STRUCTURE GEOTECHNICAL REPORT
CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 39 (PROPOSED SN 016-1808)
F.A.I ROUTE 290 (EISENHOWER EXPRESSWAY)
STATION 1319+75.65 TO STATION 1321+53.10
IDOT D-91-227-13/PTB 163-001
COOK COUNTY, ILLINOIS

For

AECOM

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11. Abstract

A 172-foot long, 21.9 feet maximum retained height new retaining wall will be constructed to accommodate the proposed Ramp SW realignment from Station 1319+75.65 to Station 1321+53.10 to Eisenhower Expressway. This report provides geotechnical recommendations for the design and construction of the proposed retaining wall.

Based on Borings 39-RWB-01 and 39-RWB-01HA drilled along the wall alignment and Borings 2081-B-01 and 2055-B-01 from Halsted Street and Van Buren Street Bridges, the foundation soils consists of up to 14.1 feet of fill, up to 5.0 feet medium stiff to very stiff clay crust, up to 36.3 feet of very soft to medium stiff silty clay, 25 feet of stiff to hard clay loam, about 15 feet of hard silty clay loam, very dense gravelly sand over very stiff to hard silty clay loam to the boring termination depths. Based on nearby deep borings, bedrock is expected at an elevation of about 485 feet elevation. Groundwater may be perched within the granular fill layers at upper levels and present intermittently between layers.

The retaining wall is a semi cut and fill wall. Our wall type evaluation shows the most technically feasible type of wall is a drilled shaft with lagging wall, or other non-gravity walls such as tangent and secant walls. Regular backfill, and Class II or Class IV lightweight cellular concrete fill options have been provided. Geotechnical parameters for design are presented in this report. The shear strength parameters for the soft clay are based on vane shear tests undertaken at the site that were used for analyses. The global stability analyses performed for the maximum height of the wall system showed satisfactory factor of safety against slope failure.

12. Path to archived file

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TABLE OF CONTENTS

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CIRCLE INTERCHANGE RECONSTRUCTION
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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 016-1808 (Retaining Wall 39) along the proposed southwest ramp (Ramp SW) to F.A.I Route 290 (Eisenhower expressway) 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 TSL dated September 25, 2015 provided by TranSystems, the proposed retaining wall (SN 016-1808) will be about 172-foot long measured along wall's front face extending from Station 1319+75.65 to Station 1321+53.10 along the newly realigned Ramp SW and will have a maximum retained height of about 21.9 feet. The maximum wall height measured from the finished grade behind the wall to the bottom of concrete facing is 23.9 feet. There will be a 4-foot concrete parapet on top of the wall. The cross sections provided show an existing ground back slope of 2H:1V which will require up to 18 feet of backfill at the maximum height of the cone.

The wall will start near Van Buren Street Bridge west abutment of and will extend southwest along the proposed Ramp SW to near Halsted Street Bridge north abutment towards I-290 westbound. The new wall will retain the embankment fill of the realigned Ramp SW. The latest TSL is shown in the *Type Size Location Plan* (Appendix C).

1.3 Existing Structure

There is an existing 4 to 5 feet high barrier wall and a temporary soil system near Ramp SW that will be removed. There is an existing monument as close a 70 feet to the proposed wall. The monument is proposed to remain in place but the surrounding blockwalls will be removed. The abutment slope is currently grass covered.

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 NW¼ 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).

Along the proposed retaining wall, the southbound I-90/94 exit ramp to westbound I-290 roadway alignment is constructed within a 20- to 25-foot deep cut. Elevations along the proposed wall range from 573 feet at the southwest end to 575 feet at the northeast end.

2.2 Surficial Cover

Within the project area, 75-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 75 to 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. On the west side of Van Buren Street, an abandoned 8-foot diameter concrete tunnel runs north to south under Halsted Street at about 536 feet elevation. This appears to be outside of the proposed wall alignment footprint thus no interference with any deep foundations.

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. Bedrock was not encountered in any of the borings drilled for the retaining wall; however, based on nearby borings in the area, bedrock is estimated to be at approximately 485 feet elevation.

3.0 EXISTING GEOTECHNICAL DATA

Boring 2081-B-01 performed for the Halsted Street Bridge north abutment and Boring 2055-B-01 performed for the Van Buren Street Bridge west abutment were used in analysis for the wall design.

4.0 METHODS OF INVESTIGATION

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

4.1 Subsurface Investigation

In addition to the existing geotechnical data mentioned in Section 3.0, Wang drilled a structure boring designated as 39-RWB-01 and a hand-auger designated as 39-RWB-01HA, between August 7 and October 28, 2014 along the proposed wall alignment. 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).

A truck-mounted drilling rig equipped with hollow stem augers, was used to advance and maintain an open borehole to 10 feet depth after that mud rotary was used to the boring termination depth. 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. 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 a separate borehole designated as Boring 39-VST-01 to determine in-situ shear strength of very soft to soft silty clay. This borehole was performed without soil sampling below 10 feet. After drilling to the desired depth, casing was installed and vane shear test was performed using Acker Vane Shear Test Kit. Tests were performed in undisturbed and remolded conditions. The sensitivity 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 test results were used for analyses.

4.3 Laboratory Testing

All soil samples were tested in the laboratory for moisture content (AASHTO T-265). 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).

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, pavement structure consists of 3.0- to 6.5-inch asphalt over 10.5- to 12.0-inch concrete. In descending order, the general lithologic succession encountered beneath the pavement 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 diamicton; 5) hard silty clay loam or very dense silty loam; 6) very dense gravelly sand; and 7) very stiff to hard silty clay to silty clay loam.

1) Man-made ground (fill)

Underneath the pavement structure, at elevations of 580.7 to 592.9 feet, the borings encountered 1.8 to 14.1 feet of cohesive or granular fill. The granular fill consists of loose to medium dense, black and brown to gray silty loam, sandy loam, and gravelly sand with SPT N-values of 6 to 20 blows/foot and moisture content (MC) values of 4 to 16%. The cohesive fill consists of stiff, brown and gray silty

clay loam and has an unconfined compressive strength (Q_u) value of 1.23 tsf and a moisture content (MC) value of 20%.

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

Below the fill, a 2.5- to 5.0-foot thick layer of medium stiff to very stiff, brown and gray silty clay to silty clay loam was sampled in the borings starting at elevations of 578.8 to 585.5 feet. This layer has Q_u values ranging from 0.5 to 2.46 tsf with an average of 1.3 tsf and MC values between 17 and 23% averaging 20%. This layer is commonly known as the "crust."

3) Very soft to medium stiff clay to silty clay

At elevations of 571.3 to 580.5 feet, the borings encountered up to 36.3 feet of very soft to medium stiff, gray clay to silty clay with Qu values of 0.08 to 0.98 tsf with an average of 0.38 tsf and MC values of 18 to29% averaging 26%. This layer is commonly known as the "Chicago Blue Clay."

4) Stiff to hard silty clay to silty clay loam diamicton

The borings advanced through up to 25 feet of stiff to hard, gray silty clay to silty clay loam at elevations of 537.5 to 546.8 feet. It has Qu values of 1.23 to 5.58 tsf with an average value of 3.6 tsf and MC values of 11 to 27% averaging 17%.

(5) Hard silty clay loam or very dense silty loam

At elevations of 521.8 to 530.1 feet, the borings advanced through hard, gray silty clay loam or very dense silty loam. This layer has Qu values of 3.3 to 10.3 tsf, MC values of 14 to 18%, and SPT N values of 24 and more than 50 blows/foot. This layer is commonly known as the "Chicago Hardpan".

(6) Very dense gravelly sand

Below the hardpan and extending to the top of silty clay loam or loam, the borings encountered up to 10.0 feet thick layer of very dense, gray silty loam to gravelly sand or sandy gravel with SPT N values of more than 50 blows/foot and MC values of 14 to 21%.

(7) Very stiff to hard silty clay loam to silty loam

At elevations of 496.8 and 502.8 feet and extending to boring termination depths, the borings encountered very stiff to hard, gray silty clay loam to silty loam with Qu values of 2.46 to 4.50 tsf, MC values of 16 to 22%.

5.2 Groundwater Conditions

Groundwater was observed during drilling at elevations of 579.4 and 583.3 feet (2.5 and 11 feet bgs) in Borings 39-RWB-01 and 2081-B-01. Groundwater may be perched within the granular fill layers at upper levels and present intermittently between layers. Water-bearing layers may also be present at deeper levels within the sandy gravel encountered at elevations of 507.5 to 501.5 feet. These possibilities 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, 2012B).

6.0 ANALYSIS AND RECOMMENDATIONS

6.1 Retaining Wall Type Evaluation

The proposed retaining wall will be required to allow the realignment of Ramp SW carrying southbound I-90/94 traffic to westbound I-290. Based on the cross sections provided, the wall is a semi cut and fill wall.

The soils below the finished grade in front of the wall at elevation of about 574 feet are very soft to medium stiff clay and silty clay extending to about 42 feet bgs (elevation 540 feet). The top of the proposed retaining wall will be at about 596 feet elevation. The maximum exposed wall height will be about 21.9 feet. The maximum wall height measured from the finished grade behind the wall to the bottom of concrete facing is 23.9 feet. The existing ground adjacent to the wall backslopes about 2H:1V.

Consideration was given in using standard gravity cast-in-place cantilever concrete (T-type) walls with spread footings or an MSE wall, however, it was ruled out due to low bearing resistance and excessive settlements unless drilled shaft support or ground improvement is performed. In addition, these walls would require a partial temporary soil retention system to retain the slope during construction for excavation of the foundations.

A non-gravity permanent cantilevered sheetpile retaining wall was considered but was ruled out due to noise and vibration concerns to the nearby buildings.

Finally, a drilled shaft with lagging type retaining wall system was considered. Other non-gravity walls such as tangent or secant wall may also be used. The lateral movement of this type of wall is relatively small compared to more flexible walls. The geotechnical parameters developed for drilled shaft with lagging wall in the next section may be used for these walls.

6.2 Drilled Shaft with Lagging Wall

The tip elevation of the drilled shafts will be determined by the lateral resistance. It should be noted that there is up to 18 feet of backfill required to fill the cone at the back of the wall to reach a finished grade at back face of wall of about 595 feet elevation. The existing ground is sloping at about 2H:1V.

The design embedment depth of the wall sections should include a minimum FOS of 1.5 against earth pressure failure for walls in the long-term (drained) condition using the soil parameters as shown in Table 1. The design of the wall should ignore 3 feet of soil in front of the wall measured from the finished ground surface elevation in providing passive pressure due to excavation required for installation of concrete facing, drainage system and frost-heave condition. In developing the design lateral pressure, the lateral pressure due to construction equipment surcharge load should be added to the lateral earth pressure. Drainage behind the wall and underdrain should be as per 2012 IDOT Bridge Manual (IDOT, 2012B). The water pressure should be added to the earth pressure if drainage is not provided. The simplified earth pressure distributions shown in 2014 AASHTO LRFD Bridge Design Specifications should be used. The wall design needs to account for the proposed drainage system.

Table 1: Earth Pressure Parameters for Design of Wall
(Borings 39-RWB-01, 39-VST-01, and 2055-B-01)

Layer Elevations/ Soil Description	Unit Weight (pcf)	Drained Shear Strength Properties		Earth Pressure Coefficients[1]	
		Cohesion (psf)	Friction Angle, φ' (Degree)	Active Pressure	Passive Pressure
574.0[2] to 562.9 Clay to Silty Clay	110	50	28	0.36	2.77
562.9 to 558.9 Clay to Silty Clay	115	50	29	0.35	2.88
558.9 to 554.9 Clay to Silty Clay	110	50	28	0.36	2.77
554.9 to 544.1 Clay to Silty Clay	115	80	29	0.35	2.88
544.1 to 538.9 Silty Clay to Silty Clay Loam	120	100	30	0.33	3.00
538.9 to 530.1 Silty Clay Loam to Silty Loam	125	100	30	0.33	3.00
530.1 to 521.8 Silty Clay to Silty Clay Loam	120	100	30	0.33	3.00
521.8 to 506.8 Silty Clay Loam	125	100	30	0.33	3.00
506.8 to 501.5 Sandy Gravel	125	0	37	0.25	4.02
501.5 to 490.0 Silty Clay Loam to Silty Loam	120	100	30	0.33	3.00

[1] Earth pressure coefficients for straight backfill
[2] Finished grade elevation at front face of wall

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 Table 2 via p-y curve (COMP624) method. The incremental parameters for the soft silty clay (**Layer 3**) undrained shear values were obtained from vane shear testing conducted at Boring 39-VST-01. In addition, the results of nearby vane shear tests, unconfined compressive test results from Shelby tube samples, and undrained shear strength (cohesion) results from triaxial UU tests were also considered in soil parameter development.

