STRUCTURE GEOTECHNICAL REPORT
CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 10 (PROPOSED SN 016-1729)
F.A.I. ROUTE SB 90/94 (DAN RYAN EXPRESSWAY)
STATION 7309+74.27 TO STATION 7316+31.15
SECTION 2015-022-I, IDOT D-91-227-13/PTB 163-001
COOK COUNTY, ILLINOIS

For

AECOM

303 East Wacker Drive

Chicago, IL 60601

(312) 938-0300

Submitted by

Wang Engineering, Inc.

1145 North Main Street

Lombard, IL 60148

(630) 953-9928

Original: December 22, 2016
Revised: May 19, 2017

Technical Report Documentation Page

1. Title and Subtitle Structure Geotechnical Report Circle Interchange Reconstruction Retaining Wall 10, F.A.I. Route SB 90/94 (Dan Ryan expressway) Station 7309+74.27 to Station 7316+31.15		**2. Report Date** Revised: May 19, 2017 **3. Report Type** ☒ SGR ☐ RGR ☐ Draft ☐ Final ☒ Revised
4. Route / Section / County F.A.I. 90/94/ 2015-022-I / Cook		**5. IDOT Job No./Contract** D-91-227-12/60X99
6. PTB / Item No. 163/001	7. Existing Structure Number(s) Partially existing wall	8. Proposed Structure Number(s) 016-1729
9. Prepared by Wang Engineering, Inc. 1145 N Main Street Lombard, IL 60148	**Contributor(s)** Author: Metin W. Seyhun, P.E. QC/QA: Jerry W. H. Wang, Ph.D., P.E. PIC: Corina T. Farez, P.E., P.G.	**Author Phone Number/Email Address** (630) 953-9928 Ext 1018 mseyhun@wangeng.com
10. Prepared for AECOM 303 East Wacker Drive Chicago, IL 60601	**Structural Engineer** Amish T. Bhatt, S.E., P.E. AECOM	**Contact Phone Number** (312) 373-6829

11. Abstract

A 654.75-foot long, 22.5 feet maximum exposed/retained height new retaining wall will be constructed extending from Station 7309+74.27 to Station 7316+31.15 along the proposed EB I-290 Ramp to Taylor Street Exit to SB I-90/94 (Dan Ryan Expressway). This report provides geotechnical recommendations for the design and construction of the proposed retaining walls.

Based on our subsurface investigation results, the soils consists of up to 15 feet of fill, up to 9 feet medium stiff to very stiff clay crust, up to 38 feet of very soft to medium stiff silty clay, up to 20 feet of very stiff to hard silty clay to silty clay loam, and loose to very dense silty loam to sand extending to the boring termination depths or bedrock. Bedrock was encountered at 101 to 102 feet bgs (elevations of 491.5 to 492.4 feet.) Water-bearing layers are present in the fill and at deeper levels within the granular materials and weathered dolostone.

The proposed wall is a cut wall. Our wall type evaluations show the most technically feasible type of wall is drilled shaft with lagging. Other non-gravity walls such as soldier pile and lagging type or tangent wall may also be used. The drilled shaft with lagging wall was considered for a length of 570 feet between Stations 7309+74.27 and 7315+46.05. For southern portion, MSE wall was considered for a length of 84.75 feet between Stations7315+46.05 and 7316+31.15 due to the existing T-type foundations with piles and other utility constrains. There will be a temporary retention system adjacent to the UIC building as well as a permanent soil retention system providing full lateral support for the excavation and MSE wall section.

The design soil parameters for drilled shaft with lagging wall and other walls are included in the report. Global stability analyses performed for the maximum height of this wall showed satisfactory factor of safety against slope failure with a critical shaft embedment elevation of 547.0 feet. 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.

12. Path to archived file

S:\Netprojects\11000401\Reports\SGRs\Walls\1729 Wall 10\PDF_Report May 19, 2017\RPT_Wang_MWS_11000401SGRFinalWall10V03_20170519.doc

TABLE OF CONTENTS

Wang Engineering

1145 North Main Street
Lombard, Illinois 60148
Phone (630) 953-9928
www.wangeng.com

STRUCTURE GEOTECHNICAL REPORT
CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 10 (PROPOSED SN 016-1729)
F.A.I. ROUTE SB 90/94 (DAN RYAN EXPRESSWAY)
STATION 7309+74.27 TO STATION 7316+31.15
IDOT D-91-227-12/PTB 163-001
COOK COUNTY, ILLINOIS
FOR
AECOM

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 016-1729 (Retaining Wall 10) along EB I-290 Ramp to Taylor Street Exit to SB I-90/94 (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 (SN 016-1729) will be about 654.75-foot long measured along wall's front face extending from Station 7309+74.27 to Station 7316+31.15. Wall 10 will run along I-290 Ramp to Taylor Street Exit and will have a maximum retained height of about 22.5 feet. The maximum wall height measured from the finished grade behind the wall to the bottom of concrete facing is 24.5 feet. There will be 570 feet of Drilled Shaft with Lagging wall and 84.75 feet of MSE wall. Noise Abutment wall 270 feet long mounted on top of the wall will also be provided. 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. The latest TSL is shown in the Type Size Location Plan (Appendix C).

1.3 Existing Structure

There is an existing concrete retaining wall with footings on piles that will overlap with the proposed MSE wall from Station 7315+61.16 to 7316+31.15. The footings and piles will remain but the stems will be 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 retaining wall along proposed F.A.I Route 90/94 (Dan Ryan expressway) south ramp from the Harrison Bridge is constructed within a 20- to 25-foot deep cut. Elevations along the proposed wall range from 597 feet at the south end to 600 feet at the north 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. Bedrock was encountered by the borings at elevations ranging from 491.5 to 492.4 feet corresponding to 101 to 102 feet bgs.

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

Six structure borings were drilled by Wang between February 2, 2014 and April 03, 2014 along the proposed wall alignment. In addition we performed one vane shear, and a piezometer boring on December 1, 2015 and December 12, 2015 respectively, which were designated as 10-RWB-01 through 10-RWB-04, 15-RWB-01, 15-RWB-02, VST-01 and 10-PZ-01. Subsequently, two additional vane shear tests designated as 1729-VST-01 and 1729-VST-02 were undertaken on July 26 and 27, 2016.

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 or ATV drilling rigs equipped with hollow stem augers were 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 separate boreholes designated as Boring VST-01, 1729-VST-01 and 1729-VST-02 to determine in-situ shear strength of very soft to soft silty clay layer. This borehole was performed with partial soil sampling. After drilling to the desired depth, casing was installed and vane shear test was performed using a Rocktest Vane Borer. Tests were performed 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 to medium stiff clays were significantly higher than the corresponding values from unconfined compressive strength tests using the RIMAC apparatus.

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). 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, the borings encountered pavement and topsoil. The pavement structure consists of 6.0-inch thick asphalt over 2.5-foot thick gravelly loam base course. The top soil consists of 4.0 to 14.0 inch thick silty loam. In descending order, the general lithologic succession encountered beneath the pavement structure or topsoil includes 1) man-made ground (fill); 2) medium stiff to very stiff silty clay to clay loose to medium dense gravelly sand to sand ; 3) very soft to medium stiff clay to silty clay; 4) very stiff to hard silty clay to silty clay loam and silty loam diamicton; 5) hard silty clay loam or loose to very dense silty loam to silt and sand; and 6) strong dolostone bedrock.

1) Man-made ground (fill)

Underneath the pavement structure and topsoil, at elevations of 577.9 to 593.55 feet, the borings encountered 3.0 to 15.0 feet of cohesive and/or granular fill. The granular fill consists of very loose to dense, black, brown and reddish brown silty loam, loam, sandy loam, sand, and gravelly loam with SPT N-value of 3 to 49 blows/foot averaging 13 blows/foot and moisture content (MC) value of 4 to 57% averaging 16%. The cohesive fill consists of very stiff, brown and gray silty clay loam with unconfined compressive strength (Qu) values of 2.05 to 2.75 tsf with an average of 2.40 tsf and moisture content (MC) values of 14 and 17% averaging 16%.

2) Medium stiff to very stiff silty clay to clay and loose to medium dense gravelly sand to sand

Below the fill, a 4.3- to 9.2-foot thick layer of medium stiff to very stiff, brown and gray to gray silty clay, silty clay loam and clay was sampled in Borings 10-RWB-01 through 10-RWB-03, 15-RWB-01,

15-RWB-02 , VST-01, 729-VST-01 and 1729-VST-02 starting at elevations of 575.1 to 586.8 feet. This layer has Qu values of 0.98 to 3.69 tsf averaging 2.0 tsf and MC values of 16 to 29% averaging 24%. Laboratory index testing performed on a sample from this layer shows liquid limit (LL) and plastic limit (PL) values of 37% and 19%, respectively. According to the AASHTO soil classification, the subgrade soils belong mainly to the A-6 group. The granular soils encountered in the borings VST-01, 15-RWB-02 and 10-RWB-04 having SPT N values of 5 to 16 averaging 10 blows/foot and MC content of 7 to 22% averaging 14%.

3) Very soft to medium stiff clay to silty clay

At elevations 540.6 to 580.5 feet, the borings encountered up to 40 feet of very soft to medium stiff, gray clay to silty clay with Qu values of 0.08 to 0.9 tsf and occasionally 1.0 tsf with an average of 0.36 tsf and MC values of 15 to 36% averaging 25%. Laboratory index testing performed on samples from this layer shows LL and PL values of 33 and 34%, 17 and 18%, respectively. According to the AASHTO soil classification, the subgrade soils belong mainly to the A-6 group. This layer is commonly known as the "Chicago Blue Clay."

4) Very stiff to hard silty clay to silty clay loam and silty loam diamiction

At elevations of 521.9 to 543.8 feet, the borings advanced through up to 20.0 feet of very stiff to hard, gray silty clay to silty clay loam and silty loam. It has Qu values of 3.28 to 8.12 tsf averaging 5.5 tsf and MC values of 12 to 21% averaging 16%. The medium dense to very dense , gray silty loam encountered in borings 10-RWB-02 and 15-RWB-02, has SPT N values of 21 to 53 blows/foot averaging 38 blows/foot and MC values of 19 to 50% averaging 26%. Laboratory index testing performed on a sample from this layer shows LL and PL values of 23% and 15%, respectively. According to the AASHTO soil classification, the subgrade soils belong mainly to the A-4 group.

5) Very stiff to hard silty clay loam or loose to very dense silty loam, gravelly silty loam and sand

At elevations of 492.1 to 541.7 feet, the borings advanced through very stiff to hard, gray silty clay loam or loose to very dense silty loam, gravelly silty loam, sand. The cohesive soils have Qu values of 3.61 to 10.25 tsf averaging 7.22 tsf and MC values of 13 to 15% averaging 14%. The granular soils encountered have SPT N values of 9 to 76 blows/foot, averaging 49 blows/foot and MC content of 9 to 24% averaging 16%. Laboratory index testing performed on samples from this layer shows LL and PL values of 0 to 26% and 0 to 16%, respectively. According to the AASHTO soil classification, the subgrade soils belong mainly to the A-4 group. This layer is commonly known as the "Chicago Hardpan."

6) Strong dolostone bedrock

Dolostone bedrock was confirmed by coring at 101.0 to 102.0 feet bgs in Borings 10-RWB-01, 10-RWB-02 and 10-RWB-04, at elevations of 491.5 to 492.4 feet. Based on a 10-foot rock core taken, RQD is about 8 to 71% corresponding to very poor to fair quality rock. Dolostone bedrock was strong, light gray, bedded fresh, and moderately vuggy. Possible weathered bedrock was encountered at 491.5 to 496.4 feet, resting on top of the fair quality bedrock. The weathered dolostone layer may be water-bearing. *Rock Core Photographs* are included in Appendix A.

5.2 Groundwater Conditions

Groundwater was observed in Borings 10-RWB-01, 10-RWB-02, 10-RWB-04 and 15-RWB-02 during drilling at elevations of 580.4 to 586.8 feet (5.5 to 13.0 feet bgs). After drilling the groundwater was measured in Boring 10-RWB-01 at an elevation of 503.6 feet (90.0 feet bgs). Groundwater level measured after 72 and 144 hrs of drilling completion in Borings 10-RWB-04 and 10-RWB-02 show at elevations of 558.4 and 577.5 feet, respectively (35.0 and 16.0 feet bgs).

A Piezometer 10-PZ-01 installed at station 7315+23.78 about 8.0 feet east from proposed retaining wall 10 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. 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 I-290 Ramp to Taylor Street Exit 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 wall types

would require a temporary soil retention system to retain the slope during construction for excavation of the foundations.

Finally, a drilled shaft with lagging wall type system was considered. Other non-gravity walls such as soldier pile and lagging type or tangent wall may also be used. The lateral movement of this type of wall is relatively smaller compared to more flexible walls.

For the southern portion of the wall alignment between Station 7315+46.05 and Station 7316+31.15, MSE wall was 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 60-inch combined sewer that will be removed and relocated to in the MSE wall area. There will be a temporary retention system adjacent to the UIC building as well as a permanent soil retention system providing full lateral support for the excavation and MSE wall section. The design of the wall needs to account for these in the final design.

The geotechnical parameters and our evaluations for proposed walls are included in the next sections.

6.2 Drilled Shaft with Lagging Wall

The tip elevation of the drilled shafts will be determined by the lateral resistance. 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 shown in Tables 1 and 2. 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, 2012). 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 Walls
Stations 7309+74.27 to 7313+30.00
(Reference Borings 10-RWB-01, 10-RWB-02, 15-RWB-01, 1729-VST-01, and 1729-VST-02)

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
593.60[2] to 583.00 Silty Loam to Sand	115	0	30	0.33	3.00
583.00 to 580.50 Clay to Silty Clay	115	100	30	0.33	3.00
580.50 to 556.00 Clay to Silty Clay	110	50	30	0.33	3.00
556.00 to 549.00 Clay to Silty Clay	110	50	30	0.33	3.00
549.00 to 541.80 Clay to Silty Clay	115	100	31	0.32	3.12
541.80 to 526.80 Silty Clay to Silty Clay Loam	120	100	32	0.31	3.25
526.80 to 516.80 Silty Loam to Sandy Loam	120	0	31	0.32	3.12
516.80 to 506.80 Silty Clay Loam	125	100	32	0.31	3.25
506.80 to 491.50[3] Silty Loam to Gravelly Sand	125	0	32	0.31	3.25

[1] Earth pressure coefficients for straight backfill
[2] Existing grade elevation at wall
[3] Top of bedrock elevation

Table 2: Earth Pressure Parameters for Design of Walls
Stations 7313+30.00 to 7316+31.15
(Reference Borings 10-RWB-03, 10-RWB-04, 15-RWB-02, and VST-01)
02)

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
593.60[2] to 582.90 Silty Loam to Sand	115	0	30	0.33	3.00
582.90 to 578.00 Clay to Silty Clay	115	100	30	0.33	3.00
578.00 to 562.60 Clay to Silty Clay	110	50	30	0.33	3.00
562.60 to 557.60 Clay to Silty Clay	110	50	30	0.33	3.00
557.60 to 540.60 Clay to Silty Clay	115	100	31	0.32	3.12
540.60 to 528.90 Silty Clay to Silty Clay Loam	120	100	32	0.31	3.25
528.90 to 514.40 Silty Loam to Sand	120	0	33	0.29	3.39
514.40 to 506.30 Silty Clay Loam	125	100	32	0.31	3.25
506.30 to 492.40[3] Silty Loam to Gravelly Sand	125	0	33	0.29	3.39

[1] Earth pressure coefficients for straight backfill
[2] Existing grade elevation at top of wall
[3] Top of bedrock elevation

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 3 and 4 for two different sections 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 VST-01, 1729-VST-01, and 1729-VST-02.

Table 3: Geotechnical Parameters for Design of Walls
Stations 7309+74.27 to 7313+30.00
(Reference Borings 10-RWB-01, 10-RWB-02, 15-RWB-01, 1729-VST-01, and 1729-VST-02)

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)		
593.60[2] to 583.00 Silty Loam to Sand	115	0	30	30	5	--
583.00 to 580.50 Clay to Silty Clay	115	2000	0	30	500	0.007
580.50 to 556.00 Clay to Silty Clay	110	600	0	30	100	0.010
556.00 to 549.00 Clay to Silty Clay	110	750	0	30	100	0.010
549.00 to 541.80 Clay to Silty Clay	115	1050	0	31	500	0.007
541.80 to 526.80 Silty Clay to Silty Clay Loam	120	5500	0	32	2000	0.004
526.80 to 516.80 Silty Loam to Sandy Loam	120	0	31	31	45	--
516.80 to 506.80 Silty Clay Loam	125	8000	0	32	2000	0.004
506.80 to 491.50[3] Silty Loam to Gravelly Sand	125	0	32	32	60	--

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

Table 4: Geotechnical Parameters for Design of Walls
Stations 7313+30.00 to 7316+31.15
(Reference Borings 10-RWB-03, 10-RWB-04, 15-RWB-02, and VST-01)

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)		
593.60[2] to 582.90 Silty Loam to Sand	115	0	30	30	5	--
582.90 to 578.00 Clay to Silty Clay	115	1500	0	30	500	0.007
578.00 to 562.60 Clay to Silty Clay	110	650	0	30	100	0.010
562.60 to 557.60 Clay to Silty Clay	110	600	0	30	100	0.010
557.60 to 540.60 Clay to Silty Clay	115	1050	0	31	500	0.007
540.60 to 528.90 Silty Clay to Silty Clay Loam	120	5300	0	32	2000	0.004
528.90 to 514.40 Silty Loam to Sand	120	0	33	33	50	--
514.40 to 506.30 Silty Clay Loam	125	8000	0	32	2000	0.004
506.30 to 492.40[3] Silty Loam to Gravelly Sand	125	0	33	33	60	--

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

As per AECOM's cross sections, there will be a temporary retention system adjacent to the UIC building as well as a permanent soil retention system providing full lateral support for the excavation and MSE wall section. These walls will be designed by others. The soil parameters in Tables 1 through 4 may be used for the design of the soil retention systems.

6.2.1 Settlement Analyses

Long-term settlement is not an issue since no new fill is planned to be added back of the drilled shaft with lagging wall.

6.2.2 Global Stability Analyses

Global stability analysis was performed for the maximum wall height with up to 25.5 feet at Station 7309+74 for both short-term (undrained) and long-term (drained) soil conditions as presented in Appendix B. The soil parameters previously established in Section 6.2 were used for the stability analysis.

We estimate the maximum cut wall section has a short-term factor of safety (FOS) of 1.5 and a long-term FOS of 1.8 (Appendices B-2 and B-3), therefore satisfying the minimum IDOT FOS requirements (IDOT, 2015). The analysis basically shows the wall configuration needed to achieve a minimum 1.5 FOS against global instability for the most critical case. We estimate that the bottom of the wall should be at or below elevation of 547 feet to achieve a minimum FOS of 1.5 against global stability failure based on the short-term conditions. Additional embedment and lateral analyses will also be performed to establish final wall design. The minimum FOS calculated was less than the minimum required of 1.5 without considering wall embedment (Appendix B-1).

6.3 MSE Wall

IDOT/AECOM are considering the MSE wall with proposed soil retention system between Station 7315+46.05 and Station 7316+31.15 due to the UIC Recreation Facility, and the existing and proposed combined sewers in the wall foot print. There will be a temporary retention system adjacent to the UIC building as well as a permanent soil retention system providing full lateral support for the excavation and MSE wall section.

Based on the information provided by AECOM, we understand the proposed MSE wall will be about 84.75 feet long with a maximum total height of 14.75 feet and exposed/retained height of 12.25 feet. 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 have analyzed several alternatives for the fill material to be used in the reinforcement zone and fill area between the reinforcement zone and the proposed soil retention system as follows:

1. Using the regular fill material for the MSE reinforcement zone and fill area, and
2. Using Class III Lightweight Cellular Concrete Fill (LCCF) for the MSE reinforcement zone and fill area.

Based on our analyses, alternative 2 satisfies the bearing capacity requirements which govern and is the recommend as backfill for the MSE wall. The LCCF filled MSE wall will have full lateral support by the proposed permanent shoring system, external stability is not a concern.

6.3.1 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. 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 3,200 psf and the factored bearing resistance is 2,100 psf. The estimated applied factored maximum uniform bearing pressure for the LCCF is 2,000 psf.

6.3.2 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 due to the retention of lateral forces by the proposed permanent shoring system. It should be noted that for very narrow MSE wall sections located between Sta. 7315+46.05 to Sta. 7315+66.46, the soil reinforcement may need to be tied to the shoring system to avoid overturning of the hardened slender LCCF MSE block.

6.3.3 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.

6.3.4 Global Stability Analyses

Global stability is not a concern due to the proposed permanent deep soil retention system.

6.4 Impact of Wall Installation on Existing Buildings and Utilities

Based on the TSL, the nearest existing building to the proposed drilled shaft with lagging wall is the UIC Recreation Facility located about 26 feet away at Station 7314+00 where a maximum wall height of 17 feet was considered. AECOM has selected a maximum lateral top of wall deflection of 0.5% of the

exposed wall height which corresponds to 1 inch for the 17 feet height. The acceptable surface movement of 0.25 inches was provided by CDOT.

Using empirical data compiled in various research papers, Wang estimated the ground movement of about 0.4 inches adjacent to the building that is 26 feet away from the wall using 0.5 % maximum lateral deflection limit criteria. The facility is supported on a deep foundation system. The ground movement estimates are provided in Appendix D.

The potential impact of the wall deflection inducing ground movements on other structures that are closer such as the relocated 60-inch diameter sewer, proposed 48-inch diameter watermain, 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.

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. 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.

7.3 Drilled Shaft with Lagging Wall

The wall should be constructed as per IDOT Standard Specifications and the current special provision

developed by IDOT for construction of secant pile wall. The impact of the presence of existing buildings, parking lots, and utilities on the construction of the proposed Wall 10 should be evaluated.

7.4 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 10 should be evaluated.

7.5 Drilled Shafts

Walls will be formed with drilled shafts. 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 IDOT Standard Specifications for Road and Bridge Construction (IDOT, 2016). 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 at 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 and heavy dewatering can result in ground loss around the perimeter of the shaft, affecting adjacent roadways and facilities.

7.6 Construction Monitoring

Due to the wall's proximity to utilities, buildings 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

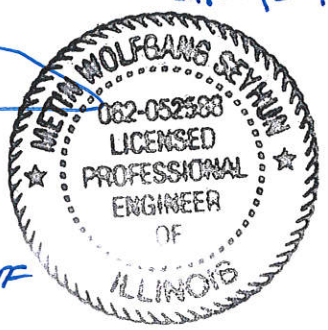
The analysis and recommendations submitted in this report are based upon the data obtained from the borings drilled at the locations shown on the boring logs and in Exhibit 3. This report does not reflect any variations that may occur between the borings or elsewhere on the site, variations whose nature 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 10 (SN016-1729) 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.
Vice President

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

REFERENCES

AMERICAN ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS (2014) *LRFD Bridge Design Specifications*. United States Department of Transportation, Washington, D.C.

