STRUCTURE GEOTECHNICAL REPORT
CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 16 (PROPOSED SN 016-1805)
F.A.I. ROUTE SB 90/94/290 (DAN RYAN EXPRESSWAY)
STATION 7320+50.00 TO STATION 7326+25.98
SECTION 2014-013R&B-R, IDOT D-91-227-13/PTB 163-001
COOK COUNTY, ILLINOIS

For

AECOM

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Original: September 27, 2017
Revised: February 15, 2018

Technical Report Documentation Page

1. Title and Subtitle Structure Geotechnical Report Circle Interchange Reconstruction Retaining Wall 16, F.A.I. Route 90/94/290 (Dan Ryan expressway) Station 7320+50.00 to Station 7326+25.98		**2. Report Date** February 15, 2018 **3. Report Type** ☒ SGR ☐ RGR ☐ Draft ☒ Final ☒ Revised
4. Route / Section / County F.A.I. 90/94/290/ 2014-013R&B-R/ Cook		**5. IDOT Job No./Contract** D-91-227-12/60X93
6. PTB / Item No. 163/001	7. Existing Structure Number(s) Existing Retaining Walls 8, 11	8. Proposed Structure Number(s) 016-1805
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11. Abstract

A 579.5-foot long, 21.1 feet maximum total height new retaining wall will be constructed extending from Station 7320+50.00 to Station 7326+25.98 along East Bound (EB) Taylor Street Exit Ramp (Dan Ryan Expressway). This report provides geotechnical recommendations for the design and construction of the proposed retaining wall structure.

Based on our subsurface investigation results, the soils consists of up to 20 feet of fill, over up to 7.5 feet of medium stiff to very stiff, brown and gray silty clay to silty clay loam, over up to 34 feet of very soft to medium stiff, gray clay to silty clay, over up to 33 feet of very stiff to hard, silty clay to silty clay loam, and into dense to very dense silt to silty loam commonly known as the "Chicago Hardpan."

The proposed wall is a cut wall. MSE walls are proposed to minimize the impact of the existing T-type wall with footings and piles, and other utility constrains in this area. There are several utilities such as existing 72-inch combined sewer that runs parallel to the proposed wall. A permanent drilled shaft soil retention system will be added to the MSE wall portion at the south end. At other locations, the MSE wall excavations will be back-sloped up to 1:1.5 (V:H) and backfilled with LCCF to eliminate lateral forces.

The design soil parameters for permanent drilled shaft soil retention system are included in the report. Global stability analyses performed for the maximum height of this wall showed satisfactory factor of safety against slope failure. For the MSE wall, we recommend the wall be designed based on a factored resistance of 2,000 psf using resistance factor of 0.65. The MSE wall fill alternatives are included in the report.

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1.0 INTRODUCTION

This report presents the results of Wang Engineering, Inc. (Wang) subsurface investigation, laboratory testing, and geotechnical engineering evaluations for the proposed wall SN 016-1805 (Retaining Wall 16) along East Bound (EB) Taylor Street Exit Ramp (Dan Ryan Expressway) in connection with the Circle Interchange Reconstruction program in the City of Chicago, Cook County, Illinois. A Site Location Map is presented as Exhibit 1.

The purpose of our investigation was to characterize the site soil and groundwater conditions, perform geotechnical engineering analyses, and provide recommendations for the design and construction of the new wall structure.

1.1 Project Description

The Circle Interchange is over 50 years old and has significant congestion and safety problems. The project is aiming to improve safety and mobility as well as upgrade the mainline and interchange facilities. The project will also improve other modes of transportation such as transit, pedestrians and bicyclists within the same corridor.

The Circle Interchange Reconstruction project is along Interstate 90/94 (I-90/94) from south of Roosevelt Road to north of Lake Street, along Interstate 290 (I-290) from Loomis Street to the Circle Interchange; and along Congress Parkway from the Circle Interchange to Canal Street/Old Post Office. The routes typically have three lanes of traffic in each direction with mostly one lane ramp at interchanges. Locally, the north leg is known as the Kennedy Expressway, the south leg as the Dan Ryan

Expressway and the west leg as the Eisenhower Expressway. Within the project area, there are several cross street bridges over I-90/94 and I-290 considered for reconstruction. Along I-90/94, from south to north, the cross street overpasses include Taylor Street, Van Buren Street, Jackson Boulevard, and Adams Street. Along I-290, from west to east, the cross street overpasses include Morgan Street, Peoria Street, and Halsted Street.

The proposed improvements include additional through lanes in each direction on I-90/94. The horizontal alignment and vertical profiles throughout the interchange will be improved. A new two-lane flyover, Ramp NW (Flyover) will be constructed for I-90/94 northbound to I-290 westbound traffic. Cross street bridges, Morgan Street, Harrison Street, Halsted Street, Peoria Street, Taylor Street, Adams Street, Jackson Boulevard, and Van Buren Street will be reconstructed. Various existing ramps will be reconstructed and up to fifty new retaining walls will be constructed.

1.2 Proposed Structure

Based on latest TSL provided by AECOM, the new retaining wall 16 (SN 016-1805) will be 579.5-foot long measured along wall's front face extending from Station 7320+50.00 to Station 7326+25.98 and will consist of MSE wall. The proposed wall will run along the EB Taylor Street Exit Ramp and will have a maximum total height of about 21.1 feet. The cross sections show the existing ground surface on the back of the wall will be mostly flat. The wall is a cut wall type.

MSE wall excavations will be back-sloped up to a maximum 1:1.5 (V:H). The latest TSL is shown in the Type Size Location Plan (Appendix C).

1.3 Existing Structure

There are existing concrete retaining walls 8 and 11 with footings on piles that will overlap with the proposed MSE wall from Station 7323+31.75 to Station 7326+25.98. Wall 8 stem will be removed and Wall 11 partially or fully removed to make space for the new MSE wall.

2.0 SITE CONDITIONS AND GEOLOGICAL SETTING

The site is located within the City of Chicago at the I-90/94 and I-290 Circle Interchange. On the USGS Chicago Loop 7.5 Minute Series map, the bridge is located in the SW¼ of Section 16, Tier 39 N, Range 14 E of the Third Principal Meridian.

The following review of published geologic data, with emphasis on factors that might influence the design and construction of the proposed engineering works, is meant to place the project area within a geological framework and confirm the dependability and consistency of the present subsurface investigation results. For the study of the regional geologic framework, Wang considered northeastern Illinois in general and Cook County in particular. Exhibit 2 illustrates the Site and Regional Geology.

2.1 Physiography

The site is situated within the northern section of the Chicago/Calumet lacustrine plain (Chrzatowsky and Thompson 1992). The area's flat, lakeward-sloping surface is a wave-scoured groundmoraine covered by thin and discontinuous lacustrine offshore silt and clay (Willman 1971).

The proposed retaining wall along EB Taylor Street Exit Ramp will be constructed with maximum cut height of 21 feet. Elevations along the proposed wall range from 575 feet at the northern end to 593 feet at the southern end.

2.2 Surficial Cover

Within the project area, 100-foot thick or more, Wisconsinan-age glacial drift covers the bedrock (Leetaru et al. 2004). The glacial cover is made up of clay and silt of the Equality Formation of the Mason Group and diamictons of the Wadsworth and Lemont Formations of the Wedron Group (Hansel and Johnson 1996). The Equality Formation is made up of bedded silt and clay, locally laminated, with lenses and/or thin beds of sand and gravel. The Wadsworth Formation consists of relatively homogenous, massive, gray till with clay to silty clay matrix, with dolostone and shale clasts and occasional lenses of sorted and stratified silt. The Wadsworth Formation is underlain by the pebbly silty clay loam to silty loam diamicton of the Yorkville Member of the Lemont Formation, known informally as the Chicago "hardpan."

From a geotechnical viewpoint, the Equality Formation is characterized by low strength, medium to high plasticity, and medium to high moisture content, whereas the Wadsworth Formation is characterized by low plasticity, medium to low moisture content, medium to very stiff consistency, poor permeability, and low compressibility. The Yorkville Member hardpan is characterized by low plasticity, high blow counts, and low moisture content (Bauer et al. 1991; Peck and Reed 1954).

2.3 Bedrock

In the project area, the glacigenic deposits rest unconformably over a 350-foot thick Silurian-age dolostone. The top of bedrock may be encountered at elevations lower than 500 feet or 100 feet below ground surface (bgs). The Silurian dolostone dips gently eastward at a pace of 15 feet per mile. Only inactive faults are known in the area, and the seismic risk to the proposed structure from the existing faults is minimal (Leetaru et al. 2004; Willman 1971). There are no records of mining activity in the area, but deep tunnel excavations are known to exist.

Our subsurface investigation results fit into the local geologic context. The borings drilled in the project area revealed the native sediments consist of silty clay lacustrine deposits of the Equality Formation and silty clay diamicton of the Wadsworth Formation resting on top of more competent silty clay loam diamicton (hardpan) of the Lemont Formation.

3.0 EXISTING GEOTECHNICAL DATA

There is no existing geotechnical information along the proposed retaining wall.

4.0 METHODS OF INVESTIGATION

The following sections outline the methods of subsurface and laboratory investigations. All elevations in this report are based on NAVD 1988.

4.1 Subsurface Investigation

Eight structure borings designated as 16-RWB-03 through 16-RWB-05, 16-RWB-04A, 16-RWB-04B, and 10-RWB-07 through 10-RWB-09, were drilled by Wang between July 15 and August 11, 2014 along the proposed wall alignment.

In addition, we have included Boring VST-07 performed by Wang in December 10, 2015, located approximately about 150 feet south of the proposed wall end point to obtain in-situ shear strength of the soft clay. Furthermore, a piezometer Boring 10-PZ-01 drilled by Wang on December 12, 2014, located approximately 350 feet north of the proposed wall start point was considered for groundwater evaluation.

The as-drilled boring locations were surveyed by Dynasty Group Inc. and station and offset information for each boring were provided by AECOM. The station and offset referenced the wall alignment. Boring

location data are presented in the Boring Logs (Appendix A). The as-drilled boring locations are shown in the Boring Location Plan (Exhibit 3).

Truck-mounted drilling rig equipped with hollow stem augers was used to advance and maintain open boreholes to 10 feet and mud rotary drilling technique was used below 10 to boring termination depths or to the bedrock. 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 30 feet below ground surface (bgs) and at 5-foot intervals to boring termination depths. Soil samples collected from each sampling interval were placed in sealed jars and transported to Wang Geotechnical Laboratory in Lombard, Illinois for further examination and laboratory testing.

Field boring logs, prepared and maintained by a Wang engineer or geologist, include lithological descriptions, visual-manual soil/rock classifications, results of Rimac and pocket penetrometer unconfined compressive strength tests, results of Standard Penetration Tests (SPT) recorded as blows per 6 inches of penetration. Vane Shear Test (VST) were also recorded on special forms. The SPT N value, shown on the soil profile, is the sum of the second and third blows per 6 inches. The soils were described and classified according to Illinois Division of Highways (IDH) Textural Classification system. The field logs were finalized by an experienced engineering geologist after verifying the field visual classifications and laboratory test results.

Groundwater observations were made during and at the end of drilling operations. Due to safety considerations, boreholes were grouted immediately upon completion.

4.2 Vane Shear Tests

Wang performed vane shear tests in Boring VST-07. Vane shear strength tests were performed using calibrated RocTest vane shear equipment in undisturbed and remolded soil conditions. The sensitivity shown in the boring logs is the ratio of shear strength in undisturbed and remolded conditions. In general, the vane shear values for soft clays were significantly higher than the corresponding values from unconfined compressive strength tests using the RIMAC apparatus. Vane shear results were used for the analyses.

4.3 Laboratory Testing

All soil samples were tested in the laboratory for moisture content (AASHTO T-265). Atterberg limits (AASHTO T 89 and T 90) and particle size (AASHTO T 88) analyses were performed on selected soil samples representing the main soil units encountered during investigation. 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 Soil Profile (Exhibit 4). Rock core photographs are shown in Appendix A.

The soil samples will be retained in our laboratory for 60 days following this report submittal. After that time, soil samples will be discarded unless a specific written request is received as to their disposition.

5.0 RESULTS OF FIELD AND LABORATORY INVESTIGATIONS

Detailed descriptions of the soil conditions encountered during our subsurface investigation are presented in the attached Boring Logs (Appendix A) and in the Soil Profile (Exhibit 4). Please note that strata contact lines represent approximate boundaries between soil types. The actual transition between soil types in the field may be gradual in horizontal and vertical directions.

5.1 Soil Conditions

Along the proposed wall, borings encountered pavement structure. The pavement structure consists of asphalt or concrete or both asphalt and concrete with thickness ranging from 10 to 24 inches over aggregate base course. In descending order, the general lithologic succession encountered beneath the pavement structure includes 1) man-made ground (fill); 2) medium stiff to very stiff silty clay to silty clay loam; 3) very soft to medium stiff clay to silty clay; 4) stiff to hard silty clay to silty clay loam and silty loam diamicton; 5) dense to very dense silt to silty loam

1) Man-made ground (fill)

Underneath the pavement structure, borings encountered up to 20 feet of cohesive and/or granular fill. The granular fill included up to 20 feet of loose to very dense, brown and gray silty loam, sand, and sandy gravel with SPT N-value of 7 to more than 50 blows/foot and moisture content values of 3 to 22% The cohesive fill measured up to 5 feet of medium stiff to stiff, brown and gray silty clay loam with unconfined compressive strength (Q_u) values of 0.74 to 1.39 tsf and moisture content (MC) values of 13 and 23%.

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

Below the fill, at elevations of 573.5 to 581.9 feet, borings 16-RWB-04B, 16-RWB-05 and 10-RWB-09 revealed up to 7.5 feet of medium stiff to very stiff, brown and gray silty clay to silty clay loam with Q_u values of 0.82 to 3.00 tsf and moisture content values of 13 to 27%.

3) Very soft to medium stiff clay to silty clay

At elevations 568.3 to 579.4 feet, borings encountered up to 34 feet of very soft to medium stiff, gray clay to silty clay with Q_u values of 0.08 to 0.82 tsf and moisture content values of 18 to 39%. Laboratory index testing performed on samples from this layer shows liquid limit (L_L) and plastic limit (P_L) values of 34 to 35%, and 17 to 18%, respectively. This layer is commonly known as the "Chicago Blue Clay." In-situ vane undistributed shear strength obtained from Boring VST-07 between elevations of 577.6 to 548.6 feet varied from 520 to 1245 psf.

4) Stiff to hard silty clay to silty clay loam and silty loam diamiction

At elevations of 541.1 to 546.3 feet and extending to the boring termination depths or top of silty loam, borings advanced through cohesive and non-cohesive soils. The cohesive soils measured up to 33 feet of very stiff to hard, silty clay to silty clay loam with Qu values of 1.23 to 7.95 tsf, and moisture content values of 12 to 33%. Laboratory index testing performed on samples from this layer shows L_L and P_L values of 25 to 26%, and 16 to 20%, respectively. The interbedded non-cohesive soil is classified as medium dense to dense, gray silty loam to sand with SPT-N values of 13 to 38 blows/foot and moisture content values of 11 to 24%.

5) Dense to very dense silt to silty loam

At elevations of 522.9 to 535.6 feet, the borings on the mid to southern end of the proposed wall alignment advanced through dense to very dense, gray silt to silty loam with SPT N values of 33 to more than 50 blows/foot, and moisture content values of 12 to 19 %. This layer is commonly known as the "Chicago Hardpan."

5.2 Groundwater Conditions

Groundwater was observed in Borings 10-RWB-07 and 16-RWB-04.during drilling at elevations of 532.5 and 568.0 feet (44.5 and 8.0 feet bgs). After drilling, mud was recorded in the borehole due to mud rotary drilling. Although groundwater was not observed within the upper fill layer, we anticipate perched water may be encountered during time of heavy precipitation.

A Piezometer 10-PZ-01 installed at station 7315+23.78 about 350 feet north from proposed retaining wall start point, was set with in silty loam to sandy loam deposit with the top and bottom of piezometer screen elevations at 519.3 and 499.3 feet (73.0 and 93.0 feet bgs), respectively. The groundwater levels monitored in the piezometer show elevations ranging from 549.2 to 554.5 feet with an average water table elevation of 552.4 feet. The groundwater elevation for design of the wall should be taken at 555 feet. Encountering under pressure groundwater bearing layer should be accounted for during design and construction of the wall foundations.

5.3 Seismic Design Considerations

The retaining wall is located in Seismic Performance Zone (SPZ) 1 and is not required to be designed for seismic forces as per 2012 IDOT Bridge Manual (IDOT, 2012).

6.0 ANALYSIS AND RECOMMENDATIONS

6.1 Retaining Wall Type Evaluation

The proposed retaining wall will be a cut wall along EB Taylor Street Exit Ramp from Tyler Street to SB I-90/94. Consideration was given in using standard cast-in-place cantilever concrete (T-type) walls with spread footings, however, it was ruled out due to low bearing resistance, excessive settlements unless drilled shaft support or ground improvement is performed. In addition, the construction of these types of wall would require a temporary soil retention system to retain the cut slope during construction of the proposed wall.

MSE wall may be used to minimize the impact of the existing T-type wall with footings and piles, and other utility constrains in this area. There are several utilities such as existing 72-inch combined sewer that runs parallel to the proposed wall. Therefore, a MSE wall will be used for the entire wall section.

The geotechnical design recommendations for the proposed MSE wall and temporary soils retention system are included in the following sections.

6.2 MSE Wall

MSE wall will be used for the entire length of the wall with a maximum height of 21.1 feet at the Taylor Street West Abutment (Station 7326+25.98.) The wall will have existing retaining wall 11 on the back side of the proposed wall alignment from Station 7320+50.00 to Station 7323+31.72. This will be removed partially or fully to make space for the new MSE wall. The remaining MSE wall from Station

7323+31.72 to Station 7326+25.98 will have existing retaining wall 8 on the front side of the proposed wall alignment. The stem of this wall will be removed.

MSE wall excavations along the entire wall can be back-sloped up to 1:1.5 (V:H) and backfilled with LCCF to eliminate lateral forces, reduce excavations, and clear Right of Way restrictions. It should be noted that saturated granular material under perched water conditions are expected and will likely create local surface sloughing. Therefore, measures such as temporary soil retention system or other temporary retention systems must be planned for construction.

During the MSE wall option development, we discussed with AECOM various fill alternatives for the MSE wall taking into consideration of the soil conditions at founding level and available MSE reinforcement zone width. We assumed a reinforcement length equal to 70 percent of the total wall height (maximum 14.8 feet) or a minimum of 8 feet. We have analyzed several alternatives for the fill material to be used in the reinforcement zone and fill area between the reinforcement zone and with backfill on top of 1:1.5 (V:H) excavation back-slope, as follows:

1. Using the regular fill material for the MSE reinforcement zone area and back-slope, and
2. Using Class III Lightweight Cellular Concrete Fill (LCCF) for the MSE reinforcement zone, and on top of 1:1.5 (V:H) excavation back-slope.

