Medium stiff, brown and gray CLAY to SILTY CLAY; damp to moist --RDR 2--		3	3 3 5	0.66 B	26
			4	3 4 6	0.82 B	25
		10				
660.4	Stiff to very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel; damp --RDR 2--		5	5 6 8	2.38 B	19
			6	4 5 5	1.39 B	22
		15				
			7	4 5 5	2.13 B	15
			8	3 3 6	1.72 B	16
650.9		20				
	Boring terminated at 20.00 ft					

GENERAL NOTES

Begin Drilling **02-21-2022** Complete Drilling **02-21-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **D25 ATV [93%]**
Driller **A&T** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Dry**
At Completion of Drilling **Dry**
Time After Drilling **NA**
Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG RW-02-HA

WEI Job No.: 411-05-03

Client: **James J. Benes & Associates**
Project: **IL Route 7 from 131st Street to 135th Street**
Location: **Cook County, IL**

Datum: NAVD 88
Elevation: 672.17 ft
North: 1814606.75 ft
East: 1118251.97 ft
Station: 112+42.67
Offset: 65.85' RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
671.4	9-inch thick, stiff, black organic SILTY CLAY LOAM --TOPSOIL--			1	PUSH	1.50 P	27
668.2	Stiff, brown and gray CLAY to SILTY CLAY; damp --L_L(%)=33, P_L(%)=17-- --%Gravel=2.3-- --%Sand=10.2-- --%Silt=59.8-- --%Clay=27.7--			2	PUSH	1.25 P	20
	Very stiff to hard, brown and gray SILTY CLAY to SILTY CLAY LOAM, trace gravel; damp	5		3	PUSH	4.00 P	16
664.2				4	PUSH	3.75 P	16
	Boring terminated at 8.00 ft	10					
		15					
		20					

GENERAL NOTES

Begin Drilling **02-23-2022** Complete Drilling **02-23-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **Geoprobe HA**
Driller **A&T** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **1.0" ID pneumatic hammer; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Dry**
At Completion of Drilling ▼ **Dry**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG RW-03

WEI Job No.: 411-05-03

Client: **James J. Benes & Associates**
Project: **IL Route 7 from 131st Street to 135th Street**
Location: **Cook County, IL**

Datum: NAVD 88
Elevation: 670.58 ft
North: 1814703.23 ft
East: 1118253.92 ft
Station: 113+34.22
Offset: 35.34' RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
670.0	7-inch thick gray SANDY GRAVEL --FILL--					
	Hard, brown and gray CLAY LOAM, trace gravel; damp --FILL-- --RDR 2--		1	6 9 9	5.58 B	15
667.6	Stiff to hard, brown and gray to gray SILTY CLAY, trace gravel; damp --RDR 2--	5	2	3 5 9	5.33 B	19
	--gray--		3	3 3 4	1.80 B	18
		10	4	5 4 4	1.15 B	15
660.1	Stiff, gray SILTY LOAM to SILTY CLAY LOAM; wet to saturated --silt seams--		5	3 2 2	1.25 P	20
	--wet spoon--	15	6	3 3 4	1.31 B	13
655.1	Loose, gray fine to medium SAND; wet					
654.3	Stiff to very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace to little gravel; damp to moist		7	3 3 3	2.25 P	14
	--RDR 2--	20	8	3 4 6	1.64 B	18
			9	3 4 5	0.57 B	21
645.6		25	10	3 5 7	1.07 B	14
	Boring terminated at 25.00 ft					
		30				
		35				
		40				

GENERAL NOTES

Begin Drilling **02-15-2022** Complete Drilling **02-15-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **GEOPROBE**
Driller **J&M** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **10.50 ft**
At Completion of Drilling **Dry**
Time After Drilling **NA**
Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG RW-04

WEI Job No.: 411-05-03

Client: **James J. Benes & Associates**
Project: **IL Route 7 from 131st Street to 135th Street**
Location: **Cook County, IL**

Datum: NAVD 88
Elevation: 668.65 ft
North: 1814804.43 ft
East: 1118295.80 ft
Station: 114+43.61
Offset: 40.87' RT