BAUER, R.A., CURRY, B.B., GRAESE, A.M., VAIDEN, R.C., SU, W.J., and HASEK, M.J., 1991, *Geotechnical Properties of Selected Pleistocene, Silurian, and Ordovician Deposits of Northeastern Illinois*: Environmental Geology 139, Illinois State Geological Survey, 69 p.

CHRZATOWSKY, M.J., and THOMPSON, T.A., 1992, Late Wisconsinan and Holocene coastal evolution of the southern shore of Lake Michigan, *in* Fletcher, C.H., III, and Wehmiller, J.F., eds., Quaternary Coasts of the United States: Marine and Lacustrine Systems: SEPM Special Publication No.48: Tulsa, Oklahoma, Society for Sedimentary Geology, p. 397-413.

HANSEL, A.K., and JOHNSON, W.H. (1996) W*edron and Mason Groups: Lithostratigraphic Reclassification of the Wisconsin Episode, Lake Michigan Lobe Area: ISGS Bulletin 104.* Illinois State Geological Survey, Champaign, IL. 116 p.

LEETARU, H.E., SARGENT, M.L., AND KOLATA, D.R, 2004, *Geologic Atlas of Cook County for Planning Purposes*, Open File Series 2004-12, Illinois State Geological Survey, p. 30.

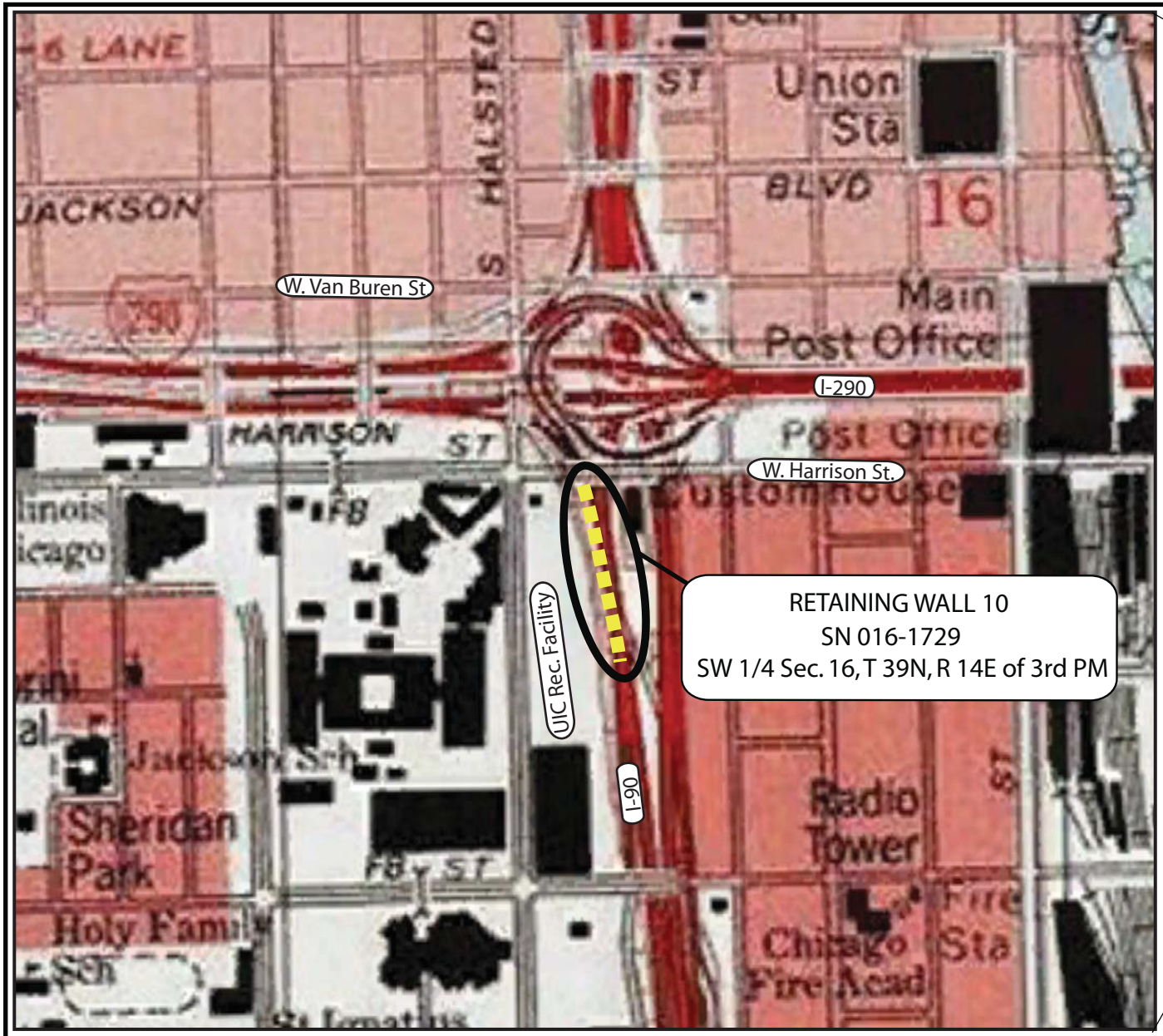
ILLINOIS DEPARTMENT OF TRANSPORTATION (2015) *Geotechnical Manual.* IDOT Bureau of Materials and Physical Research, Springfield, IL.

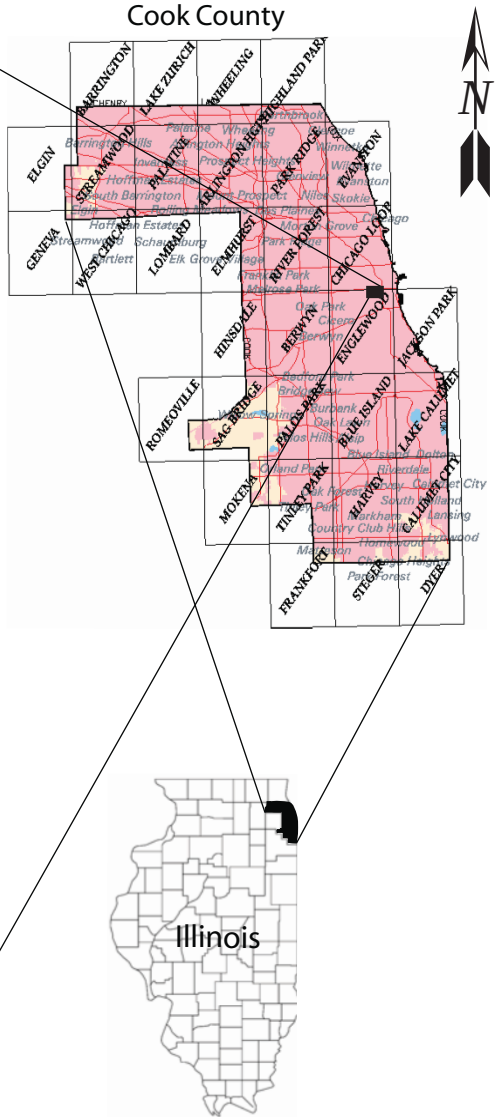
ILLINOIS DEPARTMENT OF TRANSPORTATION (2016) *Standard Specifications for Road and Bridge Construction.* IDOT Division of Highways, Springfield, IL.

ILLINOIS DEPARTMENT OF TRANSPORTATION (2012) *Bridge Manual.* IDOT Bureau of Bridges and Structures, Springfield, IL.

WILLMAN, H.B., 1971, *Summary of the Geology of the Chicago Area*, ISGS Circular C460: Urbana, Illinois State Geological Survey, p. 77.

EXHIBITS



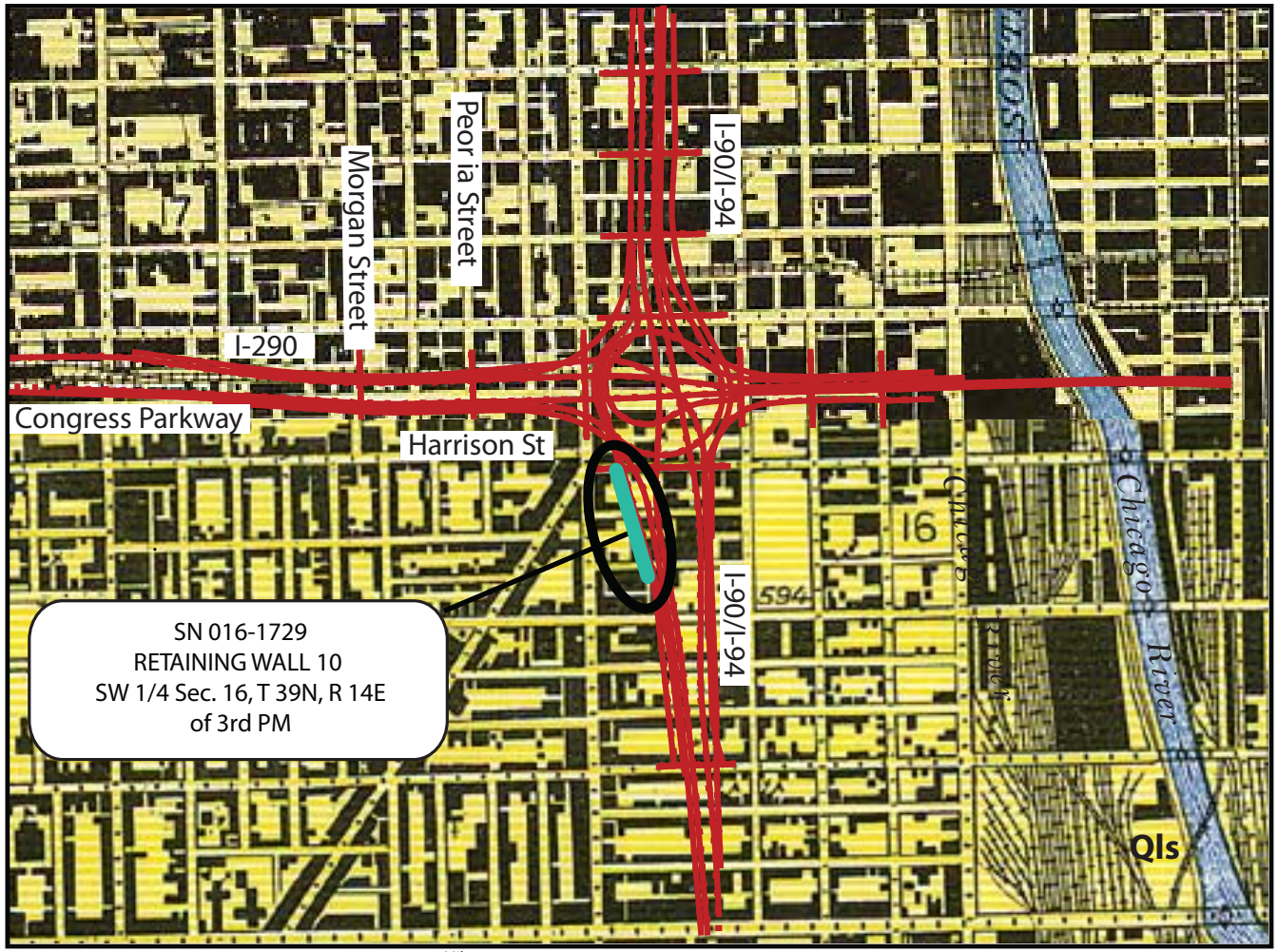


SITE LOCATION MAP: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 10, SN 016-1729, CHICAGO, IL

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: RKC CHECKED BY: C. Marin

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

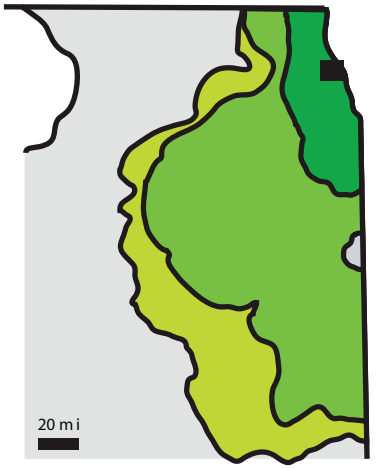
FOR AECOM	1100-04-01



Modified after Bretz (1926)

N

REGIONAL GEOLOGY



Wedron Group

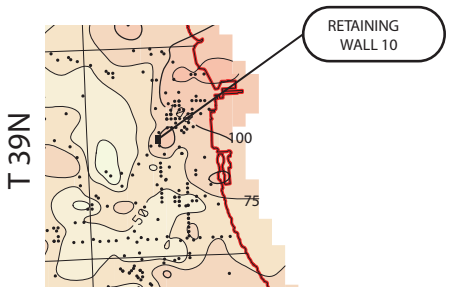
- Wadsworth Formation
- Lemont Formation
- Tiskilwa Formation

Modified after Hansel and Johnson (1996)

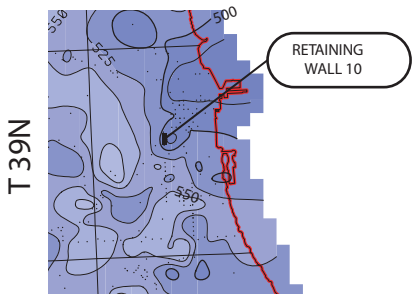
Legend

Qls	Glacial lake bottom (Covered by lacustrine deposits)

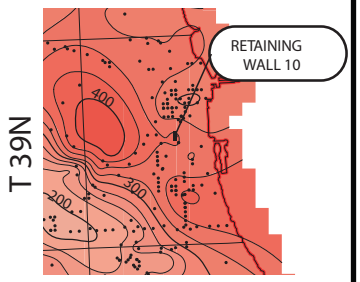
DRIFT THICKNESS



BEDROCK TOPOGRAPHY



BEDROCK THICKNESS



Modified after Leetaru et. al. (2004)

0 2 4 8 miles

SITE AND REGIONAL GEOLOGY: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 10, SN016-1729, CHICAGO, IL

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

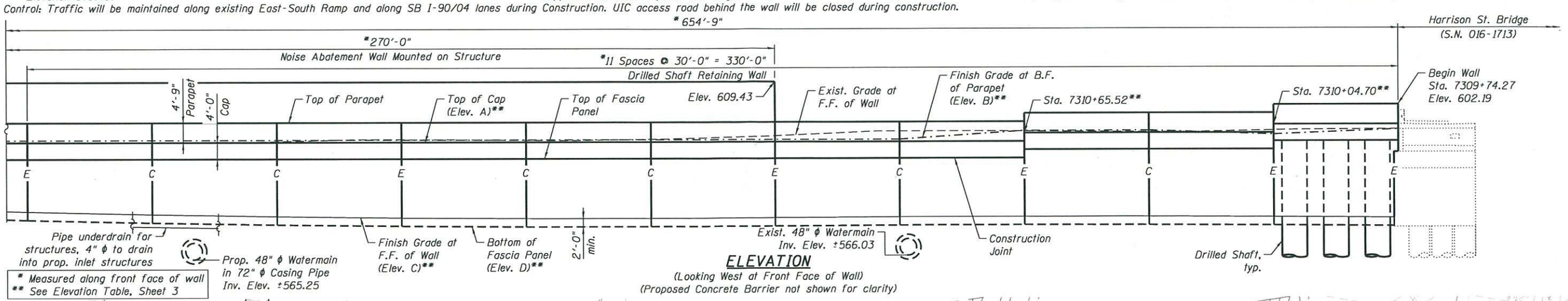
Wang Engineering
1145 N . Main Street
Lombard, IL 60148
www.wangeng.com

FOR AECOM | 1100-04-01

Bench Mark: Set "X" on westerly jaywall of accident investigation site ±35' north of east 90/94 sign, Elevation 579.45.

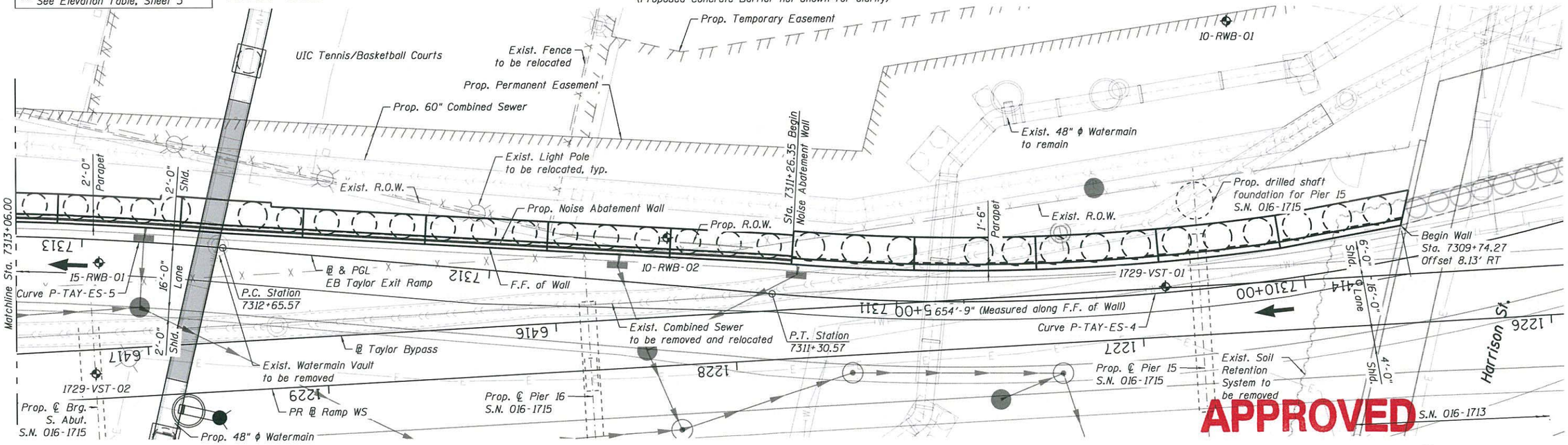
Traffic Control: Traffic will be maintained along existing East-South Ramp and along SB I-90/04 lanes during Construction. UIC access road behind the wall will be closed during construction.

Existing Structure: Exist. Cast-In-Place Ret. Wall was built in 1987 under F.A.I. Route 90/94. Section 2526.6-IP-R-3, 2626.2-28-DM & 0101.6-IP-R(85). Total length of wall is approx. 914'-5" and supported on steel H-piles. Wall height varies with max. height of approx. 21'-0". Steel sheet pilling used during wall construction was cut-off at top of wall footing elev. and left in the ground.



ELEVATION

(Looking West at Front Face of Wall)
(Proposed Concrete Barrier not shown for clarity)



NOTES:

1. Stations and offsets for the wall are given from the ℄ EB Taylor Exit Ramp to the front face of wall.
2. Wall to be built along straight chords between expansion and construction joints.

LEGEND:

Front Face	F.F.	Boring Log/Soil Test	
Back Face	B.F.	Light Pole	
Combined Sewer	C	Exist. Electric Cable	E
Exist. Storm Sewer		Prop. Lighting Cable	L
Prop. Storm Sewer		Fiber Optic	FO
Water Line	W	Exist. Fence	x x
Fire Hydrant		Soil Retention System	
Prop. catchbasin		Construction Joint	C
		Expansion Joint	E

PLAN

DESIGN SPECIFICATIONS

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

WALL DEFLECTION CRITERIA

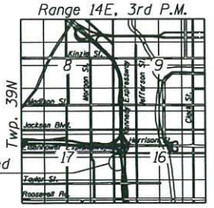
Maximum lateral deflection at top of the wall shall not exceed 1% exposed height of the wall.
Maximum lateral deflection at top of the Proposed Soil Retention System shall not exceed 1".

DESIGN STRESSES

FIELD UNITS

f'_c = 7,000 psi (Drilled Shafts)***
f'_c = 3,500 psi (All other concrete)
f_y = 60,000 psi (Reinforcement)

*** Final concrete strength will be determined during final design



LOCATION SKETCH

APPROVED
APR 18 2017
AS A BASIS FOR PREPARATION OF DETAILED PLANS

GENERAL PLAN AND ELEVATION
RETAINING WALL 10
F.A.I. RTE. SB 90/94
(DAN RYAN EXPRESSWAY)
F.A.I. RTE. 90/94 - SECTION 2015-022-I
COOK COUNTY
STATION 7309+74.27 TO STATION 7316+31.15
STRUCTURE NO. 016-1729

BORING LOCATION PLAN: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 10, SN 016-1729, CHICAGO, IL

SCALE: GRAPHICAL	EXHIBIT 3-1	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

AECOM

USER NAME = dabezicd	DESIGNED - DD	REVISED	
	CHECKED - ATB	REVISED	
PLOT SCALE = N.T.S.	DRAWN - GF	REVISED	
PLOT DATE = 4/7/2017	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	2015-022-I	COOK	6	1
		CONTRACT NO. 62A74		
		ILLINOIS FED. AID PROJECT		