Based on our analyses, alternative 2 satisfies the bearing capacity requirements which govern and is the recommend backfill for the MSE wall.

6.2.1 Bearing Resistance

The factored bearing resistance to be considered for the design of the MSE wall was calculated assuming the top of the levelling pad will be established at 3.5 feet below the finished grade on the front face of the wall with 1:1.5 (V:H) excavation back-slope eliminating lateral force. As per 2014 AASHTO LRFD Bridge Design Specifications, a bearing resistance factor of 0.65 was used. The nominal bearing resistance of the foundation soils is calculated to be 3,100 psf and the factored bearing resistance is 2,000 psf. The estimated applied factored maximum uniform bearing pressure at maximum height for the LCCF is 1,950 psf, thus satisfying bearing.

6.2.2 Sliding and Overturning

The estimated friction angles between the base of the MSE wall and the existing cohesive foundation soil or granular backfill are 28˚ and 30˚, respectively, and the corresponding friction coefficients are 0.53 and 0.58, respectively. MSE retaining walls are designed based on a geotechnical sliding resistance factor (ϕ_τ) of 1.0 for soil-on-soil contact (AASHTO 2014). Sliding and eccentricity of the LCCF filled MSE wall is stable.

6.2.3 Settlement Analyses

Considering the unloading and reloading effect and the placement of LCCF, the long-term primary settlement of MSE wall with LCCF will be 1 inch or less.

6.2.4 Global Stability Analyses

Global stability analysis was performed for the MSE wall maximum section at Station 7326+25.98 with total height of 21.1 feet for both short-term (undrained) and long-term (drained) soil conditions as presented in Appendix B. The soil parameters established in Section 6.3 were used for the stability analysis. We estimate the maximum wall section has a short-term factor of safety (FOS) of 1.5 and a long-term FOS of 1.9 (Appendices B-1 and B-2), therefore satisfying the minimum IDOT FOS requirements (IDOT, 2015). The undrained analysis for excavated ground sloped at 1:1.5 (V:H) before construction of MSE wall showed FOS of 1.5 (Appendix B-3).

6.3 Temporary Soil Retention System Parameters

In the event that a Temporary Soil Retention system is required because of actual slope sloughing soils conditions encountered during construction, the soil parameters on Tables 1 and 2 may be used.

Table 1: Earth Pressure Parameters for Design of Walls
Stations 7323+11.00 to 7326+25.98
(Ref. Borings 16-RWB-03, 16-RWB-04A, 10-RWB-08, 10-RWB-09 and VST-07)

Layer Elevations/ Soil Description	Moist Unit Weight (pcf)	Drained Shear Strength Properties		Earth Pressure coefficients[1]	
		Cohesion Cu (psf)	Friction Angle, φ' (Degree)	Active Pressure	Passive Pressure
587[2] to 579 M Dense to Dense SA to SA GR	115	0	30	0.33	3.00
579 to 572 Stiff SI CL	115	100	30	0.33	3.00
572 to 567 Soft to M Stiff CL	110	50	29	0.35	2.88
567 to 557 Soft to M Stiff CL	110	50	29	0.35	2.88
557 to 550 Soft to M Stiff CL	110	50	29	0.35	2.88
550 to 542 Stiff SI CL	115	100	30	0.33	3.00
542 to 540 V Stiff SI CL LOAM	120	100	30	0.33	3.00
540 to 530 V Stiff to Hard SI CL LOAM	125	100	31	0.32	3.12
530 to 523 V Stiff SI CL LOAM	120	100	30	0.33	3.00
523 to 511.1[3] Dense to V Dense SI to SI LOAM	125	0	33	0.29	3.39

[1] Earth pressure coefficients for straight backfill
[2] Existing grade elevation at top of wall
[3] Boring termination depth

Design considerations should include deflection control at the top of the wall. The lateral deformation of the wall should be designed using the parameters shown in Tables 2 for the p-y curve (COMP624) method. The strength parameters for the soft silty clay (Layer 3) were obtained from vane shear testing conducted at VST-07.

Table 2: Geotechnical Parameters for Design of Walls
Stations 7323+11.00 to 7326+25.98
(Ref. Borings 16-RWB-03,16-RWB-04A, 16-RWB-04B, 10-RWB-08, 10-RWB-09 and VST-07)

Layer Elevations/ Soil Description	Moist Unit Weight (pcf)	Shear Strength Properties			Estimated Lateral Soil Modulus Parameter[1], k (pci)	Estimated Soil Strain Parameter[1], ε_{50} (%)
		Short Term		Long Term		
		Cohesion Cu (psf)	Friction Angle, φ (Degree)	Friction Angle, φ' (Degree)		
587[2] to 579 M Dense to Dense SA to SA GR	115	0	30	30	40	--
579 to 572 Stiff SI CL	115	1000	0	30	500	0.7
572 to 567 Soft to M Stiff CL	110	800	0	29	100	1.0
567 to 557 Soft to M Stiff CL	110	600	0	29	100	1.0
557 to 550 Soft to M Stiff CL	110	780	0	29	100	1.0
550 to 542 Stiff SI CL	115	1000	0	30	500	0.7
542 to 540 V Stiff SI CL LOAM	120	2000	0	30	1000	0.5
540 to 530 V Stiff to Hard SI CL LOAM	125	4400	0	31	2000	0.4
530 to 523 V Stiff SI CL LOAM	120	2000	0	30	1000	0.5

Layer Elevations/ Soil Description	Moist Unit Weight (pcf)	Shear Strength Properties			Estimated Lateral Soil Modulus Parameter[1], k (pci)	Estimated Soil Strain Parameter[1], ε_{50} (%)
		Short Term		Long Term		
		Cohesion Cu (psf)	Friction Angle, φ (Degree)	Friction Angle, φ' (Degree)		
523 to 511.1[3] Dense to V Dense SI to SI LOAM	125	0	33	33	125	--

[1]Based on L-Pile Technical Manual 2012
[2] Top of boring elevation
[3] Boring termination depth

6.4 Impact of Wall Installation on Existing Walls and Utilities

The potential impact of the new wall installation on the existing walls 8, 11, and 12; existing 72-inch diameter combined sewer; and buried utilities (sewer, water, electric, ITS cable, etc.) must be considered in final design to ensure specific deformation limits are not exceeded, leading to settlement or structural cracks. The UIC building is more than 100 feet away thus surface movements next to the building would be less than 0.25 inches satisfying CDOT criteria.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Excavation and Dewatering

Foundation excavations should be performed in accordance with local, state, and federal regulations including current OSHA regulations. The potential effect of ground movements upon nearby structures and utilities should be considered during construction. Based on the results of our investigation and proposed excavation in front of the wall, perched water is likely to be encountered during construction within the fill. The water accumulated in excavation should be removed through conventional sump and pump methods.

7.2 Filling and Backfilling

All fill and backfill materials will be as per IDOT Standard Specification.

7.3 MSE Wall

The MSE wall should be constructed as per Section 522 Retaining Walls of the IDOT Standard Specifications. Select fill material should be Class III LCCF material if used, as per IDOT District One

Special Provisions. The impact of the presence of existing buildings, parking lots, and utilities on the construction of the proposed Wall 16 should be evaluated.

7.4 Construction Monitoring

Due to the wall's proximity to utilities, walls and other structures, Wang recommends instrumentation of the wall and ground surfaces with the use of ground survey monuments, survey pins on wall, and inclinometers to monitor actual deflections and movements during construction.

8.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the borings drilled at the locations shown on the boring logs and in Exhibit 3. This report does not reflect any variations that may occur between the borings or elsewhere on the site, variations whose nature and extent may not become evident until the course of construction. In the event that any changes in the design and/or location of Retaining Wall 16 (SN016-1805) are planned, we should be timely informed so that our recommendations can be adjusted accordingly.

It has been a pleasure to assist AECOM and the Illinois Department of Transportation on this project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

WANG ENGINEERING, INC. exp 11/30/2019

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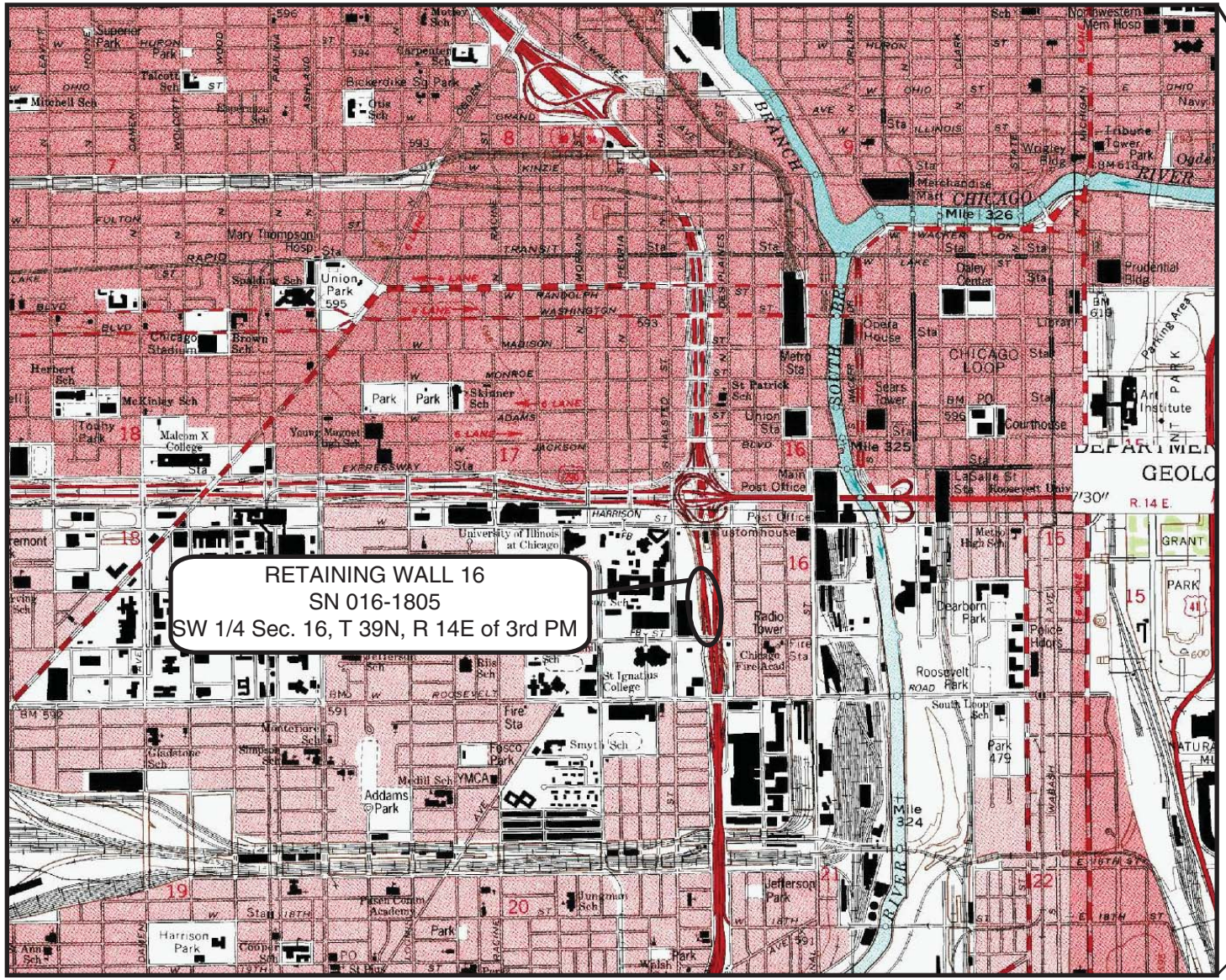
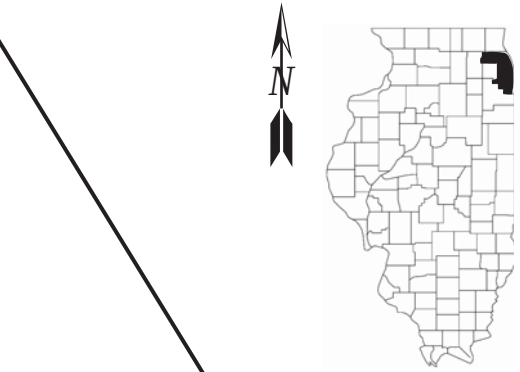
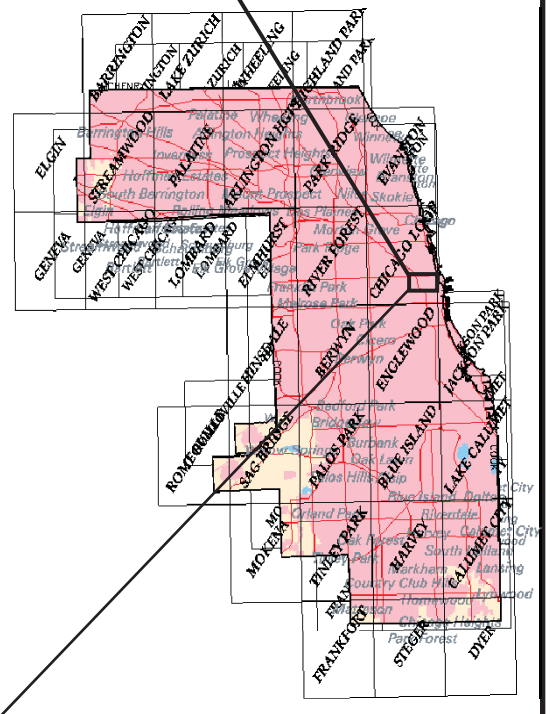
EXHIBITS







0 0.25 0.5 0.75 1.0 Mile

SITE LOCATION MAP:CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 16, SN 016-1805, COOK COUNTY

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: H. Bista CHECKED BY: M. Seyhun

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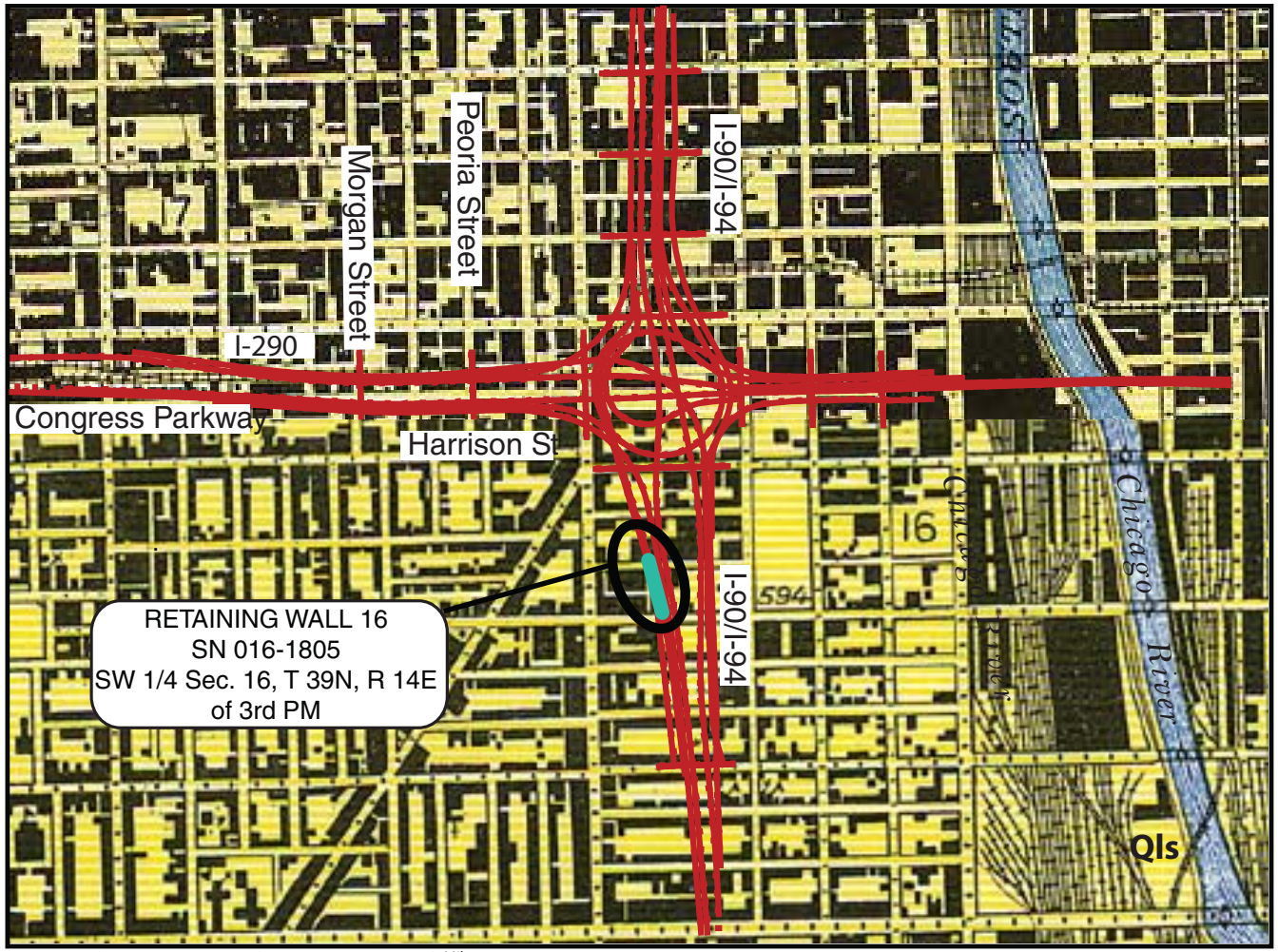