Elevation (ft)	Soil and Rock Description	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
667.7	11-inch thick gray SANDY GRAVEL; damp to wet					
663.2	Very stiff to hard, brown and gray SILTY CLAY; damp --RDR 2--		1	6, 7, 7	5.33 B	19
		5	2	4, 6, 7	3.12 B	20
660.7	Stiff, gray SILTY CLAY LOAM to SILTY LOAM; damp --RDR 2--		3	3, 4, 5	1.07 B	16
653.7	Stiff to very stiff, gray SILTY CLAY; damp --RDR 2--	10	4	4, 4, 6	2.62 B	18
			5	5, 6, 5	3.36 B	16
		15 ▽	6	4, 2, 1	1.23 B	18
652.2	Medium dense, gray coarse SAND; saturated --RDR 2--					
648.2	Very stiff, gray SILTY CLAY, trace gravel; damp --RDR 2--		7	5, 4, 6	3.36 B	15
		20	8	4, 4, 5	2.13 B	16
643.7	Very stiff, gray CLAY; damp --RDR 2--		9	4, 5, 7	2.21 B	20
		25 ▼	10	3, 6, 8	2.30 B	21
	Boring terminated at 25.00 ft	30, 35, 40				

GENERAL NOTES

Begin Drilling **02-21-2022** Complete Drilling **02-21-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **D25 ATV [93%]**
Driller **A&T** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **15.00 ft**
At Completion of Drilling ▼ **25.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG RW-05

WEI Job No.: 411-05-03

Client: **James J. Benes & Associates**
Project: **IL Route 7 from 131st Street to 135th Street**
Location: **Cook County, IL**

Datum: NAVD 88
Elevation: 670.69 ft
North: 1814889.29 ft
East: 1118316.52 ft
Station: 115+30.50
Offset: 31.93' RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
669.9	10-inch thick gray SANDY GRAVEL; damp to moist					
	Hard, brown and gray CLAY LOAM to SILTY CLAY LOAM, trace gravel; damp --FILL-- --RDR 2--		1	4, 4, 6	5.66 B	15
665.2		5	2	4, 8, 11	> 10.25 B	16
	Very stiff, brown and gray CLAY to SILTY CLAY; damp --RDR 2--		3	4, 5, 7	3.77 B	22
660.2	--L_L(%)=36, P_L(%)=18-- --%Gravel=2.0-- --%Sand=17.4-- --%Silt=51.7-- --%Clay=28.9--	10	4	3, 4, 8	3.28 B	25
	Very stiff to hard, brown to gray to gray SILTY CLAY; damp --RDR 2--		5	3, 7, 8	4.67 B	17
655.2	--gray--	15	6	3, 4, 7	2.54 B	16
654.4	Medium dense, gray SANDY GRAVEL; moist to wet					
	Stiff, gray SILTY CLAY LOAM, trace gravel; damp --RDR 2--		7	4, 7, 3	1.80 B	15
650.2		20	8	3, 4, 4	1.39 B	16
647.7	Very stiff, gray CLAY; damp --RDR 2--		9	3, 5, 7	2.30 B	20
645.7	Stiff, gray SILTY CLAY, trace gravel; damp --RDR 2--	25	10	5, 6, 8	1.56 B	15
	Boring terminated at 25.00 ft					
		30				
		35				
		40				

GENERAL NOTES

Begin Drilling **02-21-2022** Complete Drilling **02-21-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **D25 ATV [93%]**
Driller **A&T** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Dry**
At Completion of Drilling **Dry**
Time After Drilling **NA**
Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG RW-06

WEI Job No.: 411-05-03

Client: **James J. Benes & Associates**
Project: **IL Route 7 from 131st Street to 135th Street**
Location: **Cook County, IL**