0161729-62A74-SOI-TSL

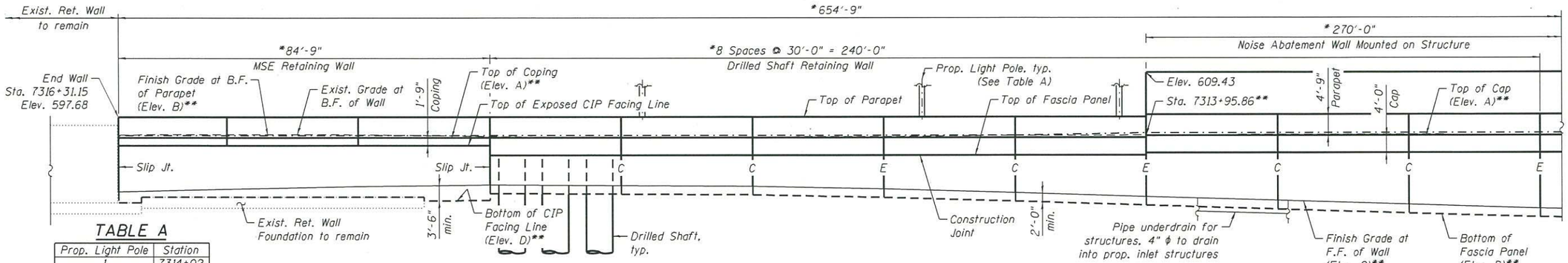


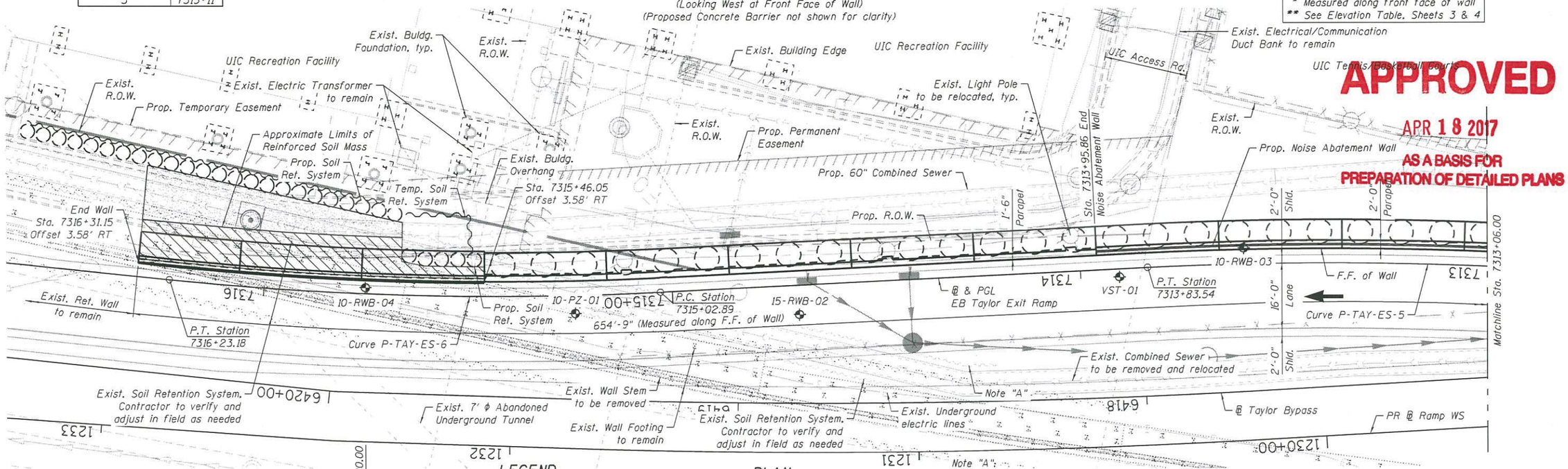
TABLE A

Prop. Light Pole	Station
1	7314+02
2	7314+47
3	7315+11

ELEVATION

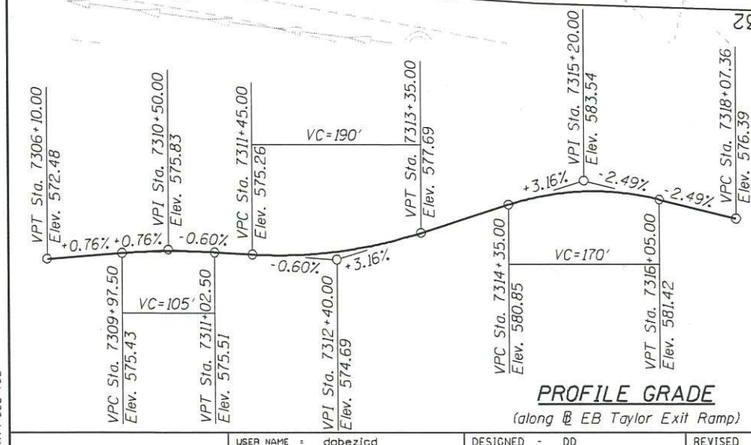
(Looking West at Front Face of Wall)
(Proposed Concrete Barrier not shown for clarity)

* Measured along front face of wall
** See Elevation Table, Sheets 3 & 4



PROFILE GRADE

(along @ EB Taylor Exit Ramp)



LEGEND:

Front Face	F.F.	Boring Log/ Soil Test	
Back Face	B.F.	Light Pole	
Combined Sewer	C	Exist. Electric Cable	E
Exist. Storm Sewer		Prop. Lighting Cable	L
Prop. Storm Sewer		Fiber Optic	FO
Water Line	W	Exist. Fence	x x
Fire Hydrant		Exist. Ret. Wall Stem Removal	
Prop. catchbasin		Soil Retention System	
Construction Joint	C	Lightweight Fill outside of Reinf. Soil Mass	
Expansion Joint	E		

PLAN

CURVE DATA

(EB Taylor Exit Ramp)
Prop. Curve P-TAY-ES-4
P.I. Sta. = 7309+26.26
Δ = 44° 07' 39" (RT)
D = 10° 13' 53
R = 560.00'
T = 226.98'
L = 431.30'
E = 44.25'
e = 5.8%
T.R. = NA
S.E. Run = 150
P.C. Sta. = 730
P.T. Sta. = 731

CURVE DATA

(EB Taylor Exit Ramp)
Prop. Curve P-TAY-ES-5
P.I. Sta. = 7313+24.65
Δ = 7° 47' 11" (LT)

CURVE DATA

(EB Taylor Exit Ramp)
Prop. Curve P-TAY-ES-6
P.I. Sta. = 7315+63.15
Δ = 8° 44' 46" (RT)

Note "A":
Existing steel sheet piling is shown as per as-designed plan information. Preliminary non-destructive evaluation suggests that existing steel sheeting is not present. Prior to construction contractor shall field verify presence of existing steel sheeting. Any change order due to presence of steel sheeting shall be paid for as per contract unit price of individual pay items associated with the work.

BORING LOCATION PLAN: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 10, SN 016-1729, CHICAGO, IL

SCALE: GRAPHICAL | EXHIBIT 3-2 | 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

APPROVED
APR 18 2017
AS A BASIS FOR PREPARATION OF DETAILED PLANS

GENERAL PLAN AND ELEVATION
RETAINING WALL 10
F.A.I. RTE. SB 90/94
(DAN RYAN EXPRESSWAY)
F.A.I. RTE. 90/94 - SECTION 2015-022-I
COOK COUNTY
STATION 7309+74.27 TO STATION 7316+31.15
STRUCTURE NO. 016-1729

AECOM

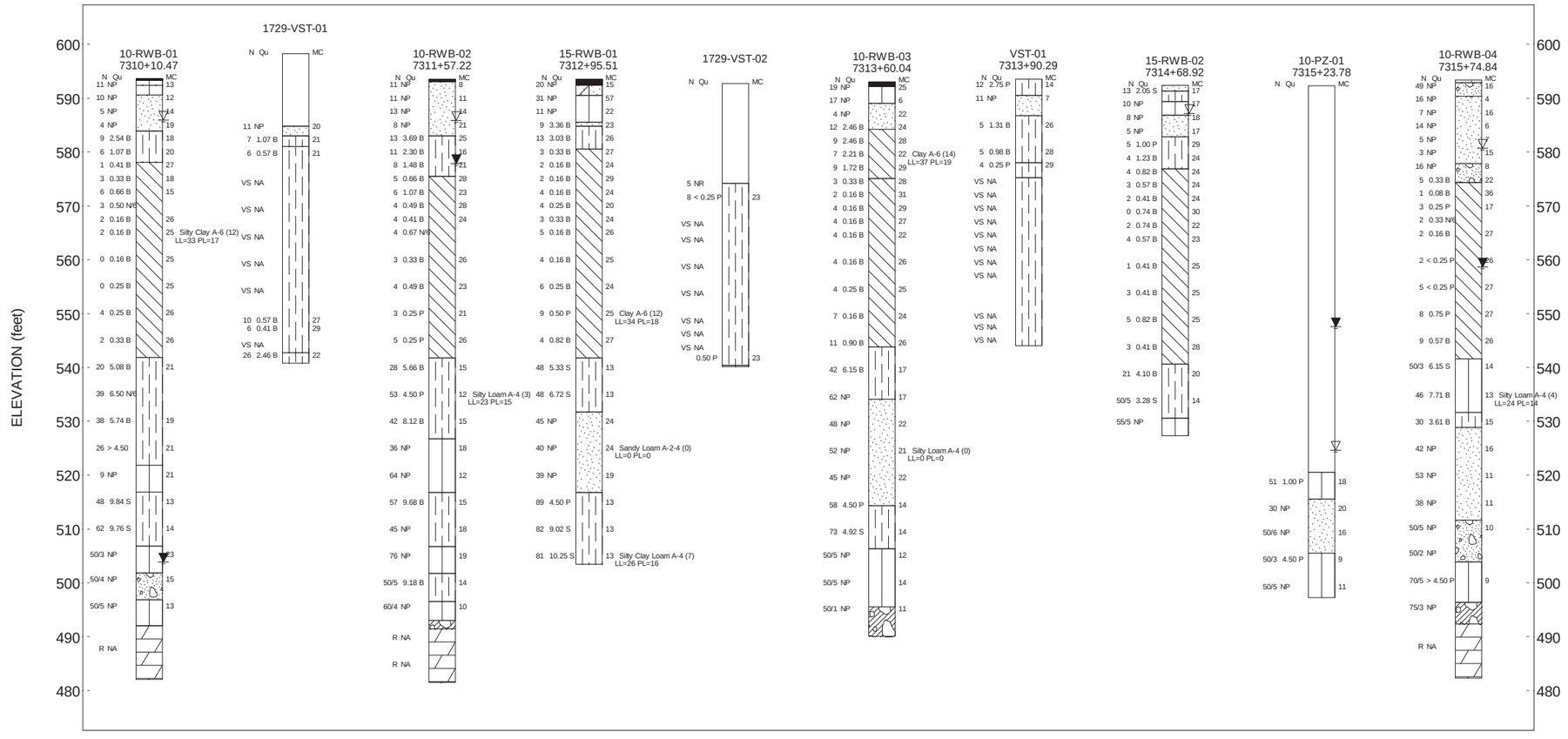
USER NAME = dabezicd	DESIGNED - DD		REVISED
	CHECKED - ATB		REVISED
PLOT SCALE = N.T.S.	DRAWN - GF		REVISED
PLOT DATE = 4/17/2017	CHECKED - ATB		REVISED

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	2015-022-I	COOK	6	2
		CONTRACT NO. 62A74		
	ILLINOIS FED. AID PROJECT			

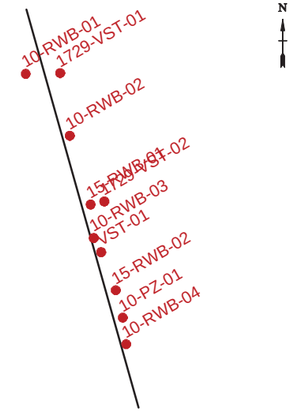
0161729-62A74-S02-TSL



DISTANCE ALONG PROFILE (feet)

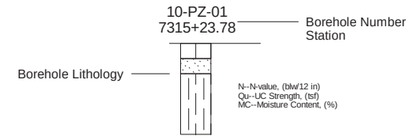
Lithology Graphics

- IDH Silt, Silty Loam
- IDH Sand, Sandy Loam
- Topsoil
- IDH Silty Clay, Silty Clay Loam
- IDH Clay
- Gravelly sand, sandy gravel
- Dolomite or Dolomitic Limestone
- Weathered bedrock
- Pavement
- IDH Loam



Site Map Scale 1 inch equals 295 feet

Explanation:



Water Level Reading at time of drilling.

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

0 80

Horizontal Scale (feet)

Vertical Exaggeration: 3.5x

Wang Engineering
1145 N Main Street
Lombard, IL 60148

Soil Profile
SN 016-1729; RW 10

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 8/12/16

APPENDIX A

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
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: 592.32 ft
North: 1896981.56 ft
East: 1171477.47 ft
Station: 7315+23.78
Offset: 8.25157 RT

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					

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*	25					
			30					
			35					
			40					

GENERAL NOTES

Begin Drilling **12-10-2014** Complete Drilling **12-11-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR**
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.

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
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: 592.32 ft
North: 1896981.56 ft
East: 1171477.47 ft
Station: 7315+23.78
Offset: 8.25157 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--pizometer 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					
			55					
			60					
		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*	65					
	520.6	Very dense, gray SILTY LOAM --Wet--	70					
			75		1	18 27 24	1.00 P	18
	515.6	Very dense, gray SANDY LOAM, trace to little gravel --Saturated--	80		2	7 14 16	NP	20

GENERAL NOTES

Begin Drilling **12-10-2014** Complete Drilling **12-11-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR**
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.

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
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: 592.32 ft
North: 1896981.56 ft
East: 1171477.47 ft
Station: 7315+23.78
Offset: 8.25157 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			85		3	50/6	NP	16
	505.6	Very dense, gray SILTY LOAM, trace gravel						
		--Moist--	90		4	50/3	4.50 P	9
		--Wet--			5	50/5	NP	11
	497.3	--HARD DRILLING--	95					
		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**
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.

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

BORING LOG 10-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: 593.61 ft
North: 1897453.61 ft
East: 1171289.67 ft
Station: 7310+10.47
Offset: 64.4358 RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
593.3	4-inch thick, dark brown SILTY LOAM						
592.4	--TOPSOIL--						
	Hard, brown SILTY CLAY LOAM, trace gravel and brick fragments --FILL--			1	9 4 7	NP	13
590.6	Medium dense, brown SILTY LOAM, trace gravel and brick fragments --FILL--			2	5 5 5	NP	12
	Loose to medium dense, brown, fine SAND --FILL--	5		3	3 3 2	NP	14
				4	3 2 2	NP	19
583.9	Stiff to hard, gray brown and gray SILTY CLAY, trace gravel	10		5	3 4 5	2.54 B	18
		15		6	3 3 3	1.07 B	20
578.1	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			7	0 0 1	0.41 B	27
		20		8	1 2 1	0.33 B	18
		25		9	2 3 3	0.66 B	15
				10	0 1 2	0.50 N/6	
				11	1 1 1	0.16 B	26
	--L_L(%)=33, P_L(%)=17-- --%Gravel=3.4-- --%Sand=14.9-- --%Silt=48.7-- --%Clay=32.9-- --A-6 (12)--	30		12	0 1 1	0.16 B	25
		35		13	0 0 0	0.16 B	25
		40		14	0 0 0	0.25 B	25

GENERAL NOTES

Begin Drilling: **02-26-2014** Complete Drilling: **03-03-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME-55 TMR**
Driller: **R&K** Logger: **D. Kolpacki** Checked by: **C. Marin**
Drilling Method: **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **8.00 ft**
At Completion of Drilling: **90.00 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

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

WANGENGINC 11000401.GPJ WANGENG.GDT 8/12/16

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

BORING LOG 10-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: 593.61 ft
North: 1897453.61 ft
East: 1171289.67 ft
Station: 7310+10.47
Offset: 64.4358 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			45		15	0 2 2	0.25 B	26
			50		16	0 0 2	0.33 B	26
	541.9	Hard, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel	55		17	6 8 12	5.08 B	21
			60		18	14 15 24	6.50 N/6	
			65		19	10 14 24	5.74 B	19
			70		20	11 11 15	> 4.50	21
	521.9	Loose, gray SILTY LOAM, trace gravel --Saturated--	75		21	4 4 5	NP	21
	516.9	Hard, gray SILTY CLAY LOAM, trace gravel	80		22	17 19 29	9.84 S	13

GENERAL NOTES

Begin Drilling **02-26-2014** Complete Drilling **03-03-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR**
Driller **R&K** Logger **D. Kolpacki** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **8.00 ft**
At Completion of Drilling ▼ **90.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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

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

BORING LOG 10-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: 593.61 ft
North: 1897453.61 ft
East: 1171289.67 ft
Station: 7310+10.47
Offset: 64.4358 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	506.9	Very dense, gray GRAVELLY SILTY LOAM --Saturated--	85		23	17 22 40	9.76 S	14
	501.9	--HARD DRILLING-- *--Possible Cobbles--*	90		24	15 21 50/3	NP	23
	496.9	Very dense, gray GRAVELLY SAND --Saturated-- --HARD DRILLING-- *--Possible Cobbles--*	95		25	50/4	NP	15
		Very dense, gray SILTY LOAM, trace gravel	100		26	50/5	NP	13
	492.1	Strong, light gray, fair rock mass quality, bedded fresh DOLOSTONE, up to 10-inch beds, 1- to 8-inch spaced joints, horizontal and vertical joints with none to more than 0.2-inch infilling, hard joint wall, with stylolitic surfaces, and moderately vuggy porosity. --Run 1 - RECOVERY=100%-- --RQD=53%--	105		1	CORE		
	482.1	Boring terminated at 111.50 ft	110 115 120					

GENERAL NOTES

Begin Drilling **02-26-2014** Complete Drilling **03-03-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR**
Driller **R&K** Logger **D. Kolpacki** Checked by **C. Marin**
Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **8.00 ft**
At Completion of Drilling ▼ **90.00 ft**
Time After Drilling **NA**
Depth to Water ▽ **NA**

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

0 3 6 9 12 inch

Boring 10-RWB-01:
Run #1, 101.5' to 111.5', RECOVERY = 100% , RQD = 53%

BEDROCK CORE: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 10, SN 016-1729, CHICAGO. IL

SCALE : GRAPHIC	10-RWB-01	DRAWN BY: M. de los Reyes CHECKED BY: C. Marin

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

FOR AECOM	1100-04-01

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

BORING LOG 10-RWB-02

WEI Job No.: 1100-04-01

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

Datum: NAVD 88
Elevation: 593.54 ft
North: 1897333.82 ft
East: 1171374.94 ft
Station: 7311+57.22
Offset: 11.9525 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	593.0	6-inch thick, black and brown SILTY LOAM --TOPSOIL--						
		Loose to medium dense, brown, fine SAND --FILL--			1	3 5 6	NP	8
			5		2	3 4 7	NP	11
					3	8 7 6	NP	14
			10		4	4 4 4	NP	21
	583.0	Stiff to very stiff, gray SILTY CLAY LOAM, trace gravel			5	3 5 8	3.69 B	25
			15		6	4 6 5	2.30 B	16
					7	3 3 5	1.48 B	21
	575.5	Soft to stiff, gray CLAY to SILTY CLAY, trace gravel	20		8	2 2 3	0.66 B	28
			25		9	1 3 3	1.07 B	23
					10	2 2 2	0.49 B	28
			30		11	1 2 2	0.41 B	24
					12	1 2 2	0.67 N/6	
			35		13	0 1 2	0.33 B	26
			40		14	1 2 2	0.49 B	23

GENERAL NOTES

Begin Drilling: **02-26-2014** Complete Drilling: **03-03-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **B-57 TMR**
Driller: **P&P** Logger: **F. Bozga** Checked by: **C. Marin**
Drilling Method: **2.25" HSA to 15', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **8.00 ft**
At Completion of Drilling: **mud at 7 ft**
Time After Drilling: **144 hours**
Depth to Water: **16.00 ft**

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

WANGENGINC 11000401.GPJ WANGENG.GDT 8/12/16

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

BORING LOG 10-RWB-02

WEI Job No.: 1100-04-01

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

Datum: NAVD 88
Elevation: 593.54 ft
North: 1897333.82 ft
East: 1171374.94 ft
Station: 7311+57.22
Offset: 11.9525 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--disturbed sample--	45		15	1 1 2	0.25 P	21
		--disturbed sample--	50		16	2 2 3	0.25 P	26
	541.8	Hard, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel						
			55		17	11 11 17	5.66 B	15
		--L_L(%)=23, P_L(%)=15-- --%Gravel=6.7-- --%Sand=26.9--	60		18	14 24 29	4.50 P	12
		--%Silt=49.7-- --%Clay=16.7-- --A-4 (3)--	65		19	11 19 23	8.12 B	15
	526.8	Dense to very dense, gray SILTY LOAM, trace gravel --Moist--	70		20	14 16 20	NP	18
			75		21	23 25 39	NP	12
	516.8	Hard, gray SILTY CLAY LOAM, trace gravel	80		22	16 26 31	9.68 B	15

GENERAL NOTES

Begin Drilling **02-26-2014** Complete Drilling **03-03-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR**
Driller **P&P** Logger **F. Bozga** Checked by **C. Marin**
Drilling Method **2.25" HSA to 15', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **8.00 ft**
At Completion of Drilling ▼ **mud at 7 ft**
Time After Drilling **144 hours**
Depth to Water ▼ **16.00 ft**

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

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

BORING LOG 10-RWB-02

WEI Job No.: 1100-04-01

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

Datum: NAVD 88
Elevation: 593.54 ft
North: 1897333.82 ft
East: 1171374.94 ft
Station: 7311+57.22
Offset: 11.9525 RT

Elevation (ft)	Depth (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
506.8		Very dense, gray SILT --Moist--					
	85			23	12 19 26	NP	18
	90			24	40 36 40	NP	19
501.8		Hard, gray SILTY CLAY LOAM, trace gravel					
	95			25	20 28 50/5	9.18 B	14
496.5		Very dense, gray GRAVELLY SILTY LOAM --Dry--					
	100			26	60/4	NP	10

Elevation (ft)	Depth (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
493.0		--DIFFICULT DRILLING-- --WEATHERED BEDROCK--					
491.5		Strong, light gray, very poor rock mass quality, bedded fresh DOLOSTONE, up to 8-inch beds, up to 4-inch spaced joints, horizontal and vertical joints with none to more than 0.2-inch greenish gray infilling, hard joint wall, with stylolitic surfaces, and moderately vuggy porosity.		1	CORE		
	105	--Run 1 - RECOVERY=97%-- --RQD=8%--					
	110	--Run 2 - RECOVERY=87%-- --RQD=20%--		2	CORE		
481.5		Boring terminated at 68.50 ft					
	115						
	120						

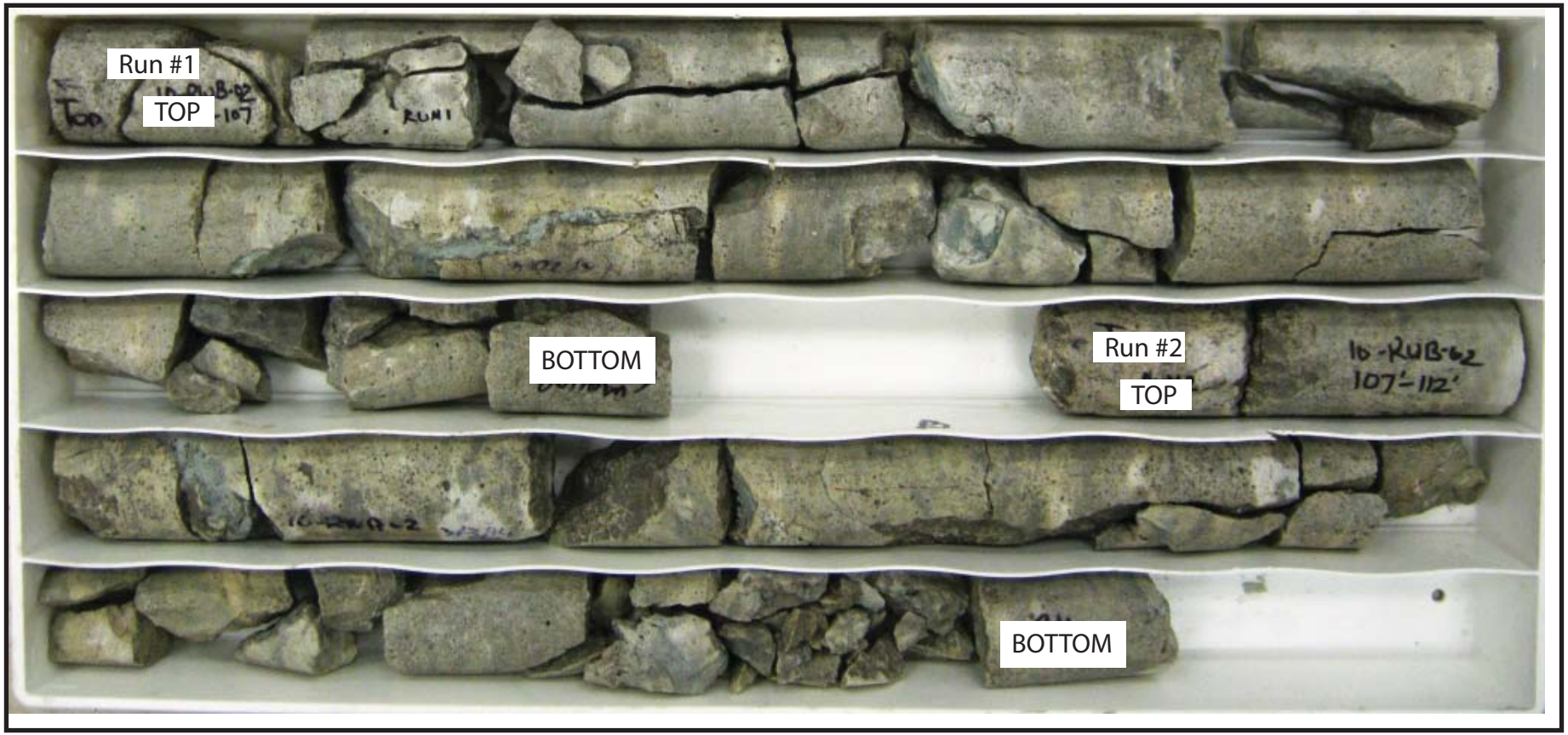
GENERAL NOTES

Begin Drilling: **02-26-2014** Complete Drilling: **03-03-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **B-57 TMR**
Driller: **P&P** Logger: **F. Bozga** Checked by: **C. Marin**
Drilling Method: **2.25" HSA to 15', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **8.00 ft**
At Completion of Drilling: **mud at 7 ft**
Time After Drilling: **144 hours**
Depth to Water: **16.00 ft**