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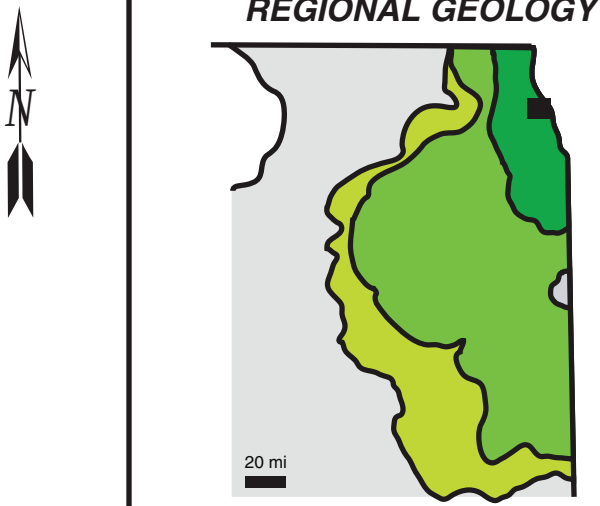
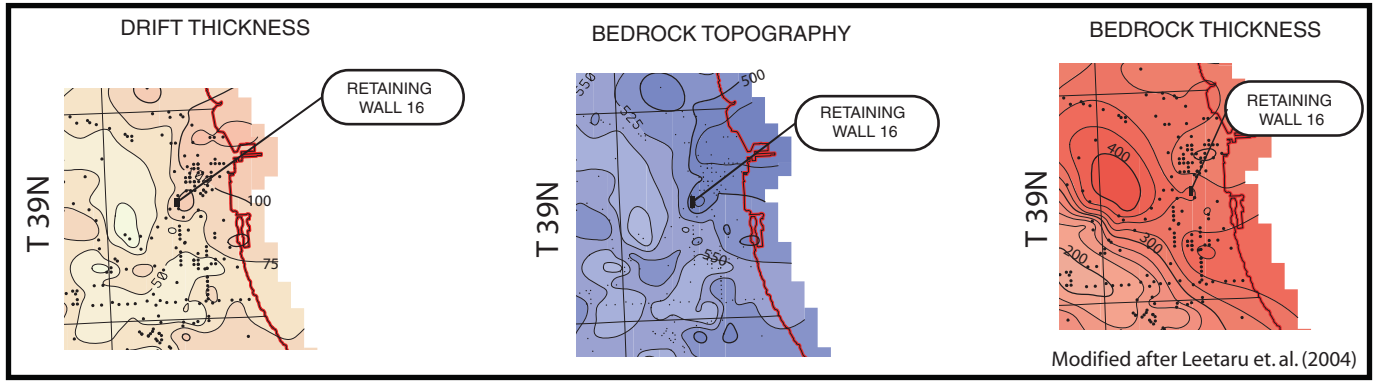


Modified after Hansel and Johnson (1996)

Legend

Qls — Glacial lake bottom
(Covered by lacustrine deposits)



Modified after Leetaru et. al. (2004)

SITE AND REGIONAL GEOLOGY:CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 16, SN 016-1805, COOK COUNTY

SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: H. Bista CHECKED BY: M. Seyhun

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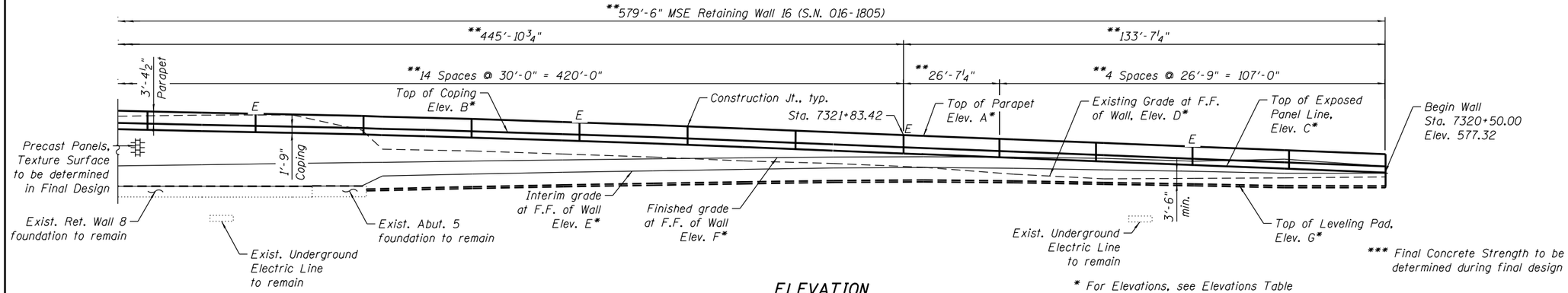
Bench Mark: Cut "X" on NE Bolt of Taylor St. on SW corner of Roosevelt and Union St. Elev. 593.36

Existing Structure: S.N. 016-2534 was built in 1988 and carries traffic for Taylor St exit ramp from SB I-90/94. Exist. four span structure has an overall length of approx. 428'. The exist. superstructure consists of steel beams with 7 1/2" thick concrete deck. The exist. substructure consists of reinforced concrete high wall abutment and piers supported on steel pile foundation. Existing structure to be removed.
Exist. Cast-In-Place Ret. Wall 8 was built under two separate contracts in 1986 & 1987. Total length of the wall is approx. 282'-9" with max. height of 23'-11". Exist. wall is supported on steel H-pile foundation. Steel sheet piling used during wall construction was cut-off at the top of wall footing elev.
Exist. Cast-In-Place Ret. Wall 11 was built in 1987. Total length of wall is approx. 296'-4" with max. height of 10'-6". Wall is supported on steel H-piles.

Traffic Control: SB Tylor St. Exit Ramp Structure and EB Taylor St. Exit Ramp will be closed and traffic will be detoured during construction. Traffic along SB I-90/94 will be maintained.

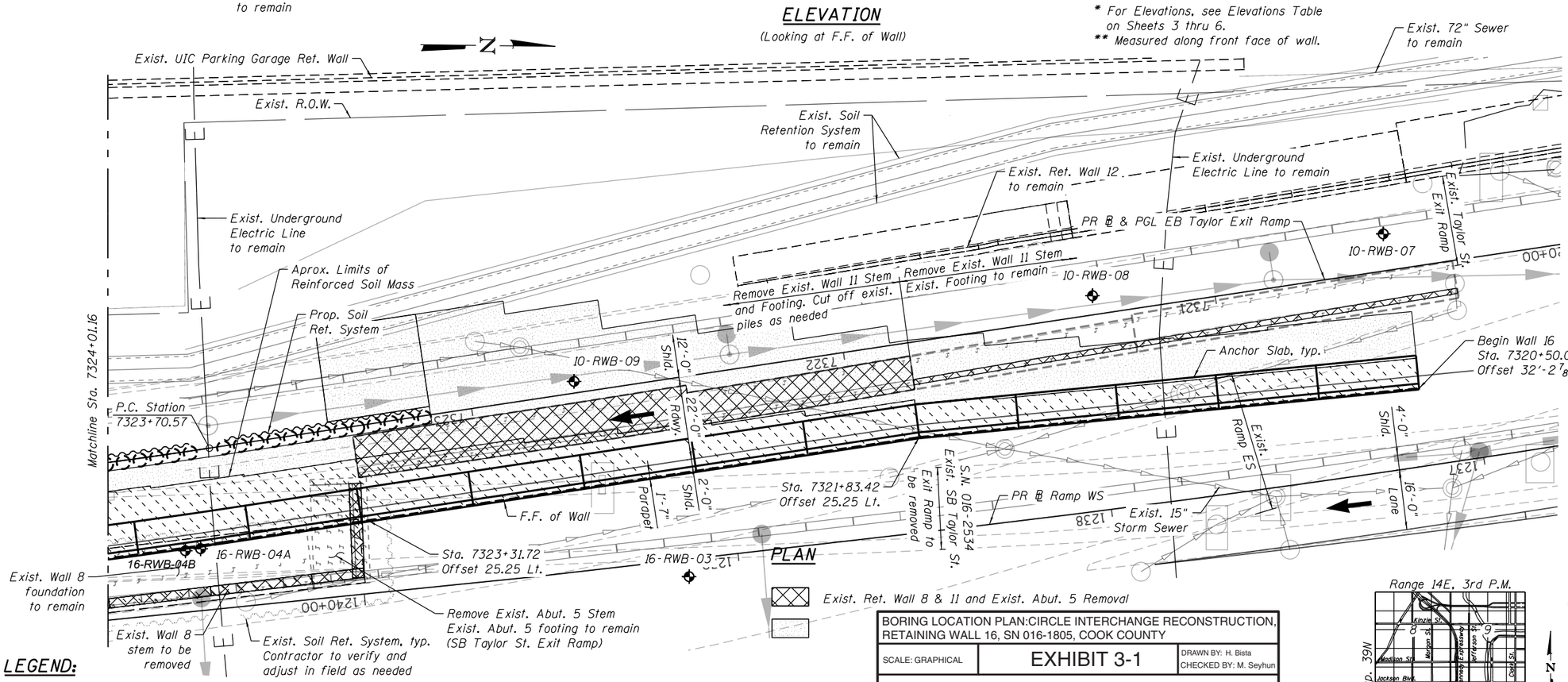


*** Final Concrete Strength to be determined during final design

ELEVATION

(Looking at F.F. of Wall)

* For Elevations, see Elevations Table on Sheets 3 thru 6.
** Measured along front face of wall.



PLAN

Exist. Ret. Wall 8 & 11 and Exist. Abut. 5 Removal

LEGEND:

- Soil Boring Location
- W — Water Line
- E — Electric
- FO — Fiber Optic
- CTV — Television Line
- Combined Sewer
- Exist. Storm Sewer
- Proposed Storm Sewer
- G — Gas Line
- Fire Hydrant
- Light Pole
- Exist. HP Pile
- T — Telephone line
- E Expansion Joint
- Proposed Barrier

BORING LOCATION PLAN:CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 16, SN 016-1805, COOK COUNTY

SCALE: GRAPHICAL	EXHIBIT 3-1	DRAWN BY: H. Bista CHECKED BY: M. Seyhun
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DESIGN SPECIFICATIONS

2014 AASHTO LRFD Bridge Design Specifications, 7th Edition with 2015 & 2016 Interims

DESIGN STRESSES

FIELD UNITS

f'c = 7,000 psi (Drilled Shaft) ***
f'c = 3,500 psi (All other concrete)
fy = 60,000 psi (Reinforcement)

PRECAST UNITS

f'c = 4,500 psi (Precast Panels)

HIGHWAY CLASSIFICATION

F.A.I. Rte. SB I-90/94
Functional Class: Interstate
ADT: 140,500 (2012); 148,000 (2040)
ADTT: 13,994 (2012); 14,741 (2040)
DHV: 8,960 (2040)
Design Speed: 60 m.p.h.
Posted Speed: 45 m.p.h.
One-Way Traffic
Directional Distribution: 100%

CURVE DATA

Prop. Curve P-TAY-ES-7
P.I. Sta. = 7324+60.48
Δ = 7° 04' 21" (Rt.)
D = 3° 56' 16"
R = 1,455.00'
T = 89.92'
L = 179.61'
E = 2.78'
e = 3.00%
T.R. = NA
S.E. Run = 38'
P.C. Sta. = 7323+70.57
P.T. Sta. = 7325+50.17
DS = 30

NOTES:

1. Stations and offsets are measured along ℄ EB Taylor Exit Ramp to the front face of Wall.
2. F.F. denotes Front Face.
3. B.F. denotes Back Face.
4. Wall to be built along straight chords between expansion and construction joints.

WALL DEFLECTION CRITERIA

Maximum lateral deflection at top of the Proposed Soil Retention System shall not exceed 1".

LOCATION SKETCH

GENERAL PLAN & ELEVATION
RETAINING WALL 16
F.A.I. RTE. 90/94/290
SECTION 2014-013R&B-R
COOK COUNTY
STA. 7320+50.00 TO STA. 7326+25.98
STRUCTURE NO. 016-1805

USER NAME = dabezlcd	DESIGNED - MK	REVISED
	CHECKED - ATB	REVISED
PLOT SCALE = N.T.S.	DRAWN - MK	REVISED
PLOT DATE = 9/26/2017	CHECKED - ATB	REVISED

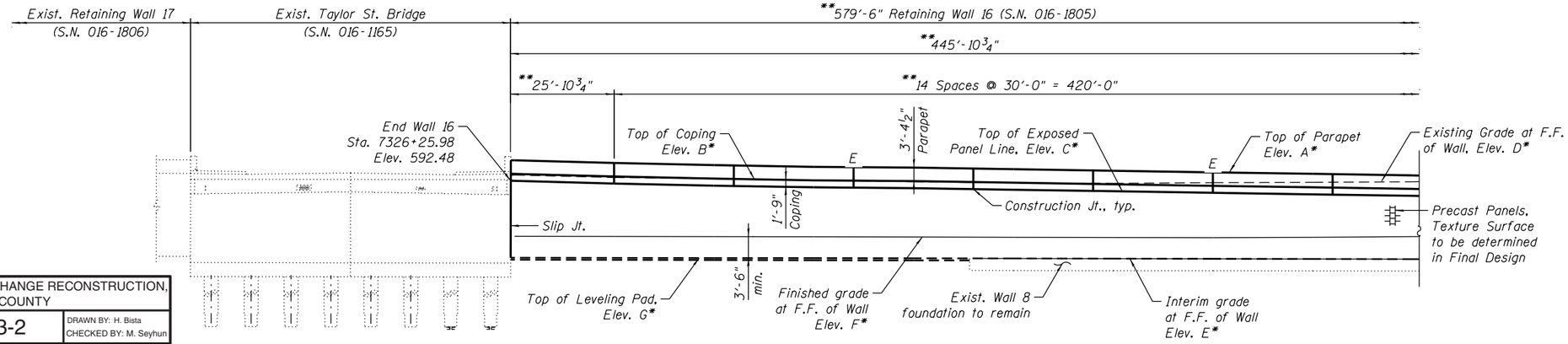
AECOM

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 6 SHEETS

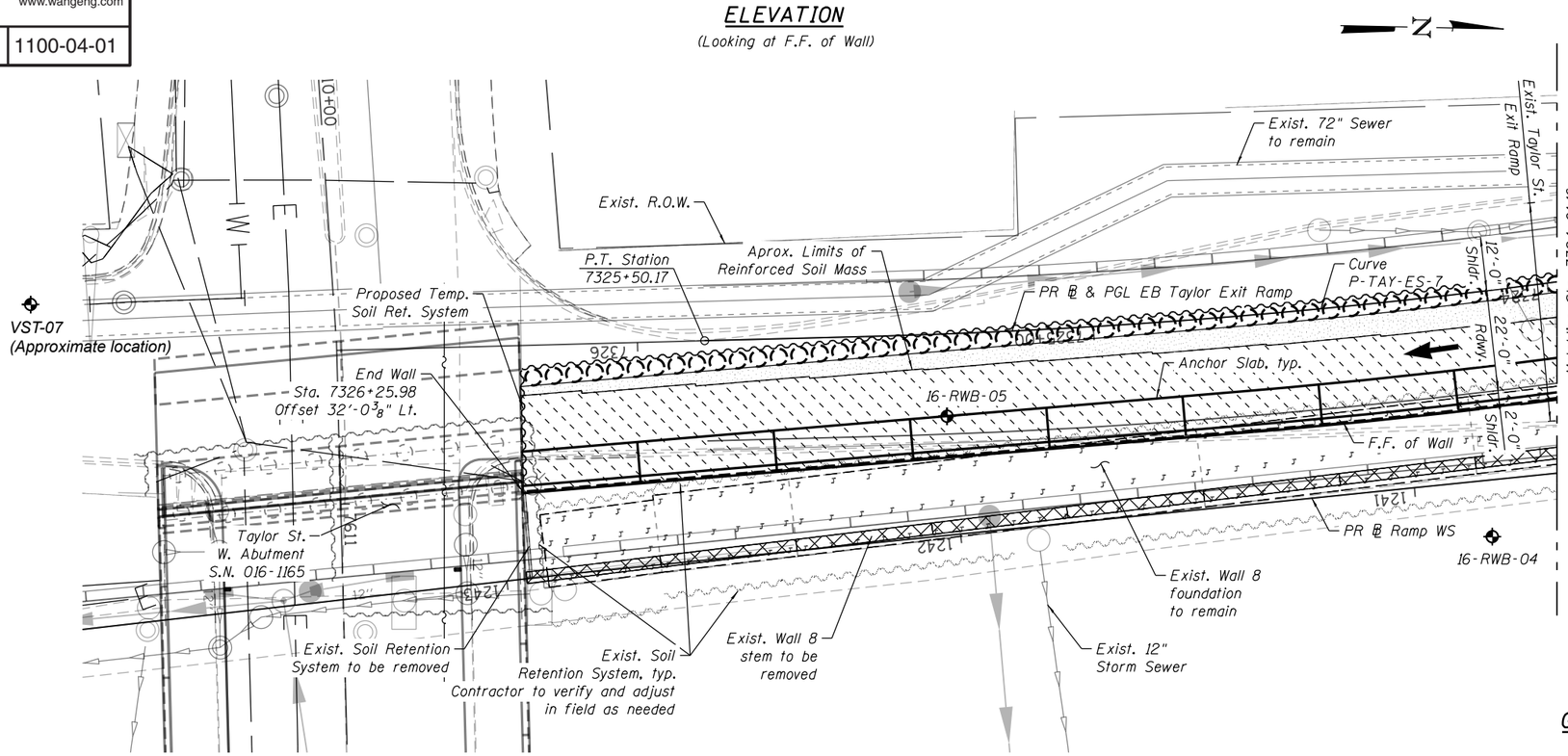
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-013R&B-R	COOK	6	1
		CONTRACT NO. 60X93		
		ILLINOIS FED. AID PROJECT		

016-1805-CIRCLE100-SHT-ACM-ST-TSL-001.dgn



ELEVATION

(Looking at F.F. of Wall)



BORING LOCATION PLAN:CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 16, SN 016-1805, COOK COUNTY

SCALE: GRAPHICAL	EXHIBIT 3-2	DRAWN BY: H. Bista CHECKED BY: M. Seyhun

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LEGEND:

- Soil Boring Location
- W — Water Line
- E — Electric
- FO — Fiber Optic
- CTV — Television Line
- Combined Sewer
- Exist. Storm Sewer
- Proposed Storm Sewer
- G — Gas Line
- Fire Hydrant
- Light Pole
- Exist. HP Pile
- T — Telephone Line
- E Expansion Joint
- Proposed Barrier

PLAN

- Exist. Ret. Wall 8 & 11 and Exist. Abut. 5 Removal
- Lightweight Fill outside of Reinf. Soil Mass

GENERAL PLAN & ELEVATION
RETAINING WALL 16
F.A.I. RTE. 90/94/290
SECTION 2014-013R&B-R
COOK COUNTY
STA. 7320+50.00 TO STA. 7326+25.98
STRUCTURE NO. 016-1805

AECOM	USER NAME = dabezicd	DESIGNED - MK	REVISED
		CHECKED - ATB	REVISED
	PLOT SCALE = N.T.S.	DRAWN - MK	REVISED
	PLOT DATE = 9/26/2017	CHECKED - ATB	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 2 OF 6 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-013R&B-R	COOK	6	2
		CONTRACT NO. 60X93		
		ILLINOIS FED. AID PROJECT		