Table 2: Recommended Parameters for Lateral Load Analyses of Wall
(Borings 39-RWB-01, 39-VST-01, and 2055-B-01)

Layer Elevations/ Soil Description	Moist Unit Weight (pcf)	Shear Strength Properties			Estimated Lateral Soil Modulus Parameter[3], k (pci)	Estimated Soil Strain Parameter[3], ε_{50}
		Short Term		Long Term		
		Cohesion Cu (psf)	Friction Angle, φ (Degree)	Friction Angle, φ' (Degree)		
574.0[1] to 562.9 Clay to Silty Clay	110	560	0	28	100	0.0100
562.9 to 558.9 Clay to Silty Clay	115	950	0	29	100	0.0100
558.9 to 554.9 Clay to Silty Clay	110	820	0	28	100	0.0100
554.9 to 544.1 Clay to Silty Clay	115	1400	0	29	500	0.0070
544.1 to 538.9 Silty Clay to Silty Clay Loam	120	2500	0	30	1000	0.0050
538.9 to 530.1 Silty Clay Loam to Silty Loam	125	5000	0	30	2000	0.0040
530.1 to 521.8 Silty Clay to Silty Clay Loam	120	3000	0	30	1000	0.0050
521.8 to 506.8 Silty Clay Loam	125	7000	0	30	2000	0.0040
506.8 to 501.5 Sandy Gravel	125	0	37	37	100	--
501.5 to 490.0[2] Silty Clay Loam to Silty Loam	120	2400	0	30	1000	0.0050

[1]Finished grade elevation at front face of wall
[2]Boring termination depth
[3]Based on L-Pile Technical Manual 2012

6.3 Settlement of Backfill

Based on the cross sections, to reach the design backfill elevation of about 595 feet, there will be significant backfilling required along the wall's sloping backside to fill the cone which will vary from 18 feet height at the wall bottom to 0 at the top. Settlement analyses were performed using IDOT spreadsheets for cohesive soils dated 12/09/2014.

Backfill options for the sloping ground (cone) behind the wall may be normal granular backfill or a Class II (30 pcf) or Class IV (42 pcf) lightweight cellular concrete fill (LCCF). Our analyses show maximum settlement of 3.5 inches for normal backfill and 1.9 inches of LCCF at the maximum height, respectively. The average cone settlement will be about half of the maximum settlement. Since landscaping is proposed adjacent to the top of finished wall, a combination of the use of normal backfill for the top 3 feet to allow for landscaping with the remaining filled with LCCF may also be considered. Since the usage at the top of the wall will be a landscaped area, the settlements should not be critical.

It should be noted that the use of the lightweight fill as backfill will significantly reduce lateral loads on the wall due to its low unit weight and strength characteristics, thus may be cost effective. The fill will act like a concrete with maximum lateral load at placement (liquid state) but self-supporting upon hardening.

It should be noted that the backfill surcharge is applied at the upper levels of the backwall slope where the existing sloping ground is located. The settlement induced by the normal backfill on the existing drilled shafts at adjoining Van Buren Street and Halsted Street bridge abutments is less than 0.4 inches, thus no downdrag is anticipated.

The nearest structure is a monument that is 70 feet away from the wall. We estimate the surface movement induced adjacent to the monument by the installation of the wall is less than 0.25 inches. However, there is a proposed drainage system that is closer and its impact to the monument and wall should be evaluated during design and construction.

6.4 Global Stability Analyses

Global stability analysis was performed for the maximum wall height with up to 18 feet of regular backfill and lightweight fill for both short-term (undrained) and long-term (drained) soil conditions as reported in Appendix B. The soil parameters used for the stability analysis were based on the shear strength parameters developed from the unconfined compressive strength (Qu) values which are more conservative. The computer program, SLIDE Version 5.0, was used to calculate the factor of safety (FOS) using the circular surface method. The minimum required FOS against global instability according to IDOT is 1.5 for both conditions.

We estimate the maximum wall section has a short-term FOS of 1.5 (Appendix B-1, B-3) and a long-term FOS of 2.6 to 2.8 (Appendix B-2, B-4), therefore satisfying the minimum IDOT FOS requirements. The analysis basically shows the wall configuration needed to achieve a minimum 1.5 FOS against global instability for the most critical case. The final wall is to be designed separately using the parameters provided in Tables 1 and 2 and should extend deeper into hard clay layer.

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 which should be removed through conventional sump and pump methods. Intermittent water-bearing layers may also be present at deeper levels within the proposed drilled shafts. These layers may locally impact drilled shaft installations. Casing will be required to seal these interbeds off in the event that they are exposed. Casing will also be necessary to prevent shaft squeeze within the soft and deformable clays encountered (**Layer 3**). Moreover, during drilling we encountered hard drilling which indicates the possibility of cobbles or boulders

7.2 Filling and Backfilling

All fill and backfill materials will be as per IDOT Standard Specification. Lightweight cellular concrete fill to be a Class II (cast density of 24-30 pcf) or Class IV (cast density of 36-42 pcf) supplied and installed in accordance with latest District One specifications.

7.3 Wall Construction

The wall should be constructed as per IDOT Standard Specifications and the current special provision developed by IDOT for construction of drilled shafts. The impact of the presence of the existing monument (about 70 feet away) and other structures on the construction of the proposed wall 39 should be evaluated.

7.4 Drilled Shafts

Drilled shafts will be constructed and lagging installed. After a drilled shaft is completed to the required elevation, the base should be cleaned and inspected, the flange placed, and the concrete discharged at the base using a tremie pipe or concrete pump. The drilled shafts should be constructed in accordance with Section 516 Drilled Shafts of 2012 or IDOT Standard Specifications for Road and Bridge Construction (IDOT, 2012A). As mentioned in section 7.1 casing will be required to seal-off water and/or prevent squeezing of soft clays. Casings will be required to maintain an open borehole in these locations. Failure to anticipate the challenges posed by the groundwater may result in caving or heaving sand and weakening of the foundation soils, as well as the potential for shaft squeeze in the soft clay. Shaft squeeze can result in ground loss around the perimeter of the shaft, affecting adjacent roadways and facilities.

7.5 Construction Monitoring

There is no need of a special construction monitoring for the retaining wall except normally required by the IDOT Standard Specifications for roadway and Bridge Construction and special provisions.

8.0 QUALIFICATIONS

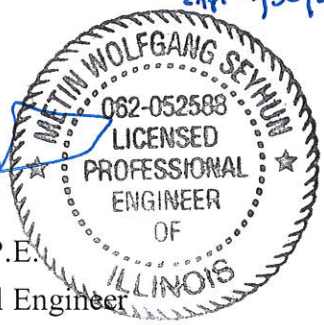
The analysis and recommendations submitted in this report are based upon the data obtained from the borings drilled at the locations shown on the boring logs and in Exhibit 3. This report does not reflect any variations that may occur between the borings or elsewhere on the site, variations whose nature 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 39 (SN016-1808) 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. 11/30/2017



Metin W. Seyhun, P.E.
Senior Geotechnical Engineer

Corina T. Farez, P.E., P.G.
Principal

Jerry W.H. Wang, PhD., P.E.
QA/QC Reviewer

REFERENCES

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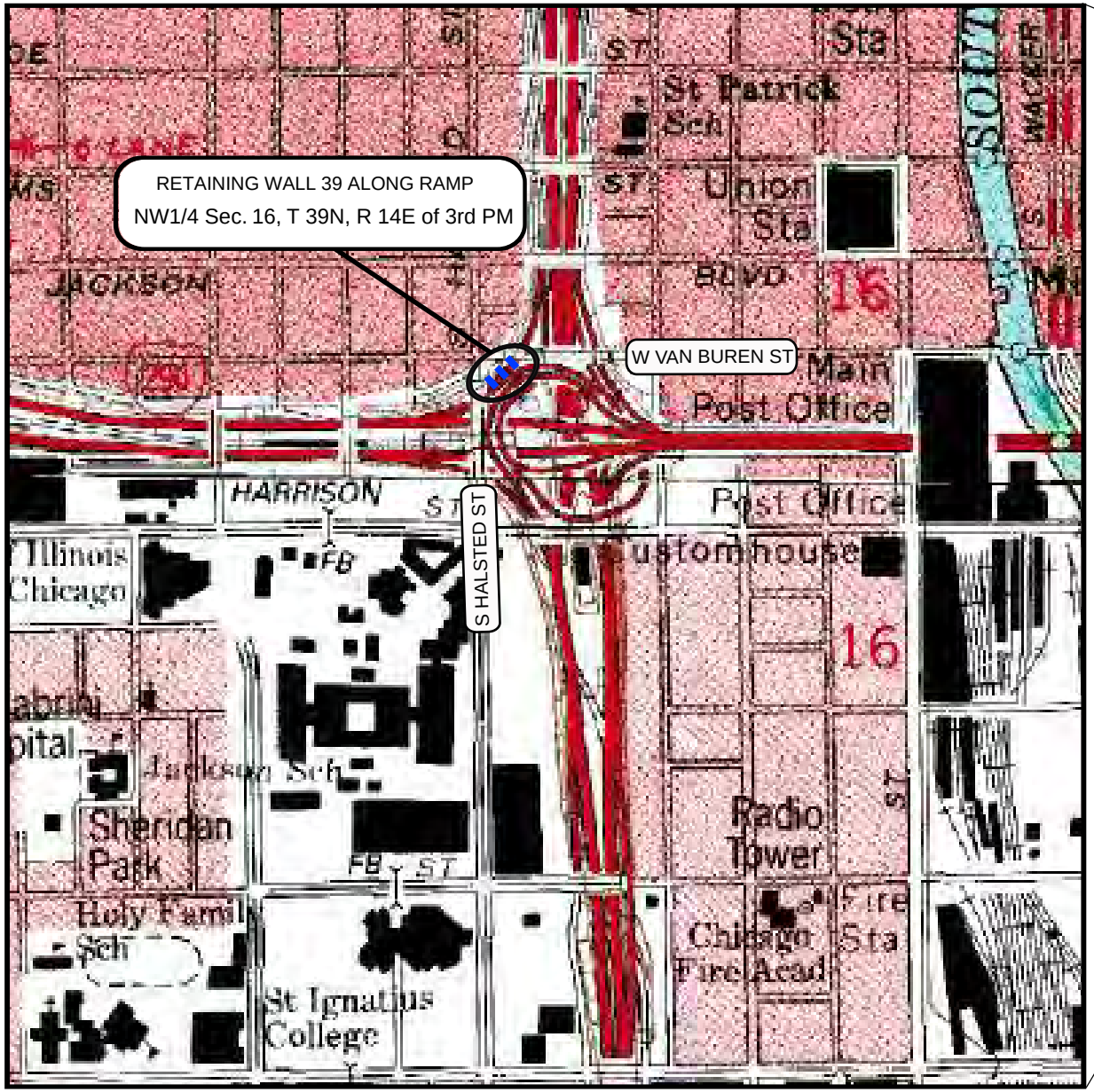
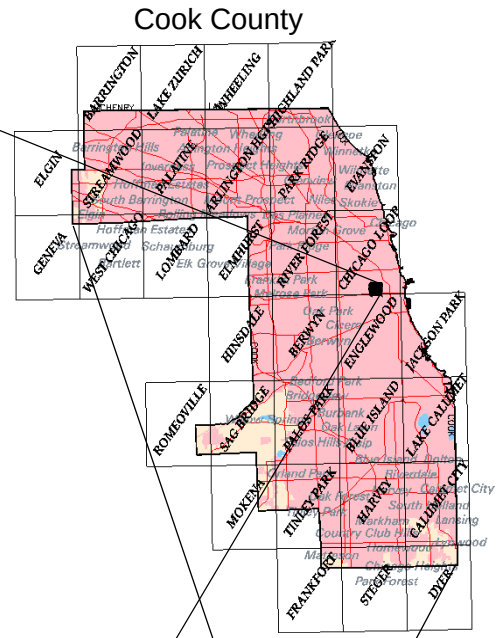
EXHIBITS