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



0 3 6 9 12 inch

Boring 10-RWB-02:
Run #1, 102' to 107', RECOVERY = 97% , RQD = 8%
Run #2, 107' to 112', RECOVERY = 87% , RQD = 20%

BEDROCK CORE: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 10, SN 016-1729, CHICAGO. IL

SCALE : GRAPHIC	10-RWB-02	DRAWN BY: M. de los Reyes CHECKED BY: C. Marin

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

FOR AECOM	1100-04-01

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

BORING LOG 10-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: 593.09 ft
North: 1897135.88 ft
East: 1171421.19 ft
Station: 7313+60.04
Offset: 3.9003 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	592.2	11-inch thick, dark brown SILTY LOAM						
		--TOPSOIL--						
		Medium dense, black and reddish brown SILTY LOAM, trace gravel			1	16 9 10	NP	25
		--FILL--						
	589.1	Loose to medium dense. brown SAND, trace gravel	5		2	5 7 10	NP	6
		--FILL--			3	2 2 2	NP	22
	584.3	Stiff to very stiff, gray CLAY, trace gravel	10		4	2 4 8	2.46 B	24
					5	4 4 5	2.46 B	28
		--L_L(%)=37, P_L(%)=19--			6	2 3 4	2.21 B	22
		--%Gravel=2.0--						
		--%Sand=15.8--						
		--%Silt= 39.6--	15					
		--%Clay=42.5--						
		--A-6 (14)--			7	3 4 5	1.72 B	29
	575.1	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel						
			20		8	2 1 2	0.33 B	28
			25		9	1 1 1	0.16 B	31
					10	1 2 2	0.16 B	29
			30		11	2 2 2	0.16 B	27
					12	2 2 2	0.16 B	22
			35		13	2 1 3	0.16 B	26
			40		14	2 2 2	0.25 B	25

GENERAL NOTES

Begin Drilling: **02-21-2014** Complete Drilling: **02-25-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **D-25 ATV**
Driller: **N&J** Logger: **A. Happel** 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: **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.

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

BORING LOG 10-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: 593.09 ft
North: 1897135.88 ft
East: 1171421.19 ft
Station: 7313+60.04
Offset: 3.9003 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			45		15	2 3 4	0.16 B	24
	543.8		50		16	3 5 6	0.90 B	26
		Hard, gray SILTY CLAY, trace gravel	55		17	10 17 25	6.15 B	17
	534.1	Dense to very dense, gray, fine SAND and SILT laminations	60		18	16 28 34	NP	17
		--Moist to wet--	65		19	12 21 27	NP	22
		--L_L(%)=NP, P_L(%)=NP-- --%Gravel=0.1-- --%Sand=44.4-- --%Silt=51.6-- --%Clay=4.0-- --A-4 (0)--	70		20	16 21 31	NP	21
			75		21	21 20 25	NP	22
	514.4	Hard, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel	80		22	18 27 31	4.50 P	14

GENERAL NOTES

Begin Drilling: **02-21-2014** Complete Drilling: **02-25-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **D-25 ATV**
Driller: **N&J** Logger: **A. Happel** 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: **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.

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

BORING LOG 10-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: 593.09 ft
North: 1897135.88 ft
East: 1171421.19 ft
Station: 7313+60.04
Offset: 3.9003 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	506.3	Very dense, gray SILTY LOAM, trace to little gravel --Damp to dry--	85		23	20 27 46	4.92 S	14
			90		24	50/5	NP	12
			95		25	50/5	NP	14
		--HARD DRILLING--						
	495.6	Very dense, gray DOLOSTONE fragments -- WEATHERED BEDROCK--	100		26	50/1	NP	11
	490.1	--DIFFICULT DRILLING-- --AUGER REFUSAL-- Boring terminated at 103.00 ft	105					
			110					
			115					
			120					

GENERAL NOTES

Begin Drilling **02-21-2014** Complete Drilling **02-25-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV**
Driller **N&J** Logger **A. Happel** 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 ▼ **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 8/12/16

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

BORING LOG 10-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: 593.40 ft
North: 1896930.29 ft
East: 1171484.09 ft
Station: 7315+74.84
Offset: 0.8034' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	592.9	6-inch thick ASPHALT --PAVEMENT--						
		Dense, brown GRAVELLY LOAM --BASE COURSE--			1	29 29 20	NP	16
	590.4	Very loose to medium dense, brown, coarse SAND --Dry to saturated-- --FILL--	5		2	6 9 7	NP	4
					3	3 3 4	NP	16
			10		4	4 8 6	NP	6
					5	3 2 3	NP	7
			15		6	2 2 1	NP	15
	577.9	Medium dense, gray GRAVELLY SAND --Wet--			7	3 7 9	NP	8
	574.4	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace	20		8	10 3 2	0.33 B	22
		gravel	25		9	0 0 1	0.08 B	36
					10	1 1 2	0.25 P	17
					11	0 0 2	0.33 N/6	
			30		12	1 1 1	0.16 B	27
			35		13	0 0 2	< 0.25 P	26
			40		14	1 2 3	< 0.25 P	27

GENERAL NOTES

Begin Drilling: **03-10-2014** Complete Drilling: **03-13-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME-55 TMR**
Driller: **P&N** Logger: **F. Bozga** Checked by: **C. Marin**
Drilling Method: **2.25" SSA to 15', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **13.00 ft**
At Completion of Drilling: **unable to measure**
Time After Drilling: **72 hours**
Depth to Water: **35.00 ft**

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

WANGENGINC 11000401.GPJ WANGENG.GDT 8/12/16

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

BORING LOG 10-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: 593.40 ft
North: 1896930.29 ft
East: 1171484.09 ft
Station: 7315+74.84
Offset: 0.8034' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			45		15	4 4 4	0.75 P	27
			50		16	1 3 6	0.57 B	26
	541.7	Hard, gray SILTY LOAM, trace gravel						
			55		17	15 50/3"	6.15 S	14
		--L_L(%)=24, P_L(%)=14-- --%Gravel=4.5-- --%Sand=26.8--	60		18	18 19 27	7.71 B	13
		--%Silt=51.5-- --%Clay=17.2-- --A-4 (4)--						
	531.7	Very stiff, gray SILTY CLAY LOAM, trace gravel						
	528.9	Dense to very dense, gray, medium to coarse SAND, trace gravel --Wet--	65		19	7 11 19	3.61 B	15
			70		20	14 22 20	NP	16
			75		21	16 17 36	NP	11
			80		22	16 18 20	NP	11

GENERAL NOTES

Begin Drilling **03-10-2014** Complete Drilling **03-13-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR**
Driller **P&N** Logger **F. Bozga** Checked by **C. Marin**
Drilling Method **2.25" SSA to 15', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **13.00 ft**
At Completion of Drilling ▼ **unable to measure**
Time After Drilling **72 hours**
Depth to Water ▼ **35.00 ft**

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

WANGENGINC 11000401.GPJ WANGENG.GDT 8/12/16

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

BORING LOG 10-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: 593.40 ft
North: 1896930.29 ft
East: 1171484.09 ft
Station: 7315+74.84
Offset: 0.8034' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--HARD DRILLING-- *--Possible Cobbles--*						
	511.7	Very dense, gray GRAVELLY SAND						
		--Wet--						
					23	45 50/5	NP	10
			85					
		-HARD DRILLING up to 89.5 ft- *--Possible Cobbles--*			24	50/2	NP	
	503.9	Hard, gray SILTY LOAM, trace to little gravel	90					
		--Dry--						
					25	70/5	> 4.50 P	9
			95					
		--HARD DRILLING at 97 ft-- *--Possible Cobbles--*						
	496.4	--WEATHERED BEDROCK--						
		--HARD DRILLING--			26	75/3	NP	
			100					

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	492.4	Strong, light gray, fair rock mass quality, bedded fresh DOLOSTONE, up to 19-inch beds, 11-inch joint spacing, horizontal and vertical joints with none to more than 0.2-inch greenish gray infilling, hard joint wall, with stylolitic surfaces, and moderately vuggy porosity.	105		1	CORE		
		--Run 1 - RECOVERY=96%-- --RQD=71%--						
	482.4	Boring terminated at 111.00 ft	110					
			115					
			120					

GENERAL NOTES

Begin Drilling: **03-10-2014** Complete Drilling: **03-13-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME-55 TMR**
Driller: **P&N** Logger: **F. Bozga** Checked by: **C. Marin**
Drilling Method: **2.25" SSA to 15', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **13.00 ft**
At Completion of Drilling: **unable to measure**
Time After Drilling: **72 hours**
Depth to Water: **35.00 ft**

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

0 3 6 9 12 inch

Boring 10-RWB-04:
Run #1, 101' to 111', RECOVERY = 100% , RQD = 71%

BEDROCK CORE: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 10, SN 016-1729, CHICAGO. IL

SCALE : GRAPHIC	10-RWB-04	DRAWN BY: M. de los Reyes CHECKED BY: C. Marin

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

FOR AECOM	1100-04-01

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

BORING LOG 15-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: 593.54 ft
North: 1897200.61 ft
East: 1171415.26 ft
Station: 7312+95.51
Offset: 3.9204 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	592.4	14-inch thick, black SILTY LOAM --TOPSOIL--						
		Medium dense, black and brown LOAM, some gravel and brick fragments --FILL--			1	6 10 10	NP	15
	590.5	Medium dense to dense, black and brown SILTY LOAM, trace gravel and brick fragments --FILL--	5		2	3 17 14	NP	57
					3	9 6 5	NP	22
	585.5	Gray, medium SAND, trace gravel						
	584.8	Very stiff, gray SILTY CLAY, trace gravel	10		4	2 3 6	3.36 B	23
					5	5 6 7	3.03 B	26
	580.5	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel	15		6	2 1 2	0.33 B	27
					7	1 1 1	0.16 B	24
			20		8	1 1 1	0.16 B	29
			25		9	2 1 3	0.16 B	24
					10	2 2 2	0.25 B	20
					11	2 1 2	0.33 B	24
			30		12	1 2 3	0.16 B	26
			35		13	1 2 2	0.16 B	25
			40		14	2 3 3	0.25 B	24

GENERAL NOTES

Begin Drilling: **02-25-2014** Complete Drilling: **02-28-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **D-25 ATV**
Driller: **N&J** Logger: **A. Happel** Checked by: **CLM**
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: **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.

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

BORING LOG 15-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: 593.54 ft
North: 1897200.61 ft
East: 1171415.26 ft
Station: 7312+95.51
Offset: 3.9204 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--L_L(%)=34, P_L(%)= 18--						
		--%Gravel=4.4--						
		--%Sand=14.5--						
		--%Silt=47.7--	45		15	3 4 5	0.50 P	25
		--%Clay=33.3--						
		--A-6 (12)--						
			50		16	2 2 2	0.82 B	27
	541.8	Hard, gray SILTY CLAY LOAM, trace gravel						
			55		17	14 18 30	5.33 S	13
			60		18	14 22 26	6.72 S	13
	531.8	Dense, gray, medium SAND, trace gravel						
		--Moist to wet--						
			65		19	13 20 25	NP	24
		--HARD DRILLING--						
		--Possible Cobbles--						
		--%Gravel=0.2--						
		--%Sand=79.5--						
		--%Silt=18.3--						
		--%Clay=2.0--	70		20	22 16 24	NP	24
		--A-2-4 (0)--						
			75		21	14 18 21	NP	19
	516.8	Hard, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel						
			80		22	18 39 50	4.50 P	13

GENERAL NOTES

Begin Drilling **02-25-2014** Complete Drilling **02-28-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV**
Driller **N&J** Logger **A. Happel** Checked by **CLM**
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 ▼ **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 8/12/16

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

BORING LOG 15-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: 593.54 ft
North: 1897200.61 ft
East: 1171415.26 ft
Station: 7312+95.51
Offset: 3.9204 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			85		23	22 32 50	9.02 S	13
		--L_L(%)=26, P_L(%)=16-- --%Gravel=0.1-- --%Sand=11.7-- --%Silt=62.6-- --%Clay=25.6-- --A-4 (7)--						
	503.5		90		24	25 33 48	10.25 S	13
		Boring terminated at 90.00 ft						
			95					
			100					

GENERAL NOTES

Begin Drilling **02-25-2014** Complete Drilling **02-28-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV**
Driller **N&J** Logger **A. Happel** Checked by **CLM**
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 ▼ **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.

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

BORING LOG 15-RWB-02

WEI Job No.: 1100-04-01

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

Datum: NAVD 88
Elevation: 592.37 ft
North: 1897034.79 ft
East: 1171464.06 ft
Station: 7314+68.92
Offset: 10.2077' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	591.4	12-inch thick, brown SANDY LOAM						
		--FILL--						
		Very stiff, gray SILTY CLAY LOAM, trace gravel and roots			1	3 6 7	2.05 S	17
		--FILL--						
	589.4	Medium dense, SILTY LOAM to SILTY CLAY LOAM, trace gravel, sand and brick						
		--FILL--	5		2	6 5 5	NP	17
	586.9	Very loose to loose, brown, fine SAND						
		--Wet--			3	3 4 4	NP	18
	582.9				4	2 3 2	NP	17
		Stiff, brown and gray SILTY CLAY, trace gravel	10		5	2 2 3	1.00 P	29
			15		6	0 2 2	1.23 B	24
	576.9	Soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			7	0 2 2	0.82 B	24
			20		8	0 1 2	0.57 B	24
			25		9	0 0 2	0.41 B	24
					10	0 0 0	0.74 B	30
			30		11	1 1 1	0.74 B	22
					12	0 2 2	0.57 B	23
			35		13	0 0 1	0.41 B	25
			40		14	0 1 2	0.41 B	25

GENERAL NOTES

Begin Drilling: **04-03-2014** Complete Drilling: **04-03-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig: **D-50 TMR**
Driller: **R&J** Logger: **M. de los Reyes** Checked by: **CLM**
Drilling Method: **2.25" SSA to 11', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **5.50 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.

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

BORING LOG 15-RWB-02

WEI Job No.: 1100-04-01

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

Datum: NAVD 88
Elevation: 592.37 ft
North: 1897034.79 ft
East: 1171464.06 ft
Station: 7314+68.92
Offset: 10.2077' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			45		15	0 2 3	0.82 B	25
			50		16	0 1 2	0.41 B	28
	540.6	Very stiff to hard, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel						
			55		17	7 7 14	4.10 B	20
		--HARD DRILLING-- *--Possible Cobbles--*						
			60		18	10 25 50/5	3.28 S	14

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	530.6	Very dense, gray SILT --Wet--			19	55/5	NP	
	527.4	Boring terminated at 65.00 ft	65					
			70					
			75					
			80					

GENERAL NOTES

Begin Drilling **04-03-2014** Complete Drilling **04-03-2014**
Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
Driller **R&J** Logger **M. de los Reyes** Checked by **CLM**
Drilling Method **2.25" SSA to 11', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **5.50 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 8/12/16

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

BORING LOG 1729-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: 598.29 ft
North: 1897455.09 ft
East: 1171356.40 ft
Station:
Offset:

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					
	584.8	Medium dense, brown and black SANDY LOAM; trace gravel; trace brick and wood fragments; mosit; fill	15		1	4 6 5	NP	20
	583.0	--FILL--						
		Stiff, gray SILTY CLAY LOAM, trace gravel; fill						
		--FILL--			2	3 3 4	1.07 B	21
	581.0	Medium stiff, gray SILTY CLAY, trace gravel						
			20		3	2 3 3	0.57 B	21

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--In-Situ Vane Shear, 25.0 feet--	25		1	VS		
		--$S_{u\ undis}$ = 926.51 psf--						
		--$S_{u\ remold}$ = 452.48 psf--						
		--Sensitivity = 2.05--						
		--In-Situ Vane Shear, 30.0 feet--	30		2	VS		
		--$S_{u\ undis}$ = 603.30 psf--						
		--$S_{u\ remold}$ = 344.75 psf--						
		--Sensitivity = 1.75--						
		--In-Situ Vane Shear, 35.0 feet--	35		3	VS		
		--$S_{u\ undis}$ = 592.53 psf--						
		--$S_{u\ remold}$ = 301.65 psf--						
		--Sensitivity = 1.96--						
		--In-Situ Vane Shear, 40.0 feet--	40		4			

GENERAL NOTES

Begin Drilling **07-25-2016** Complete Drilling **07-26-2016**
Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV**
Driller **N&N** Logger **F. Bozga** Checked by **M. Seyhun**
Drilling Method **2.25" IDA HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **Mud at 20 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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

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

BORING LOG 1729-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: 598.29 ft
North: 1897455.09 ft
East: 1171356.40 ft
Station:
Offset:

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--$S_{u\ undis}$ = 635.62 psf--				VS		
		--$S_{u\ remold}$ = 355.52 psf--						
		--Sensitivity = 1.78--						
		--In-Situ Vane Shear, 45.0 feet--	45		5	VS		
		--$S_{u\ undis}$ = 840.32 psf--						
		--$S_{u\ remold}$ = 430.93 psf--						
		--Sensitivity = 1.95--						
			50		4	4 5 5	0.57 B	27
					5	2 3 3	0.41 B	29
		--In-Situ Vane Shear, 54.5 feet--	55		6	VS		
		--$S_{u\ undis}$ = 1508.26 psf--						
		--$S_{u\ remold}$ = 1249.71 psf--						
		--Sensitivity = 1.21--						
	542.8	Very stiff, gray SILTY CLAY, trace gravel			6	5 10 16	2.46 B	22
	540.8	Boring terminated at 57.50 ft						
			60					

GENERAL NOTES

Begin Drilling: **07-25-2016** Complete Drilling: **07-26-2016**
Drilling Contractor: **Wang Testing Services** Drill Rig: **D-25 ATV**
Driller: **N&N** Logger: **F. Bozga** Checked by: **M. Seyhun**
Drilling Method: **2.25" IDA HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **Mud at 20 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

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

WANGENGINC 11000401.GPJ WANGENG.GDT 8/12/16

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

BORING LOG 1729-VST-02

WEI Job No.: 1100-04-01

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

Datum: NAVD 88
Elevation: 592.70 ft
North: 1897206.55 ft
East: 1171441.79 ft
Station:
Offset:

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					
	574.2	Very soft to medium stiff, gray SILTY CLAY, trace gravel	20		1	2 2 3	NR	
			25		2	2 3 5	< 0.25 P	23
		--In-Situ Vane Shear, 27.0 feet-- --Failed test--			1	VS		
		--In-Situ Vane Shear, 30.0 feet-- --$S_{u\ undis}$ = 624.85 psf-- --$S_{u\ remold}$ = 409.38 psf-- --Sensitivity = 1.53--	30		2	VS		
		--In-Situ Vane Shear, 35.0 feet-- --$S_{u\ undis}$ = 603.31 psf-- --$S_{u\ remold}$ = 387.84 psf-- --Sensitivity = 1.56--	35		3	VS		
		--In-Situ Vane Shear, 40.0 feet--	40		4			

GENERAL NOTES

Begin Drilling: **07-27-2016** Complete Drilling: **07-27-2016**
Drilling Contractor: **Wang Testing Services** Drill Rig: **D-25 ATV**
Driller: **N&N** Logger: **F. Bozga** Checked by: **M. Seyhun**
Drilling Method: **2.25" IDA HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **Mud at 22.5 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

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

WANGENGINC 11000401.GPJ WANGENG.GDT 8/12/16

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

BORING LOG 1729-VST-02

WEI Job No.: 1100-04-01

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

Datum: NAVD 88
Elevation: 592.70 ft
North: 1897206.55 ft
East: 1171441.79 ft
Station:
Offset:

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--$S_{u\ undis}$ = 743.36 psf--				VS		
		--$S_{u\ remold}$ = 452.48 psf--						
		--Sensitivity = 1.64--						
		--In-Situ Vane Shear, 45.0 feet--	45		5	VS		
		--Failed test--						
		--In-Situ Vane Shear, 47.5 feet--			6	VS		
		--$S_{u\ undis}$ = 1422.08 psf--						
		--$S_{u\ remold}$ = 775.68 psf--						
		--Sensitivity = 1.83--						
		--In-Situ Vane Shear, 49.5 feet--	50		7	VS		
		--$S_{u\ undis}$ = 1422.07 psf--						
		--$S_{u\ remold}$ = 775.68 psf--						
		--Sensitivity = 1.83--						
					3		0.50 P	23
	540.4							
	540.2	Hard, gray SILTY CLAY						
		Boring terminated at 52.50 ft						
			55					
			60					

GENERAL NOTES

Begin Drilling: **07-27-2016** Complete Drilling: **07-27-2016**
Drilling Contractor: **Wang Testing Services** Drill Rig: **D-25 ATV**
Driller: **N&N** Logger: **F. Bozga** Checked by: **M. Seyhun**
Drilling Method: **2.25" IDA HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **Mud at 22.5 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