Datum: NAVD 88
Elevation: 670.35 ft
North: 1814971.79 ft
East: 1118347.32 ft
Station: 116+18.56
Offset: 33.29' RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
669.6	9-inch thick gray SANDY GRAVEL; damp to moist					
667.9	Medium dense, brown and gray LOAM, some gravel; damp --FILL-- --RDR 2--		1	8 7 4	NP	10
	Soft to stiff, brown and gray CLAY to SILTY CLAY LOAM, trace organic matter; damp --RDR 2--	5	2	2 2 2	1.00 P	30
			3	1 2 1	0.74 B	36
659.9		10	4	1 1 2	0.33 B	31
657.4	Stiff, brown and gray SILTY CLAY to SILTY CLAY LOAM, trace gravel; damp --RDR 2--		5	2 3 4	1.89 B	19
654.9	Medium stiff, brown and gray SILTY CLAY LOAM toSILTY LOAM, trace gravel; moist --RDR 2--	15	6	3 3 4	0.50 P	26
652.4	Hard, gray SILTY CLAY; damp --RDR 2--		7	4 4 7	4.59 B	19
649.9	Very stiff, gray CLAY; damp --RDR 2--	20	8	4 7 8	2.95 B	21
	Very stiff, gray SILTY CLAY, trace gravel; damp --RDR 2--		9	5 5 6	NR	
645.4		25	10	3 5 5	2.13 B	15
	Boring terminated at 25.00 ft	30				
		35				
		40				

GENERAL NOTES

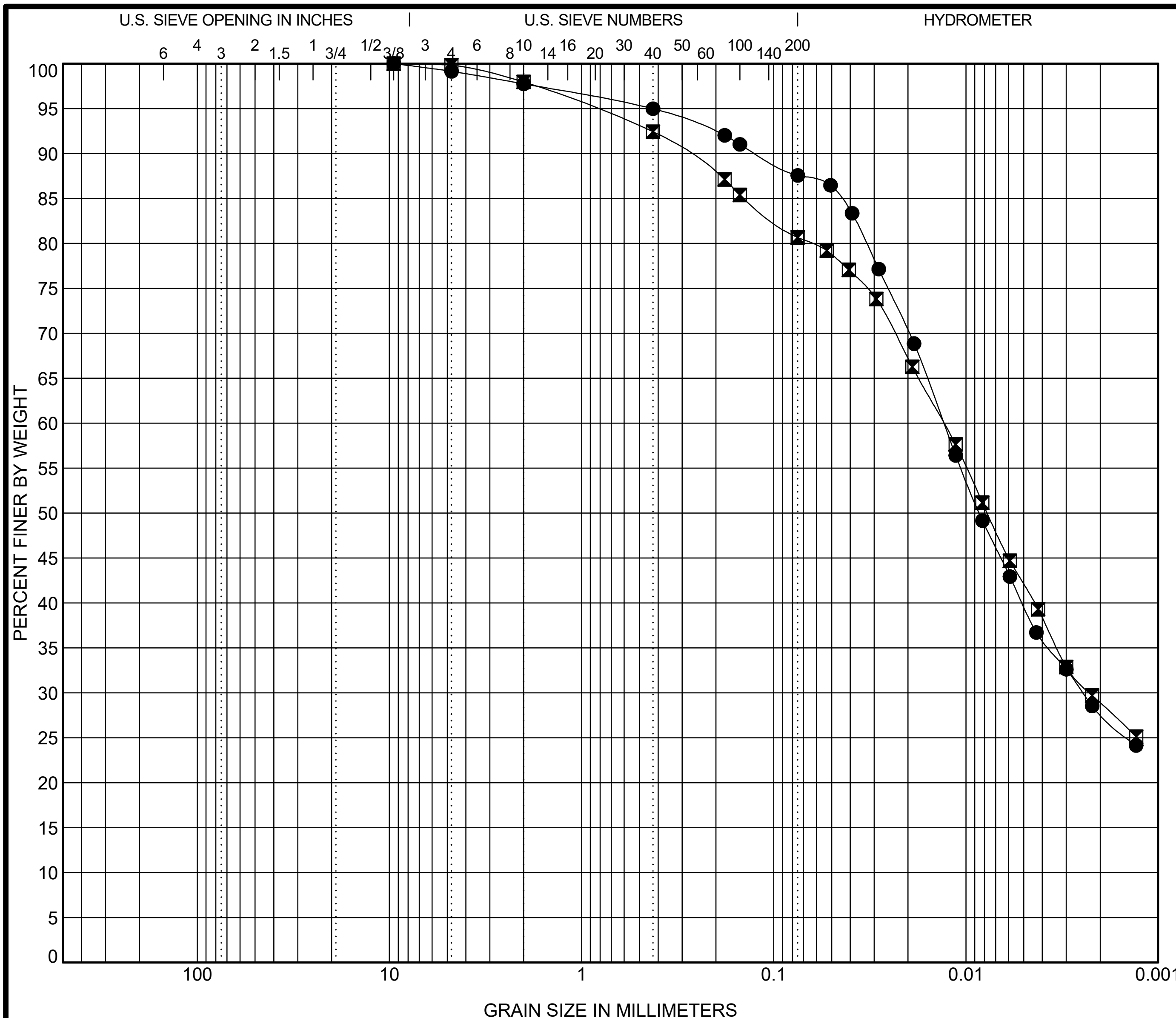
Begin Drilling **02-23-2022** Complete Drilling **02-23-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **D25 ATV [93%]**
Driller **A&T** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Dry**
At Completion of Drilling **Dry**
Time After Drilling **NA**
Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