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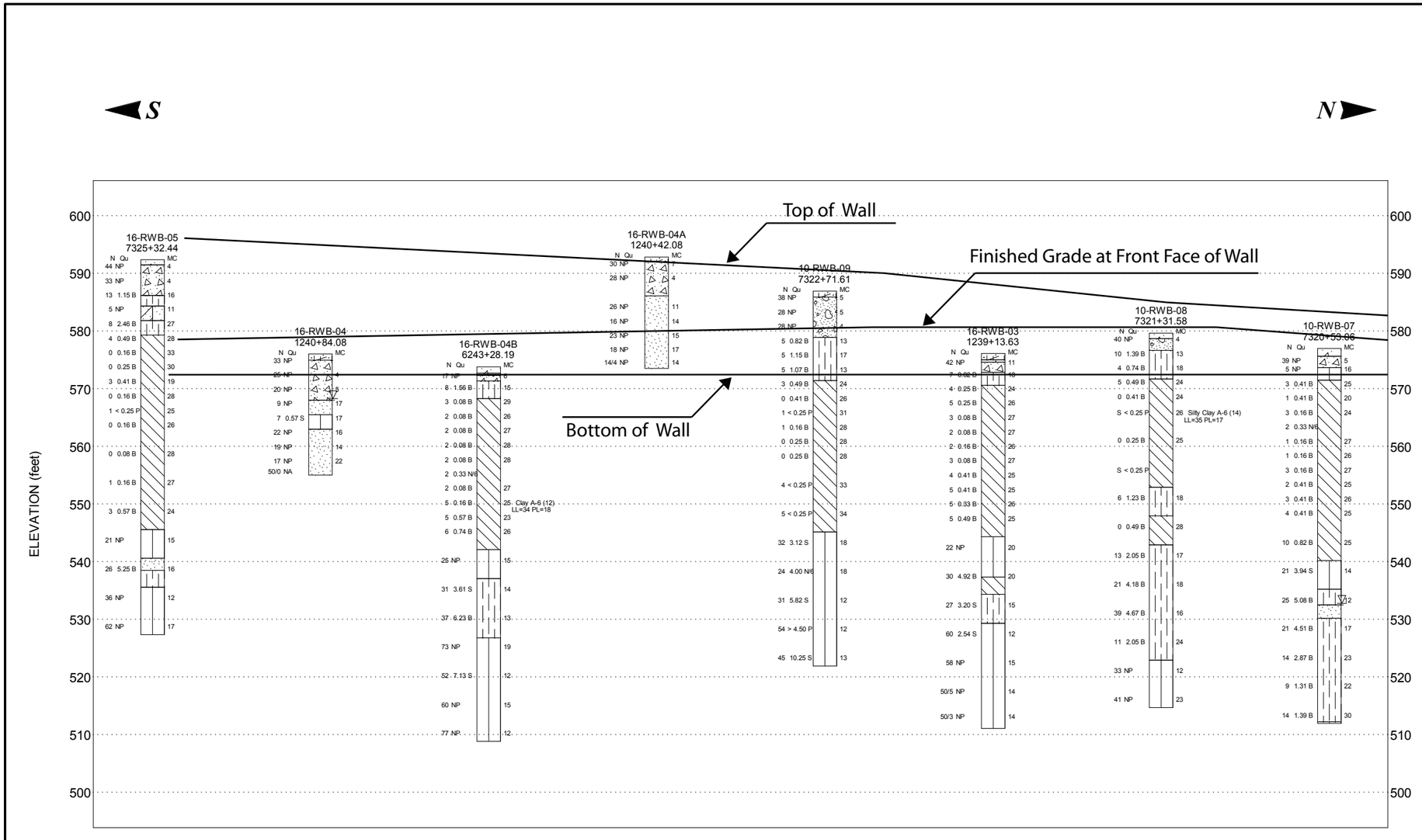
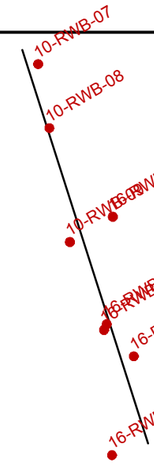


ELEVATION (feet)

DISTANCE ALONG PROFILE (feet)

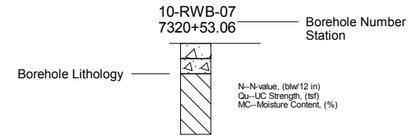
Lithology Graphics

- Concrete
- Crushed stone
- IDH Silt, Silty Loam
- IDH Clay
- IDH Silty Clay, Silty Clay Loam
- IDH Sand, Sandy Loam
- Gravelly sand, sandy gravel
- Pavement
- IDH Loam



Site Map Scale 1 inch equals 185 feet

Explanation:



Water Level Reading at time of drilling.

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

0 50

Horizontal Scale (feet)

Vertical Exaggeration: 2.5x

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Soil Profile
SN 016-1805

WEI SINCE 1982

Circle Interchange Reconstruction
Section 17, T39N, R14E of 3rd PM

JOB NUMBER	PLATE NUMBER
1100-04-01	EXHIBIT 4

WEI 11X17 1100401.GPJ WANGENG.GDT 9/26/17

APPENDIX A

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BORING LOG 10-PZ-01

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 592.93 ft
North: 1897019.14 ft
East: 1171462.69 ft
Station: 7315+23.85
Offset: 4.45 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--Drilled without sampling--	5					
			10					
			15					
			20					
			25					

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Piezometer Data: *--Installed in Dec. 11, 2014* *--Bentonite Seal 66 to 71 feet* *--Top of Sand Pack at 71 feet* *--Top of Screen at 73 feet* *--Screen Length 20 feet* *--Bottom of Screen at 93 feet*	30					
			35					
			40					
		--piezometer stabilized water level reading -- --reading during well development (12/15/2014) = 43.85 feet bgs-- --reading date: 12/26/2014 = 43.72 feet bgs--	45 ▼					
			50					

GENERAL NOTES

Begin Drilling **12-10-2014** Complete Drilling **12-11-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
Driller **P&P** Logger **A. Happel** Checked by **C. Marin**
Drilling Method **4.25" HSA, monitoring water well; pizometer installed on 12/11/2014**

WATER LEVEL DATA

While Drilling ▽ **68.00 ft**
At Completion of Drilling ▼ **74.00 ft**
Time After Drilling **24 hours**
Depth to Water ▼ **45.04 ft**

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

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Lombard, IL 60148
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Fax: 630 953-9928

BORING LOG 10-PZ-01

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 592.93 ft
North: 1897019.14 ft
East: 1171462.69 ft
Station: 7315+23.85
Offset: 4.45 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	521.2	Very dense, gray SILTY LOAM --Wet--	75		1	18 27 24	1.00 P	18
		Piezometer Data: *--Installed in Dec. 11, 2014* *--Bentonite Seal 66 to 71 feet* *--Top of Sand Pack at 71 feet* *--Top of Screen at 73 feet* *--Screen Length 20 feet* *--Bottom of Screen at 93 feet*	55 60 65 70					
	516.2	Very dense, gray SANDY LOAM, trace to little gravel --Saturated--	80		2	7 14 16	NP	20
			85		3	50/6	NP	16
	506.2	Very dense, gray SILTY LOAM, trace gravel --Moist--	90		4	50/3	4.50 P	9
		--Wet--	95		5	50/5	NP	11
	497.9	--HARD DRILLING-- Boring terminated at 95.00 ft	100					

GENERAL NOTES

Begin Drilling **12-10-2014** Complete Drilling **12-11-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
Driller **P&P** Logger **A. Happel** Checked by **C. Marin**
Drilling Method **4.25" HSA, monitoring water well; pizometer installed on 12/11/2014**

WATER LEVEL DATA

While Drilling ▽ **68.00 ft**
At Completion of Drilling ▼ **74.00 ft**
Time After Drilling **24 hours**
Depth to Water ▼ **45.04 ft**

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

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BORING LOG 10-RWB-07

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 576.99 ft
North: 1896456.57 ft
East: 1171549.47 ft
Station: 7320+53.06
Offset: 8.9634 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	575.7	16-inch thick CONCRETE --PAVEMENT--						
	573.7	Dense, white CRUSHED STONE --BASE COURSE--			1	18 23 16	NP	5
		Loose, brown and gray SILTY LOAM, trace gravel --FILL--	5		2	2 3 2	NP	16
	571.5	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			3	1 1 2	0.41 B	25
			10		4	0 0 1	0.41 B	20
					5	0 1 2	0.16 B	24
			15		6	0 1 1	0.33 N/6	14
					7	0 0 1	0.16 B	27
			20		8	0 0 1	0.16 B	26
					9	0 1 2	0.16 B	27
			25		10	0 1 1	0.41 B	25
			30		11	0 1 2	0.41 B	26
					12	1 2 2	0.41 B	25
			35		13	2 3 7	0.82 B	25
	540.2	Medium dense, gray SILTY LOAM, trace gravel --DRY--			14	8 8 13	3.94 S	14
	535.2	Hard, gray SILTY CLAY LOAM, trace gravel	40					
	532.5	Gray, medium to coarse SAND, little gravel	45		15	5 12 13	5.08 B	12
	530.2	Stiff to hard, gray SILTY CLAY, trace gravel						
			50		16	4 9 12	4.51 B	17

GENERAL NOTES

Begin Drilling **07-16-2014** Complete Drilling **07-20-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
Driller **A&K** Logger **A. Happel** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10'; mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **44.50 ft**
At Completion of Drilling ▼ **mud in the borehole**
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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wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9928

BORING LOG 10-RWB-07

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 576.99 ft
North: 1896456.57 ft
East: 1171549.47 ft
Station: 7320+53.06
Offset: 8.9634 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			55		17	4 6 8	2.87 B	23
			60		18	2 4 5	1.31 B	22
	512.2		65		19	5 7 7	1.39 B	30
	512.0	Gray SILTY LOAM --Moist--						
		Boring terminated at 65.00 ft						
			70					
			75					

GENERAL NOTES

Begin Drilling **07-16-2014** Complete Drilling **07-20-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
Driller **A&K** Logger **A. Happel** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10'; mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **44.50 ft**
At Completion of Drilling ▼ **mud in the borehole**
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 10-RWB-08

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 579.69 ft
North: 1896379.22 ft
East: 1171563.12 ft
Station: 7321+31.58
Offset: 7.0147 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	578.7	12-inch thick, CONCRETE --PAVEMENT--						
		Dense, grayish white SANDY GRAVEL --BASE COURSE--			1	30 22 18	NP	4
	576.7	Medium stiff to stiff, brown and gray, SILTY CLAY LOAM, trace gravel --FILL--	5		2	4 5 5	1.39 B	13
					3	1 2 2	0.74 B	18
	571.7	Very soft to soft, gray CLAY to SILTY CLAY, trace gravel	10		4	1 2 3	0.49 B	24
					5	0 0 0	0.41 B	24
		--L_L(%)=35, P_L(%)=17-- --%Gravel=2.7-- --%Sand=15.6-- --%Silt=51.1-- --%Clay=30.6-- --A-6 (14)--	15		1	PUSH	< 0.25 P	26
			20		6	0 0 0	0.25 B	25
			25		2	PUS	< 0.25	
	552.9	Stiff, gray SILTY CLAY LOAM, trace gravel	30		7	2 3 3	1.23 B	18
	547.9	Soft, gray CLAY to SILTY CLAY, trace gravel	35		8	0 0 0	0.49 B	28
	542.9	Very stiff to hard, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel	40		9	2 4 9	2.05 B	17
			45		10	5 8 13	4.18 B	18
			50		11	10 9 30	4.67 B	16

GENERAL NOTES

Begin Drilling **07-15-2014** Complete Drilling **07-15-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **mud in the borehole**
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 10-RWB-08

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 579.69 ft
North: 1896379.22 ft
East: 1171563.12 ft
Station: 7321+31.58
Offset: 7.0147 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			55		12	3 4 7	2.05 B	24
	522.9	Dense, gray SILTY LOAM, trace gravel						
			60		13	14 15 18	NP	12
			65		14	16 22 19	NP	23
	514.7	Boring terminated at 65.00 ft						
			70					
			75					

GENERAL NOTES

Begin Drilling **07-15-2014** Complete Drilling **07-15-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **mud in the borehole**
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 10-RWB-09

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 586.92 ft
North: 1896241.34 ft
East: 1171587.89 ft
Station: 7322+71.61
Offset: 3.0944 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	585.9	12-inch thick CONCRETE --PAVEMENT--						
		Medium dense to dense, grayish white SANDY GRAVEL --FILL--			1	11 20 18	NP	5
			5		2	15 13 15	NP	5
					3	13 14 14	NP	4
	578.9	Medium stiff to stiff, brown and gray SILTY CLAY LOAM, trace gravel						
			10		4	2 2 3	0.82 B	13
					5	1 2 3	1.15 B	17
			15		6	1 2 3	1.07 B	13
	571.4	Very soft to soft, gray CLAY to SILTY CLAY, trace to some gravel			7	1 1 2	0.49 B	24
			20		8	0 0 0	0.41 B	26
					9	0 0 1	< 0.25 P	31
			25		10	0 0 1	0.16 B	28
			30		11	0 0 0	0.25 B	28
					12	0 0 0	0.25 B	28
			35		13	0 2 2	< 0.25 P	33
			40		14	2 2 3	< 0.25 P	34
	545.2	Very stiff to hard, gray SILTY LOAM to SILTY CLAY LOAM, trace gravel --DRY--			15	10 11 21	3.12 S	18
			50		16	8 11 13	4.00 N/6	18

GENERAL NOTES

Begin Drilling **07-15-2014** Complete Drilling **07-16-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **mud in the borehole**
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 10-RWB-09

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 586.92 ft
North: 1896241.34 ft
East: 1171587.89 ft
Station: 7322+71.61
Offset: 3.0944 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			55		17	9 14 17	5.82 S	12
			60		18	27 24 30	> 4.50 P	12
	521.9	Boring terminated at 65.00 ft	65		19	14 19 26	10.25 S	13
			70					
			75					

GENERAL NOTES

Begin Drilling **07-15-2014** Complete Drilling **07-16-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **mud in the borehole**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG 16-RWB-03

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Circle Interchange Reconstruction**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 576.10 ft
North: 1896271.92 ft
East: 1171639.81 ft
Station: 1239+13.63
Offset: 4.6520 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	575.0	13.5-inch thick, CONCRETE --PAVEMENT--						
	574.6	4.5-inch thick, ASPHALT --BASE COURSE--						
		Dense, brown and gray SANDY GRAVEL			1	23 21 21	NP	11
	572.9	--FILL--						
		Medium stiff, gray SILTY CLAY, trace gravel	5		2	2 3 4	0.82 B	18
	570.6	Soft to very soft, gray CLAY to SILTY CLAY, trace gravel			3	1 2 2	0.25 B	24
			10		4	1 2 3	0.25 B	26
					5	1 1 2	0.08 B	27
			15		6	1 1 1	0.08 B	27
					7	1 1 1	0.16 B	26
			20		8	1 1 2	0.08 B	27
					9	1 2 2	0.41 B	25
			25		10	1 2 3	0.41 B	25
			30		11	0 2 3	0.33 B	26
					12	2 2 3	0.49 B	25
	544.4	Medium dense, gray SILTY LOAM, trace gravel --Dry--	35		13	8 11 11	NP	20
	537.4	Hard, gray CLAY to SILTY CLAY, trace gravel	40		14	11 12 18	4.92 B	20
	534.4	Very stiff, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel	45		15	10 13 14	3.20 S	15
	529.4	Very dense, gray SILTY LOAM, trace gravel --Dry--	50		16	15 27 33	2.54 S	12

GENERAL NOTES

Begin Drilling: **08-10-2014** Complete Drilling: **08-10-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME-55 TMR [85%]**
Driller: **R&J** Logger: **S. Woods** Checked by: **C. Marin**
Drilling Method: **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
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 16-RWB-03

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 576.10 ft
North: 1896271.92 ft
East: 1171639.81 ft
Station: 1239+13.63
Offset: 4.6520 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Very dense, gray SILTY LOAM, trace gravel						
		--Dry--						
			55		17	16 23 35	NP	15
			60		18	15 23 50/5	NP	14
					19	50/3	NP	14
	511.1		65					
		Boring terminated at 65.00 ft						
			70					
			75					

GENERAL NOTES

Begin Drilling **08-10-2014** Complete Drilling **08-10-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR [85%]**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **mud in the borehole**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG 16-RWB-04

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 576.03 ft
North: 1896103.12 ft
East: 1171665.21 ft
Station: 1240+84.08
Offset: 12.2833 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	574.9	13-inch thick, CONCRETE						
		Medium dense to dense, white CRUSHED STONE --BASE COURSE--			1	13 13 20	NP	
			5		2	3 15 10	NP	4
					3	15 11 9	NP	5
	568.0	Loose, gray SANDY LOAM			4	5 2 7	NP	17
			10					
	565.5	Loose, gray SILTY LOAM, trace gravel			5	5 3 4	0.57 S	17
	563.0	Medium dense, brown fine and medium SAND, trace gravel			6	6 9 13	NP	16
			15		7	11 9 10	NP	14
					8	8 6 11	NP	22
			20					
		--Boring terminated due to obstruction--						
	555.0				9	50/0		
		Boring terminated at 21.00 ft						
			25					

GENERAL NOTES

Begin Drilling **07-23-2014** Complete Drilling **07-23-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR [85%]**
Driller **A&K** Logger **A. Happel** Checked by **C. Marin**
Drilling Method **3.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **8.00 ft**
At Completion of Drilling ▼ **mud in the borehole**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG 16-RWB-04A

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 592.85 ft
North: 1896141.99 ft
East: 1171632.40 ft
Station: 1240+42.08
Offset: 16.4134 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	592.0	10-inch thick, CONCRETE --PAVEMENT--						
		Medium dense to dense, grayish white CRUSHED STONE --FILL--			1	5 13 17	NP	7
			5		2	8 14 14	NP	4
	586.1	Medium dense, brown SAND to SANDY LOAM, trace gravel --FILL--			4	9 14 12	NP	11
			10		5	8 8 8	NP	14
					6	7 12 11	NP	15
			15		7	7 8 10	NP	17
		--Sampler Refusal--			8	2 14/4	NP	14
	573.5	Boring terminated at 19.32 ft						
			20					
			25					

GENERAL NOTES

Begin Drilling **08-07-2014** Complete Drilling **08-07-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **mud in the borehole**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG 16-RWB-04B