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

WANGENGINC 11000401.GPJ WANGENG.GDT 8/12/16

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

BORING LOG 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: 593.55 ft
North: 1897108.36 ft
East: 1171435.63 ft
Station: 7313+90.29
Offset: 3.222 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 stiff, brown SILTY CLAY LOAM, trace gravel --FILL--			1	3 5 7	2.75 P	14
	590.5	Medium dense, fine SAND	5		2	5 5 6	NP	7
	586.8	Medium stiff to stiff, gray SILTY CLAY	10		3	2 2 3	1.31 B	26
			15		4	2 2 3	0.98 B	28
	578.0	Soft, gray SILTY CLAY			5	1 2 2	0.25 P	29
	575.3	--In-Situ Vane Shear, 19.5 feet--	20		1			
		--$S_{u\ undis}$ = 786.3 psf-- --$S_{u\ remold}$ = 371.3 psf-- --Sensitivity = 2.1--				VS		
		--In-Situ Vane Shear, 22.0 feet-- --$S_{u\ undis}$ = 742.6 psf-- --$S_{u\ remold}$ = 305.8 psf-- --Sensitivity = 2.4--			2	VS		
		--In-Situ Vane Shear, 24.5 feet-- --$S_{u\ undis}$ = 578.8 psf-- --$S_{u\ remold}$ = 382.2 psf-- --Sensitivity = 1.5--	25		3	VS		
		--In-Situ Vane Shear, 27.0 feet-- --$S_{u\ undis}$ = 742.6 psf-- --$S_{u\ remold}$ = 415.0 psf-- --Sensitivity = 1.8--			4	VS		
		--In-Situ Vane Shear, 29.5 feet-- --$S_{u\ undis}$ = 589.7 psf-- --$S_{u\ remold}$ = 283.9 psf-- --Sensitivity = 2.1--	30		5	VS		
		--In-Situ Vane Shear, 32.0 feet-- --$S_{u\ undis}$ = 1026.6 psf-- --$S_{u\ remold}$ = 447.8 psf-- --Sensitivity = 2.3--			6	VS		
		--In-Situ Vane Shear, 34.5 feet-- --$S_{u\ undis}$ = 764.5 psf-- --$S_{u\ remold}$ = 480.5 psf-- --Sensitivity = 1.6--	35		7	VS		
		--In-Situ Vane Shear, 37.0 feet-- --$S_{u\ undis}$ = 1026.6 psf-- --$S_{u\ remold}$ = 589.7 psf-- --Sensitivity = 1.7--			8	VS		
			40					

GENERAL NOTES

Begin Drilling **12-01-2015** Complete Drilling **12-01-2015**
Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR**
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 ▼ **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 8/12/16

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

BORING LOG 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: 593.55 ft
North: 1897108.36 ft
East: 1171435.63 ft
Station: 7313+90.29
Offset: 3.222 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--Equipment Slipped--	45		9	VS		
		--In-Situ Vane Shear, 46.5 feet-- --$S_{u\ undis}$ = 1070.2 psf-- --$S_{u\ remold}$ = 633.4 psf-- --Sensitivity = 1.7--			10	VS		
	544.0	--In-Situ Vane Shear, 49.0 feet-- --$S_{u\ undis}$ = 1157.6 psf-- --$S_{u\ remold}$ = 611.6 psf-- --Sensitivity = 2.3-- Boring terminated at 49.50 ft	50		11	VS		
			55					
			60					

GENERAL NOTES

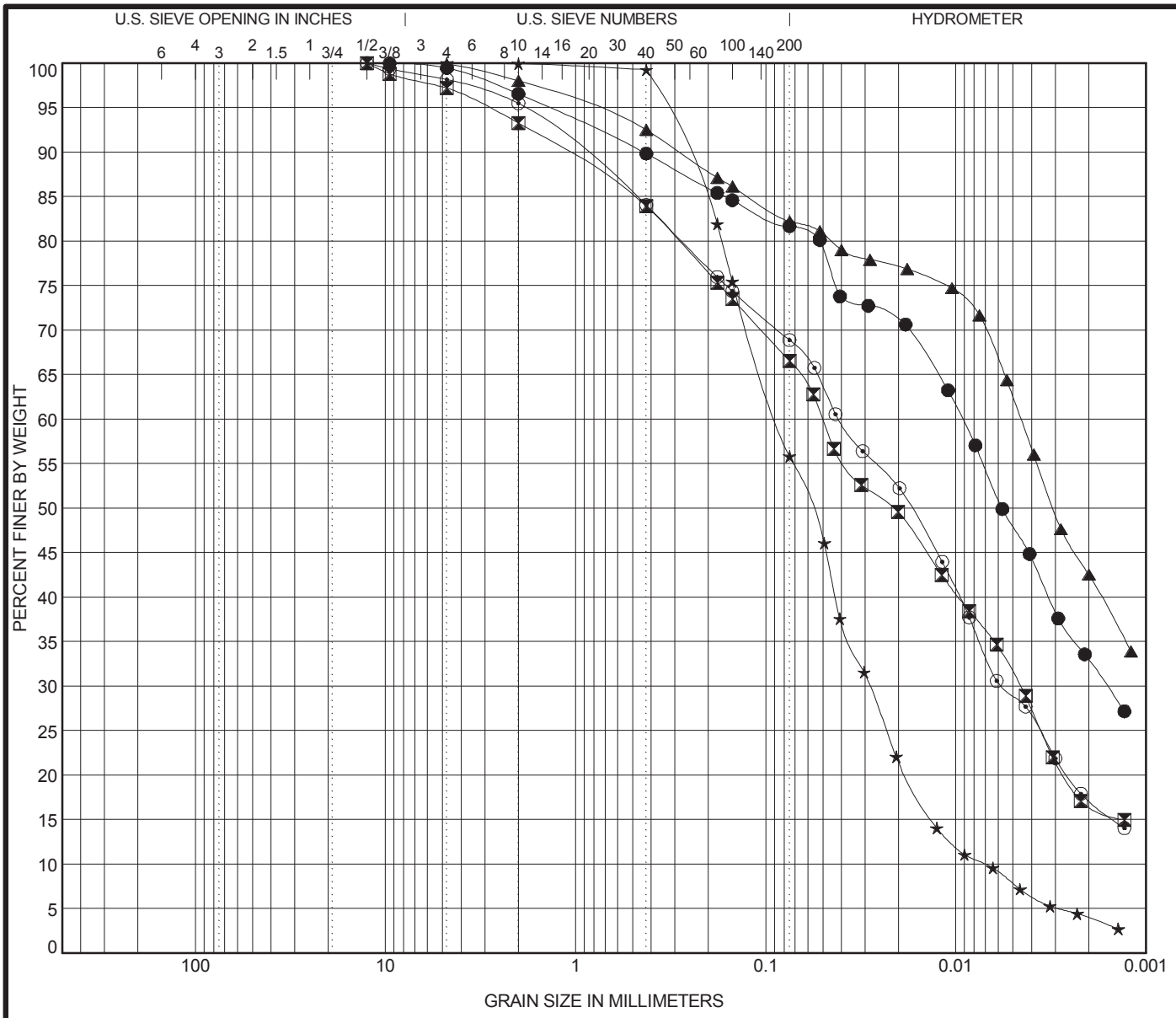
Begin Drilling **12-01-2015** Complete Drilling **12-01-2015**
Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR**
Driller **R&N** Logger **F. Bozga** Checked by **A. Kurnia**
Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **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 8/12/16



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification			IDH Classification	LL	PL	PI	Cc	Cu
●	10-RWB-01#12	28.5 ft	**Silty Clay**	**33**	**17**	**16**		
⊠	10-RWB-02#18	58.5 ft	**Silty Loam**	**23**	**15**	**8**		
▲	10-RWB-03#6	13.5 ft	**Clay**	**37**	**19**	**18**		
★	10-RWB-03#20	68.5 ft	**Silty Loam**	**NP**	**NP**	**NP**	**1.33**	**12.36**
⊙	10-RWB-04#18	58.5 ft	**Silty Loam**	**24**	**14**	**10**		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	10-RWB-01#12	28.5 ft	**9.5**	**0.009**	**0.002**		**3.4**	**14.9**	**48.7**	**32.9**
⊠	10-RWB-02#18	58.5 ft	**12.5**	**0.05**	**0.005**		**6.7**	**26.9**	**49.7**	**16.7**
▲	10-RWB-03#6	13.5 ft	**9.5**	**0.005**			**2.0**	**15.8**	**39.6**	**42.5**
★	10-RWB-03#20	68.5 ft	**4.75**	**0.087**	**0.029**	**0.007**	**0.1**	**44.4**	**51.6**	**4.0**
⊙	10-RWB-04#18	58.5 ft	**12.5**	**0.041**	**0.006**		**4.5**	**26.8**	**51.5**	**17.2**

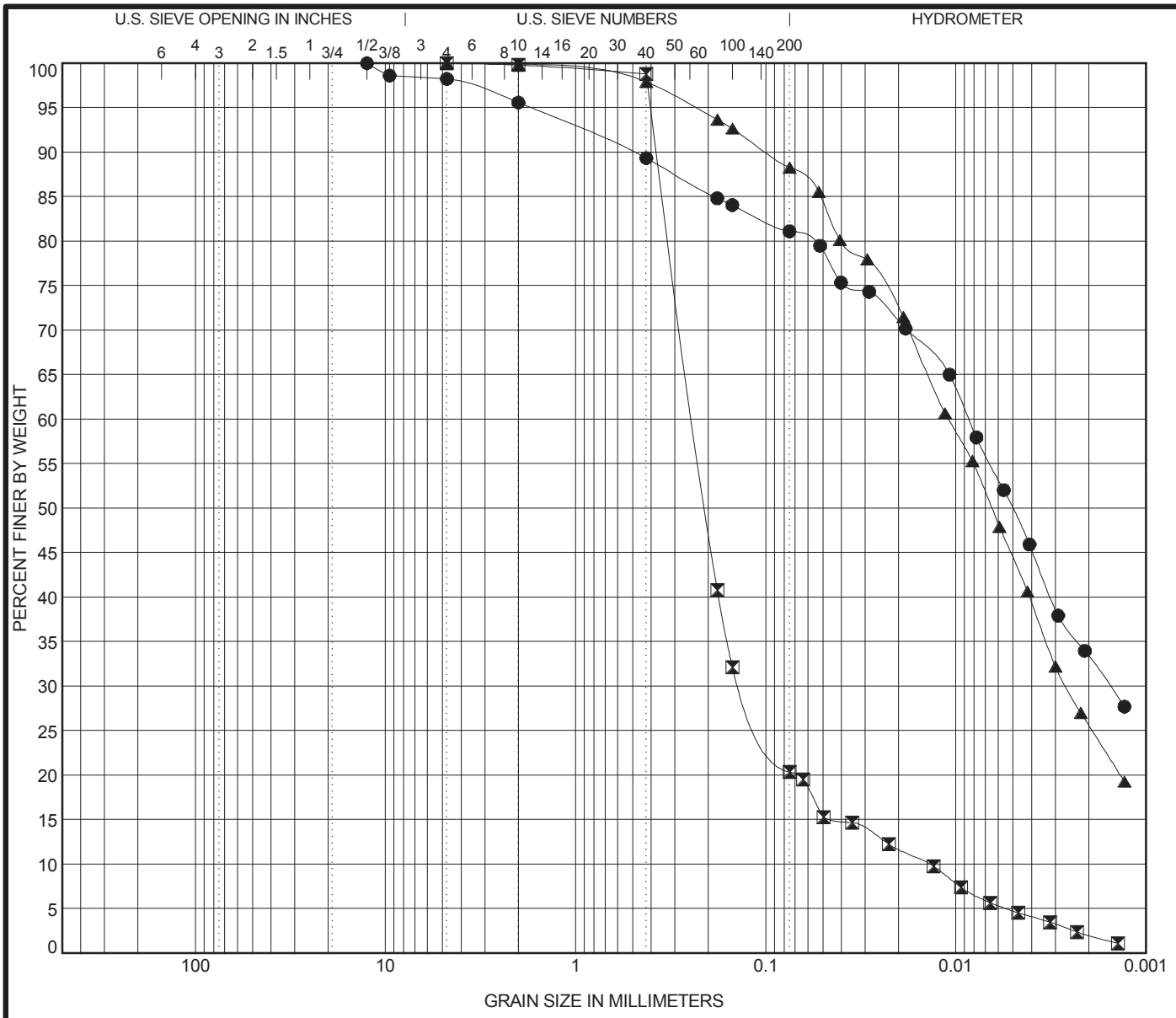
WEI SINCE 1982
Wang Engineering
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9928

GRAIN SIZE DISTRIBUTION

Project: Circle Interchange Reconstruction

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

Number: 1100-04-01



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	15-RWB-01#15	43.5 ft	**Clay**	**34**	**18**	**16**		
⊠	15-RWB-01#20	68.5 ft	**Sandy Loam**	**NP**	**NP**	**NP**	**5.29**	**17.33**
▲	15-RWB-01#24	88.5 ft	**Silty Clay Loam**	**26**	**16**	**10**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	15-RWB-01#15	43.5 ft	**12.5**	**0.009**	**0.002**		**4.4**	**14.5**	**47.7**	**33.3**
⊠	15-RWB-01#20	68.5 ft	**4.75**	**0.239**	**0.132**	**0.014**	**0.2**	**79.5**	**18.3**	**2.0**
▲	15-RWB-01#24	88.5 ft	**4.75**	**0.011**	**0.003**		**0.1**	**11.7**	**62.6**	**25.6**

WEI SINCE 1982
Wang Engineering
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9928

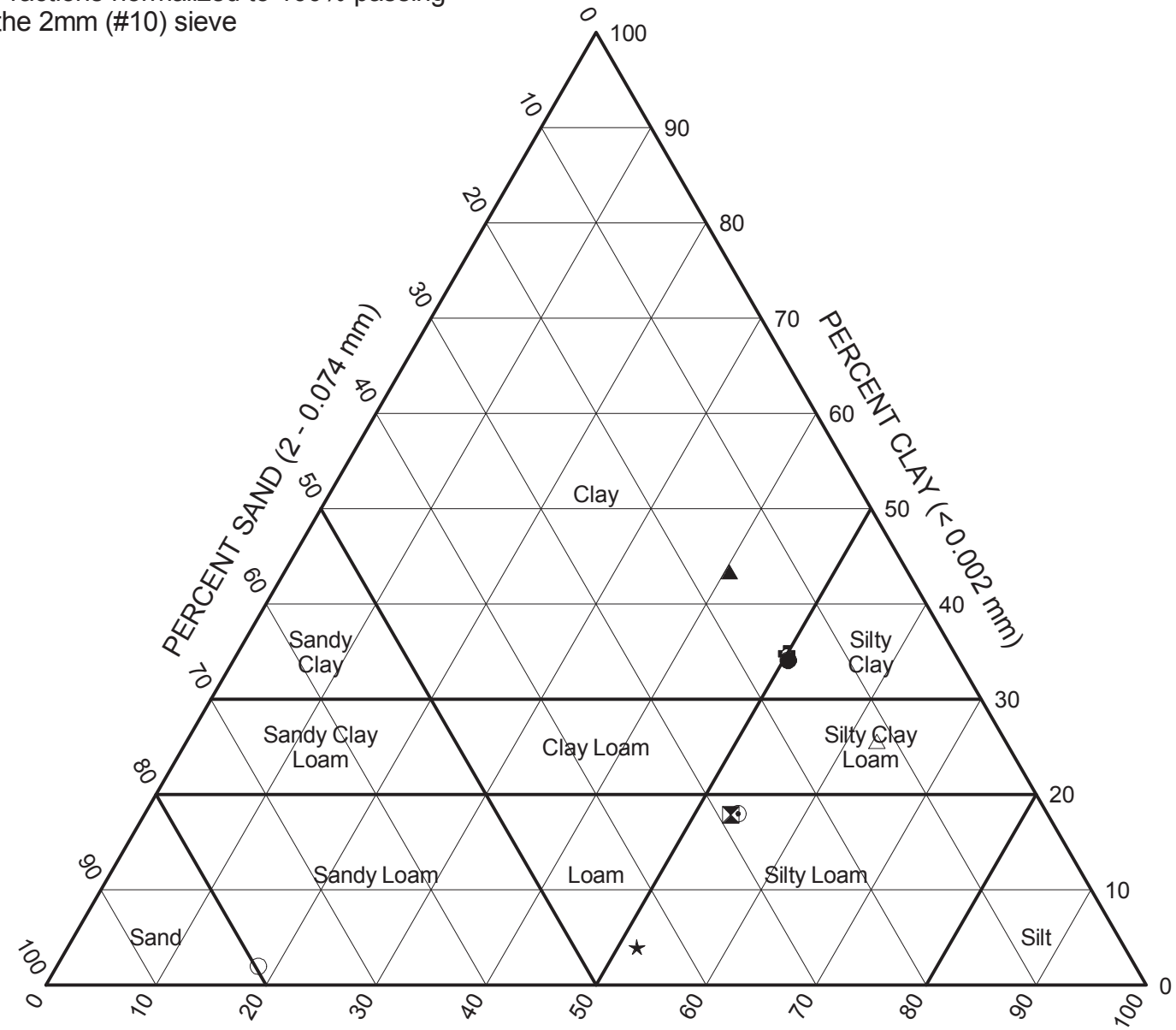
GRAIN SIZE DISTRIBUTION

Project: Circle Interchange Reconstruction

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

Number: 1100-04-01

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



	Sample	Depth (ft)	Sand (%)	Silt (%)	Clay (%)	Classification		
						IL DOT	AASHTO	ASTM
●	10-RWB-01#12	28.5	15.4	50.4	34.1	Silty Clay	A-6 (12)	CL
⊠	10-RWB-02#18	58.5	28.8	53.3	17.9	Silty Loam	A-4 (3)	CL
▲	10-RWB-03#6	13.5	16.1	40.4	43.4	Clay	A-6 (14)	CL
★	10-RWB-03#20	68.5	44.4	51.7	4.0	Silty Loam	A-4 (0)	ML
⊙	10-RWB-04#18	58.5	28.1	53.9	18.0	Silty Loam	A-4 (4)	CL
✿	15-RWB-01#15	43.5	15.2	49.9	34.8	Clay	A-6 (12)	CL
○	15-RWB-01#20	68.5	79.7	18.3	2.0	Sandy Loam	A-2-4 (0)	SM
△	15-RWB-01#24	88.5	11.7	62.7	25.6	Silty Clay Loam	A-4 (7)	CL

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

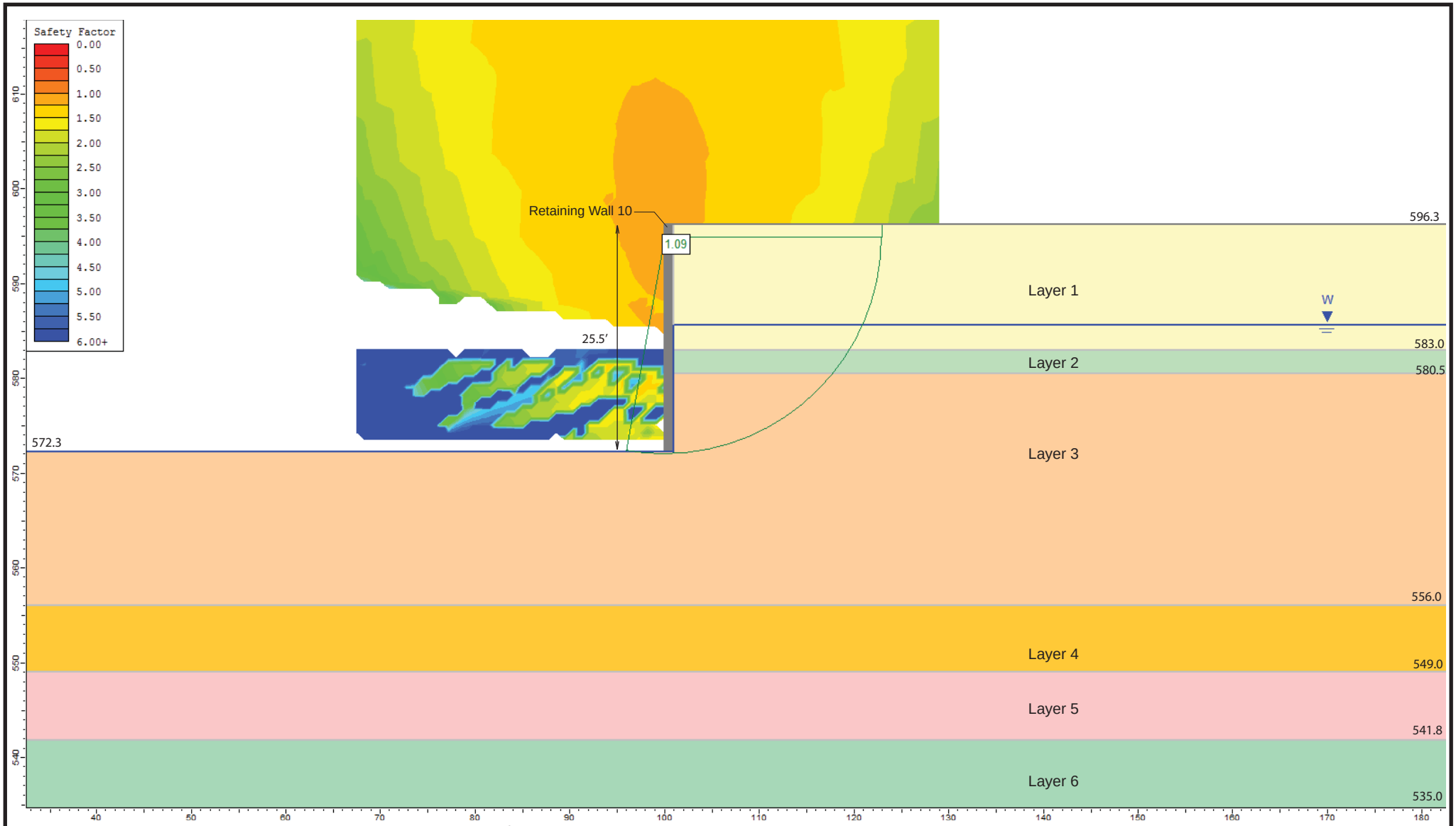
IDH Textural Classification Chart

Project: Circle Interchange Reconstruction

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

Number: 1100-04-01

APPENDIX B



Undrained Analysis without Embedment, Station 7309+74, Ref Borings 10-RWB-01, 10-RWB-02, 15-RWB-01, 1729-VST-01 and 1729-VST-02