0 0.25 0.5 Mile

SITE LOCATION MAP: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 39, SN 016-1808, CHICAGO, IL

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

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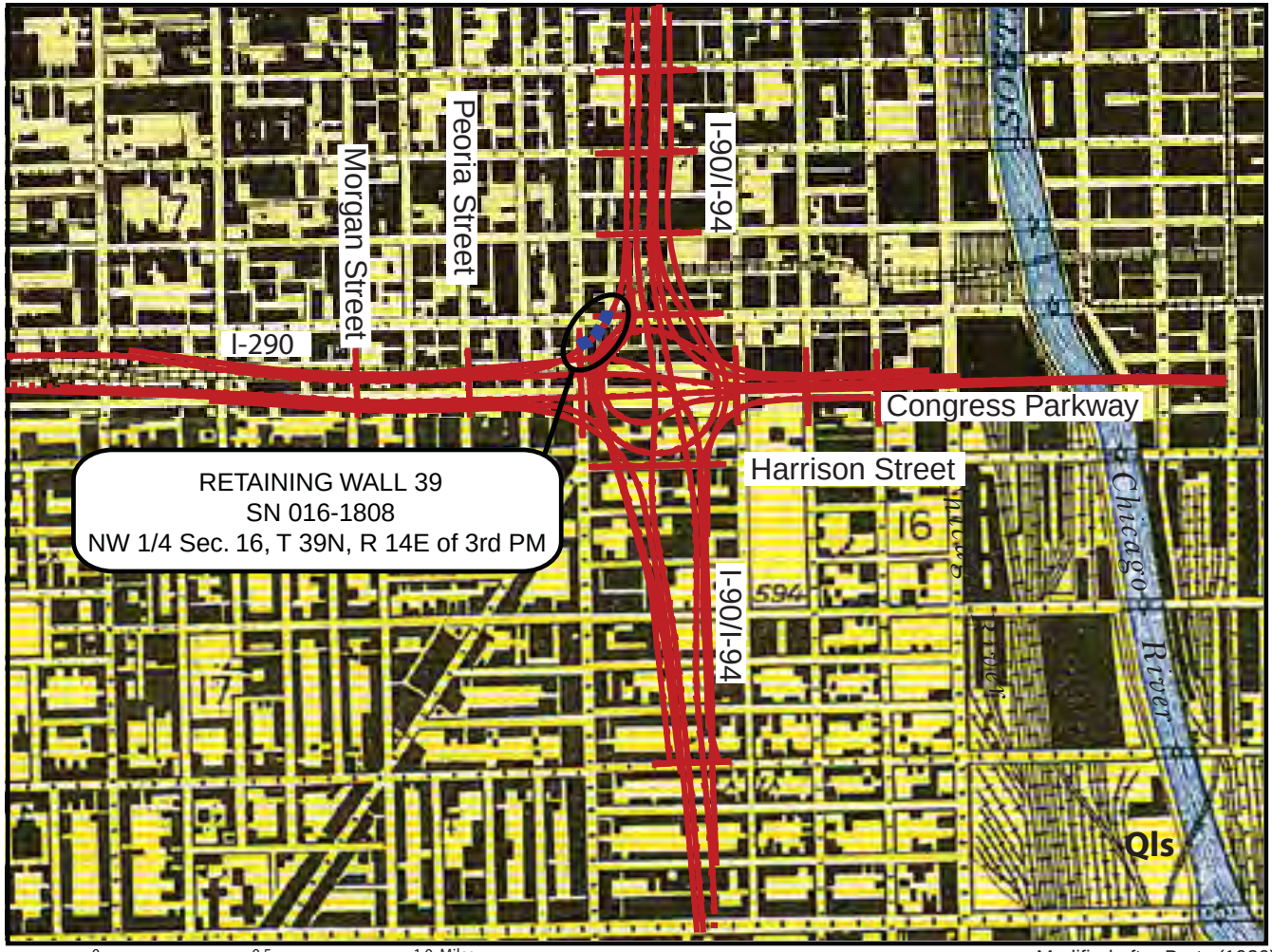
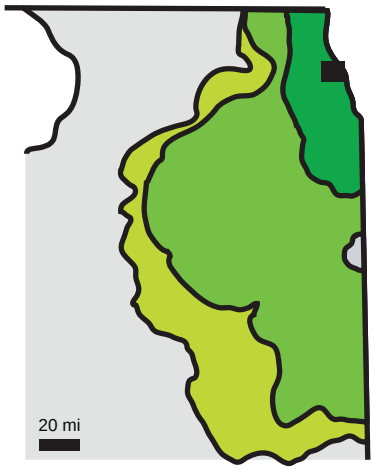


Modified after Bretz (1926)

N

REGIONAL GEOLOGY



Wedron Group

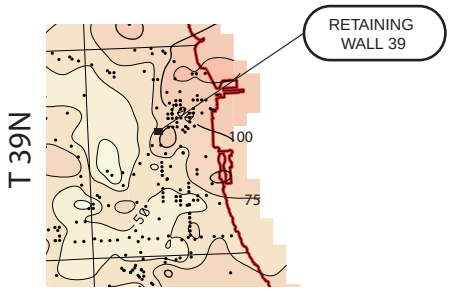
- Wadsworth Formation
- Lemont Formation
- Tiskilwa Formation

Modified after Hansel and Johnson (1996)

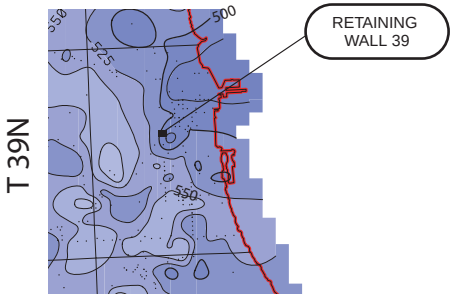
Legend

Qls — Glacial lake bottom
(Covered by lacustrine deposits)

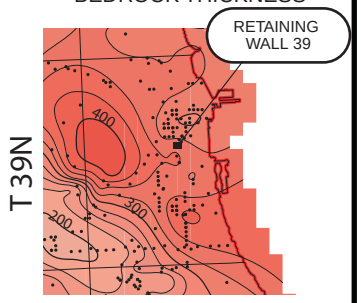
DRIFT THICKNESS



BEDROCK TOPOGRAPHY



BEDROCK THICKNESS



Modified after Leetaru et. al. (2004)

0 2 4 8 miles

SITE AND REGIONAL GEOLOGY: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 39, SN 016-1808, CHICAGO, IL

SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: B. Wilson CHECKED BY: M. Seyhun

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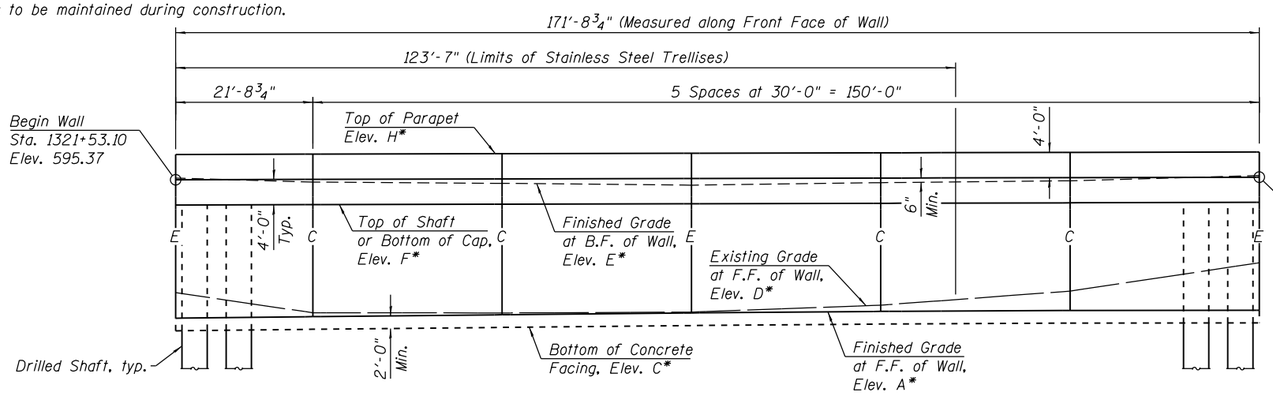
FOR AECOM	1100-04-01

Bench Mark: Cut "X" at SE Corner of Van Buren and Halsted Streets. Elev. 593.24.

Existing Structure: Barrier Wall Along Existing Ramp SW.

Traffic is to be maintained during construction.



* For elevations, see Table 1 on Sheet 2 of 2.

ELEVATION

(Looking Northwest at F.F. of Wall, Proposed Cocnrete Barrier not shown for clarity.)

LEGEND:

- Ex. Chain Link Fence — X — X — X —
- Electric — E — E —
- Ex. Storm Sewer
- Prop. Storm Sewer
- Soil Boring

CURVE DATA

(Ramp SW)

Prop. Curve P-CIR-SW-3
P.I. Sta. = 1322+16.98
Δ = 83° 35' 08" (RT)
D = 10° 03' 07"
R = 570.00'
T = 509.51'
L = 831.54'
E = 194.53'
e = 5.40%
T.R. = NA
S.E. Run = 101'
P.C. Sta. = 1317+07.47
P.T. Sta. = 1325+39.01

HIGHWAY CLASSIFICATION

Ramp SW
Functional Class: Interstate
ADT: 24,500 (2012); 23,000 (2040)
ADTT: 907 (2012); 851 (2040)
DHV: 1,720 (2040)
Design Speed: 35 m.p.h.
Posted Speed: 35 m.p.h.
One-Way Traffic
Directional Distribution: NA