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Circle Interchange Reconstruction**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 573.83 ft
North: 1896134.97 ft
East: 1171629.13 ft
Station: 6243+28.19
Offset: 76.2948 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	572.7	13.5-inch thick, CONCRETE --PAVEMENT--						
	572.3	4.5-inch thick ASPHALT						
	571.3	Grayish white CRUSHED STONE --BASE COURSE--			1	16 12 5	NP	6
		Stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel	5		2	2 4 4	1.56 B	15
	568.3	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			3	1 1 2	0.08 B	29
			10		4	1 1 1	0.08 B	26
					5	1 1 1	0.08 B	27
			15		6	0 1 1	0.08 B	28
					7	1 1 1	0.08 B	28
			20		8	1 1 1	0.33 N/6	
					9	1 1 1	0.08 B	27
			25		10	1 2 3	0.16 B	25
			30		11	1 2 3	0.57 B	23
					12	1 3 3	0.74 B	26
	542.1	Medium dense, gray SILTY LOAM, trace gravel --Dry--						
			35		13	6 7 18	NP	15
	537.1	Very stiff to hard, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel						
			40		14	11 13 18	3.61 S	14
			45		15	15 16 21	6.23 B	13
	526.8	Very dense, gray, SILTY LOAM, trace gravel --DRY--						
			50		16	27 37 36	NP	19

GENERAL NOTES

Begin Drilling: **08-11-2014** Complete Drilling: **08-11-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME-55 TMR [85%]**
Driller: **R&J** Logger: **S. Woods** Checked by: **C. Marin**
Drilling Method: **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
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 16-RWB-04B

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 573.83 ft
North: 1896134.97 ft
East: 1171629.13 ft
Station: 6243+28.19
Offset: 76.2948 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Very dense, gray, SILTY LOAM, trace gravel --DRY--						
			55		17	18 22 30	7.13 S	12
			60		18	24 32 28	NP	15
	508.8		65		19	21 27 50	NP	12
		Boring terminated at 65.00 ft						
			70					
			75					

GENERAL NOTES

Begin Drilling **08-11-2014** Complete Drilling **08-11-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR [85%]**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **mud in the borehole**
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 16-RWB-05

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 592.35 ft
North: 1895983.56 ft
East: 1171638.82 ft
Station: 7325+32.44
Offset: 17.9588 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	591.5	10-inch thick CONCRETE --PAVEMENT--						
		Dense, white CRUSHED STONE --FILL--			1	20 22 22	NP	4
			5		2	4 14 19	NP	4
	586.2	Stiff, black and brown SILTY CLAY LOAM, trace gravel --FILL--			3	6 6 7	1.15 B	16
	584.4	Stiff, black and brown LOAM to SILTY LOAM, trace gravel --FILL--	10		4	3 2 3	NP	11
	581.9	Very stiff, brownish gray SILTY CLAY, trace gravel			5	3 4 4	2.46 B	27
	579.4	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel	15		6	2 2 2	0.49 B	28
					7	0 0 0	0.16 B	33
			20		8	0 0 0	0.25 B	30
					9	0 1 2	0.41 B	19
			25		10	0 0 0	0.16 B	28
			30		11	0 0 1	< 0.25 P	25
					12	0 0 0	0.16 B	26
			35		13	0 0 0	0.08 B	28
			40		14	0 0 1	0.16 B	27
			45		15	0 0 3	0.57 B	24
	545.6	Medium dense, gray SILT to SILTY LOAM, trace gravel --DRY--						
			50		16	11 10 11	NP	15

GENERAL NOTES

Begin Drilling **07-24-2014** Complete Drilling **07-24-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25' SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **mud in the borehole**
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 16-RWB-05

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Circle Interchange Reconstruction**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 592.35 ft
North: 1895983.56 ft
East: 1171638.82 ft
Station: 7325+32.44
Offset: 17.9588 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	540.6	Brown, coarse SAND						
	538.5	Hard, gray SILTY CLAY LOAM, trace gravel	55		17	10 11 15	5.25 B	16
	535.6	Dense to very dense, gray SILTY LOAM to SILT, trace gravel, occasional sand seams --DRY--	60		18	14 18 18	NP	12
	527.4	Boring terminated at 65.00 ft	65		19	28 30 32	NP	17
			70					
			75					

GENERAL NOTES

Begin Drilling **07-24-2014** Complete Drilling **07-24-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
Drilling Method **2.25' SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **mud in the borehole**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG VST-07

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Circle Interchange Reconstruction**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 593.11 ft
North: 1895740.00 ft
East: 1171636.91 ft
Station: 6247+22.16
Offset: 105.461 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	591.9	6-inch thick ASPHALT over 9-inch thick CONCRETE --PAVEMENT--						
		Medium dense, brown SAND --FILL--						
			5		1	6 6 6	NP	9
	584.1							
		Medium stiff to stiff, brown and gray SILTY CLAY	10		2	2 2 2	1.75 P	26
			15		3	1 1 2	0.82 B	27
	577.6							
		--In-Situ Vane Shear, 16.5 feet-- --$S_{u\ undis}$ = 764.5 psf-- --$S_{u\ remold}$ = 305.8 psf-- --Sensitivity = 2.5--			1	VS		
		--In-Situ Vane Shear, 19.0 feet-- --$S_{u\ undis}$ = 1157.6 psf-- --$S_{u\ remold}$ = 633.4 psf-- --Sensitivity = 1.8--	20		2	VS		
		--In-Situ Vane Shear, 21.5 feet-- --$S_{u\ undis}$ = 1245.0 psf-- --$S_{u\ remold}$ = 808.1 psf-- --Sensitivity = 1.5--			3	VS		
		--In-Situ Vane Shear, 24.0 feet-- --$S_{u\ undis}$ = 808.1 psf--	25		4	VS		
		--$S_{u\ remold}$ = 546.0 psf-- --Sensitivity = 1.5--						
		--In-Situ Vane Shear, 26.5 feet-- --$S_{u\ undis}$ = 666.2 psf-- --$S_{u\ remold}$ = 371.3 psf-- --Sensitivity = 1.8--			5	VS		
		--In-Situ Vane Shear, 29.0 feet-- --$S_{u\ undis}$ = 600.6 psf-- --$S_{u\ remold}$ = 327.6 psf-- --Sensitivity = 1.8--	30		6	VS		
		--In-Situ Vane Shear, 31.5 feet-- --$S_{u\ undis}$ = 524.2 psf-- --$S_{u\ remold}$ = 316.7 psf-- --Sensitivity = 1.7--			7	VS		
		--In-Situ Vane Shear, 34.0 feet-- --$S_{u\ undis}$ = 611.6 psf-- --$S_{u\ remold}$ = 338.5 psf-- --Sensitivity = 1.8--	35		8	VS		
		--In-Situ Vane Shear, 36.5 feet-- --$S_{u\ undis}$ = 830.0 psf-- --$S_{u\ remold}$ = 535.1 psf-- --Sensitivity = 1.6--			9	VS		
		--In-Situ Vane Shear, 39.0 feet-- --$S_{u\ undis}$ = 633.4 psf-- --$S_{u\ remold}$ = 393.1 psf-- --Sensitivity = 1.6--	40		10	VS		
		--In-Situ Vane Shear, 41.5 feet-- --$S_{u\ undis}$ = 895.5 psf-- --$S_{u\ remold}$ = 655.2 psf-- --Sensitivity = 1.4--			11	VS		
	548.6	--In-Situ Vane Shear, 44.0 feet-- --$S_{u\ undis}$ = 1026.6 psf-- --$S_{u\ remold}$ = 698.9 psf-- --Sensitivity = 1.5--	45		12	VS		
		Boring terminated at 44.50 ft	50					

GENERAL NOTES

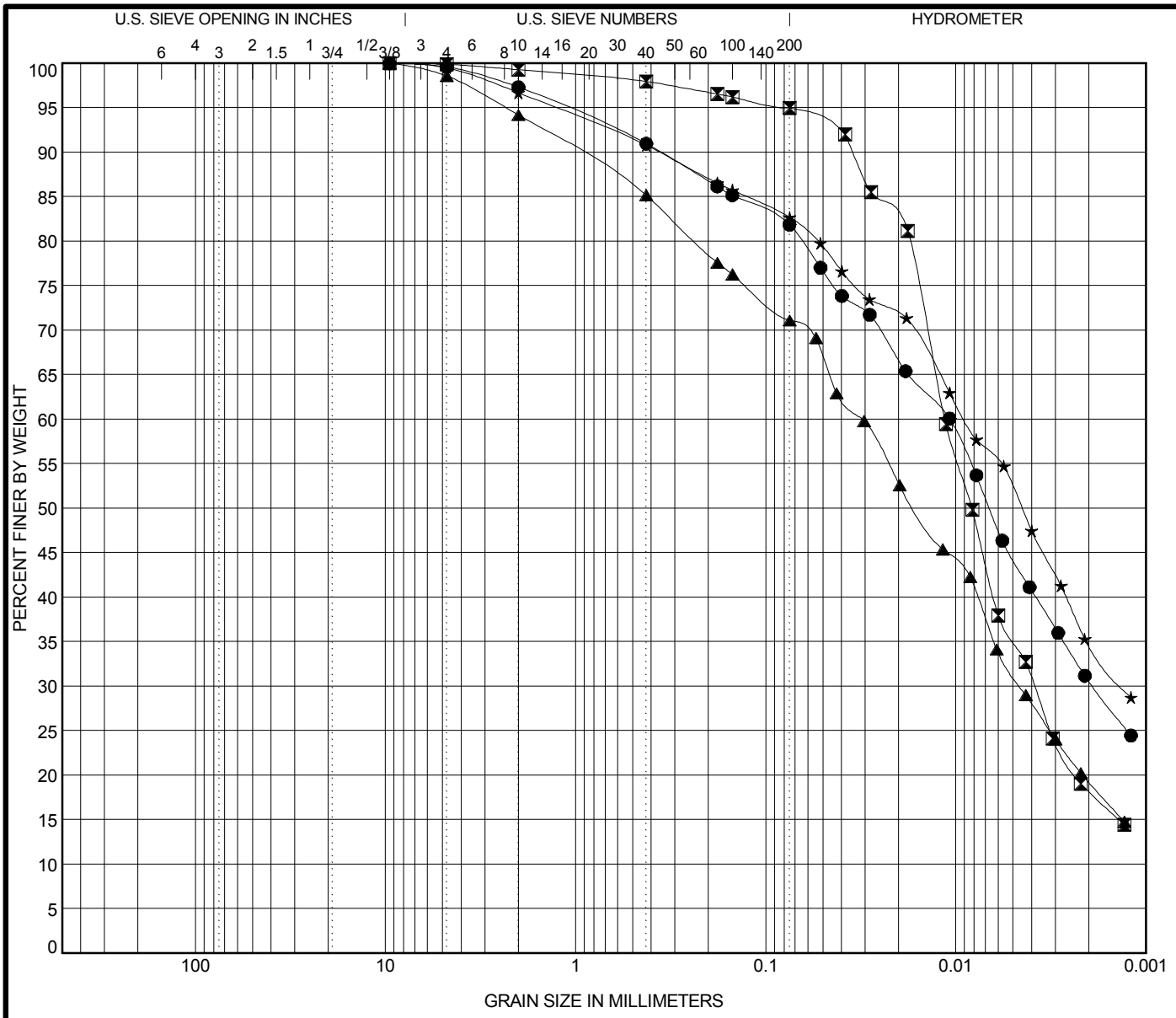
Begin Drilling: **12-10-2015** Complete Drilling: **12-10-2015**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME-55 TMR [85%]**
Driller: **R&N** Logger: **F. Bozga** Checked by: **A. Kurnia**
Drilling Method: **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

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

WANGENGINC 11000401.GPJ WANGENG.GDT 9/8/17



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	10-RWB-08#1	13.5 ft	**Silty Clay**	**35**	**17**	**18**		
⧓	16-RWB-01B#15	43.5 ft	**Silty Loam**	**26**	**20**	**6**		
▲	16-RWB-02#15	43.5 ft	**Silty Clay Loam**	**25**	**16**	**9**		
★	16-RWB-04B#10	23.5 ft	**Clay**	**34**	**18**	**16**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	10-RWB-08#1	13.5 ft	**9.5**	**0.011**	**0.002**		**2.7**	**15.6**	**51.1**	**30.6**
⧓	16-RWB-01B#15	43.5 ft	**9.5**	**0.011**	**0.004**		**0.7**	**4.4**	**76.7**	**18.2**
▲	16-RWB-02#15	43.5 ft	**9.5**	**0.031**	**0.005**		**5.8**	**23.2**	**51.8**	**19.2**
★	16-RWB-04B#10	23.5 ft	**9.5**	**0.009**	**0.001**		**3.3**	**14.1**	**47.9**	**34.7**

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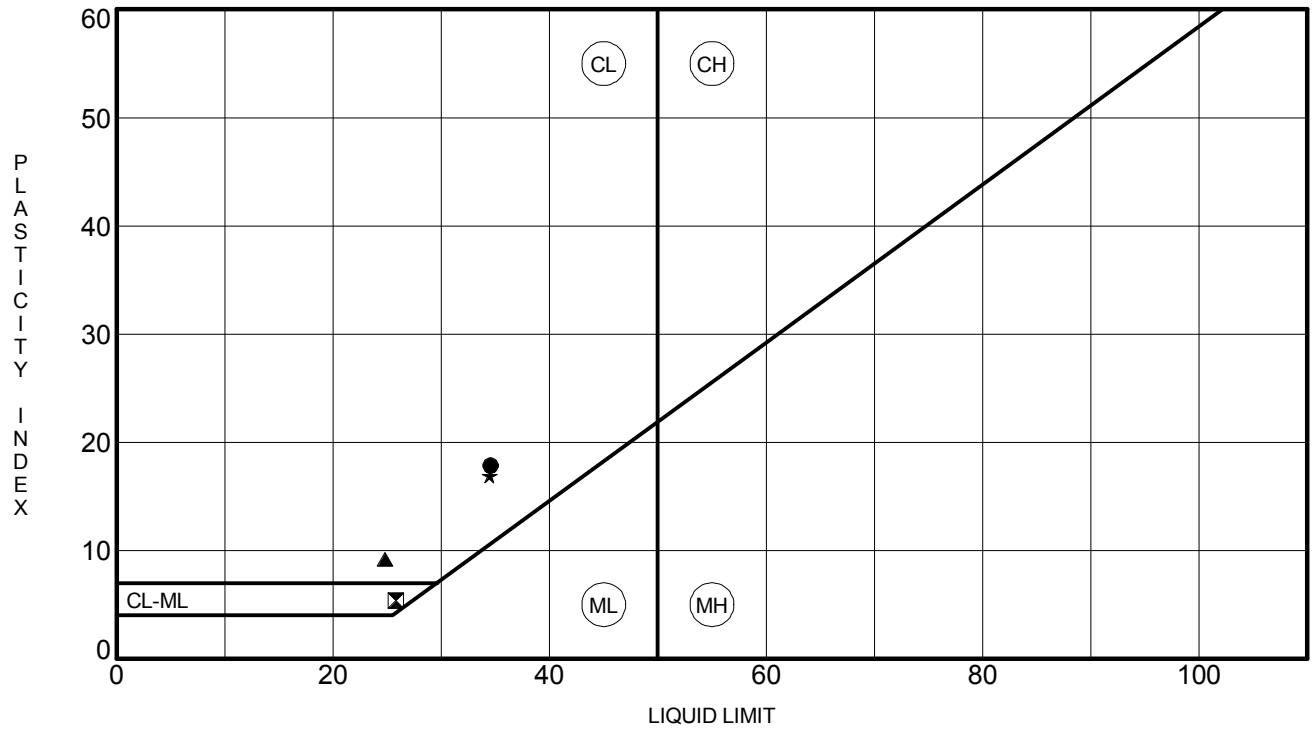
Wang Engineering
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9928

GRAIN SIZE DISTRIBUTION

Project: Circle Interchange Reconstruction

Location: Section 17, T39N, R14E of 3rd PM

Number: 1100-04-01



	Specimen Identification		LL	PL	PI	Fines	IDH Classification
●	10-RWB-08#1	13.5 ft	35	17	18	82	Silty Clay
⧓	16-RWB-01B#15	43.5 ft	26	20	6	95	Silty Loam
▲	16-RWB-02#15	43.5 ft	25	16	9	71	Silty Clay Loam
★	16-RWB-04B#10	23.5 ft	34	18	16	83	Clay

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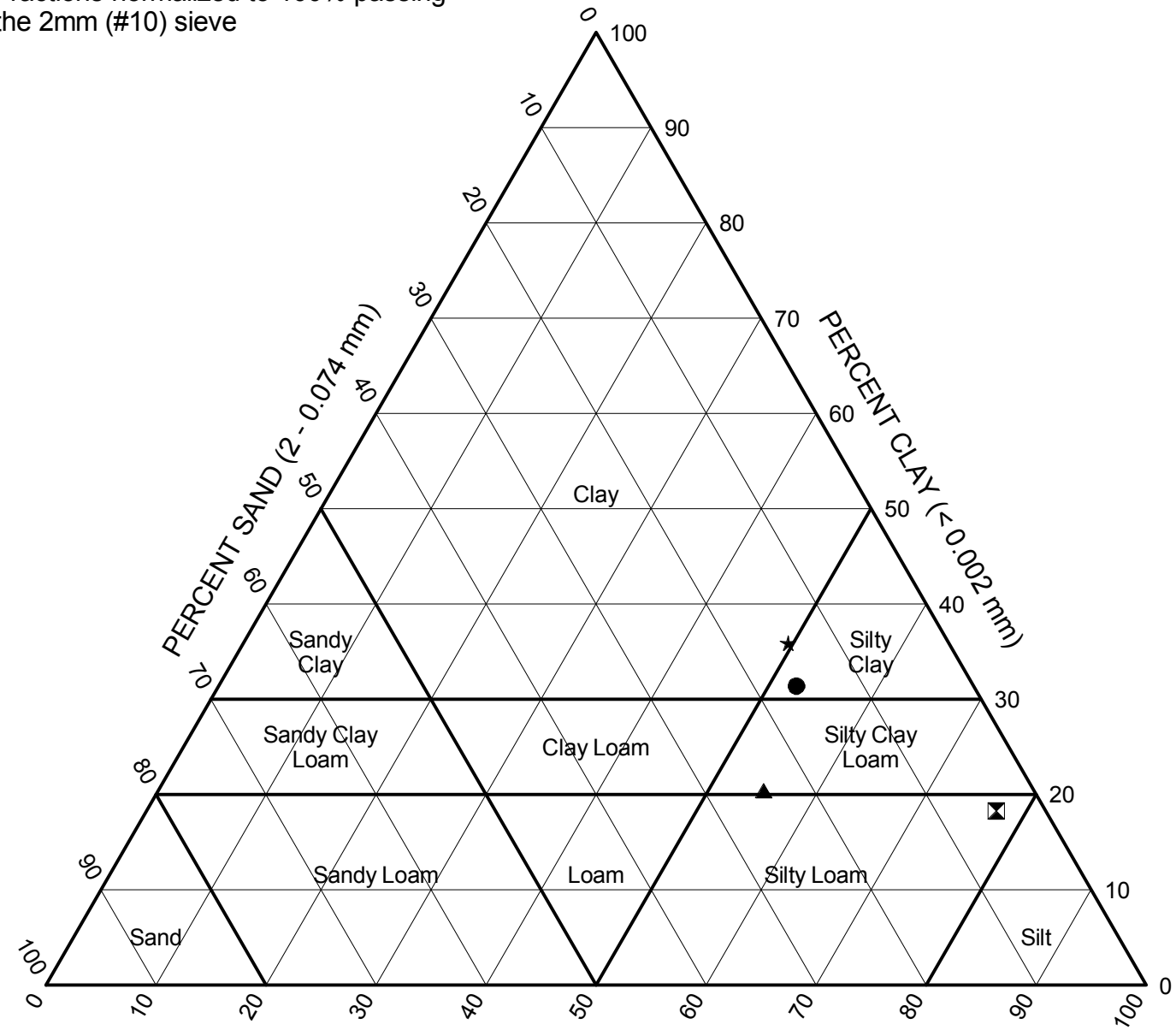
ATTERBERG LIMITS' RESULTS