APPENDIX B



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification			IDH Classification	LL	PL	PI	Cc	Cu
●	RW-02-HA#2	2.0 ft	**Silty Clay Loam**	33	17	16		
⧗	RW-05#4	8.5 ft	**Silty Clay Loam**	36	18	18		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-02-HA#2	2.0 ft	9.5	0.013	0.002		2.3	10.2	59.8	27.7
⧗	RW-05#4	8.5 ft	9.5	0.013	0.002		2.0	17.4	51.7	28.9

WEI SINCE 1982

Terracon

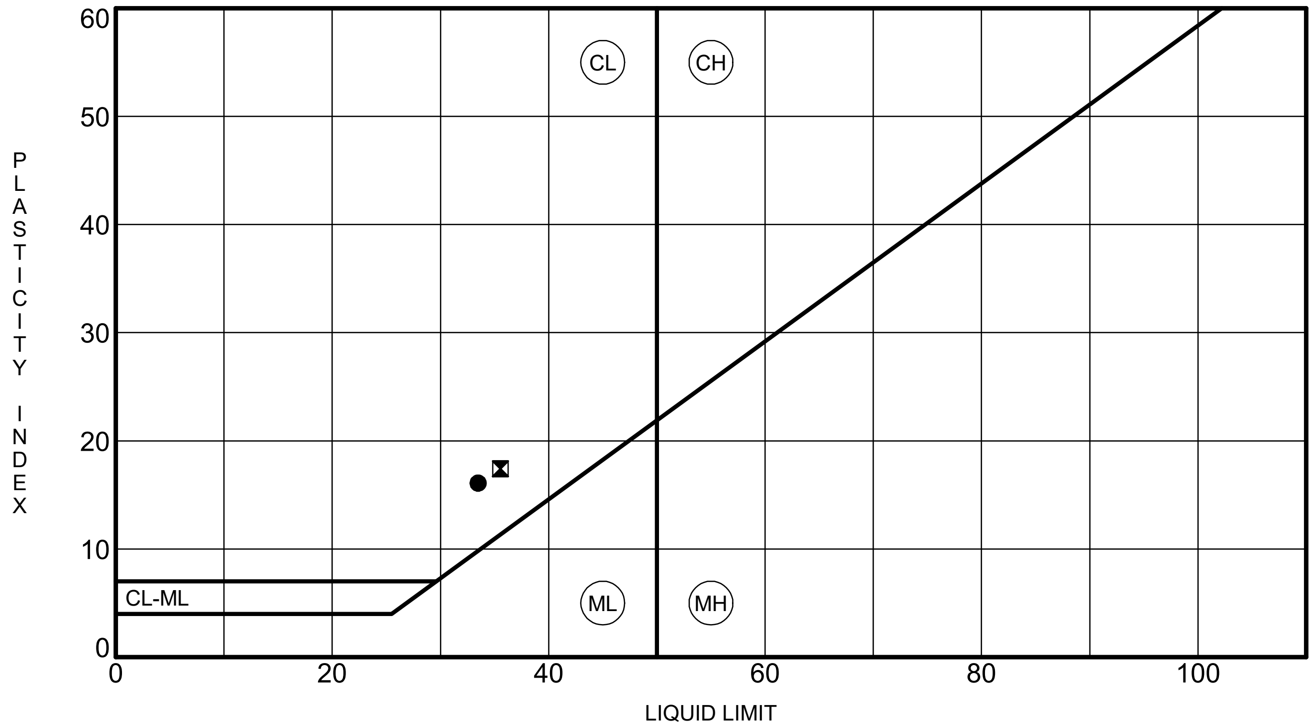
Telephone:
Fax:

GRAIN SIZE DISTRIBUTION

Project: IL Route 7 from 131st Street to 135th Street

Location: Cook County, IL

Number: 411-05-03



	Specimen Identification		LL	PL	PI	Fines	IDH Classification
●	**RW-02-HA#2**	**2.0 ft**	**33**	**17**	**16**	**88**	**Silty Clay Loam**
⧗	**RW-05#4**	**8.5 ft**	**36**	**18**	**18**	**81**	**Silty Clay Loam**

Terracon

Telephone:
Fax:

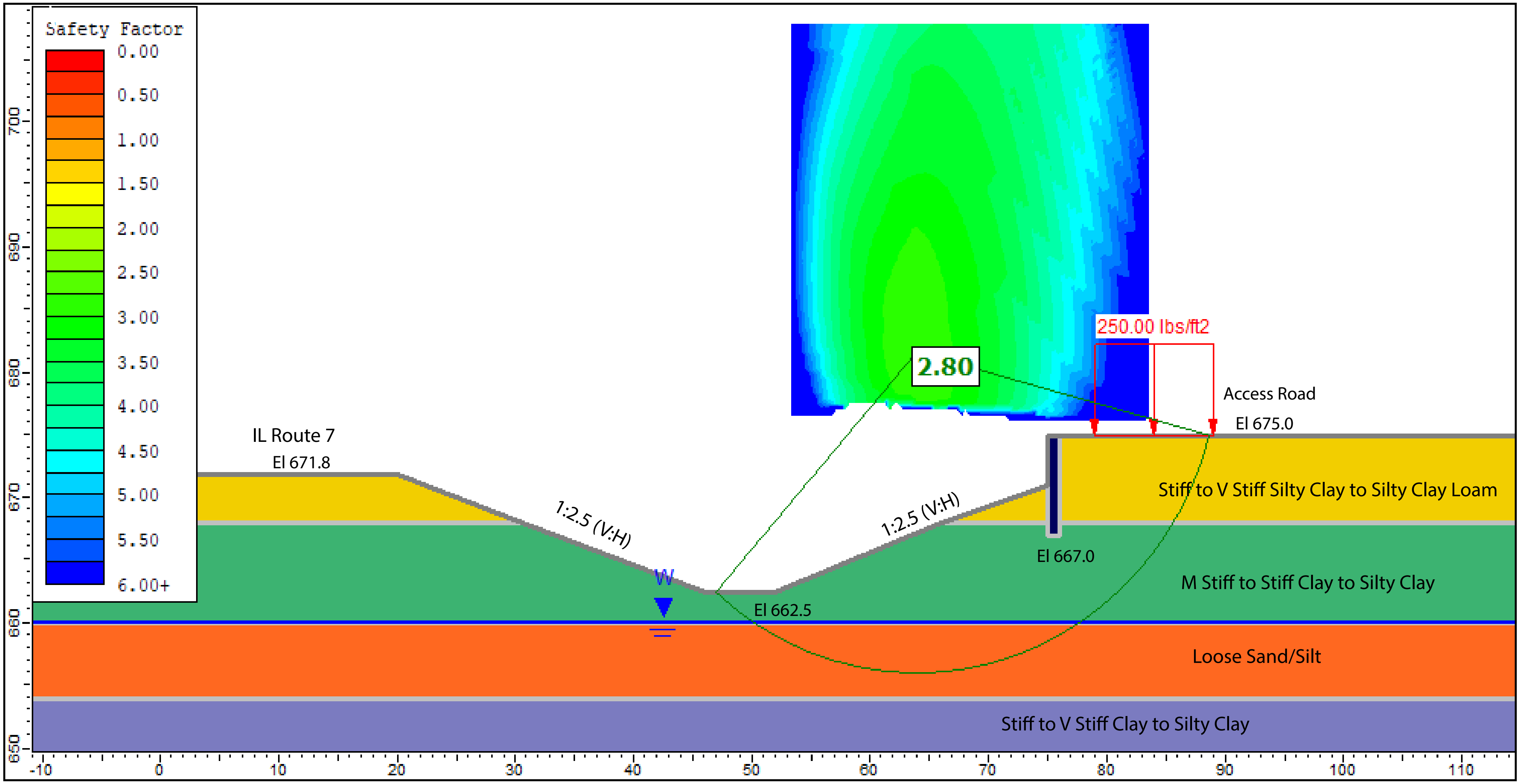
ATTERBERG LIMITS' RESULTS

Project: IL Route 7 from 131st Street to 135th Street

Location: Cook County, IL

Number: 411-05-03

APPENDIX C



Undrained Analysis, IL Route 7, Station 115+00, Ref Borings: RW-02 to RW-06

Layer ID	Description	Total Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Stiff to V Stiff Clay to Silty Clay	120	1300	0
2	M Stiff to Stiff Clay to Silty Clay	115	800	0
3	Loose Sand/Silt	120	0	29
4	Stiff to V Stiff Clay to Silty Clay to Clay	120	1800	0

GLOBAL STABILITY: IL ROUTE 7 / SOUTHWEST HIGHWAY, RETAINING WALL, COOK COUNTY, IL

SCALE: GRAPHICAL | APPENDIX C-1 | DRAWN BY: N. Balakumaran | CHECKED BY: M. Seyhun