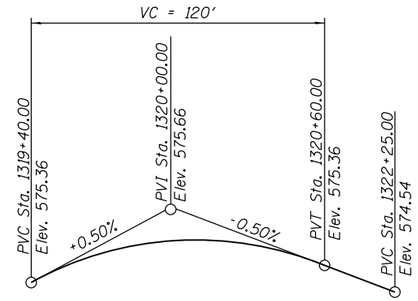
DESIGN SPECIFICATIONS

2014 AASHTO LRFD Bridge Design Specifications 7th Edition

DESIGN STRESSES

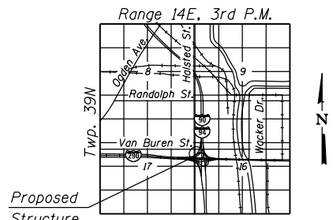
FIELD UNITS

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

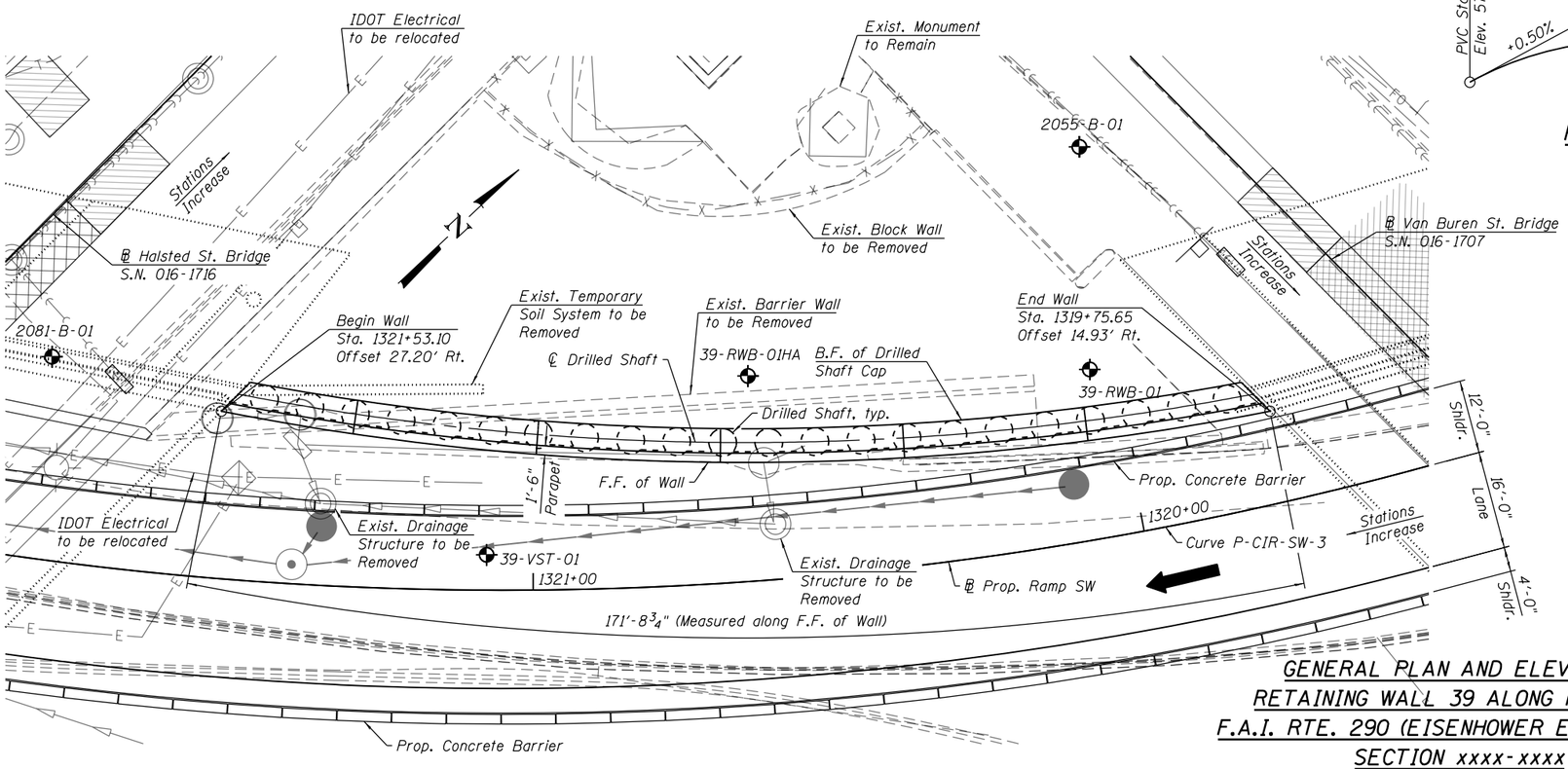


PROFILE GRADE

(Along ℄ Ramp SW)



LOCATION SKETCH



PLAN

Notes:

1.) Wall offsets are measured from the ℄ of F.A.I. Rte. 90/94 (Ramp SW) to the front face of precast panels.
2.) C denotes Construction Joint
3.) E denotes Expansion Joint
4.) F.F. denotes Front Face.
5.) B.F. denotes Back Face.
6.) Wall to be built along straight chords between construction joints.
7.) Shaft diameter, spacing and top elevation to be determined during final design.
8.) Connect pipe underdrain below retaining wall to storm sewer system.
9.) Utility relocation will be finalized in final design and will be shown in Civil plans.
10.) The Contractor shall exercise extreme caution during wall construction to make certain that construction activities will not have detrimental effects on the adjacent buildings and utilities.
11.) Proposed drainage is conceptual. See contract drawings for final proposed drainage.
12.) Stainless Steel Trellises to be installed on the face of the wall. For limits, see Elevation View. For details, see Typical Cross Section and SS Cable Wall Mount Unit Detail on Sheet 2 of 2.

GENERAL PLAN AND ELEVATION
RETAINING WALL 39 ALONG RAMP SW
F.A.I. RTE. 290 (EISENHOWER EXPRESSWAY)
SECTION xxxx-xxxx
COOK COUNTY
STATION 1319+75.65 TO STATION 1321+53.10
STRUCTURE NO. 016-1808

BORING LOCATION PLAN: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 39, SN 016-1808, CHICAGO, IL

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

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TranSystems

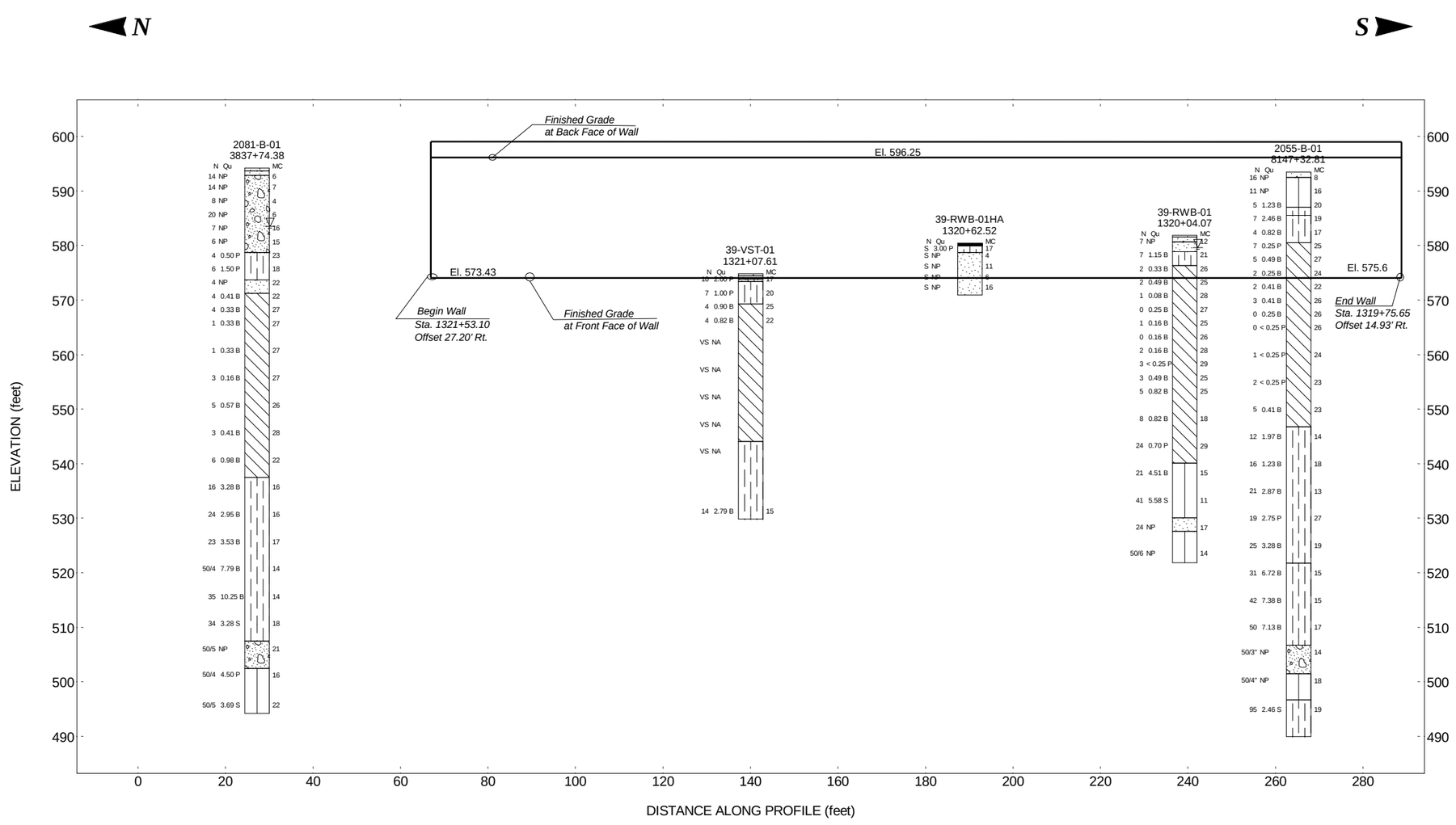
USER NAME = $USER$	DESIGNED - WJC	REVISED -
	CHECKED - DL	REVISED -
PLOT SCALE = $SCALE$	DRAWN - WJC	REVISED -
PLOT DATE = $DATE$	CHECKED - DL	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 2 SHEETS

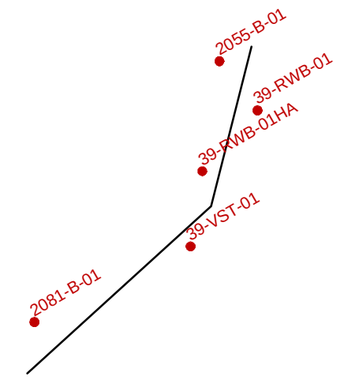
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
290	xxxx-xxxx	COOK	2	1
		CONTRACT NO. 60X99		
		ILLINOIS FED. AID PROJECT		

$TIME$ - $FILE$



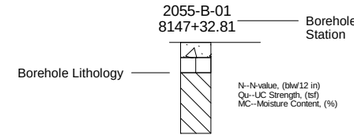
Lithology Graphics

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



Site Map Scale 1 inch equals 105 feet

Explanation:



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

0 28

Horizontal Scale (feet)

Vertical Exaggeration: 1x

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Soil Profile
Retaining Wall 39

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 4/9/15

APPENDIX A

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BORING LOG 2055-B-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: 593.52 ft
North: 1898392.15 ft
East: 1171221.90 ft
Station: 8147+32.81
Offset: 7.5987 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	592.5	12-inch thick CONCRETE --PAVEMENT-- *subbase not noticed*						
		Medium dense, black and brown SILTY LOAM, trace to little gravel --FILL--			1	15 9 7	NP	8
			5		2	4 6 5	NP	16
	587.0							
		Stiff, brown and gray SILTY CLAY LOAM, trace gravel, thin lenses of fine to medium sand			3	2 3 2	1.23 B	20
	585.5	--FILL--						
		Medium stiff to very stiff, brown to gray SILTY CLAY LOAM, trace gravel	10		4	2 4 3	2.46 B	19
					5	2 2 2	0.82 B	17
	580.5							
		Very soft to soft, gray CLAY TO SILTY CLAY, trace gravel	15		6	0 2 5	0.25 P	25
					7	0 2 3	0.49 B	27
			20		8	0 1 1	0.25 B	24
					9	0 0 2	0.41 B	22
			25		10	0 0 3	0.41 B	26
			30		11	0 0 0	0.25 B	26
					12	0 0 0	< 0.25 P	26
			35		13	0 0 1	< 0.25 P	24
			40		14	0 0 2	< 0.25 P	23
			45		15	0 2 3	0.41 B	23
	546.8	Stiff to very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel						
		coarse sand lenses	50		16	3 5 7	1.97 B	14

GENERAL NOTES

Begin Drilling: **04-21-2013** Complete Drilling: **04-22-2013**
Drilling Contractor: **Wang Testing Services** Drill Rig: **D-50 TMR**
Driller: **R&N** 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: **Rotary wash**
At Completion of Drilling: **unable to measure**
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 2055-B-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: 593.52 ft
North: 1898392.15 ft
East: 1171221.90 ft
Station: 8147+32.81
Offset: 7.5987 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	3 6 10	1.23 B	18
			60		18	9 10 11	2.87 B	13
			65		19	5 7 12	2.75 P	27
			70		20	10 11 14	3.28 B	19
	521.8	Hard, gray SILTY CLAY LOAM. trace gravel	75		21	12 13 18	6.72 B	15
			80		22	12 16 26	7.38 B	15
			85		23	12 17 33	7.13 B	17
		1-inch thick gravel						
	506.8	Very dense, whitish gray SANDY GRAVEL with gray clay clasts	90		24	50/3"	NP	14
		--HARD DRILLING-- *--Possible Cobbles--*						
	501.5	Very dense, gray SILTY LOAM to SILTY CLAY LOAM, trace gravel	95		25	37 50/4"	NP	18
	496.8	Very stiff, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel	100		26	37 45 50	2.46 S	19