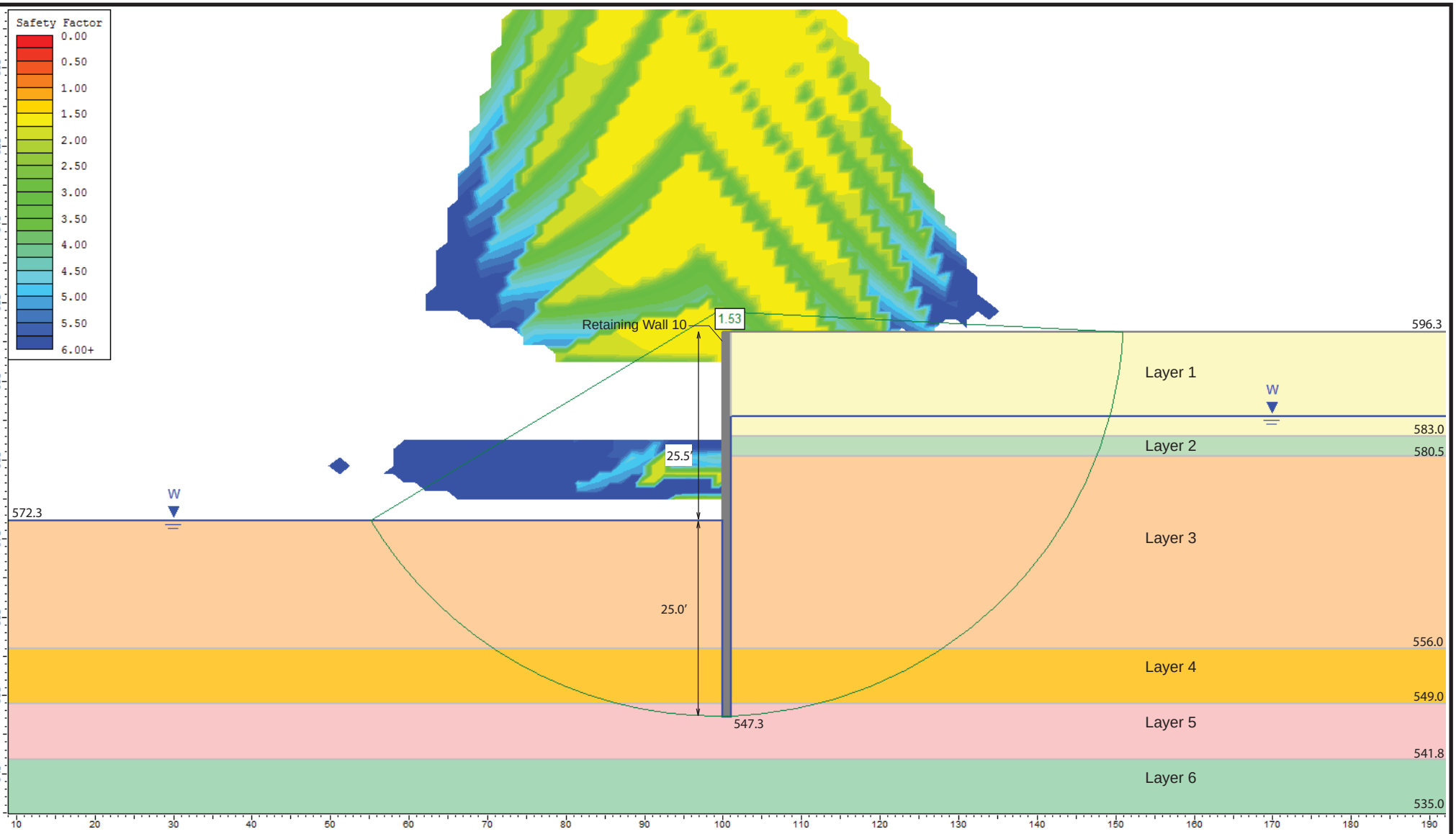
Layer ID	Description	Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Loose to M Dense SI LOAM to SAND	110	0	28
2	Stiff to V Stiff SI CL	115	2000	0
3	Soft to M Stiff CLAY to SILTY CLAY	110	600	0
4	Soft to M Stiff CLAY to SILTY CLAY	110	750	0
5	Stiff CLAY to SILTY CLAY	115	1050	0
6	Hard SI CL to SI CL LOAM	120	5500	0

GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 10, SN 016-1729, CHICAGO, IL

SCALE: GRAPHICAL | 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



Undrained Analysis with Embedment, Station 7309+74, Ref Borings 10-RWB-01, 10-RWB-02, 15-RWB-01, 1729-VST-01 and 1729-VST-02

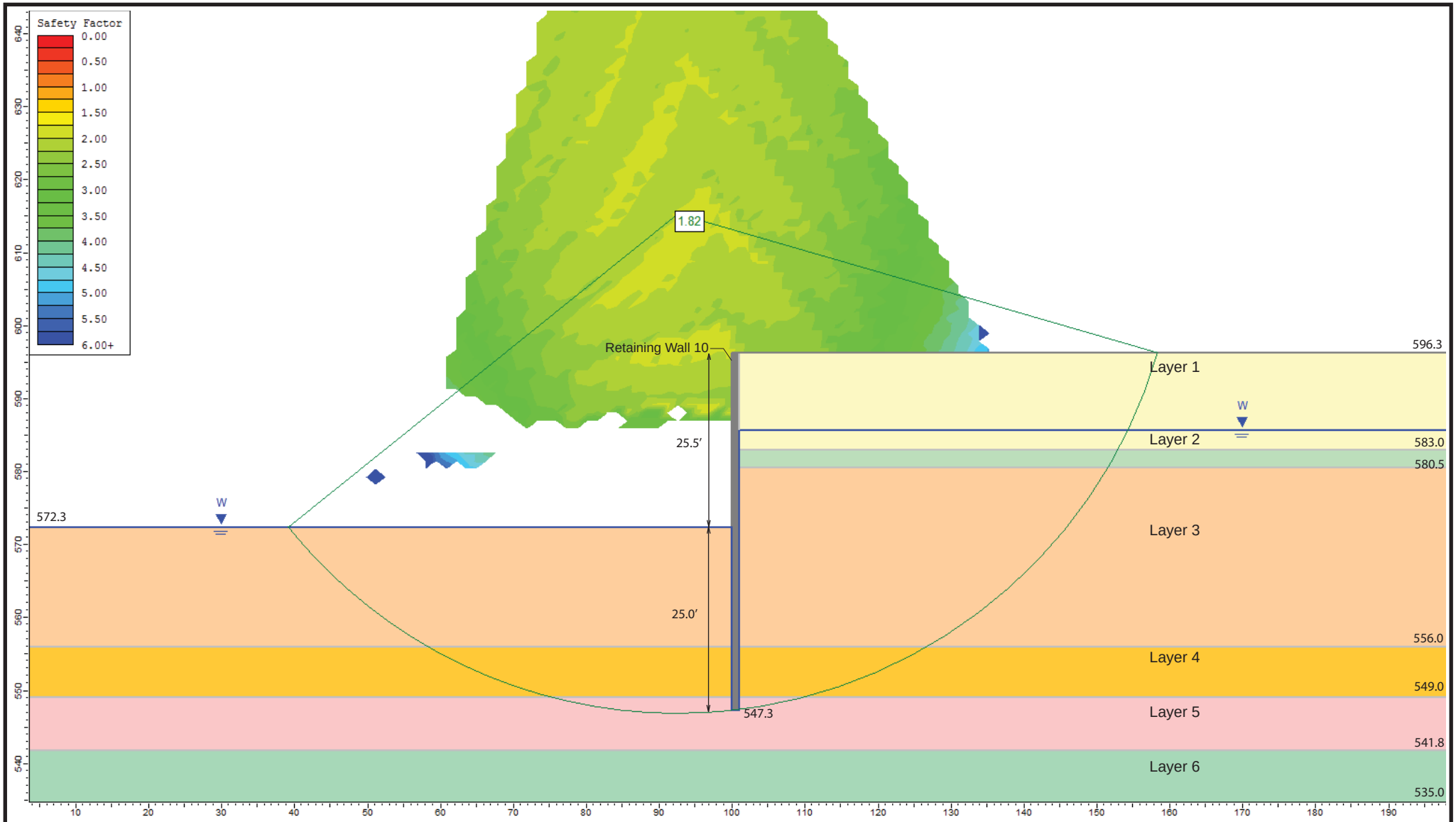
Layer ID	Description	Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Loose to M Dense SI LOAM to SAND	110	0	28
2	Stiff to V Stiff SI CL	115	2000	0
3	Soft to M Stiff CLAY to SILTY CLAY	110	600	0
4	Soft to M Stiff CLAY to SILTY CLAY	110	750	0
5	Stiff CLAY to SILTY CLAY	115	1050	0
6	Hard SI CL to SI CL LOAM	120	5500	0

GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 10, SN 016-1729, CHICAGO, IL

SCALE: GRAPHICAL | APPENDIX B-2 | 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



Drained Analysis with Embedment at Station 7309+74; Ref Borings 10-RWB-01, 10-RWB-02, 15-RWB-01, 1729-VST-01 and 1729-VST-02

Layer ID	Description	Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Loose to M Dense SI LOAM to SAND	110	0	28
2	Stiff to V Stiff SI CL	115	100	30
3	Soft to M Stiff CLAY to SILTY CLAY	110	50	30
4	Soft to M Stiff CLAY to SILTY CLAY	110	50	30
5	Stiff CLAY to SILTY CLAY	115	100	31
6	Hard SI CL to SI CL LOAM	120	100	32

GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 10, SN 016-1729, CHICAGO, IL

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

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

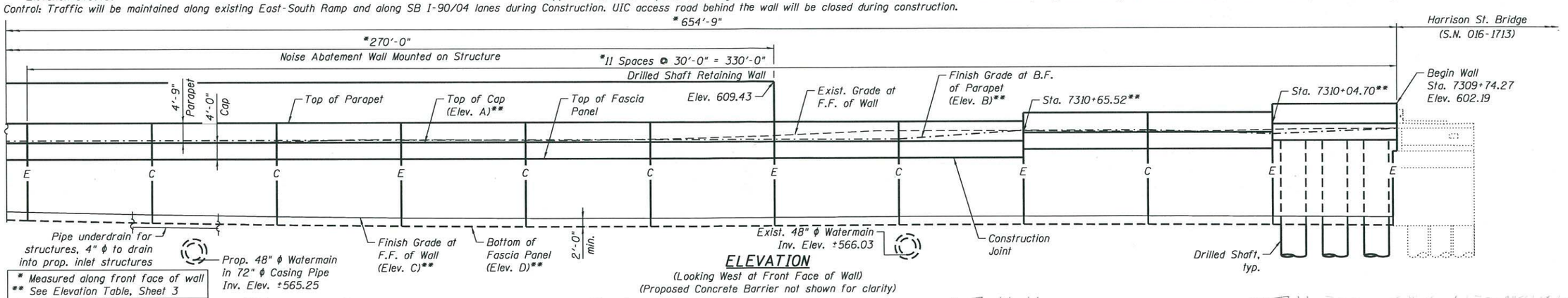
FOR AECOM | 1100-04-01

APPENDIX C

Bench Mark: Set "X" on westerly jaywall of accident investigation site ±35' north of east 90/94 sign, Elevation 579.45.

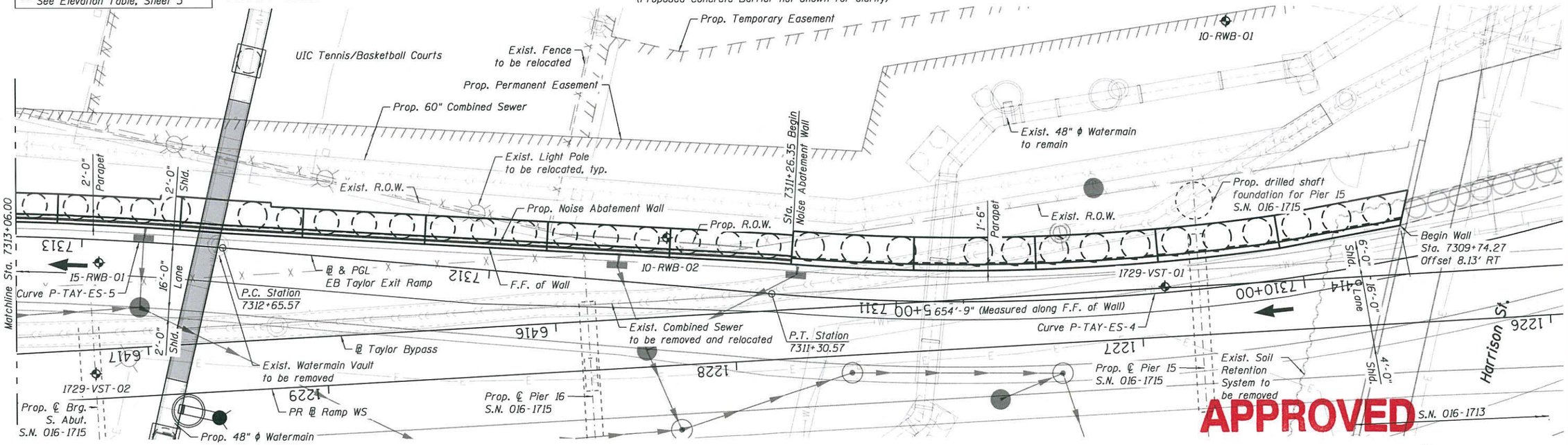
Traffic Control: Traffic will be maintained along existing East-South Ramp and along SB I-90/04 lanes during Construction. UIC access road behind the wall will be closed during construction.

Existing Structure: Exist. Cast-In-Place Ret. Wall was built in 1987 under F.A.I. Route 90/94. Section 2526.6-IP-R-3, 2626.2-28-DM & 0101.6-IP-R(85). Total length of wall is approx. 914'-5" and supported on steel H-piles. Wall height varies with max. height of approx. 21'-0". Steel sheet pilling used during wall construction was cut-off at top of wall footing elev. and left in the ground.



ELEVATION

(Looking West at Front Face of Wall)
(Proposed Concrete Barrier not shown for clarity)



NOTES:

1. Stations and offsets for the wall are given from the ℄ EB Taylor Exit Ramp to the front face of wall.
2. Wall to be built along straight chords between expansion and construction joints.

HIGHWAY CLASSIFICATION

EB Taylor Exit Ramp
Functional Class: Interstate
ADT: NA (2012); 2,000 (2040)
ADTT: NA (2012); 60 (2040)
DHV: 150 (2040)
Design Speed: 35 m.p.h.
Posted Speed: NA m.p.h.
One-Way Traffic
Directional Distribution: 100%

LEGEND:

Front Face	F.F.	Boring Log/Soil Test	
Back Face	B.F.	Light Pole	
Combined Sewer	C	Exist. Electric Cable	E
Exist. Storm Sewer		Prop. Lighting Cable	L
Prop. Storm Sewer		Fiber Optic	FO
Water Line	W	Exist. Fence	x x
Fire Hydrant		Soil Retention System	
Prop. catchbasin		Construction Joint	C
		Expansion Joint	E

PLAN

DESIGN SPECIFICATIONS

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

WALL DEFLECTION CRITERIA

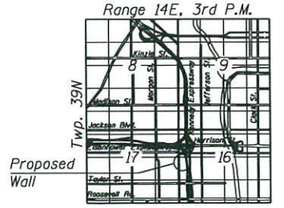
Maximum lateral deflection at top of the wall shall not exceed 1% exposed height of the wall.
Maximum lateral deflection at top of the Proposed Soil Retention System shall not exceed 1".

DESIGN STRESSES

FIELD UNITS

f'_c = 7,000 psi (Drilled Shafts)***
f'_c = 3,500 psi (All other concrete)
f_y = 60,000 psi (Reinforcement)

*** Final concrete strength will be determined during final design



LOCATION SKETCH

APPROVED
APR 18 2017
AS A BASIS FOR PREPARATION OF DETAILED PLANS

GENERAL PLAN AND ELEVATION
RETAINING WALL 10
F.A.I. RTE. SB 90/94
(DAN RYAN EXPRESSWAY)
F.A.I. RTE. 90/94 - SECTION 2015-022-I
COOK COUNTY
STATION 7309+74.27 TO STATION 7316+31.15
STRUCTURE NO. 016-1729

AECOM

USER NAME = dabezicd	DESIGNED - DD	REVISED	
	CHECKED - ATB	REVISED	
PLOT SCALE = N.T.S.	DRAWN - GF	REVISED	
PLOT DATE = 4/7/2017	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	2015-022-I	COOK	6	1
		CONTRACT NO. 62A74		
		ILLINOIS FED. AID PROJECT		

0161729-62A74-SOI-TSL

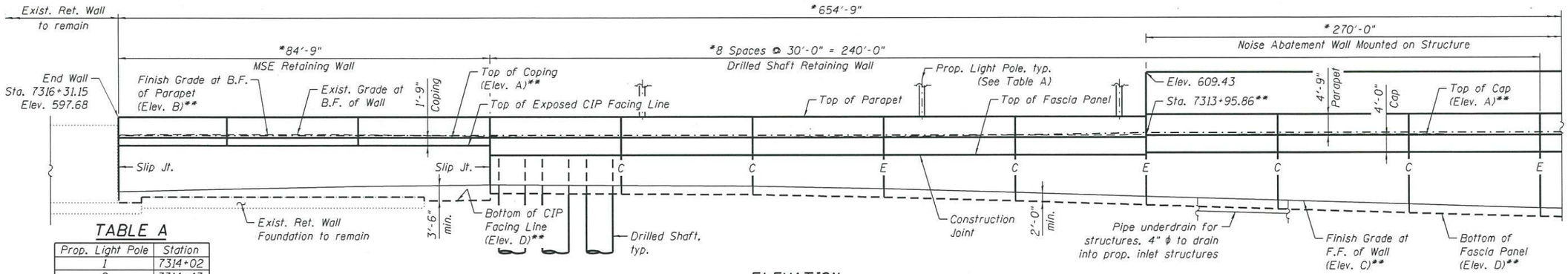


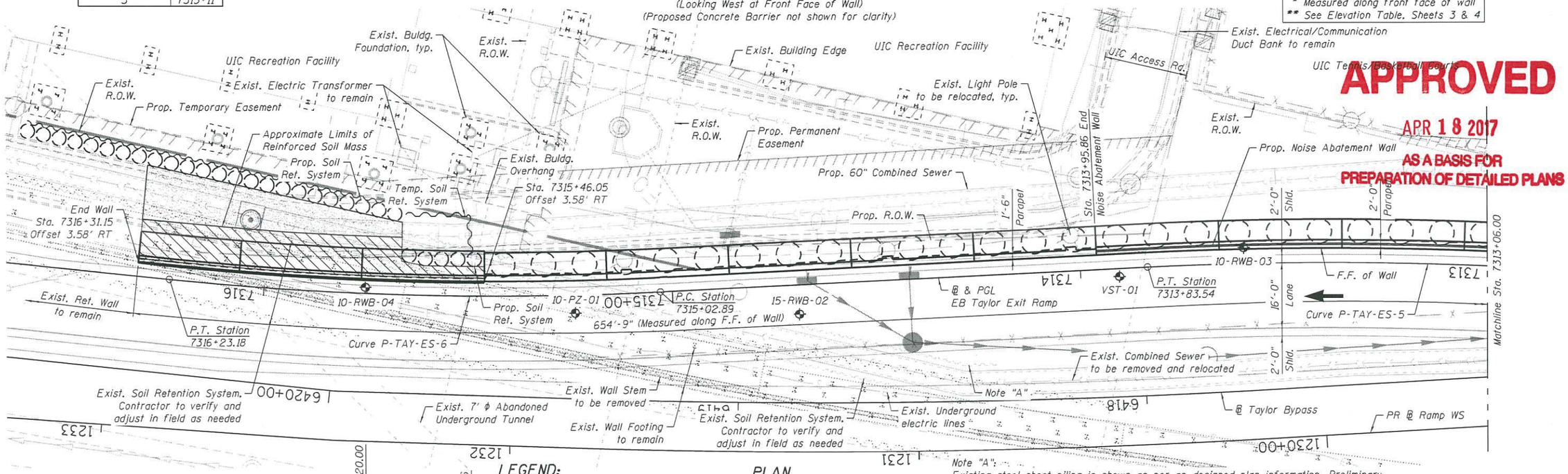
TABLE A

Prop. Light Pole	Station
1	7314+02
2	7314+47
3	7315+11

ELEVATION

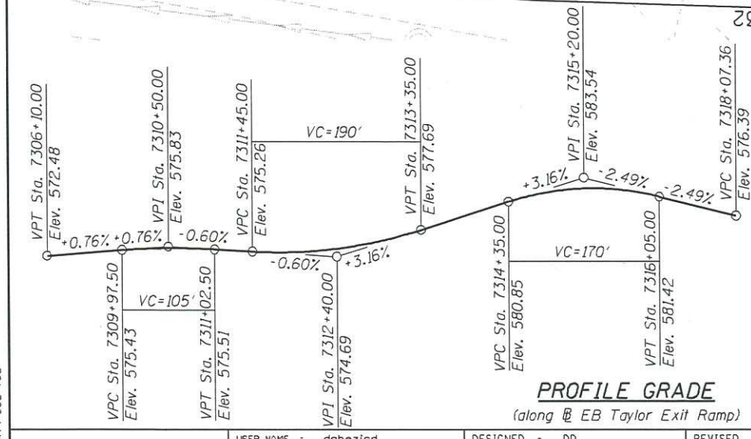
(Looking West at Front Face of Wall)
(Proposed Concrete Barrier not shown for clarity)

* Measured along front face of wall
** See Elevation Table, Sheets 3 & 4



PROFILE GRADE

(along ℄ EB Taylor Exit Ramp)



LEGEND:

Front Face	F.F.	Boring Log/ Soil Test	Lightweight Fill outside of Reinf. Soil Mass
Back Face	B.F.	Light Pole	
Combined Sewer	C	Exist. Electric Cable	E
Exist. Storm Sewer		Prop. Lighting Cable	L
Prop. Storm Sewer		Fiber Optic	FO
Water Line	W	Exist. Fence	x x
Fire Hydrant		Exist. Ret. Wall Stem Removal	
Prop. catchbasin		Soil Retention System	
Construction Joint	C		
Expansion Joint	E		

PLAN

CURVE DATA

(EB Taylor Exit Ramp)
Prop. Curve P-TAY-ES-4
P.I. Sta. = 7309+26.26
Δ = 44° 07' 39" (RT)
D = 10° 13' 53"
R = 560.00'
T = 226.98'
L = 431.30'
E = 44.25'
e = 5.8%
T.R. = NA
S.E. Run = 150'
P.C. Sta. = 7306+99.28
P.T. Sta. = 7311+30.57

CURVE DATA

(EB Taylor Exit Ramp)
Prop. Curve P-TAY-ES-5
P.I. Sta. = 7313+24.65
Δ = 7° 47' 11" (LT)
D = 6° 36' 03"
R = 868.00'
T = 59.07'
L = 117.96'
E = 2.01'
e = 4.4%
T.R. = NA
S.E. Run = 114'
P.C. Sta. = 7312+65.57
P.T. Sta. = 7313+83.54

CURVE DATA

(EB Taylor Exit Ramp)
Prop. Curve P-TAY-ES-6
P.I. Sta. = 7315+63.15
Δ = 8° 44' 46" (RT)
D = 7° 16' 16"
R = 788.00'
T = 60.26'
L = 120.29'
E = 2.30'
e = 4.6%
T.R. = NA
S.E. Run = 119'
P.C. Sta. = 7315+02.89
P.T. Sta. = 7316+23.18

Note "A":
Existing steel sheet piling is shown as per as-designed plan information. Preliminary non-destructive evaluation suggests that existing steel sheeting is not present. Prior to construction contractor shall field verify presence of existing steel sheeting. Any change order due to presence of steel sheeting shall be paid for as per contract unit price of individual pay items associated with the work.