Project: Circle Interchange Reconstruction

Location: Section 17, T39N, R14E of 3rd PM

Number: 1100-04-01

Fractions normalized to 100% passing the 2mm (#10) sieve



	Sample	Depth (ft)	Sand (%)	Silt (%)	Clay (%)	Classification		
						IL DOT	AASHTO	ASTM
●	10-RWB-08#1	13.5	16.0	52.5	31.4	Silty Clay	A-6 (14)	CL
⧓	16-RWB-01B#15	43.5	4.4	77.2	18.3	Silty Loam	A-4 (5)	CL-ML
▲	16-RWB-02#15	43.5	24.6	55.0	20.4	Silty Clay Loam	A-4 (4)	CL
★	16-RWB-04B#10	23.5	14.6	49.5	35.9	Clay	A-6 (12)	CL

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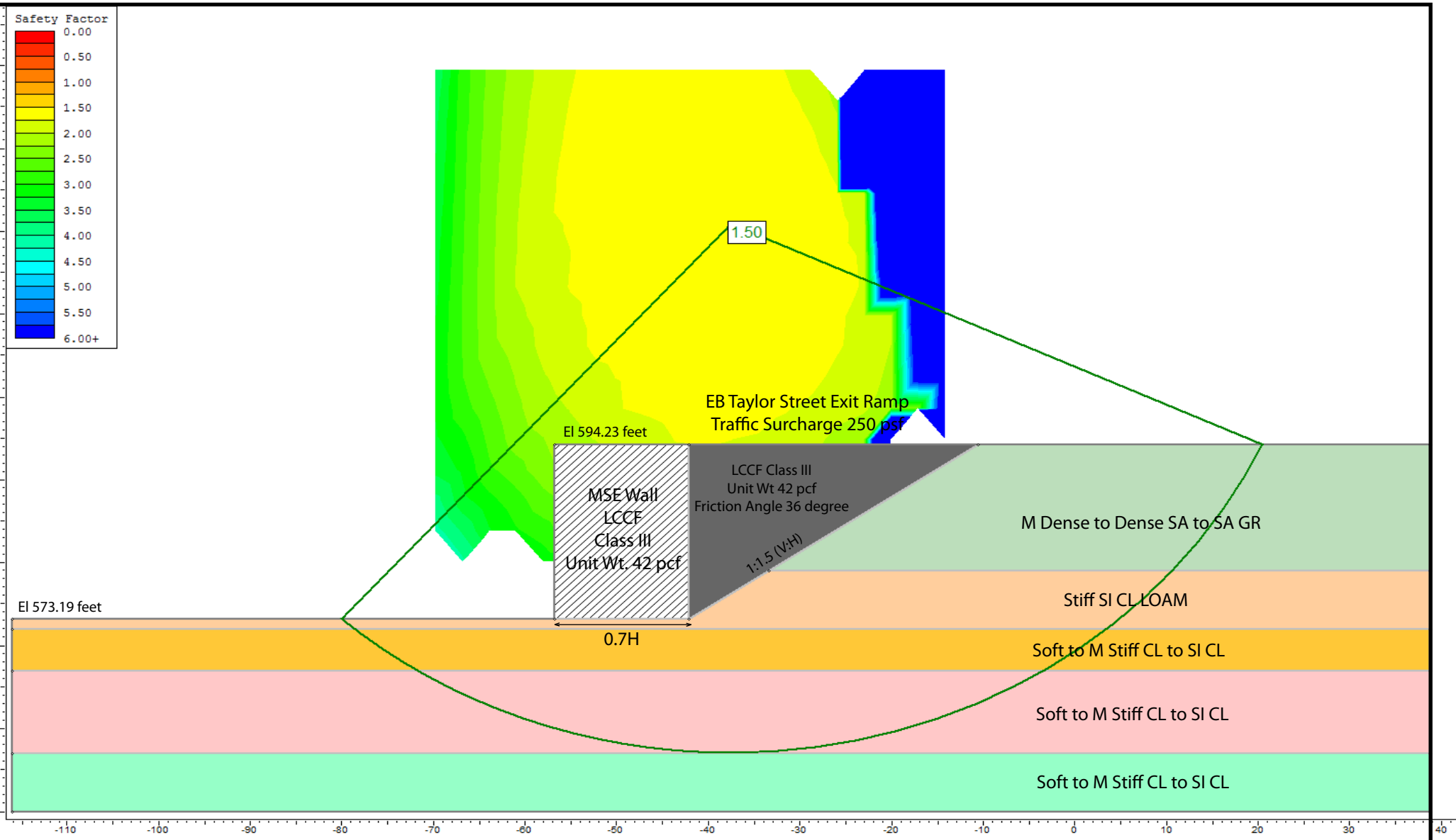
IDH Textural Classification Chart

Project: Circle Interchange Reconstruction

Location: Section 17, T39N, R14E of 3rd PM

Number: 1100-04-01

APPENDIX B



Undrained Analysis for MSE Wall at Station 7326+25.98, Ref Borings 10-RWB-09, 16-RWB-04A, 16-RWB-04B, 16-RWB-05 and VST-07

Layer ID	Description	Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Medium Dense to Dense SA to SA GR	115	0	30
2	Stiff SI CL LOAM	115	1000	0
3	Soft to M Stiff CL to SI CL	110	800	0
4	Soft to M Stiff CL to SI CL	110	600	0
5	Soft to M Stiff CL to SI CL	110	780	0

GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 16, SN 016-1805, CHICAGO, IL

SCALE: GRAPHICAL | APPENDIX B-1 | DRAWN BY: R. Gorlagunta CHECKED BY: M. Seyhun

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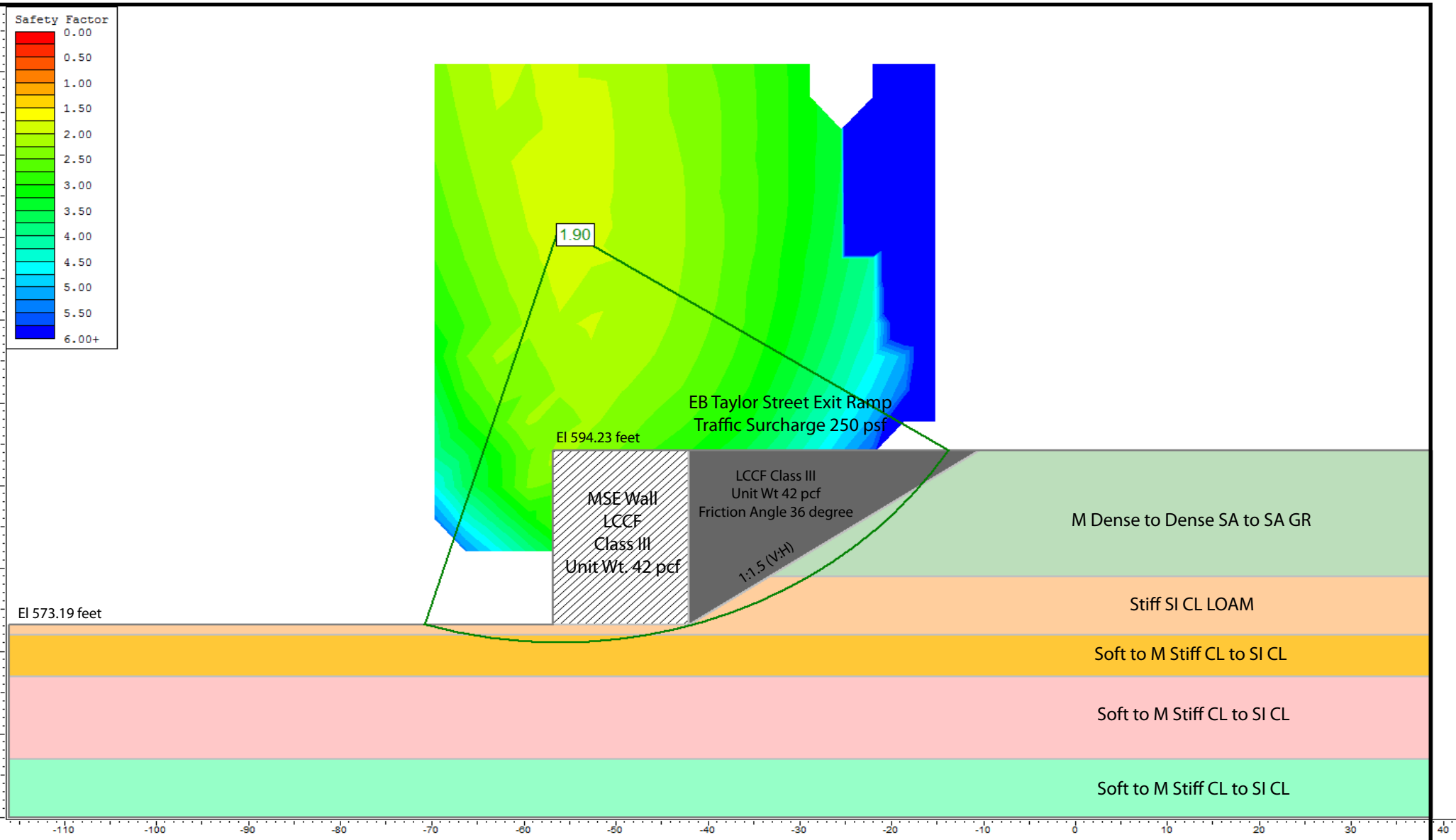

Drained Analysis for MSE Wall at Station 7326+25.98, Ref Borings 10-RWB-09, 16-RWB-04A, 16-RWB-04B, 16-RWB-05 and VST-07

Layer ID	Description	Unit Weight (pcf)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	Medium Dense to Dense SA to SA GR	115	0	30
2	Stiff SI CL LOAM	115	100	29
3	Soft to M Stiff CL to SI CL	110	50	29
4	Soft to M Stiff CL to SI CL	110	50	29
5	Soft to M Stiff CL to SI CL	110	50	29

GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 16, SN 016-1805, CHICAGO, IL

SCALE: GRAPHICAL | APPENDIX B-2 | DRAWN BY: R. Gorlagunta CHECKED BY: M. Seyhun

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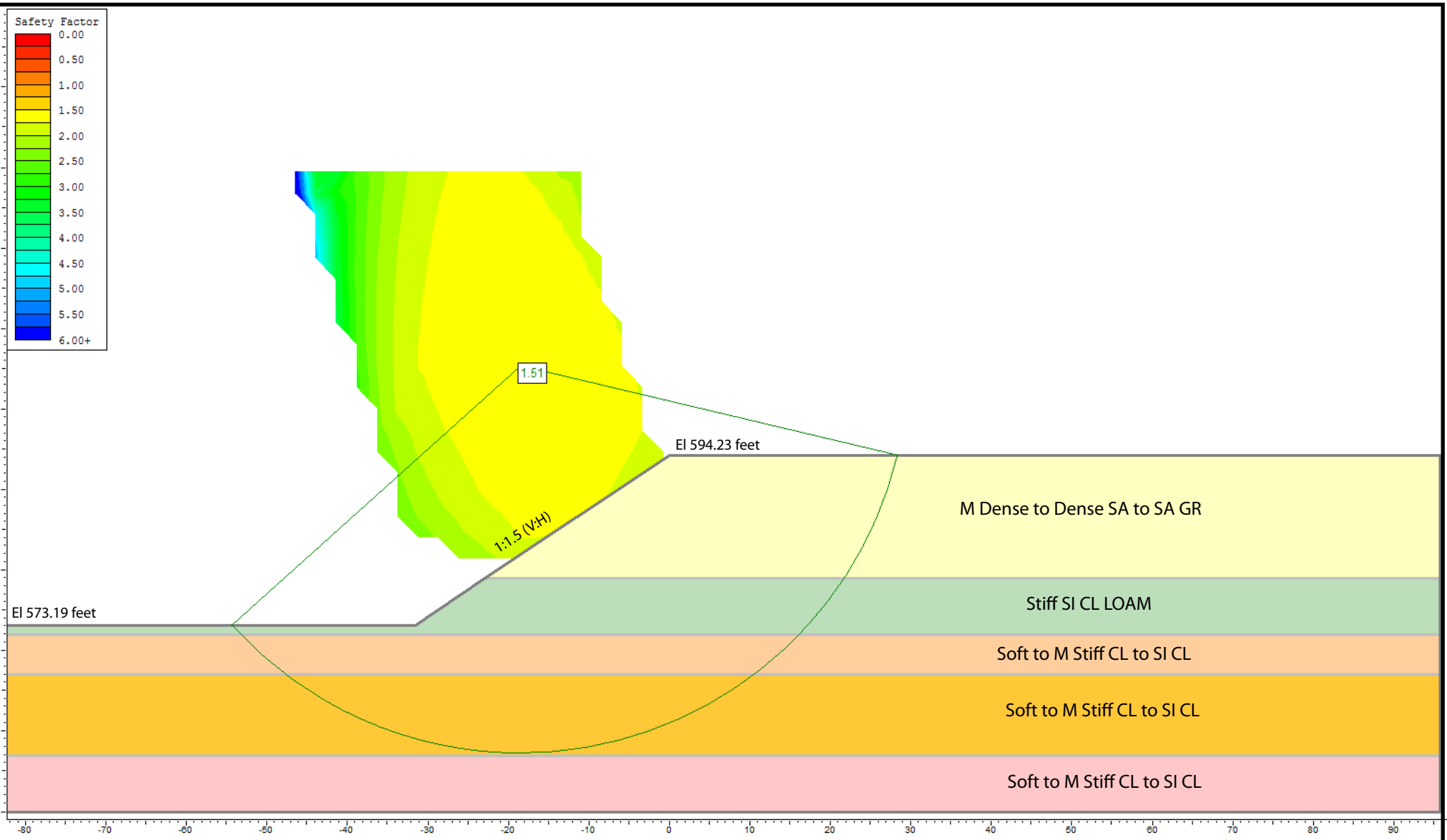

Undrained Analysis for Excavation at Station 7326+25.98, Ref Borings 10-RWB-09, 16-RWB-04A, 16-RWB-04B, 16-RWB-05 and VST-07

Layer ID	Description	Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Medium Dense to Dense SA to SA GR	115	0	30
2	Stiff SI CL LOAM	115	1000	0
3	Soft to M Stiff CL to SI CL	110	800	0
4	Soft to M Stiff CL to SI CL	110	600	0
5	Soft to M Stiff CL to SI CL	110	780	0

GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 16, SN 016-1805, CHICAGO, IL

SCALE: GRAPHICAL | APPENDIX B-3 | DRAWN BY: R. Gorlagunta CHECKED BY: M. Seyhun

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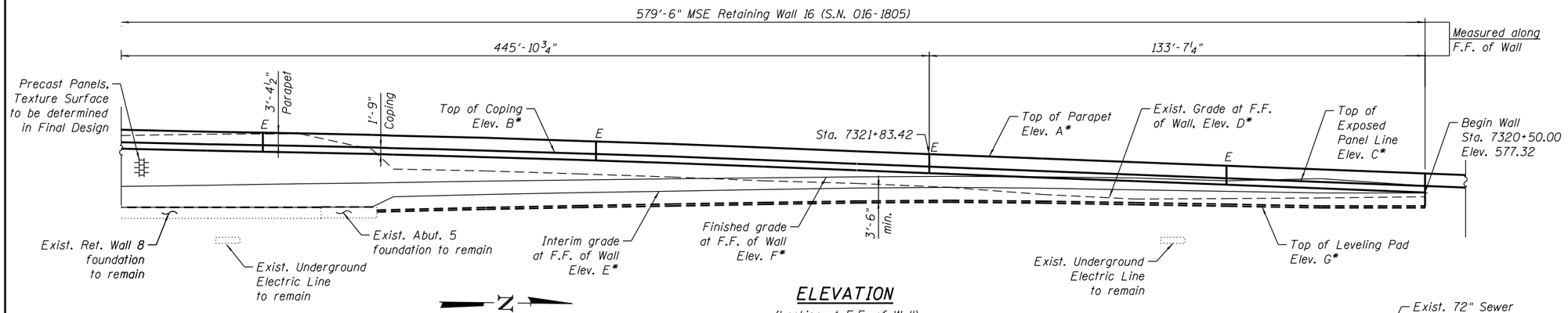
APPENDIX C