GENERAL NOTES

Begin Drilling **04-21-2013** Complete Drilling **04-22-2013**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
Driller **R&N** 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 ▽ **Rotary wash**
At Completion of Drilling ▼ **unable to measure**
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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Fax: 630 953-9938

BORING LOG 2055-B-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: 593.52 ft
North: 1898392.15 ft
East: 1171221.90 ft
Station: 8147+32.81
Offset: 7.5987 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	490.0	--AUGER REFUSAL-- *--Possible Boulder--* Boring terminated at 103.50 ft	105 110 115 120 125					

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)

GENERAL NOTES

Begin Drilling **04-21-2013** Complete Drilling **04-22-2013**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
Driller **R&N** 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 ▽ **Rotary wash**
At Completion of Drilling ▼ **unable to measure**
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 2081-B-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: 594.27 ft
North: 1898215.40 ft
East: 1171096.56 ft
Station: 3837+74.38
Offset: 18.2325 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	593.7	6.5-inch thick ASPHALT --PAVEMENT--						
	592.9	10.5-inch thick CONCRETE --PAVEMENT--						
		Loose to medium dense, gray, GRAVELLY SAND --FILL--			1	7 8 6	NP	6
			5		2	7 7 7	NP	7
					3	4 4 4	NP	4
			10		4	10 11 9	NP	6
					5	5 4 3	NP	16
			15		6	5 3 3	NP	15
	578.8	Medium stiff to stiff, black and gray SILTY CLAY, trace gravel			7	4 2 2	0.50 P	23
			20		8	8 4 2	1.50 P	18
	573.8	Loose, gray, medium SAND			9	2 2 2	NP	22
	571.3	Soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			10	2 2 2	0.41 B	22
			25					
			30		11	0 2 2	0.33 B	27
					12	0 0 1	0.33 B	27
			35		13	0 0 1	0.33 B	27
			40		14	0 0 3	0.16 B	27
			45		15	0 2 3	0.57 B	26
			50		16	0 0 3	0.41 B	28

GENERAL NOTES

Begin Drilling: **04-02-2013** Complete Drilling: **04-02-2013**
Drilling Contractor: **Wang Testing Services** Drill Rig: **B-57 TMR**
Driller: **R&T** Logger: **D. Wind** Checked by: **C. Marin**
Drilling Method: **3.25" HSA to 11', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **11.00 ft**
At Completion of Drilling: **unable to measure**
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 2081-B-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: 594.27 ft
North: 1898215.40 ft
East: 1171096.56 ft
Station: 3837+74.38
Offset: 18.2325 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	537.5	Very stiff to hard, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel	55		17	0 3 3	0.98 B	22
			60		18	5 6 10	3.28 B	16
			65		19	4 10 14	2.95 B	16
			70		20	5 10 13	3.53 B	17
			75		21	18 22 50/4	7.79 B	14
	507.5	Very dense, gray GRAVELLY SAND	80		22	12 14 21	10.25 B	14
			85		23	10 17 17	3.28 S	18
			90		24	45 50/5	NP	21
	502.5	Very stiff to hard, gray SILTY LOAM, trace gravel	95		25	50/4	4.50 P	16
	494.3	Boring terminated at 100.00 ft	100		26	40 37 50/5	3.69 S	22

GENERAL NOTES

Begin Drilling **04-02-2013** Complete Drilling **04-02-2013**
Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR**
Driller **R&T** Logger **D. Wind** Checked by **C. Marin**
Drilling Method **3.25" HSA to 11', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **11.00 ft**
At Completion of Drilling ▼ **unable to measure**
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 39-RWB-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: 581.87 ft
North: 1898358.83 ft
East: 1171247.64 ft
Station: 1320+04.07
Offset: 27.4619 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	581.6	3-inch thick, ASPHALT --PAVEMENT--						
	580.7	11-inch thick, CONCRETE --PAVEMENT--			1	2 4 3	NP	12
	578.9	Loose, gray SANDY LOAM, trace gravel and brick fragments --FILL--						
		Stiff, gray SILTY CLAY, trace gravel	5		2	1 3 4	1.15 B	21
	576.4	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			3	0 0 2	0.33 B	26
			10		4	0 1 1	0.49 B	25
					5	0 0 1	0.08 B	28
			15		6	0 0 0	0.25 B	27
					7	0 0 1	0.16 B	25
			20		8	0 0 0	0.16 B	26
					9	1 1 1	0.16 B	28
			25		10	1 1 2	< 0.25 P	29
			30		11	0 1 2	0.49 B	25
					12	0 2 3	0.82 B	25
			35		13	3 3 5	0.82 B	18
			40		14	4 7 17	0.70 P	29
	540.1	Hard, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel --DRY--						
			45		15	5 8 13	4.51 B	15
			50		16	12 20 21	5.58 S	11

GENERAL NOTES

Begin Drilling: **08-07-2014** Complete Drilling: **08-07-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **D-50 TMR**
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: **2.50 ft**
At Completion of Drilling: **unable to measure**
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 4/9/15

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Fax: 630 953-9938

BORING LOG 39-RWB-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: 581.87 ft
North: 1898358.83 ft
East: 1171247.64 ft
Station: 1320+04.07
Offset: 27.4619 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	530.1							
		Gray, fine SAND, trace gravel --DRY--						
	527.6				17	8 11 13	NP	17
		Very dense, gray SILTY LOAM, trace gravel --DRY--	55					
					18	13 50/6	NP	14
	521.9		60					
		Boring terminated at 60.00 ft						
			65					
			70					
			75					

GENERAL NOTES

Begin Drilling **08-07-2014** Complete Drilling **08-07-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
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 ▽ **2.50 ft**
At Completion of Drilling ▼ **unable to measure**
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 39-RWB-01HA

WEI Job No.: 1100-04-01

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

Datum: NAVD 88
Elevation: 580.50 ft
North: 1898317.61 ft
East: 1171210.29 ft
Station: 1320+62.52
Offset: 33.3936' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	580.0	6-inch thick, brown CLAY LOAM, trace roots						
	578.7	--TOPSOIL--						
		Very stiff, gray SILTY CLAY LOAM, trace gravel			1	PUSH	3.00 P	17
		Gray, fine to coarse SAND			2	PUSH	NP	4
			5		3	PUSH	NP	11
					4	PUSH	NP	6
					5	PUSH	NP	16
	571.0	--Wet--						
		Boring terminated at 9.50 ft	10					
			15					
			20					
			25					

GENERAL NOTES

Begin Drilling **10-28-2014** Complete Drilling **10-28-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **Geoprobe HA**
Driller **P&P** Logger **F. Bozga** Checked by **M. Seyhun**
Drilling Method **1" IDA Pneumatic Geoprobe LB Sampler**

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 39-VST-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: 574.85 ft
North: 1898266.68 ft
East: 1171202.33 ft
Station: 1321+07.61
Offset: 5.7540' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	574.5	4.5-inch thick ASPHALT --PAVEMENT--						
	573.9							
	573.4	7.5-inch thick CONCRETE --PAVEMENT--						
		5-inch thick, brown SANDY GRAVEL, crushed stone --SUB-BASE--						
		Stiff to very stiff, brown to gray SILTY CLAY LOAM, trace gravel			1	6 6 4	2.00 P	17
			5		2	4 3 4	1.00 P	20
	569.4	--FILL--						
		Medium stiff, gray CLAY to SILTY CLAY, trace gravel			3	2 2 2	0.90 B	25
			10		4	1 2 2	0.82 B	22
		--In-Situ Vane Shear, 13.0 feet-- --$S_{u\ undis}$ = 1551.0-- --$S_{u\ remold}$ = 878.9-- --Sensitivity = 1.76--	15		1	VS		
		--In-Situ Vane Shear, 18.0 feet-- --$S_{u\ undis}$ = 827.2-- --$S_{u\ remold}$ = 517.0-- --Sensitivity = 1.60--	20		2	VS		
		--In-Situ Vane Shear, 23.0 feet-- --$S_{u\ undis}$ = 1240.8-- --$S_{u\ remold}$ = 775.5-- --Sensitivity = 1.60--	25		3	VS		
		--In-Situ Vane Shear, 28.0 feet-- --$S_{u\ undis}$ = 1654.4-- --$S_{u\ remold}$ = 1137.4-- --Sensitivity = 1.45--	30		4	VS		
	544.1	Very stiff, gray SILTY CLAY LOAM, trace gravel						
		--In-Situ Vane Shear, 33.0 feet-- --$S_{u\ undis}$ = 2533.3-- --$S_{u\ remold}$ = 1912.9-- --Sensitivity = 1.32--	35		5	VS		
			40					
	529.9	Boring terminated at 45.00 ft	45		5	3 6 8	2.79 B	15
			50					

GENERAL NOTES

Begin Drilling: **10-15-2014** Complete Drilling: **10-19-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME-55 TMR**
Driller: **R&J** Logger: **F. Bozga** Checked by: **CLM (-coord)**
Drilling Method: **2.25" IDA HSA, boring backfilled upon completion**

WATER LEVEL DATA

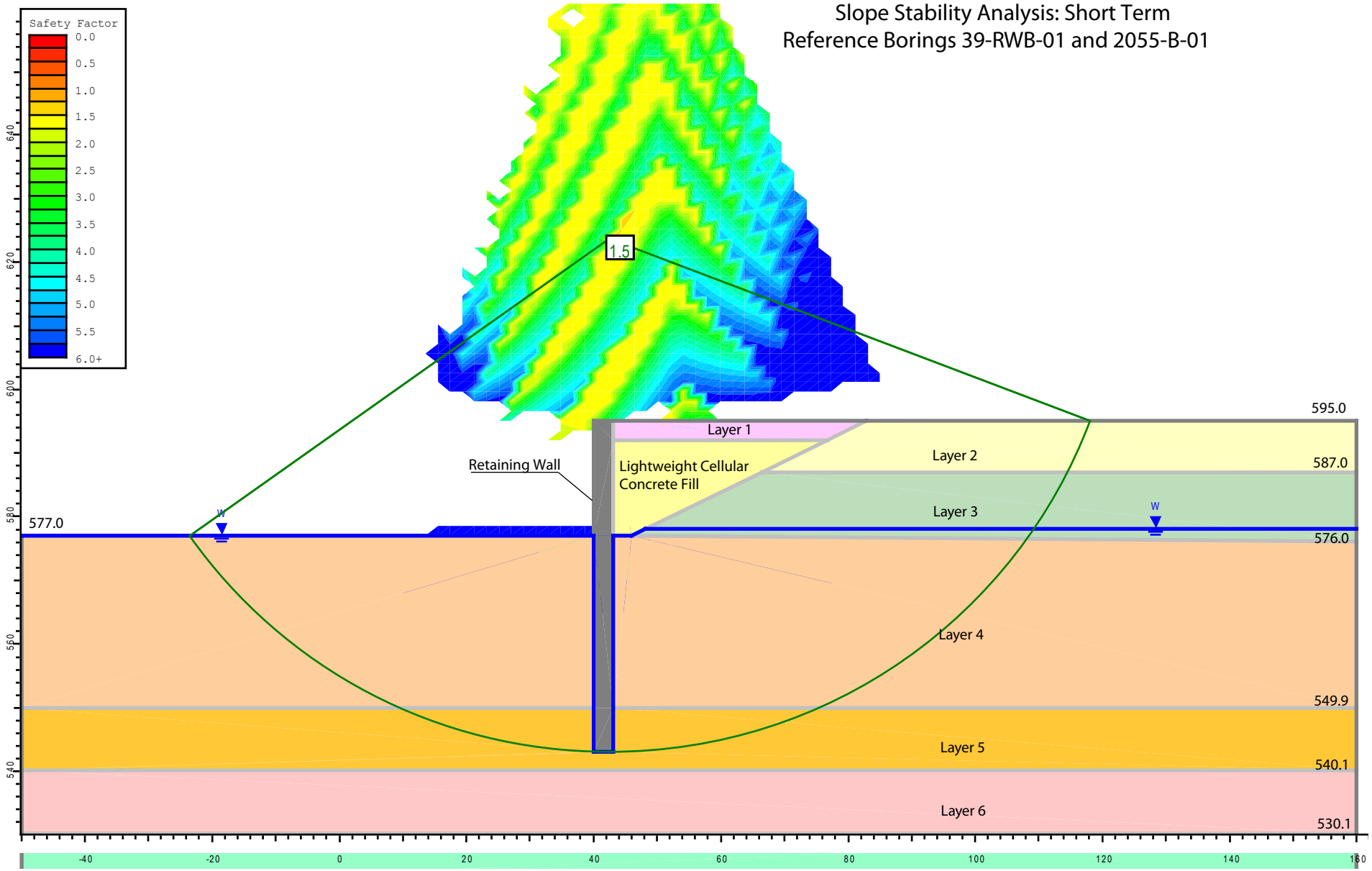
While Drilling: **Rotary wash**
At Completion of Drilling: **unable to measure**
Time After Drilling: **NA**
Depth to Water: **NA**