APPROVED
APR 18 2017
AS A BASIS FOR PREPARATION OF DETAILED PLANS

GENERAL PLAN AND ELEVATION
RETAINING WALL 10
F.A.I. RTE. SB 90/94
(DAN RYAN EXPRESSWAY)
F.A.I. RTE. 90/94 - SECTION 2015-022-I
COOK COUNTY
STATION 7309+74.27 TO STATION 7316+31.15
STRUCTURE NO. 016-1729

AECOM

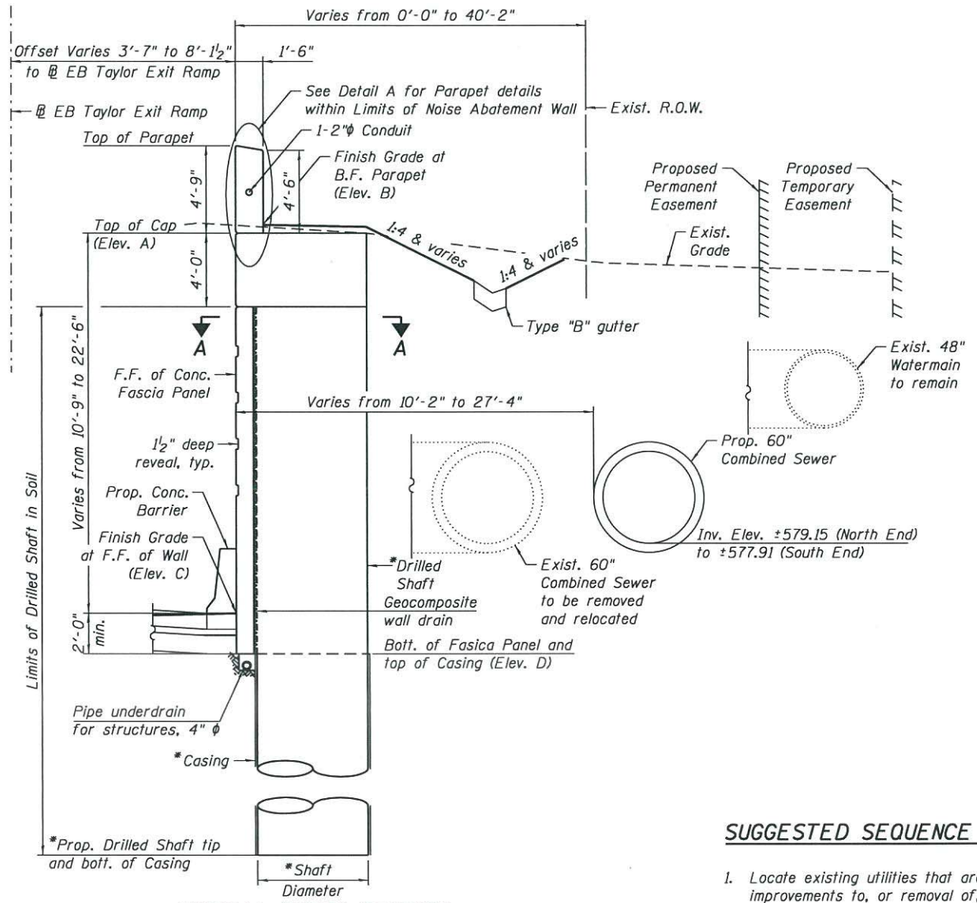
USER NAME = dabezicd	DESIGNED - DD	REVISED	
	CHECKED - ATB	REVISED	
PLOT SCALE = N.T.S.	DRAWN - GF	REVISED	
PLOT DATE = 4/17/2017	CHECKED - ATB	REVISED	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 2 OF 6 SHEETS

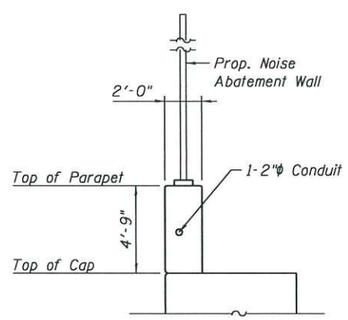
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2015-022-I	COOK	6	2
		CONTRACT NO. 62A74		
		ILLINOIS FED. AID PROJECT		

0161729-62A74-S02-TSL



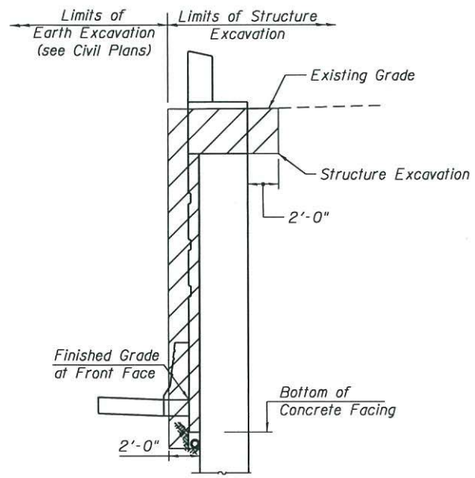
TYPICAL CROSS SECTION

(Sta. 7309+74.27 to Sta. 7315+46.05)
(Looking Upstation)



DETAIL A

(Sta. 7311+26.35 to Sta. 7313+95.86)
(Looking Upstation)



STRUCTURE EXCAVATION

NOTES:

See Sheet 5 for Section A-A.

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

ELEVATION TABLE

Wall Type	Station	Offset	Elevation A	Elevation B	Elevation C	Elevation D
Drilled Shaft	7309+74.27	8.13' RT	597.44	596.21	574.91	572.91
Drilled Shaft	7310+04.70	7.58' RT	597.44 (N)	595.02	575.13	573.13
			595.44 (S)			
Drilled Shaft	7310+35.11	7.58' RT	595.44	596.00	575.26	573.26
Drilled Shaft	7310+65.52	7.58' RT	595.44 (N)	596.00	575.31	573.31
			593.43 (S)			
Drilled Shaft	7310+95.93	7.58' RT	593.43	593.99	575.29	573.29
Drilled Shaft	7311+26.35	7.58' RT	593.43	593.99	575.13	573.13
Drilled Shaft	7311+56.38	6.82' RT	593.43	593.99	575.01	573.01
Drilled Shaft	7311+86.37	5.93' RT	593.43	593.99	575.02	573.02
Drilled Shaft	7312+16.36	5.04' RT	593.43	593.99	575.21	573.21
Drilled Shaft	7312+46.35	4.15' RT	593.43	593.99	575.57	573.57
Drilled Shaft	7312+76.29	3.58' RT	593.43	593.99	576.10	574.10
Drilled Shaft	7313+06.17	3.58' RT	593.43	593.99	576.80	574.80
Drilled Shaft	7313+36.05	3.58' RT	593.43	593.99	577.65	575.65
Drilled Shaft	7313+65.92	3.58' RT	593.43	593.99	578.59	576.59
Drilled Shaft	7313+95.86	3.58' RT	593.43 (N)	593.99	579.54	577.54
			592.93 (S)			
Drilled Shaft	7314+25.86	3.58' RT	592.93	593.49	580.48	578.48
Drilled Shaft	7314+55.86	3.58' RT	592.93	593.49	581.34	579.34
Drilled Shaft	7314+85.86	3.58' RT	592.93	593.49	581.92	579.92
Drilled Shaft	7315+15.91	3.58' RT	592.93	593.49	582.04	580.04
Drilled Shaft	7315+46.05	3.58' RT	592.93	593.49	582.22	580.22

Elevation A - Top of Cap
Elevation B - Finish Grade at B.F. of Parapet
Elevation C - Finish Grade at F.F. of Wall
Elevation D - Bottom of Fascia Panel

SUGGESTED SEQUENCE OF CONSTRUCTION

1. Locate existing utilities that are to remain. Contractor to coordinate any required improvements to, or removal of, existing utilities with utility owner.
2. Complete 48" water main relocation and associated work as outline in the Civil plans.
3. Install proposed soil retention system & temporary soil retention system as shown in the plans.
4. Excavate for jacking and receiving pit.
5. Install proposed 60" Combined Sewer.
6. Excavate for proposed MSE wall and remove portion of existing wall stem that is in conflict with MSE wall construction.
7. Construct MSE wall with sacrificial fascia. Backfill jacking and receiving pit areas.
8. Cut off steel sheeting for proposed soil retention system and remove temporary soil retention system. Remove soil retention system at Southwest corner of Harrison St bridge West Abutment.
9. Drill for drilled shafts. Install permanent casing and shaft concrete to complete drill shaft construction.
10. Complete earth excavation for drilled shaft wall to bottom of facing. Install timber lagging and geocomposite wall drain between drilled shafts. Install pipe underdrain for the wall.
11. Construct concrete fascia panel for drilled shaft wall and CIP facing for MSE wall.
12. Complete removal of existing retaining wall and finish interim grading in front of the wall.

APPROVED

APR 18 2017

AS A BASIS FOR PREPARATION OF DETAILED PLANS

ELEVATION TABLE AND
DRILLED SHAFT WALL SECTION
RETAINING WALL 10
F.A.I. RTE. SB 90/94
(DAN RYAN EXPRESSWAY)
F.A.I. RTE. 90/94 - SECTION 2015-022-I
COOK COUNTY
STATION 7309+74.27 TO STATION 7316+31.15
STRUCTURE NO. 016-1729

0161729-62A74-S03-TSL

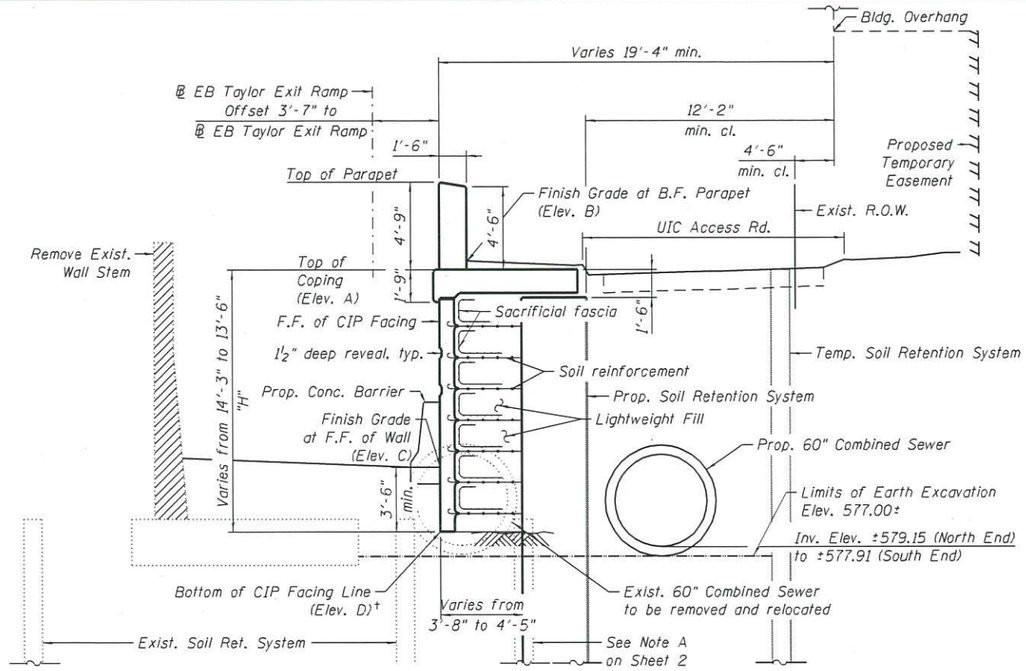
AECOM

USER NAME = dabezlcd	DESIGNED - DD	REVISED	
	CHECKED - ATB	REVISED	
PLOT SCALE = N.T.S.	DRAWN - GF	REVISED	
PLOT DATE = 4/7/2017	CHECKED - ATB	REVISED	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

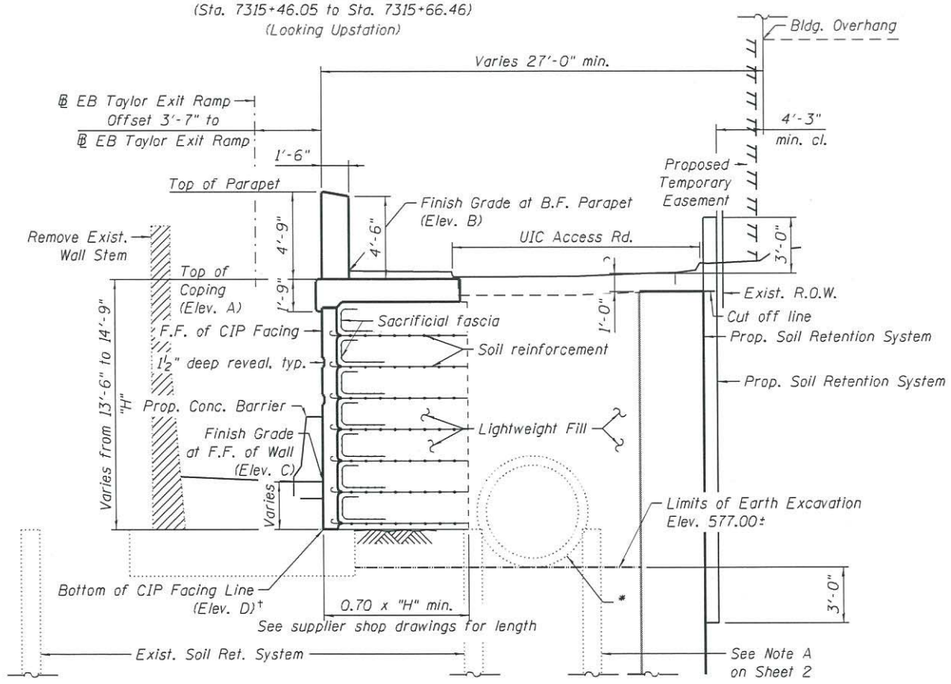
SHEET NO. 3 OF 6 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2015-022-I	COOK	6	3
		CONTRACT NO. 62A74		
	ILLINOIS FED. AID PROJECT			



TYPICAL SECTION

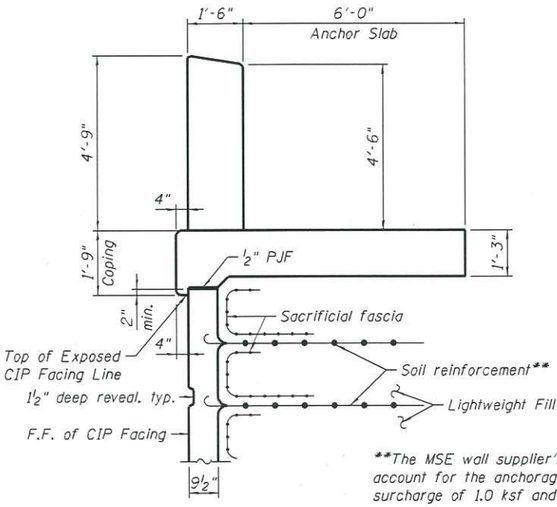
(Sta. 7315+46.05 to Sta. 7315+66.46)
(Looking Upstation)



TYPICAL SECTION

(Sta. 7315+66.46 to Sta. 7316+31.15)
(Looking Upstation)

*Prop. 60" Combined Sewer (Sta. 7315+66.46 to Sta. 7316+02.31)
Exist. 60" Combined Sewer (Sta. 7316+02.31 to Sta. 7316+31.15)



**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 0.5 kips/ft. of wall.

MSE SECTION

(Looking Upstation)

ELEVATION TABLE

Wall Type	Station	Offset	Elevation A	Elevation B	Elevation C	Elevation D
MSE	7315+46.05	3.58' RT	592.93	593.49	582.22	578.72
MSE	7315+76.18	3.58' RT	592.93	593.49	581.91	579.44
MSE	7316+06.32	3.58' RT	592.93	593.49	581.31	579.44
MSE	7316+31.15	3.58' RT	592.93	593.49	580.69	578.19

Elevation A - Top of Coping
Elevation B - Finish Grade at B.F. of Parapet
Elevation C - Finish Grade at F.F. of Wall
Elevation D - Bottom of CIP Facing Line

NOTES:

† From Sta. 7315+61.16 to Sta. 7316+31.15 MSE Panels are supported on the existing Ret. Wall footing.

1. For Proposed & Temporary Soil Retention System see Sheet 6.

APPROVED
APR 18 2017
AS A BASIS FOR
PREPARATION OF DETAILED PLANS

ELEVATION TABLE AND MSE WALL SECTION RETAINING WALL 10 F.A.I. RTE. SB 90/94 (DAN RYAN EXPRESSWAY) F.A.I. RTE. 90/94 - SECTION 2015-022-I COOK COUNTY STATION 7309+74.27 TO STATION 7316+31.15 STRUCTURE NO. 016-1729

AECOM

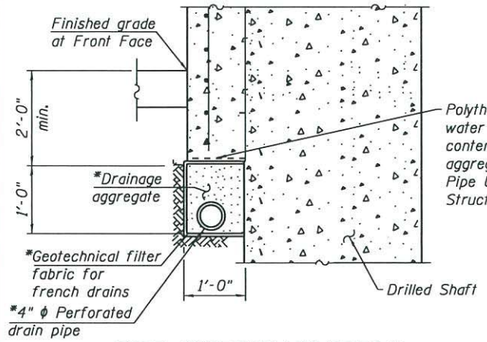
USER NAME = dabezicd	DESIGNED - DD	REVISED
	CHECKED - ATB	REVISED
PLOT SCALE = N.T.S.	DRAWN - GF	REVISED
PLOT DATE = 4/17/2017	CHECKED - ATB	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 4 OF 6 SHEETS

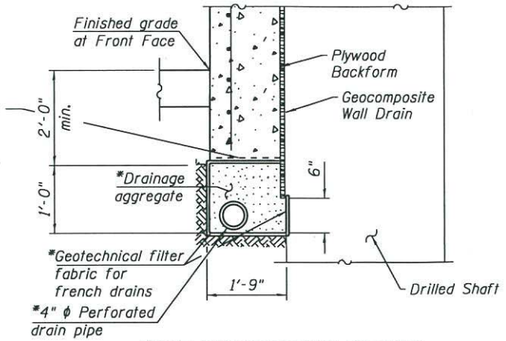
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2015-022-I	COOK	6	4
		CONTRACT NO. 62A74		
	ILLINOIS FED. AID PROJECT			

016129-62AT4-S04-TSL



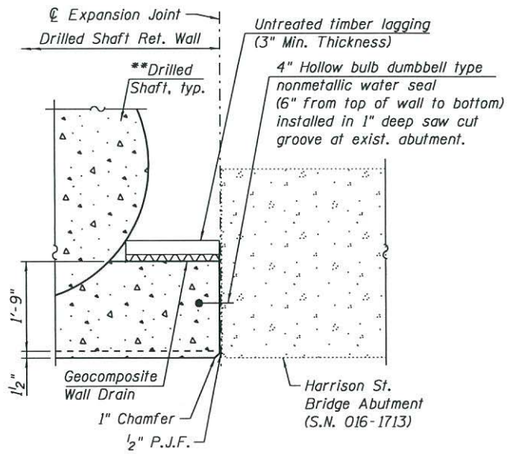
PIPE UNDERDRAIN DETAIL

(At Drilled Shaft)
(Roadway Barrier is not shown for clarity)

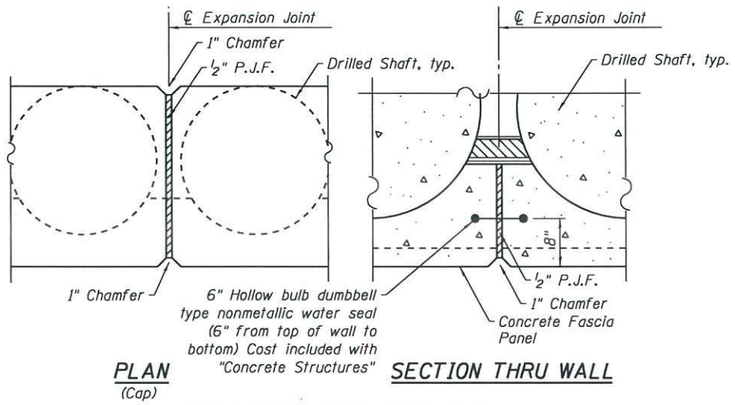


PIPE UNDERDRAIN DETAIL

(Between Drilled Shaft)
(Roadway barrier is not shown for clarity)



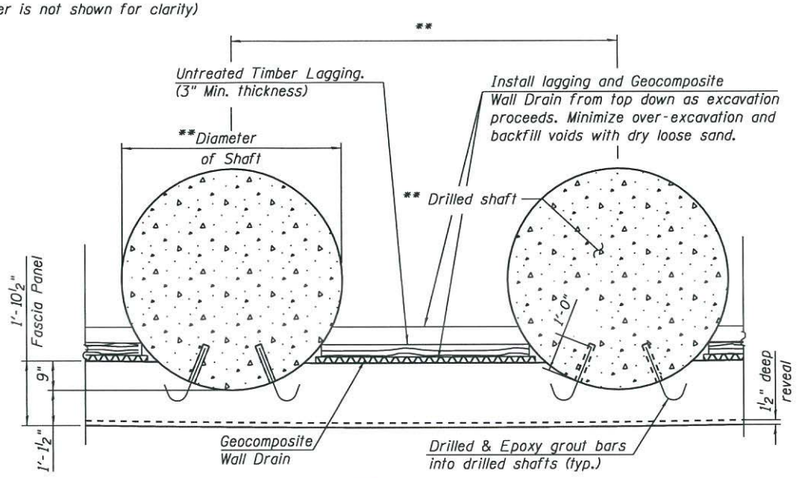
EXPANSION JOINT DETAILS AT HARRISON ST. BRIDGE ABUTMENT



PLAN (Cap)

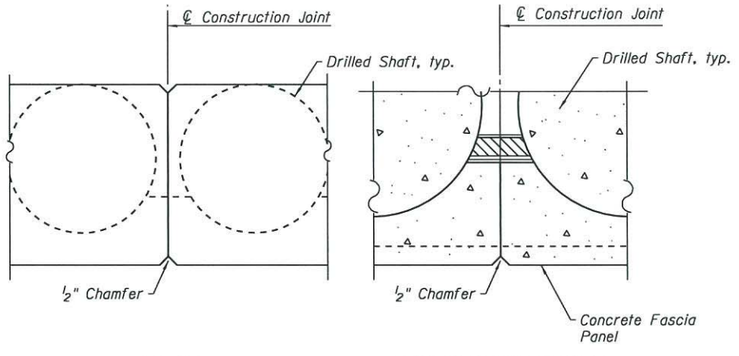
SECTION THRU WALL

EXPANSION JOINT DETAILS



SECTION A-A

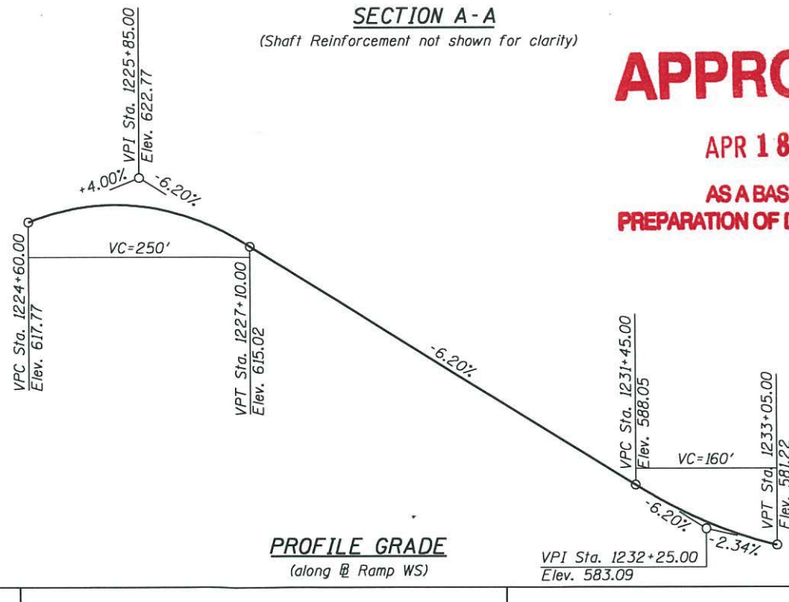
(Shaft Reinforcement not shown for clarity)



PLAN (Cap)

SECTION THRU WALL

CONSTRUCTION JOINT DETAILS



PROFILE GRADE

(along ℄ Ramp WS)

APPROVED

APR 18 2017

AS A BASIS FOR PREPARATION OF DETAILED PLANS

CURVE DATA

(Ramp WS)
Prop. Curve P-CIR-WS-3
P.I. Sta. = 1231+01.94
Δ = 5° 04' 12" (RT)
D = 3° 00' 56"
R = 1,900.00'
T = 84.12'
L = 168.13'
E = 1.86'
e = 4.0%
T.R. = NA
S.E. Run = 44'
P.C. Sta. = 1230+17.82
P.T. Sta. = 1231+85.95

NOTES:

* Included in the cost of pipe Underdrains for Structures.