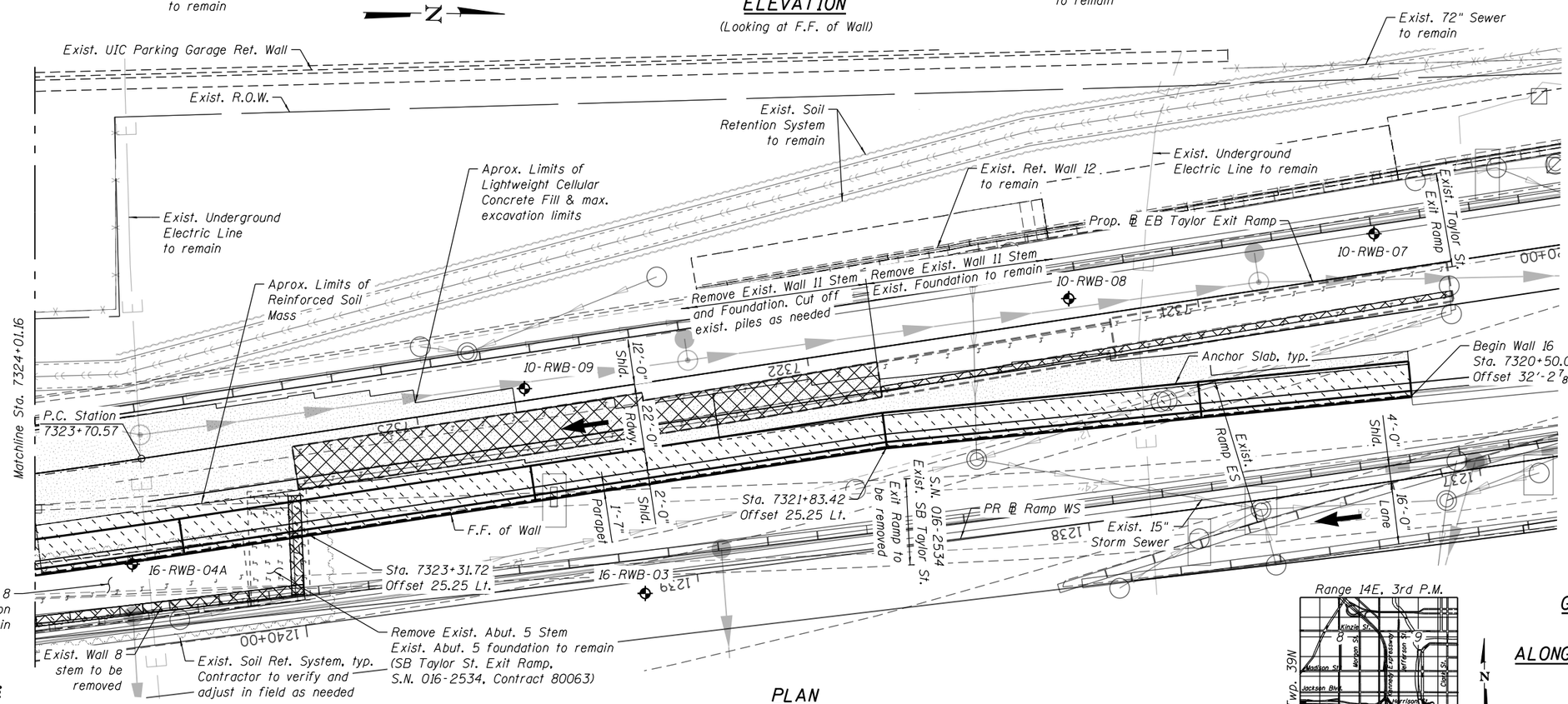
Bench Mark: Cut "X" on NE Bolt of Taylor St. on SW corner of Roosevelt and Union St. Elev. 593.36

Existing Structure: S.N. 016-2534 was built in 1988 and carries traffic for Taylor St exit ramp from SB I-90/94. Exist. four span structure has an overall length of approx. 428'. The exist. superstructure consists of steel beams with 7 1/2" thick concrete deck. The exist. substructure consists of reinforced concrete high wall abutment and piers supported on steel pile foundation. Existing structure to be removed.
Exist. Cast-In-Place Ret. Wall 8 was built under two separate contracts in 1986 & 1987. Total length of the wall is approx. 282'-9" with max. height of 23'-11". Exist. wall is supported on steel H-pile foundation. Steel sheet piling used during wall construction was cut-off at the top of wall footing elev.
Exist. Cast-In-Place Ret. Wall 11 was built in 1987. Total length of wall is approx. 296'-4" with max. height of 10'-6". Wall is supported on steel H-piles.

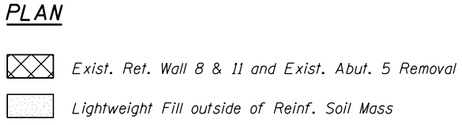
Traffic Control: SB Taylor St. Exit Ramp Structure and EB Taylor St. Exit Ramp will be closed and traffic will be detoured during construction. Traffic along SB I-90/94 will be maintained.



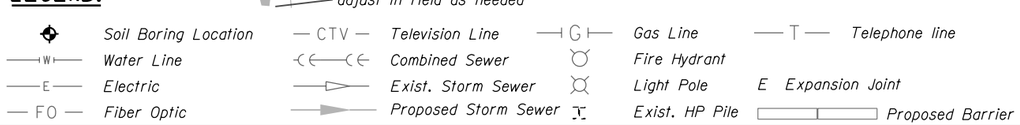
ELEVATION
(Looking at F.F. of Wall)



PLAN



LEGEND:



DESIGN SPECIFICATIONS

2014 AASHTO LRFD Bridge Design Specifications. 7th Edition with 2015 & 2016 Interims

DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi (All other concrete)
fy = 60,000 psi (Reinforcement)

PRECAST UNITS

f'c = 4,500 psi (Precast Panels)

HIGHWAY CLASSIFICATION

F.A.I. Rte. SB I-90/94
Functional Class: Interstate
ADT: 140,500 (2012); 148,000 (2040)
ADTT: 13,994 (2012); 14,741 (2040)
DHV: 8,960 (2040)
Design Speed: 60 m.p.h.
Posted Speed: 45 m.p.h.
One-Way Traffic
Directional Distribution: 100%

Taylor Street Exit Ramp
Functional Class: Interstate
ADT: 10,700 (2012); 11,000 (2040)
ADTT: 310 (2012); 319 (2040)
DHV: 750 (2040)
Design Speed: 25 m.p.h.
Posted Speed: 25 m.p.h.
One-Way Traffic
Directional Distribution: 100%

Ramp WS
Functional Class: Interstate
ADT: 7,200 (2012); 8,000 (2040)
ADTT: 114 (2012); 127 (2040)
DHV: 710 (2040)
Design Speed: 25 m.p.h.
Posted Speed: 25 m.p.h.
One-Way Traffic
Directional Distribution: 100%

* For Elevations, see Elevations Table on Sheets 3 thru 6.

NOTES:

1. Stations and offsets are measured along Prop. ℄ EB Taylor Exit Ramp to the front face of Wall.
2. F.F. denotes Front Face.
3. B.F. denotes Back Face.

LOCATION SKETCH

GENERAL PLAN & ELEVATION
RETAINING WALL 16
ALONG EB TAYLOR STREET EXIT RAMP
F.A.I. RTE. 90/94/290
SECTION 2014-013R&B-R
COOK COUNTY
STA. 7320+50.00 TO STA. 7326+25.98
STRUCTURE NO. 016-1805

AECOM

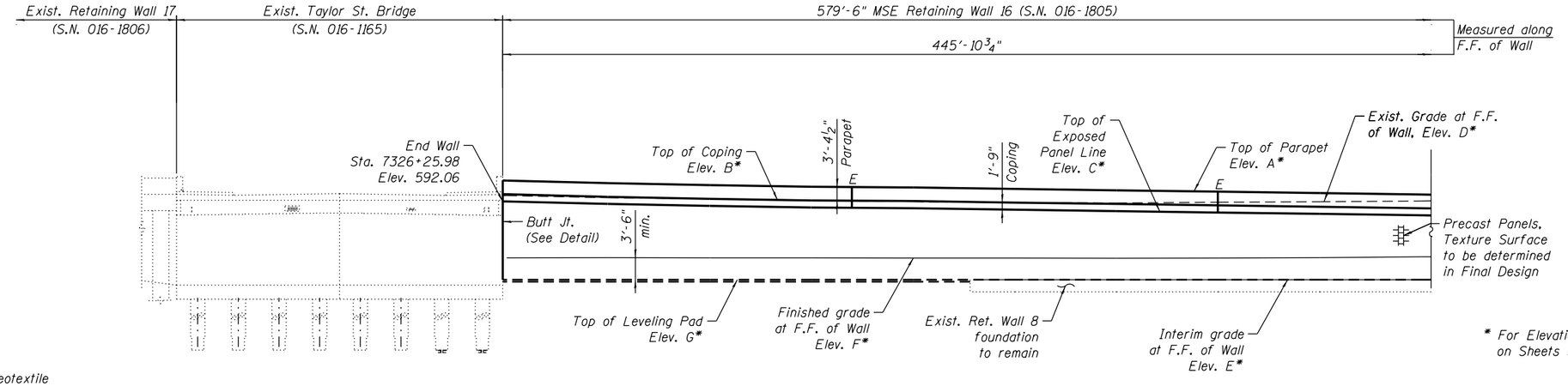
USER NAME = keserovicm	DESIGNED - MK	REVISED
	CHECKED - ATB	REVISED
PLOT SCALE = N.T.S.	DRAWN - MK	REVISED
PLOT DATE = 2/8/2018	CHECKED - ATB	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

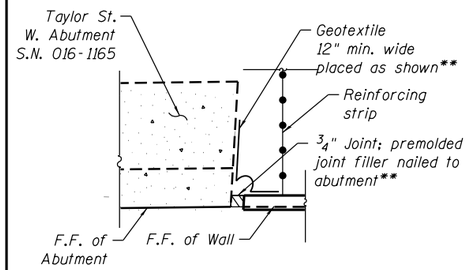
SHEET NO. 1 OF 6 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-013R&B-R	COOK	6	1
		CONTRACT NO. 60X93		
	ILLINOIS FED. AID PROJECT			

016-1805-CIRCLE100-SHT-ACM-ST-TSL-001.dgn



* For Elevations, see Elevations Table on Sheets 3 thru 6.

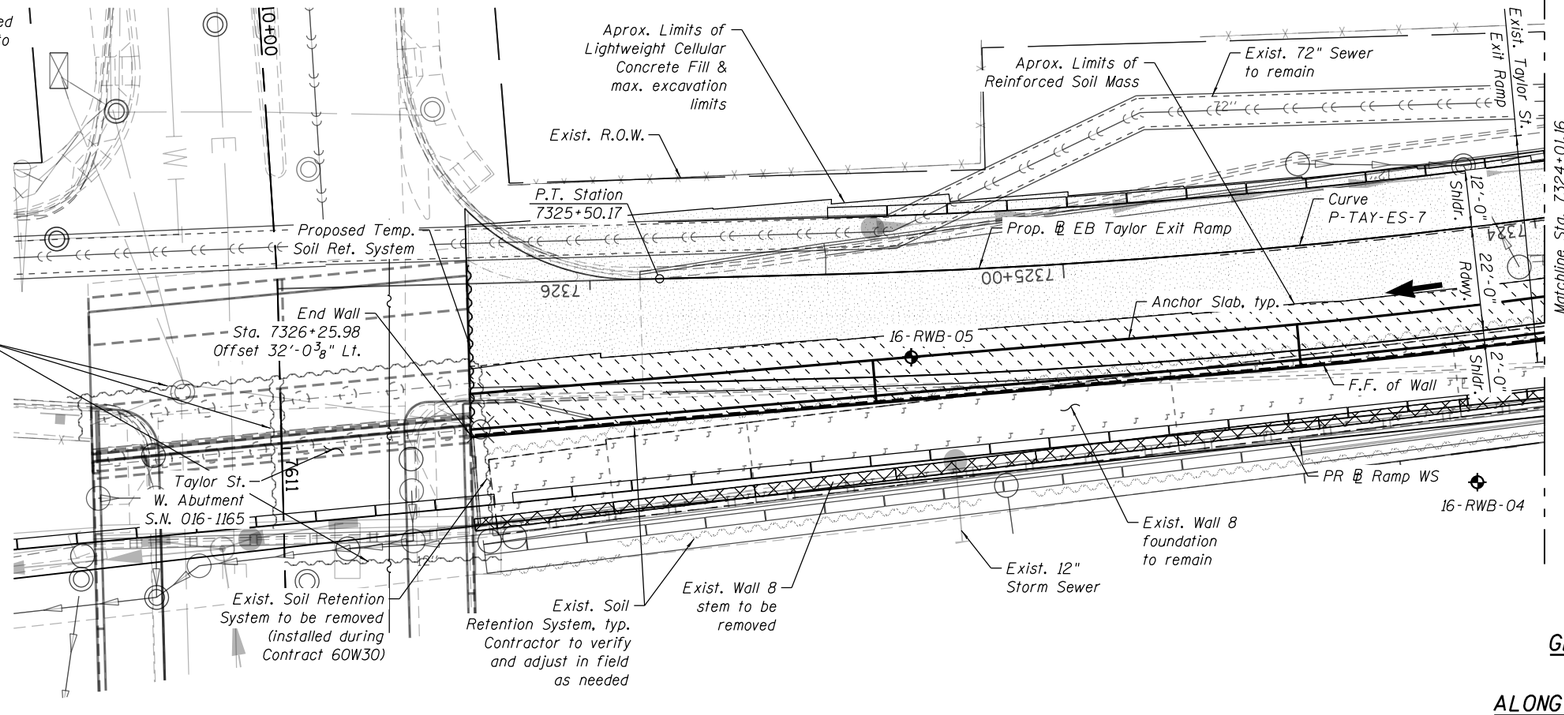


BUTT JOINT DETAIL

** Cost of Geotextile Fabric and Joint is included in cost of Mechanically Stabilized Earth Retaining Wall, Special.

ELEVATION

(Looking at F.F. of Wall)



CURVE DATA

Prop. Curve P-TAY-ES-7
P.I. Sta. = 7324+60.48
Δ = 7° 04' 21" (Rt.)
D = 3° 56' 16"
R = 1,455.00'
T = 89.92'
L = 179.61'
E = 2.78'
e = 3.00%
T.R. = NA
S.E. Run = 38'
P.C. Sta. = 7323+70.57
P.T. Sta. = 7325+50.17
DS = 30

NOTES:

1. Stations and offsets are measured along Prop. ℄ EB Taylor Exit Ramp to the front face of Wall.
2. F.F. denotes Front Face.
3. B.F. denotes Back Face.

LEGEND:

- Soil Boring Location
- W — Water Line
- E — Electric
- FO — Fiber Optic
- CTV — Television Line
- Combined Sewer
- Exist. Storm Sewer
- Proposed Storm Sewer
- G — Gas Line
- Fire Hydrant
- Light Pole
- Exist. HP Pile
- T — Telephone Line
- E Expansion Joint
- Proposed Barrier

PLAN

- Exist. Ret. Wall 8 & 11 and Exist. Abut. 5 Removal
- Lightweight Fill outside of Reinf. Soil Mass

GENERAL PLAN & ELEVATION
RETAINING WALL 16
ALONG EB TAYLOR STREET EXIT RAMP
F.A.I. RTE. 90/94/290
SECTION 2014-013R&B-R
COOK COUNTY
STA. 7320+50.00 TO STA. 7326+25.98
STRUCTURE NO. 016-1805

USER NAME = keserovicm	DESIGNED - MK	REVISED	
	CHECKED - ATB	REVISED	
PLOT SCALE = N.T.S.	DRAWN - MK	REVISED	
PLOT DATE = 2/8/2018	CHECKED - ATB	REVISED	

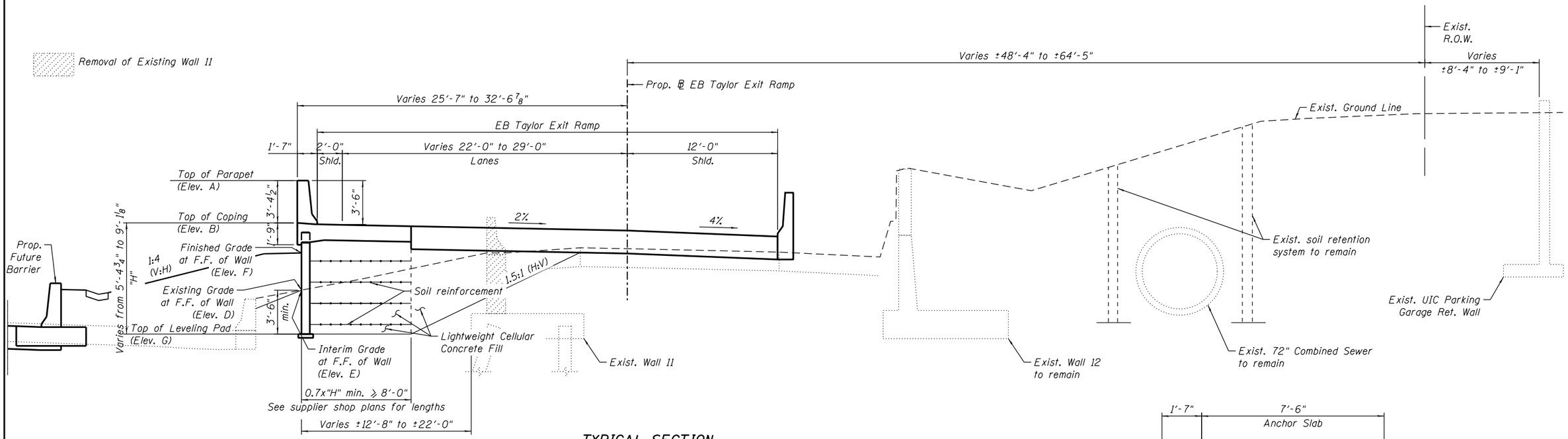
AECOM

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 2 OF 6 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-013R&B-R	COOK	6	2
		CONTRACT NO. 60X93		
	ILLINOIS FED. AID PROJECT			

016-1805-CIRCLE100-SHT-ACM-ST-TSL-002.dgn



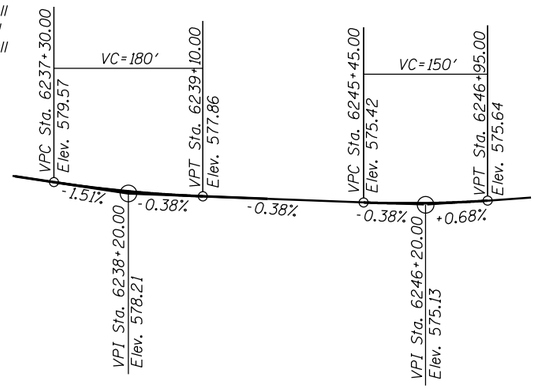
TYPICAL SECTION

(Sta. 7320+50.00 to Sta. 7321+83.42)
(Looking Upstation)

ELEVATION TABLE

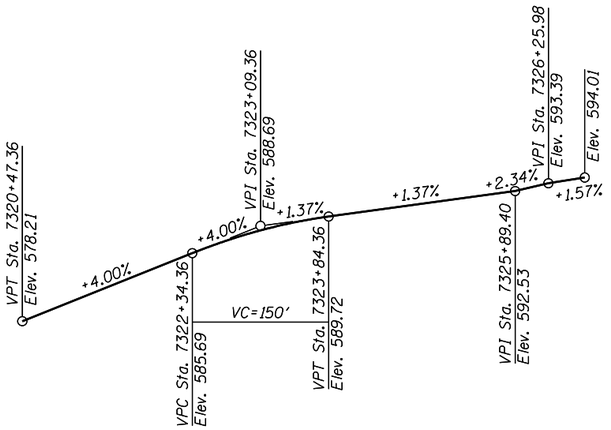
Wall Type	Station	Offset	Elevation A	Elevation B	Elevation C	Elevation D	Elevation E	Elevation F	Elevation G
MSE	7320+50.00	32.24 Lt.	582.44	579.07	577.32	575.97	577.17	578.80	573.67
MSE	7320+75.00	30.93 Lt.	583.41	580.04	578.29	575.74	577.68	579.45	574.18
MSE	7321+00.00	29.62 Lt.	584.38	581.01	579.26	575.55	577.78	580.61	574.28
MSE	7321+25.00	28.31 Lt.	585.36	581.99	580.24	575.41	578.18	580.95	574.68
MSE	7321+50.00	27.00 Lt.	586.33	582.96	581.21	577.25	578.59	581.26	575.09
MSE	7321+75.00	25.69 Lt.	587.30	583.93	582.18	578.63	578.82	581.61	575.32
MSE	7321+83.42	25.37 Lt.	587.64	584.27	582.52	578.90	578.67	581.49	575.17

Elevation A - Top of Parapet
Elevation B - Top of Coping
Elevation C - Top of Exposed Panel Line
Elevation D - Existing Grade at F.F. of Wall
Elevation E - Interim Grade at F.F. of Wall
Elevation F - Finished Grade at F.F. of Wall
Elevation G - Top of Leveling Pad



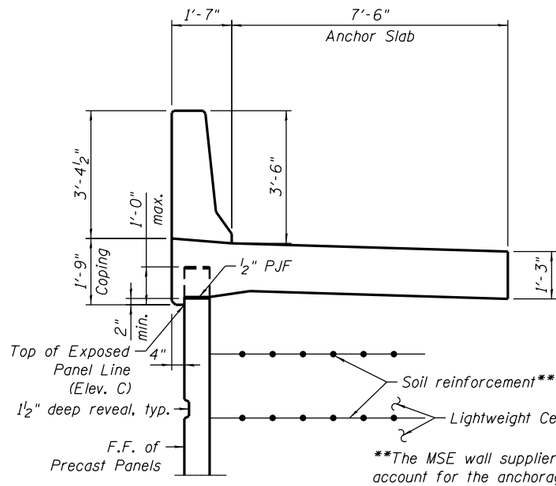
PROFILE GRADE

(along ℄ SB I-90/94)



PROFILE GRADE

(along ℄ EB Taylor Exit Ramp)



**The MSE wall supplier's internal stability design shall account for the anchorage slab's bearing pressure surcharge of 1.0 ksf and horizontal sliding force of 0.7 kips/ft. of wall.