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

WANGENGINC 11000401.GPJ WANGENG.GDT 4/9/15

APPENDIX B

Slope Stability Analysis: Short Term
Reference Borings 39-RWB-01 and 2055-B-01



Soil Properties:

Layer ID	Soil Type	Unit Weight (pcf)	Undrained Parameters C (psf)	Undrained Parameters ϕ (deg.)
1	Granular BACKFILL	120	0	32
2	Medium Dense SI LOAM	115	0	31
3	Medium Stiff to Very Stiff SI CL to SI CL LOAM	120	1400	0
4	Very Soft to Soft CL to SI CL	110	260	0
5	Medium Stiff CL to SI CL	115	780	0
6	Hard SI CL LOAM	125	5000	0

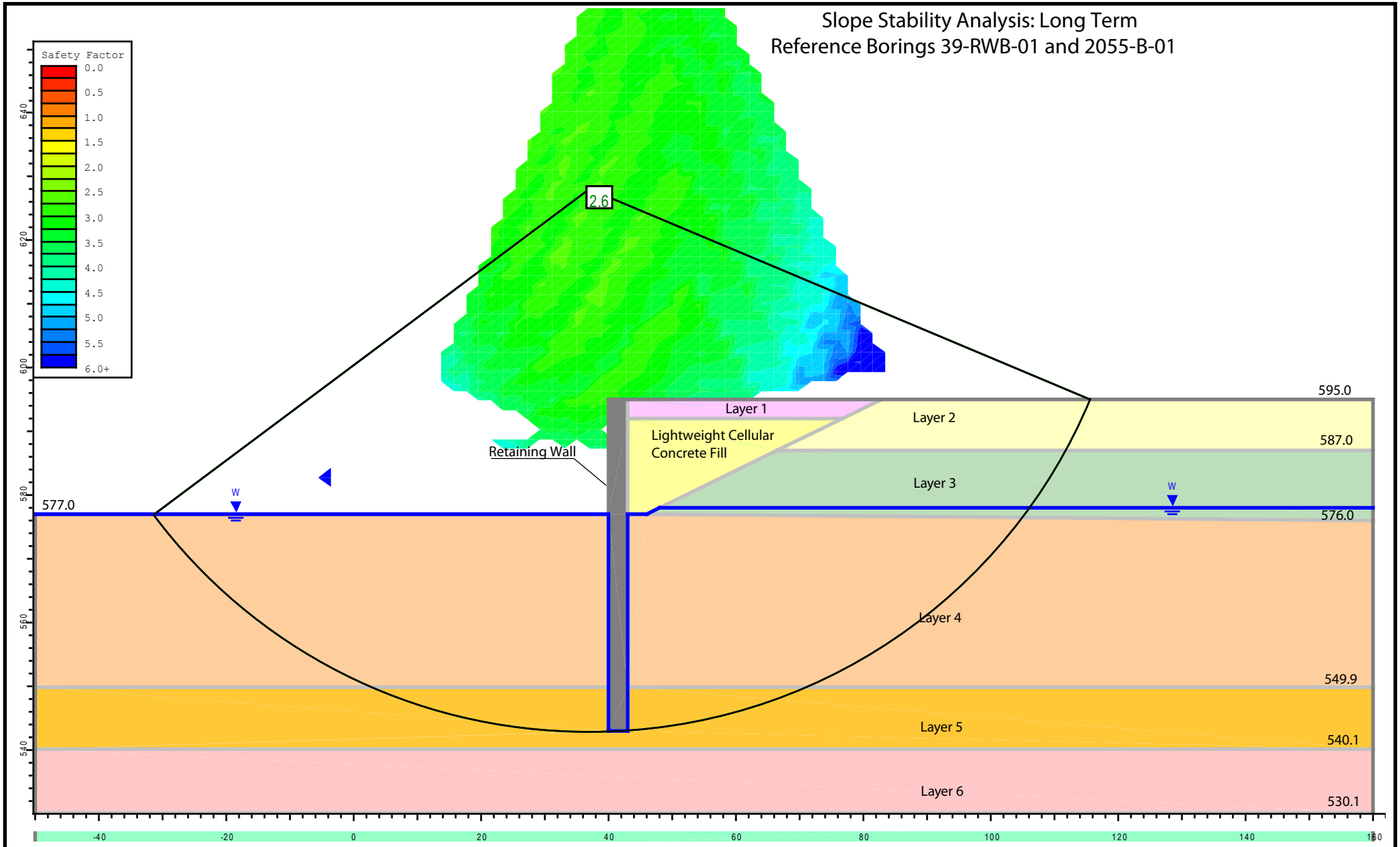
SLOPE STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 39, SN 016-1808, CHICAGO, IL

SCALE: GRAPHIC | APPENDIX B-1 | DRAWN BY: H. Bista | CHECKED BY: M. Seyhun

Wang Engineering
1145 N. Main Street
Lombard, IL 60148
www.wangeng.com

FOR AECOM | 1100-04-01

Slope Stability Analysis: Long Term
Reference Borings 39-RWB-01 and 2055-B-01



Soil Properties:

Layer ID	Soil Type	Unit Weight (pcf)	Drained Parameters C' (psf)	Drained Parameters ϕ (deg.)
1	Granular BACKFILL	120	0	32
2	Medium Dense SI LOAM	115	0	31
3	Medium Stiff to Very Stiff SI CL to SI CL LOAM	120	100	29
4	Very Soft to Soft CL to SI CL	110	50	26
5	Medium Stiff CL to SI CL	115	50	28
6	Hard SI CL LOAM	125	100	30

SLOPE STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 39, SN 016-1808, CHICAGO, IL

SCALE: GRAPHIC | APPENDIX B-2 | DRAWN BY: H. Bista | CHECKED BY: M. Seyhun

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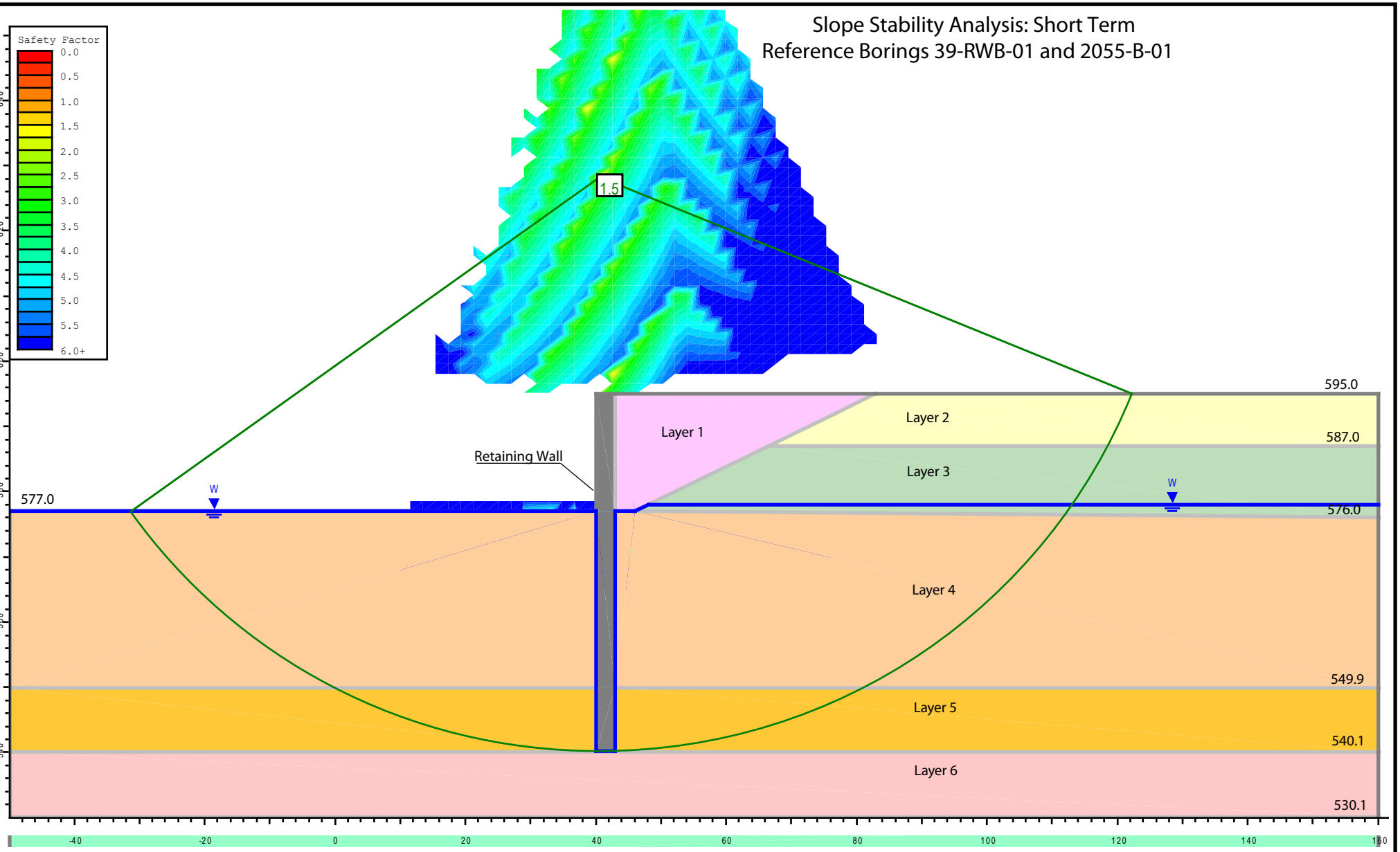
Slope Stability Analysis: Short Term
Reference Borings 39-RWB-01 and 2055-B-01



Soil Properties:

Layer ID	Soil Type	Unit Weight (pcf)	Undrained Parameters C (psf)	Undrained Parameters ϕ (deg.)
1	Granular BACKFILL	120	0	32
2	Medium Dense SI LOAM	115	0	31
3	Medium Stiff to Very Stiff SI CL to SI CL LOAM	120	1400	0
4	Very Soft to Soft CL to SI CL	110	260	0
5	Medium Stiff CL to SI CL	115	780	0
6	Hard SI CL LOAM	125	5000	0

SLOPE STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 39, SN 016-1808, CHICAGO, IL