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

DRILLED SHAFT WALL DETAILS
RETAINING WALL 10
F.A.I. RTE. SB 90/94
(DAN RYAN EXPRESSWAY)
F.A.I. RTE. 90/94 - SECTION 2015-022-I
COOK COUNTY
STATION 7309+74.27 TO STATION 7316+31.15
STRUCTURE NO. 016-1729

0161729-62A74-SD5-TSL

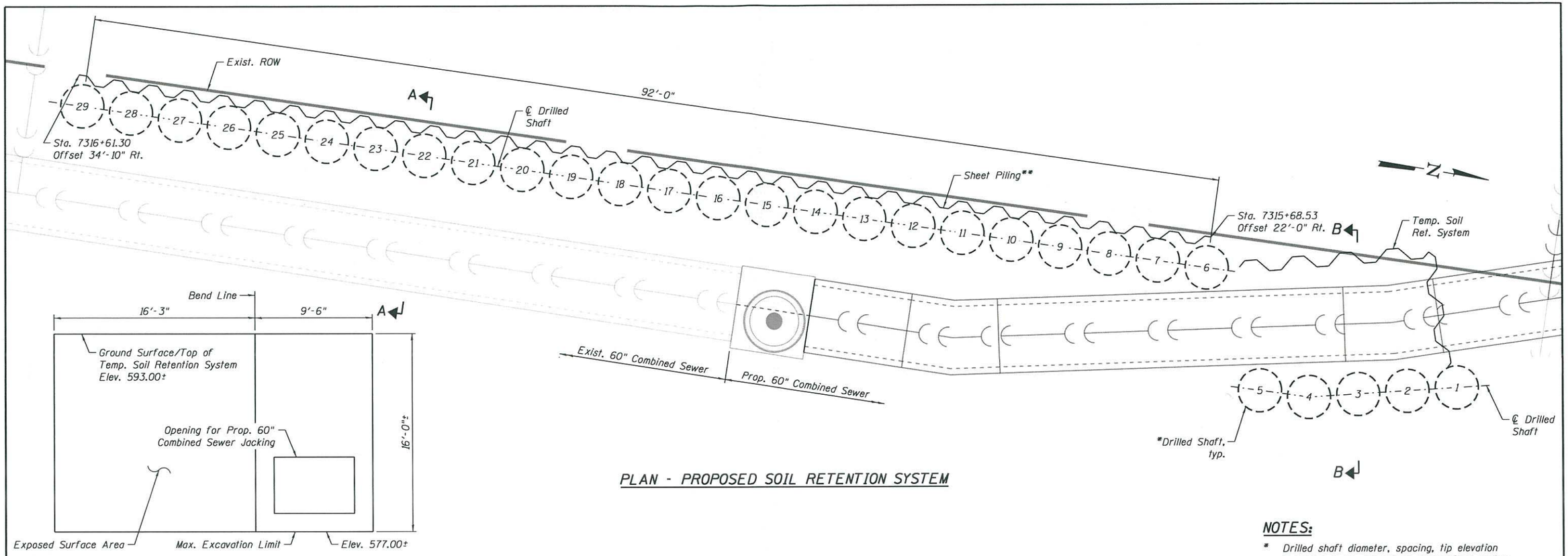
AECOM

USER NAME = dabezlcd	DESIGNED - DD	REVISED	
	CHECKED - ATB	REVISED	
PLOT SCALE = N.T.S.	DRAWN - GF	REVISED	
PLOT DATE = 4/7/2017	CHECKED - ATB	REVISED	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 5 OF 6 SHEETS

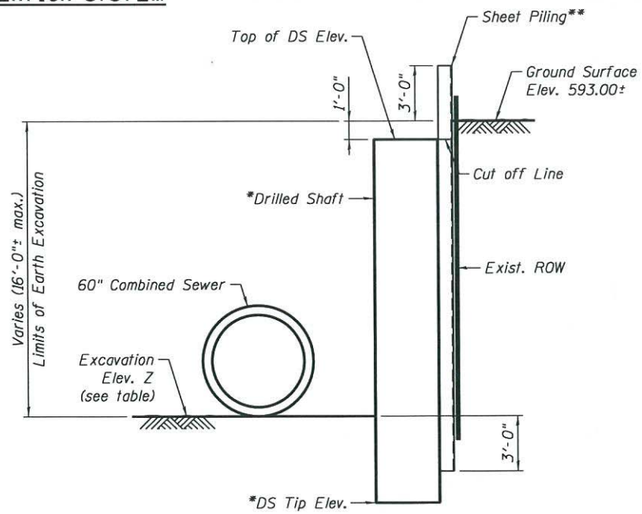
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2015-022-I	COOK	6	5
		CONTRACT NO. 62A74		
		ILLINOIS FED. AID PROJECT		



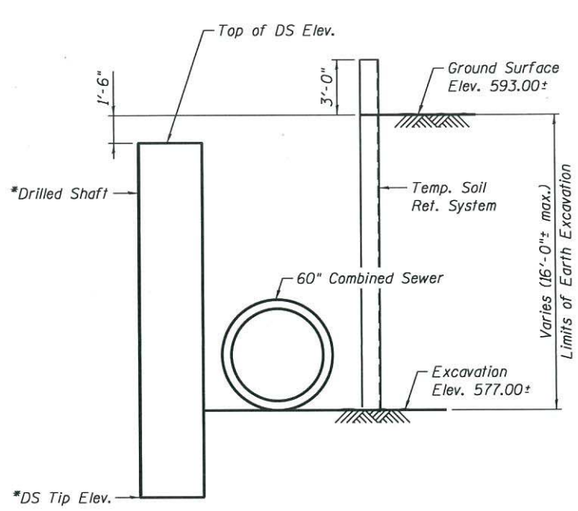
PLAN - PROPOSED SOIL RETENTION SYSTEM

UNFOLDED ELEVATION - TEMPORARY SOIL RETENTION SYSTEM

Drilled Shaft Schedule			
Shaft No.	Station	Offset (ft)	Excavation Elev. Z
1	7315+48.58	9.00 Rt.	577.00±
2	7315+52.62	9.00 Rt.	577.00±
3	7315+56.67	9.00 Rt.	577.00±
4	7315+60.71	9.00 Rt.	577.00±
5	7315+64.69	9.75 Rt.	577.00±
6	7315+68.53	19.88 Rt.	577.00±
7	7315+72.56	20.62 Rt.	577.00±
8	7315+76.61	21.34 Rt.	577.00±
9	7315+80.66	22.04 Rt.	577.00±
10	7315+84.71	22.72 Rt.	577.00±
11	7315+88.78	23.38 Rt.	577.00±
12	7315+92.85	24.02 Rt.	577.00±
13	7315+96.93	24.64 Rt.	577.00±
14	7316+01.01	25.24 Rt.	577.00±
15	7316+05.10	25.82 Rt.	577.00±
16	7316+09.20	26.37 Rt.	577.00±
17	7316+13.30	26.91 Rt.	577.00±
18	7316+17.41	27.43 Rt.	577.00±
19	7316+21.52	27.92 Rt.	577.00±
20	7316+25.56	28.40 Rt.	577.00±
21	7316+29.53	28.88 Rt.	577.00±
22	7316+33.50	29.35 Rt.	579.00±
23	7316+37.47	29.83 Rt.	581.00±
24	7316+41.44	30.30 Rt.	583.00±
25	7316+45.41	30.78 Rt.	585.00±
26	7316+49.39	31.26 Rt.	587.00±
27	7316+53.36	31.73 Rt.	589.00±
28	7316+57.33	32.21 Rt.	591.00±
29	7316+61.30	32.69 Rt.	593.00±



SECTION A-A



SECTION B-B

NOTES:

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

** Sheet piling to be determined during final design.

1. Stations and offsets for the Prop. Soil Ret. System are given from the ℄ EB Taylor Exit Ramp to the center of drilled shafts.

APPROVED

APR 18 2017

AS A BASIS FOR PREPARATION OF DETAILED PLANS

PROPOSED SOIL RETENTION SYSTEM
RETAINING WALL 10
F.A.I. RTE. SB 90/94
(DAN RYAN EXPRESSWAY)
F.A.I. RTE. 90/94 - SECTION 2015-022-I
COOK COUNTY
STATION 7309+74.27 TO STATION 7316+31.15
STRUCTURE NO. 016-1729

AECOM

USER NAME = dabezlcd	DESIGNED - DD	REVISED	
	CHECKED - ATB	REVISED	
PLOT SCALE = N.T.S.	DRAWN - GF	REVISED	
PLOT DATE = 4/7/2017	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	2015-022-I	COOK	6	6
		CONTRACT NO. 62A74		
		ILLINOIS FED. AID PROJECT		

0161729-62A74-SO6-TSL

APPENDIX D

Wang Engineering
1145 North Main Street
Lombard, Illinois 60148
Phone: (630)-953-9928

Date: 2/9/2017 Sheet: 1 of 5
Calculation By: N. Balakumaran Approved By: M. Seyhun MP
Project Number: 1100-04-01 Client Name: AECOM
Project Name: Circle Interchange
Wall 10
SN 016-1729

Ground Movement Estimates

Purpose: To eshimate the surface ground movement at UIC Recreation Facility located West of Wall 10 induced by the Movement of the proposed Wall 10's Drilled Shaft and lagging type wall.

Reference (1) Clough, W and O'Rourke T (1990) "Construction induced movement of in-sity walls.

(2) Ou, C.Y, H.Sieh, P.t, and Chev. D (1993) "Characteristics of ground surface Settlements during excavation" Canadian Geotechnical Journal, V.30, P 758-767

(3) Wang J.H, XU Z.H, and Wang W.D (2010) Wall and Ground Movements due to deep foundations in Shanghai" Soft Soils" Journal of Geotech & Geoenvironmental Engineering, P985-994

Assumptions: (1) UIC Recreation Facility is 26 feet away from Wall 10's drilled shaft and Lagging wall at Sta 7314+00

(2) Maximum Height of Wall = 17 feet

(3) There is no existing wall behind Wall 10.

Notations: S_{hm} = Max. lateral displacement of wall

S_v = Ground surface settlement

S_{vm} = Max. Ground surface Settlement

Wang Engineering
1145 North Main Street
Lombard, Illinois 60148
Phone: (630)-953-9928

Date: 2/9/2017 Sheet: 2 of 5
Calculation By: N. Balakumaran Approved By: M. Seyhun
Project Number: 1100-04-01 Client Name: AECOM
Project Name: Circle Interchange

Wall 10
SN 016-1729

Design Criteria: Max S_{hm} is 0.5% of Wall height = 1.02 inches.

Evaluations:

From Figure 6.14, using a ratio $\frac{S_{VM}}{S_{hm}} = 1.0$

obtain $S_{vm} = 1.02$ inches

Then Figure 11

for $\frac{d}{H} = \frac{26}{17} = 1.529$

Method 1

obtain $\frac{S_v}{S_{vm}} = 0.4$ (Clough and O'Rourke 1990)

$S_v = 0.4 \times 1.02 = 0.41$ inches

Say 0.4 inches

Method 2

obtain $\frac{S_v}{S_{hm}} = 0.4$ (Kung et al. (2007))

$S_v = 0.4 \times 1.02$

$= 0.41$ inches

Say 0.4 inches

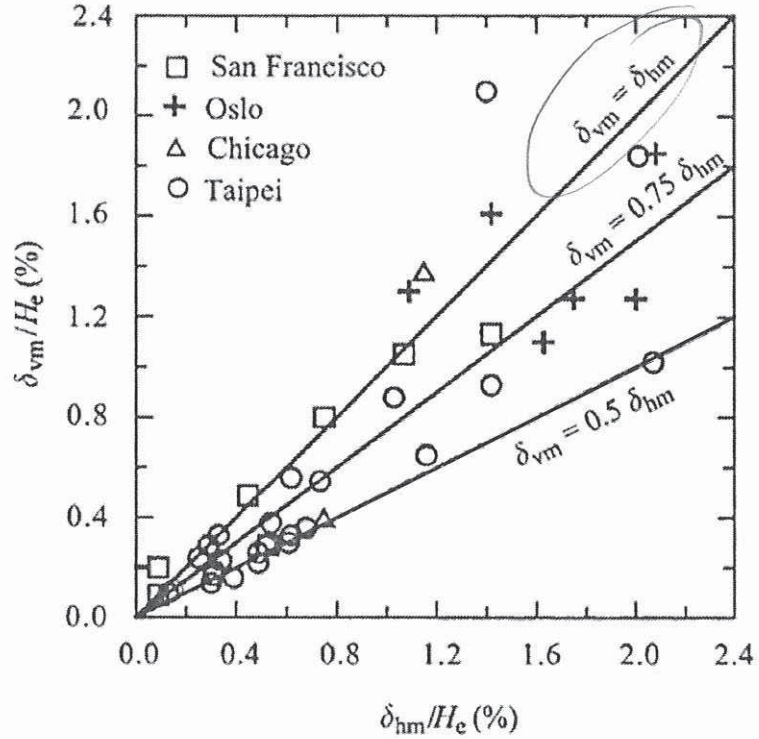


Figure 6.14 Maximum ground surface settlement and lateral wall deflection (Ou *et al.*, 1993).

OU, C.-Y., HSIEH, P.-G., AND CHIOU, D.-C., 1993, Characteristics of ground surface settlement during excavation: Canadian Geotechnical Journal, v. 30, p. 758-767.

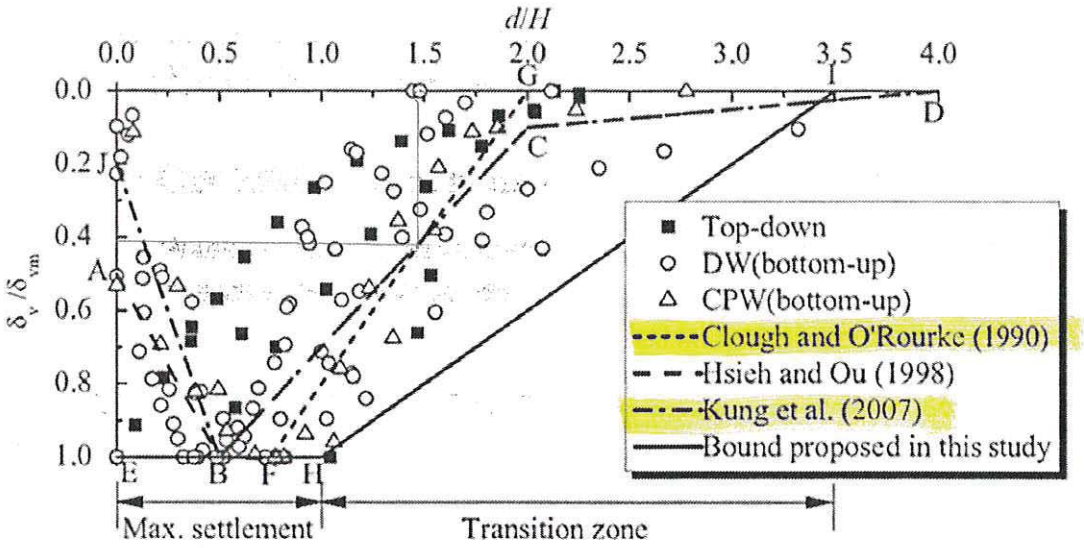


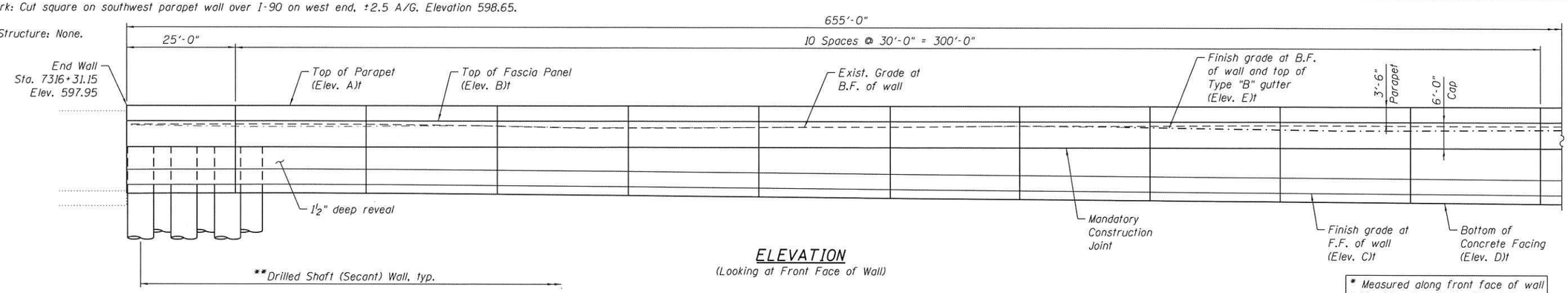
Fig. 11. Relationship between ground settlement normalized by maximum settlement and normalized distance from wall

WANG, J., XU, Z., AND WANG, W., 2009, Wall and ground movements due to deep excavations in Shanghai soft soils Journal of Geotechnical and Geoenvironmental Engineering, v. 136, p. 985-994.

Bench Mark: Cut square on southwest parapet wall over I-90 on west end, ±2.5 A/G. Elevation 598.65.

Existing Structure: None.

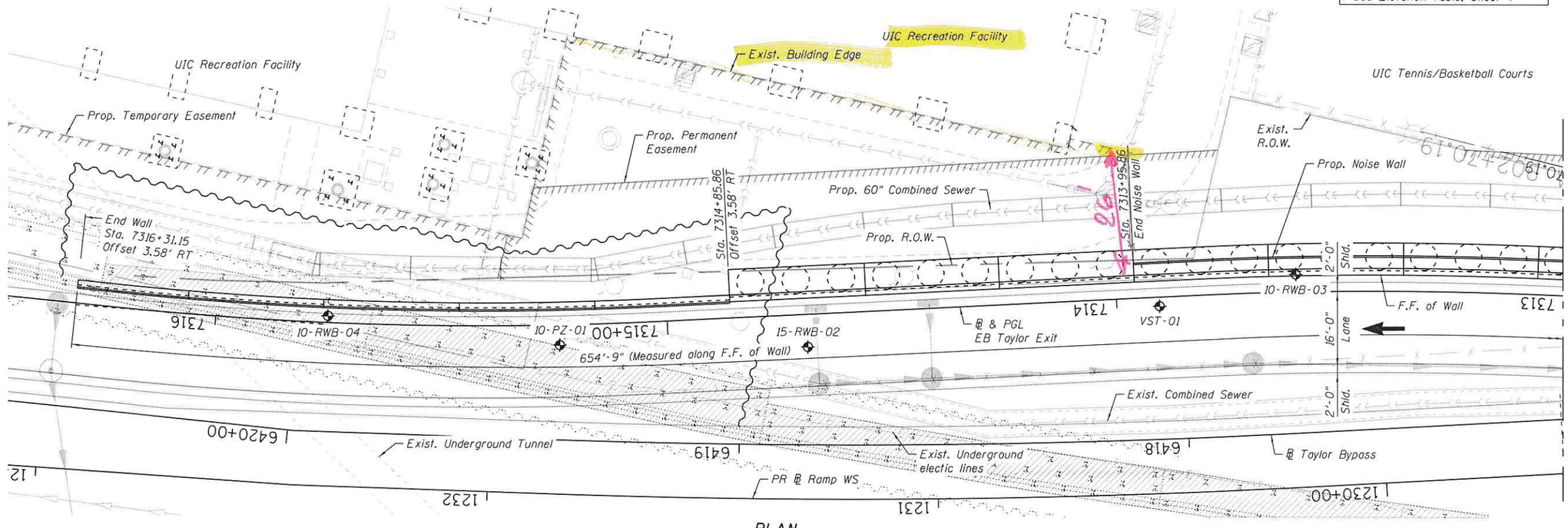
5/5



ELEVATION

(Looking at Front Face of Wall)

* Measured along front face of wall
† See Elevation Table, Sheet 4

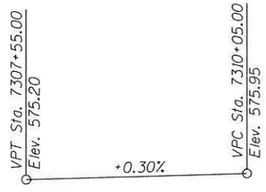


PLAN

N

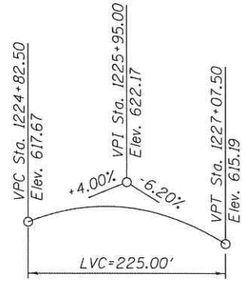
LEGEND:

Front Face	F.F.	Boring Log/Soil Test	⌖
Back Face	B.F.	Light Pole	☼
Combined Sewer	—C—	Exist. Electric Cable	—E—
Exist. Storm Sewer	———	Prop. Lighting Cable	—L—
Prop. Storm Sewer	———	Fiber Optic	—FO—
Water Line	—W—	Exist. Fence	— x — x —
Fire Hydrant	♉	Foundation Removal	▨
Prop. catchbasin	●	Temp. Soil Retention System	∿∿∿



PROFILE GRADE

(along ℄ EB Taylor Exit)



PROFILE GRADE

(along ℄ Ramp WS)

GENERAL PLAN AND ELEVATION
RETAINING WALL 10
F.A.I. RTE. SB 90/94
(DAN RYAN EXPRESSWAY)
F.A.I. RTE. 90/94 - SECTION 2013-008R
COOK COUNTY
STATION 7309+74.27 TO STATION 7316+31.15
STRUCTURE NO. 016-1729

AECOM

USER NAME = FloresG	DESIGNED -	REVISED	
	CHECKED -	REVISED	
PLOT SCALE = N.T.S.	DRAWN -	REVISED	
PLOT DATE = 12/16/2016	CHECKED -	REVISED	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 2 OF 4 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290		COOK	4	2
		CONTRACT NO. 62A74		
		ILLINOIS FED. AID PROJECT		

0161729-62A74-S02-TSL