SECTION THRU PARAPET AND ANCHORAGE SLAB

(Looking Upstation)

TYPICAL SECTION I
RETAINING WALL 16
ALONG EB TAYLOR STREET EXIT RAMP
F.A.I. RTE. 90/94/290
SECTION 2014-013R&B-R
COOK COUNTY
STA. 7320+50.00 TO STA. 7326+25.98
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AECOM

USER NAME = keserovicm	DESIGNED - MK	REVISED	
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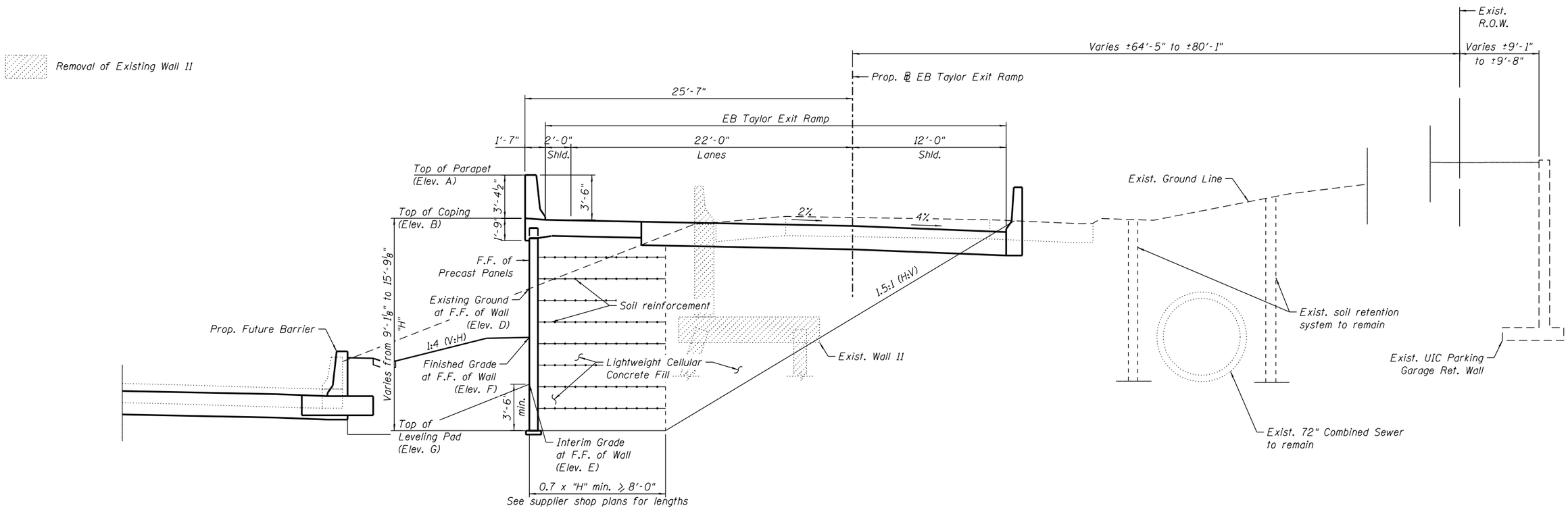
PLOT SCALE = N.T.S.	DRAWN - MK	REVISED	
PLOT DATE = 2/8/2018	CHECKED - ATB	REVISED	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 3 OF 6 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-013R&B-R	COOK	6	3
		CONTRACT NO. 60X93		
	ILLINOIS FED. AID PROJECT			

016-1805-CIRCLE100-SHT-ACM-ST-TSL-003.dgn



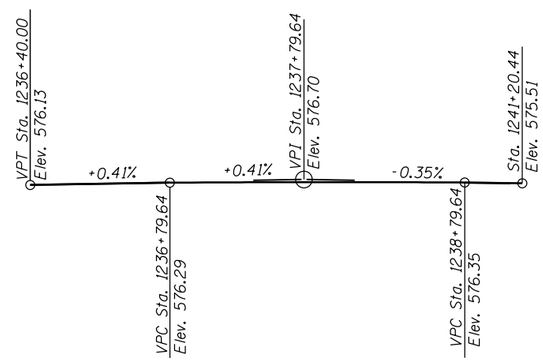
TYPICAL SECTION

(Sta. 7321+83.42 to Sta. 7323+11.00)
(Looking Upstation)

ELEVATION TABLE

Wall Type	Station	Offset	Elevation A	Elevation B	Elevation C	Elevation D	Elevation E	Elevation F	Elevation G
MSE	7321+83.42	25.37 Lt.	587.64	584.27	582.52	578.90	578.67	581.49	575.17
MSE	7322+00.00	25.25 Lt.	588.30	584.93	583.18	579.35	578.64	581.31	575.14
MSE	7322+25.00	25.25 Lt.	589.30	585.93	584.18	581.98	578.25	580.99	574.75
MSE	7322+50.00	25.25 Lt.	590.27	586.90	585.15	579.87	577.83	580.66	574.33
MSE	7322+75.00	25.25 Lt.	591.15	587.78	586.03	580.49	577.44	580.34	573.94
MSE	7323+00.00	25.25 Lt.	591.92	588.55	586.80	581.77	576.89	579.99	573.39
MSE	7323+11.00	25.25 Lt.	592.22	588.85	587.10	585.30	576.58	579.92	573.08

Elevation A - Top of Parapet
Elevation B - Top of Coping
Elevation C - Top of Exposed Panel Line
Elevation D - Existing Grade at F.F. of Wall
Elevation E - Interim Grade at F.F. of Wall
Elevation F - Finished Grade at F.F. of Wall
Elevation G - Top of Leveling Pad



PROFILE GRADE

(along ℄ Ramp WS)

NOTE:

1. For Section thru Parapet and Anchorage Slab, see Sheet 3.

TYPICAL SECTION II
RETAINING WALL 16
ALONG EB TAYLOR STREET EXIT RAMP
F.A.I. RTE. 90/94/290
SECTION 2014-013R&B-R
COOK COUNTY
STA. 7320+50.00 TO STA. 7326+25.98
STRUCTURE NO. 016-1805

016-1805-CIRCLE100-SHT-ACM-ST-TSL-004.dgn

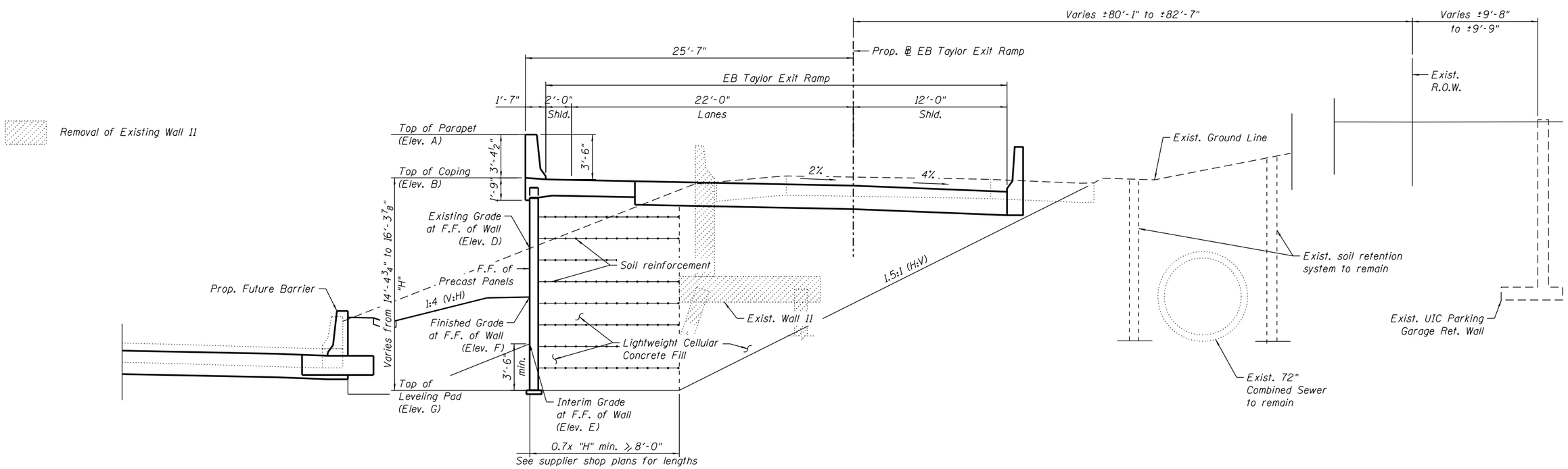
AECOM

USER NAME = keserovicm	DESIGNED - MK	REVISED	
	CHECKED - ATB	REVISED	
PLOT SCALE = N.T.S.	DRAWN - MK	REVISED	
PLOT DATE = 2/8/2018	CHECKED - ATB	REVISED	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 4 OF 6 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-013R&B-R	COOK	6	4
		CONTRACT NO. 60X93		
	ILLINOIS FED. AID PROJECT			



TYPICAL SECTION

(Sta. 7323+11.00 to Sta. 7323+31.72)
(Looking Upstation)

NOTE:

1. For Section thru Parapet and Anchorage Slab, see Sheet 3.

ELEVATION TABLE

Wall Type	Station	Offset	Elevation A	Elevation B	Elevation C	Elevation D	Elevation E	Elevation F	Elevation G
MSE	7323+11.00	25.25 Lt.	592.22	588.85	587.10	585.30	576.58	579.92	573.08
MSE	7323+25.00	25.25 Lt.	592.57	589.20	587.45	587.72	576.37	579.58	572.87
MSE	7323+31.72	25.25 Lt.	592.73	589.36	587.61	588.30	578.46	579.55	574.96

Elevation A - Top of Parapet
Elevation B - Top of Coping
Elevation C - Top of Exposed Panel Line
Elevation D - Existing Grade at F.F. of Wall
Elevation E - Interim Grade at F.F. of Wall
Elevation F - Finished Grade at F.F. of Wall
Elevation G - Top of Leveling Pad

TYPICAL SECTION III
RETAINING WALL 16
ALONG EB TAYLOR STREET EXIT RAMP
F.A.I. RTE. 90/94/290
SECTION 2014-013R&B-R
COOK COUNTY
STA. 7320+50.00 TO STA. 7326+25.98
STRUCTURE NO. 016-1805

016-1805-CIRCLE100-SHT-ACM-ST-TSL-005.dgn

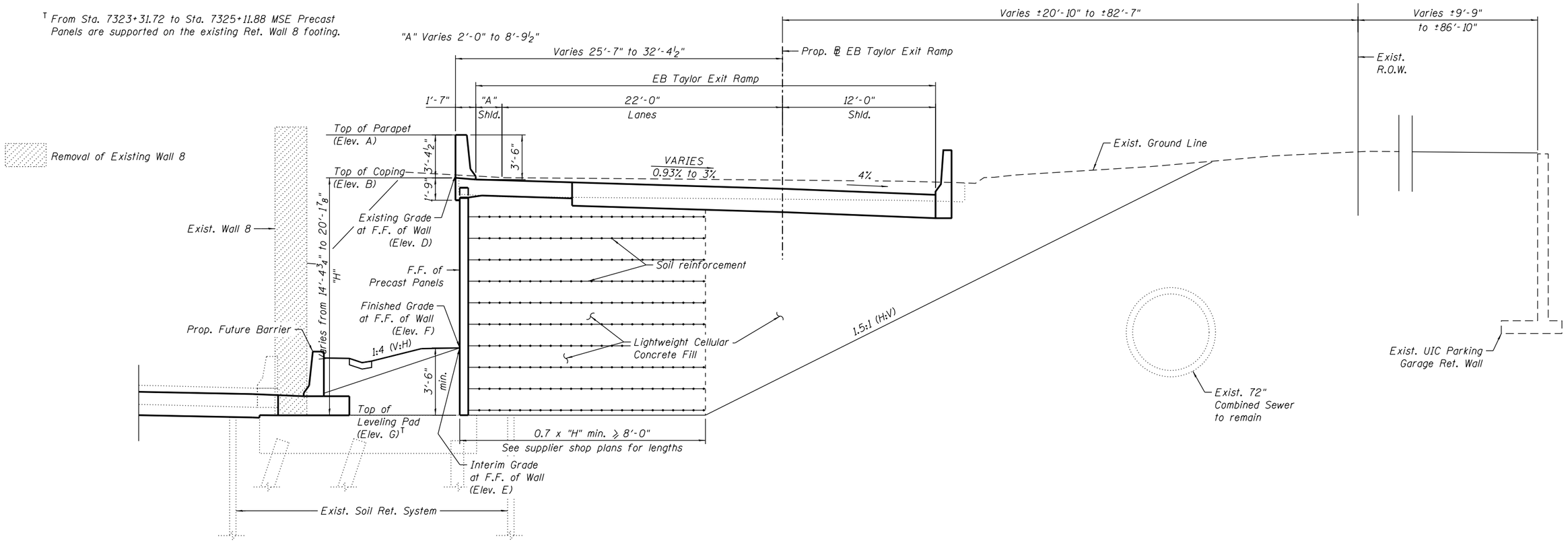
AECOM

USER NAME = keserovicm	DESIGNED - MK	REVISED	
	CHECKED - ATB	REVISED	
PLOT SCALE = N.T.S.	DRAWN - MK	REVISED	
PLOT DATE = 2/8/2018	CHECKED - ATB	REVISED	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 5 OF 6 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-013R&B-R	COOK	6	5
		CONTRACT NO. 60X93		
	ILLINOIS FED. AID PROJECT			



TYPICAL SECTION

(Sta. 7323+31.72 to Sta. 7326+25.98)
(Looking Upstation)

ELEVATION TABLE

Wall Type	Station	Offset	Elevation A	Elevation B	Elevation C	Elevation D	Elevation E	Elevation F	Elevation G
MSE	7323+31.72	25.25 Lt.	592.73	589.36	587.61	588.30	578.46	579.55	574.96
MSE	7323+50.00	25.25 Lt.	593.12	589.75	588.00	594.09	578.05	579.18	574.55
MSE	7323+75.00	25.25 Lt.	593.61	590.24	588.49	592.94	577.48	578.79	573.98
MSE	7324+00.00	25.25 Lt.	594.15	590.78	589.03	592.54	577.01	578.45	573.51
MSE	7324+25.00	25.25 Lt.	594.50	591.13	589.38	592.90	576.73	578.24	573.23
MSE	7324+50.00	25.25 Lt.	594.84	591.47	589.72	592.23	576.60	578.11	573.10
MSE	7324+75.00	25.27 Lt.	595.18	591.81	590.06	592.03	576.66	578.10	573.16
MSE	7325+00.00	25.64 Lt.	595.54	592.17	590.42	592.14	576.84	578.12	573.34
MSE	7325+25.00	26.44 Lt.	595.90	592.53	590.78	592.34	577.03	578.14	573.53
MSE	7325+50.00	27.67 Lt.	596.15	592.78	591.03	592.70	577.22	578.15	573.72
MSE	7325+75.00	29.11 Lt.	596.38	593.01	591.26	578.65	577.40	578.17	573.90
MSE	7326+00.00	30.54 Lt.	596.71	593.34	591.59	593.33	577.58	578.18	574.08
MSE	7326+25.00	31.98 Lt.	597.16	593.79	592.04	593.87	577.74	578.18	574.24
MSE	7326+25.98	32.03 Lt.	597.18	593.81	592.06	593.84	577.15	578.17	573.65

Elevation A - Top of Parapet
Elevation B - Top of Coping
Elevation C - Top of Exposed Panel Line
Elevation D - Existing Grade at F.F. of Wall
Elevation E - Interim Grade at F.F. of Wall
Elevation F - Finished Grade at F.F. of Wall
Elevation G - Top of Leveling Pad

NOTE:

1. For Section thru Parapet and Anchorage Slab, see Sheet 3.

TYPICAL SECTION IV
RETAINING WALL 16
ALONG EB TAYLOR STREET EXIT RAMP
F.A.I. RTE. 90/94/290
SECTION 2014-013R&B-R
COOK COUNTY
STA. 7320+50.00 TO STA. 7326+25.98
STRUCTURE NO. 016-1805

016-1805-CIRCLE100-SHT-ACM-ST-TSL-006.dgn

AECOM

USER NAME = keserovicm	DESIGNED - MK	REVISED	
	CHECKED - ATB	REVISED	
PLOT SCALE = N.T.S.	DRAWN - MK	REVISED	
PLOT DATE = 2/8/2018	CHECKED - ATB	REVISED	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 6 OF 6 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-013R&B-R	COOK	6	6
		CONTRACT NO. 60X93		
		ILLINOIS FED. AID PROJECT		