SCALE: GRAPHIC | APPENDIX B-3 | DRAWN BY: H. Bista | CHECKED BY: M. Seyhun

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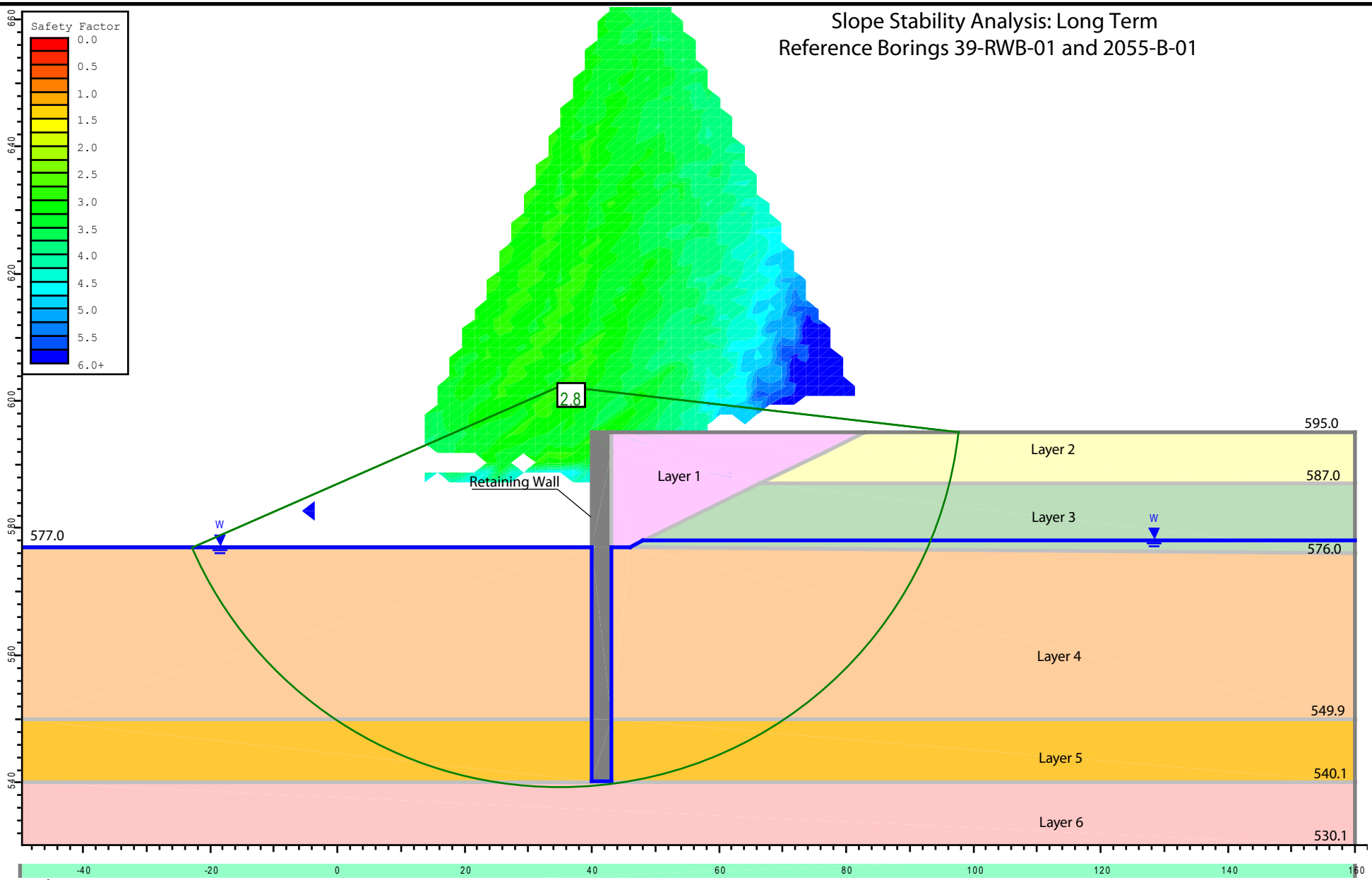
Slope Stability Analysis: Long Term
Reference Borings 39-RWB-01 and 2055-B-01



Soil Properties:

Layer ID	Soil Type	Unit Weight (pcf)	Drained Parameters C' (psf)	Drained Parameters ϕ (deg.)
1	Granular BACKFILL	120	0	32
2	Medium Dense SI LOAM	115	0	31
3	Medium Stiff to Very Stiff SI CL to SI CL LOAM	120	100	29
4	Very Soft to Soft CL to SI CL	110	50	26
5	Medium Stiff CL to SI CL	115	50	28
6	Hard SI CL LOAM	125	100	30

SLOPE STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 39, SN 016-1808, CHICAGO, IL

SCALE: GRAPHIC | APPENDIX B-4 | DRAWN BY: H. Bista | CHECKED BY: M. Seyhun

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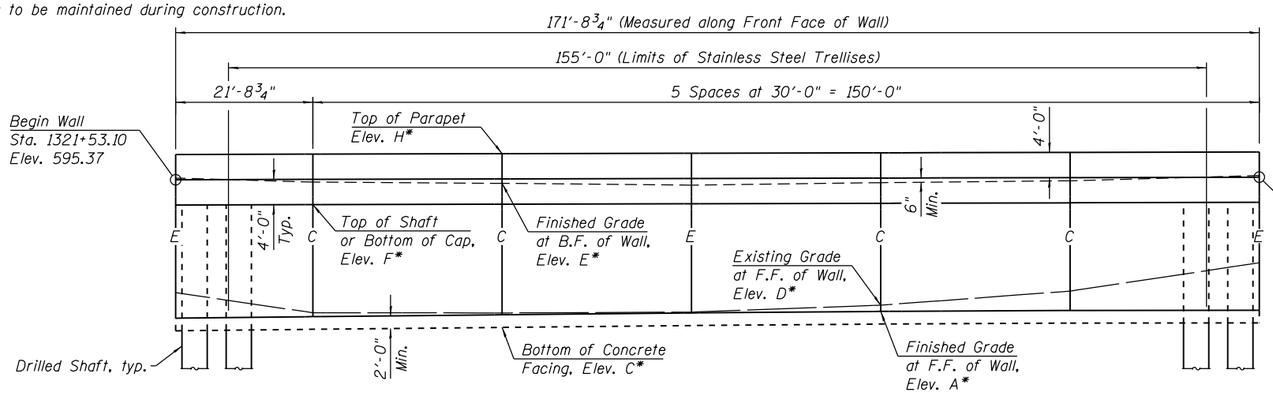
APPENDIX C

Bench Mark: Cut "X" at SE Corner of Van Buren and Halsted Streets. Elev. 593.24.

Existing Structure: Barrier Wall Along Existing Ramp SW.

Traffic is to be maintained during construction.



* For elevations, see Table 1 on Sheet 2 of 2.

ELEVATION

(Looking Northwest at F.F. of Wall, Proposed Cocnrete Barrier not shown for clarity.)

LEGEND:

- Ex. Chain Link Fence — X — X — X —
- Electric — E — E —
- Ex. Storm Sewer
- Prop. Storm Sewer
- Soil Boring

CURVE DATA

(Ramp SW)

Prop. Curve P-CIR-SW-3
P.I. Sta. = 1322+16.98
Δ = 83° 35' 08" (RT)
D = 10° 03' 07"
R = 570.00'
T = 509.51'
L = 831.54'
E = 194.53'
e = 5.40%
T.R. = NA
S.E. Run = 101'
P.C. Sta. = 1317+07.47
P.T. Sta. = 1325+39.01

HIGHWAY CLASSIFICATION

Ramp SW
Functional Class: Interstate
ADT: 24,500 (2012); 23,000 (2040)
ADTT: 907 (2012); 851 (2040)
DHV: 1,720 (2040)
Design Speed: 35 m.p.h.
Posted Speed: 35 m.p.h.
One-Way Traffic
Directional Distribution: NA

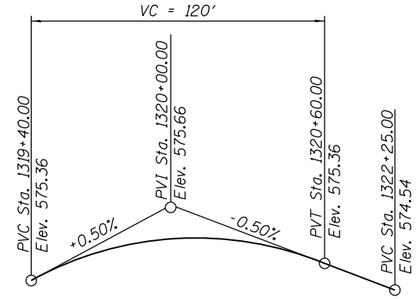
DESIGN SPECIFICATIONS

2014 AASHTO LRFD Bridge Design Specifications 7th Edition with 2015 Interim

DESIGN STRESSES

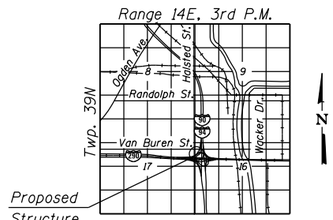
FIELD UNITS

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

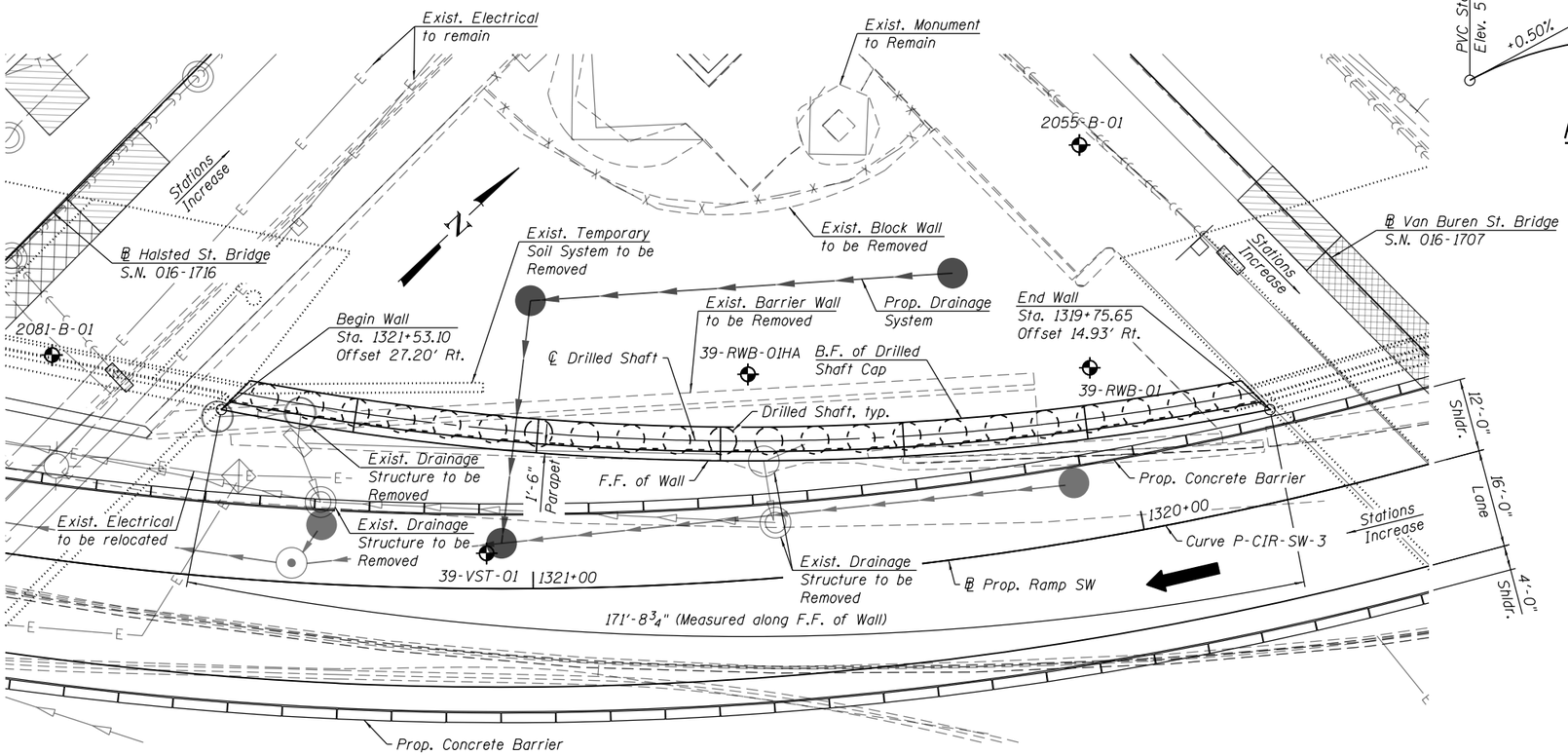


PROFILE GRADE

(Along ℄ Ramp SW)



LOCATION SKETCH



PLAN

Notes:

1.) Wall offsets are measured from the ℄ of F.A.I. Rte. 90/94 (Ramp SW) to the front face of precast panels.
2.) C denotes Construction Joint
3.) E denotes Expansion Joint
4.) F.F. denotes Front Face.
5.) B.F. denotes Back Face.
6.) Wall to be built along straight chords between construction joints.
7.) Shaft diameter, spacing and top elevation to be determined during final design.
8.) Stainless Steel Trellises to be installed on the face of the wall. For limits, see Elevation View. For details, see Typical Cross Section and SS Cable Wall Mount Unit Detail on Sheet 2 of 2.