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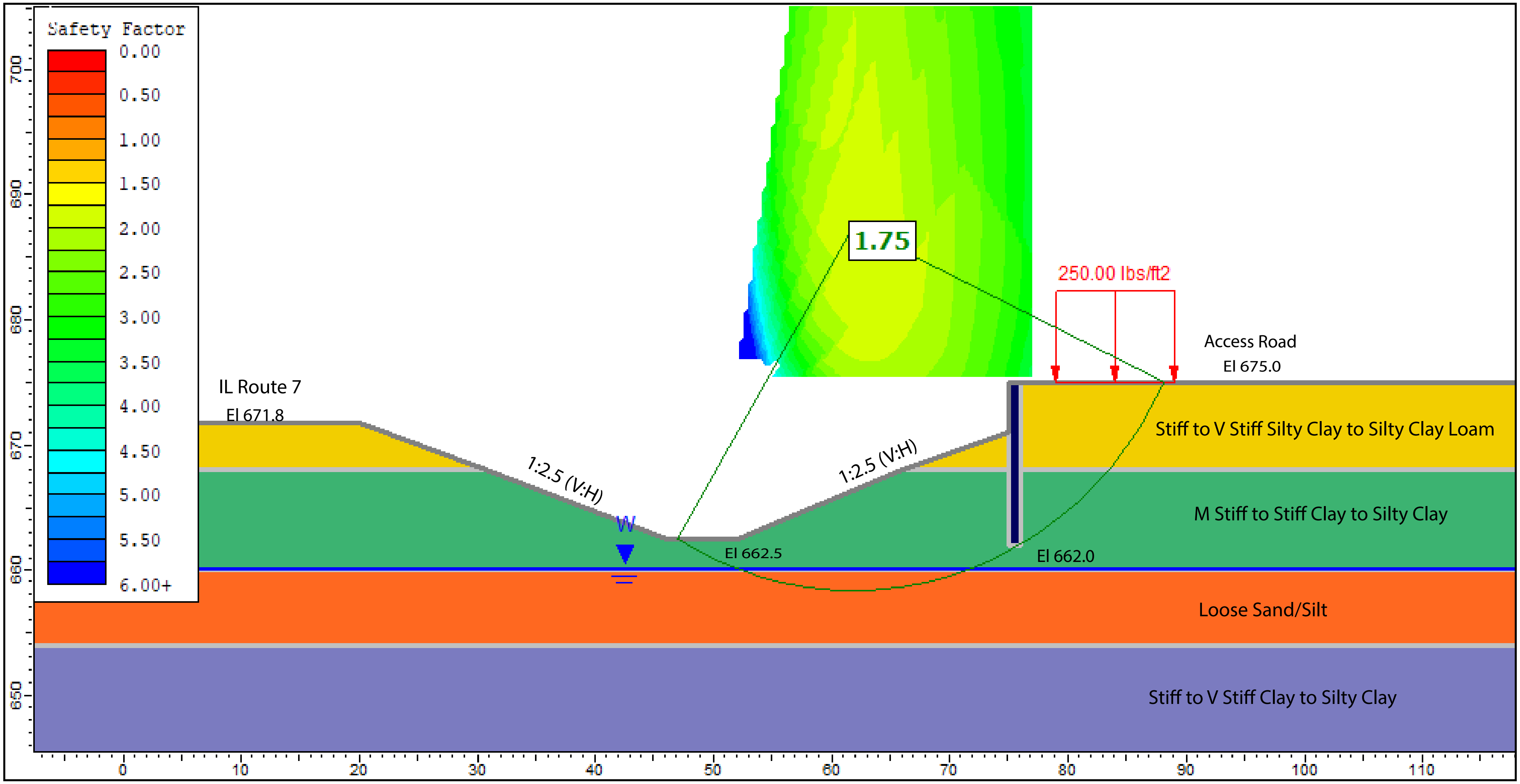
FOR James J. Benes & Associates | 411-05-03



Drained Analysis, IL Route 7, Station 115+00, Ref Borings: RW-02 to RW-06

Layer ID	Description	Total Unit Weight (pcf)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	Stiff to V Stiff Clay to Silty Clay	120	1300	0
2	M Stiff to Stiff Clay to Silty Clay	115	800	0
3	Loose Sand/Silt	120	0	29
4	Stiff to V Stiff Clay to Silty Clay to Clay	120	1800	0

GLOBAL STABILITY: IL ROUTE 7 / SOUTHWEST HIGHWAY, RETAINING WALL, COOK COUNTY, IL

SCALE: GRAPHICAL | APPENDIX C-2 | DRAWN BY: N. Balakumaran | CHECKED BY: M. Seyhun

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FOR James J. Benes & Associates | 411-05-03

APPENDIX D

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

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

FILE NAME = $FILEL$
$MODEL NAME$
USER NAME = $USER$
PLOT SCALE = $SCALE$
PLOT DATE = $DATE$

DESIGNED - BLG
DRAWN - SMP
CHECKED - BDH
DATE -

REVISED -
REVISED -
REVISED -
REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CROSS SECTIONS – IL RTE 7

SCALE: 1"=10' HORIZ. 1"=5' VERT.
SHEET OF SHEETS
STA. 111+50.00 TO STA. 113+50.00

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
3578	2019-001-R	COOK	198	175
		CONTRACT NO. 62H82		
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		

FILE NAME = $FILEL$
$MODELNAME$
USER NAME = $USER$
PLOT SCALE = $SCALE$
PLOT DATE = $DATE$

DESIGNED - BLG
DRAWN - SMP
CHECKED - BDH
DATE -
REVISED -
REVISED -
REVISED -
REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CROSS SECTIONS – IL RTE 7

SCALE: 1"=10' HORIZ. 1"=5' VERT.
SHEET OF SHEETS
STA. 114+00.00 TO STA. 116+00.00

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
3578	2019-001-R	COOK	198	176

ILLINOIS FED. AID PROJECT
CONTRACT NO. 62H82