GENERAL PLAN AND ELEVATION
RETAINING WALL 39 ALONG RAMP SW
F.A.I. RTE. 290 (EISENHOWER EXPRESSWAY)
SECTION xxxx-xxxx
COOK COUNTY
STATION 1319+75.65 TO STATION 1321+53.10
STRUCTURE NO. 016-1808

$TIME$ - $FILE$

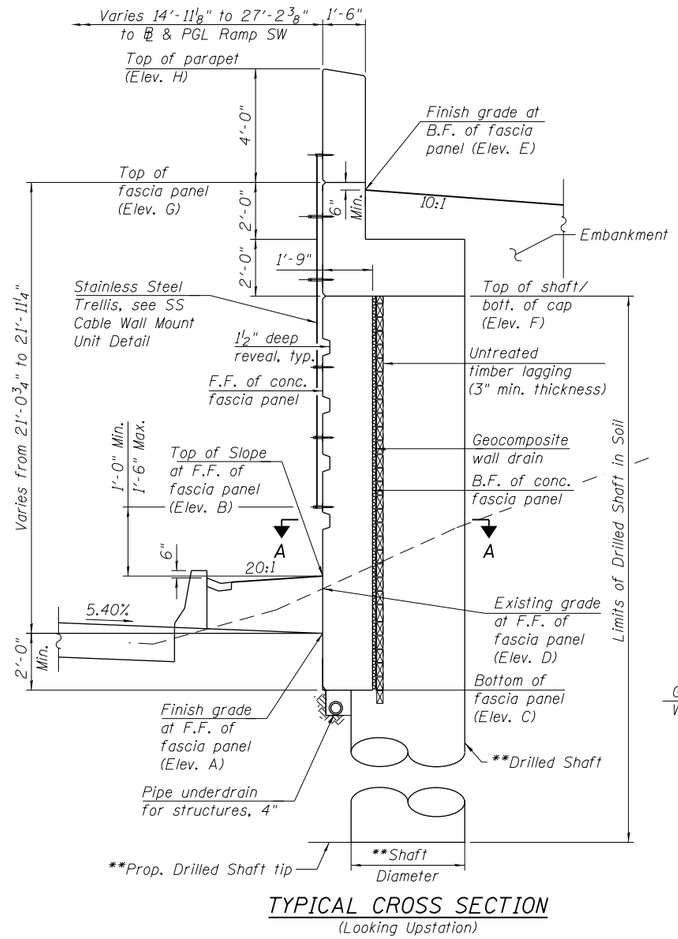
TranSystems

USER NAME = $USER$	DESIGNED - WJC	REVISED -
	CHECKED - DL	REVISED -
PLOT SCALE = $SCALE$	DRAWN - WJC	REVISED -
PLOT DATE = $DATE$	CHECKED - DL	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

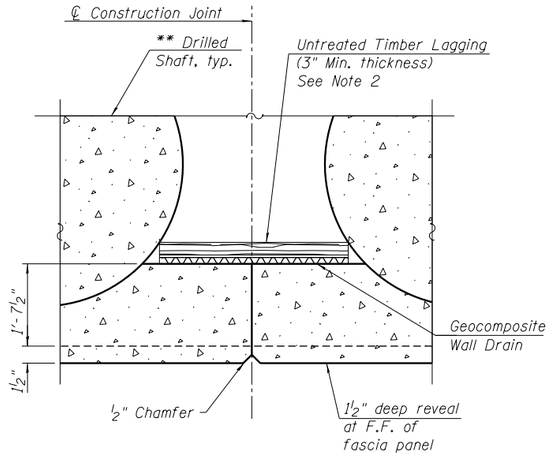
SHEET NO. 1 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
290	xxxx-xxxx	COOK	2	1
		CONTRACT NO. 60X99		
		ILLINOIS FED. AID PROJECT		

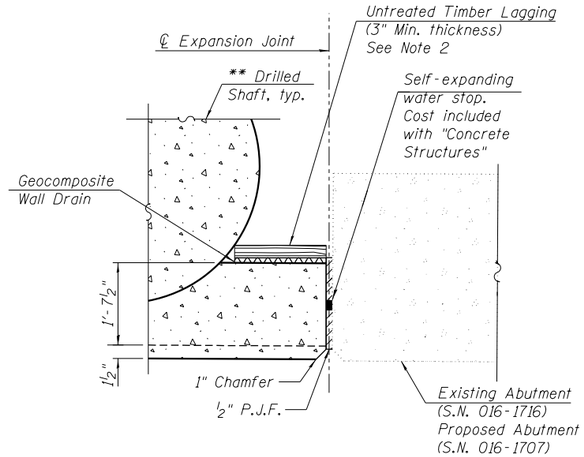


TYPICAL CROSS SECTION

(Looking Upstation)



CONSTRUCTION JOINT DETAILS



EXPANSION JOINT DETAILS

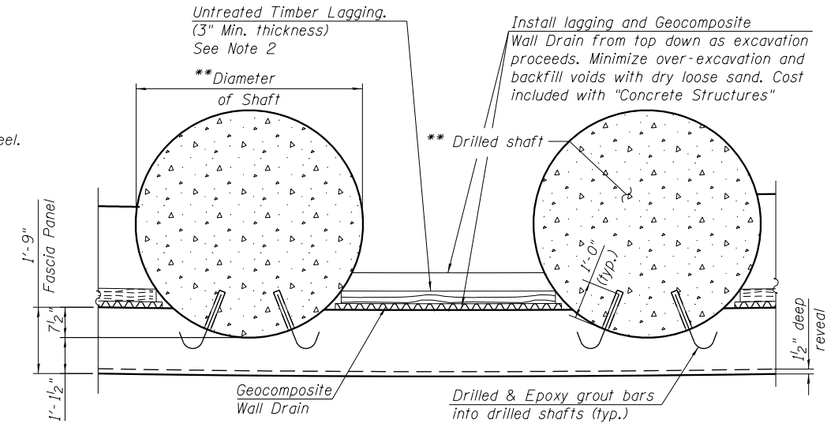
TABLE 1 - WALL ELEVATIONS

Station	Offset	Elevation A	Elevation B	Elevation C	Elevation D	Elevation E	Elevation F	Elevation G	Elevation H
1319+75.65	14'-11 1/8"	574.68	577.84	572.68	582.21	596.03	591.78	595.78	599.78
1320+06.46	16'-1 1/8"	574.64	577.67	572.64	577.50	595.20	591.71	595.71	599.71
1320+37.33	17'-8"	574.50	577.70	572.50	575.35	594.91	591.64	595.64	599.64
1320+68.28	19'-8"	574.26	577.66	572.26	574.39	594.51	591.56	595.56	599.56
1320+99.31	22'-1"	573.97	577.63	571.97	574.26	594.80	591.49	595.49	599.49
1321+30.46	24'-10 7/8"	573.67	577.61	571.67	577.60	594.99	591.42	595.42	599.42
1321+53.10	27'-2 3/8"	573.43	577.61	571.43	577.47	595.62	591.37	595.37	599.37

Elevation A- Finish Grade at Front Face of Fascia Panel
Elevation B- Top of Slope at Front Face of Fascia Panel
Elevation C- Bottom of Fascia Panel / Top of Encasement Concrete
Elevation D- Existing Grade at Front Face of Fascia Panel
Elevation E- Finish Grade at Back Face of Fascia Panel
Elevation F- Top of Shaft / Bottom of Cap
Elevation G- Top of Fascia Panel
Elevation H- Top of Parapet

LEGEND:

B.F. - denotes Back Face.
E.F. - denotes Each Face.
F.F. - denotes Front Face.
SS - denotes Stainless Steel.



SECTION A-A

(Shaft Reinforcement not shown for clarity)

Notes:

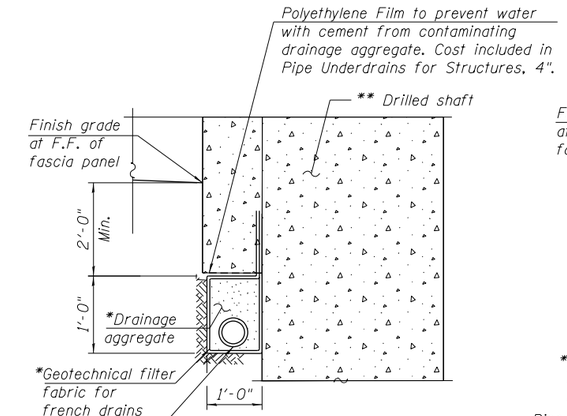
1.) The geocomposite wall drain shall be constructed according to Section 591 of the Standard Specifications.

2.) The Contractor is responsible for the design and performance of the lagging system, using no less than a 3 in. nominal rough-sawn thickness and timber with a minimum allowable bending stress of 1000 psi, until the concrete facing is installed. The Contractor shall submit design calculations and details prepared by an Illinois Licensed Structural Engineer for the attachment of the lagging to the shaft for approval by the Engineer. Alternative equivalent systems may be submitted for approval by the Engineer.

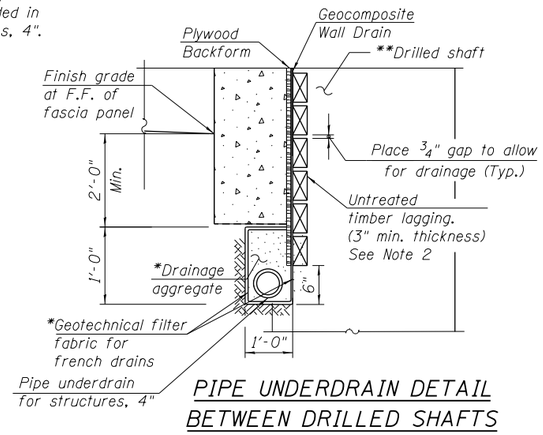
3.) SS wall anchor location and SS cable layout to be determined in final design.

*Cost included with "Pipe Underdrains for Structures, 4".

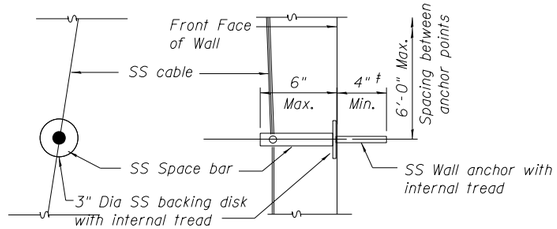
**Drilled shaft diameter, spacing and tip elevation to be determined during final design.



PIPE UNDERDRAIN DETAIL AT DRILLED SHAFT



PIPE UNDERDRAIN DETAIL BETWEEN DRILLED SHAFTS



† For size and type of wall anchor follow Manufacturer's instructions and installation guide.

SS CABLE WALL MOUNT UNIT DETAIL

CROSS SECTION AND DETAILS
RETAINING WALL 39 ALONG RAMP SW
F.A.I. RTE. 290 (EISENHOWER EXPRESSWAY)
SECTION xxxx-xxxx
COOK COUNTY
STATION 1319+75.65 TO STATION 1321+53.10
STRUCTURE NO. 016-1808

USER NAME = wjcolletti	DESIGNED - WJC	REVISED -	
	CHECKED - DL	REVISED -	
PLOT SCALE = 0.17 ' / in.	DRAWN - WJC	REVISED -	
PLOT DATE = 10/7/2015	CHECKED - DL	REVISED -	

TranSystems

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 2 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
290	xxxx-xxxx	COOK	2	2
		CONTRACT NO. 60X99		
		ILLINOIS FED. AID PROJECT		

3:30:29 PM - pw:\\61f479-PWINT.geconline.local:AECOM_DS02.NA\Documents\01Americas\Transportation\60269938 Circle\Phase_IN\000_CAD\008_Structural\Structure_016-1808\TSL\Sheets\016808-60X99-SHT-TSL-002