STRUCTURE GEOTECHNICAL REPORT

LONGMEADOW PARKWAY OVER FOX RIVER
SN: 045-3024
STATION 2210+35.40

KANE COUNTY DIVISION OF TRANSPORTATION
ILLINOIS

For

McDonough Associates, Inc.

130 East Randolph Street, Suite 1000

Chicago, IL 60601

(312) 946-8600

By

Wang Engineering, Inc.

1145 North Main Street

Lombard, IL 60148

(630) 953-9928

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Wang Engineering

Technical Report Documentation Page

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7. Prepared by Wang Engineering, Inc. 1145 N Main Street Lombard, IL 60148	**Contributor(s)** Author: Mohammed Kothawala, P.E. QC/QA: Jerry W.H. Wang, PhD, P.E. PM: Mohammed Kothawala, P.E.	**Contact Phone Number** (630) 953-9928 ext 36
9. Prepared for McDonough Associates, Inc. 130 East Randolph Street Suite 1000 Chicago, IL 60601	**Design / Structural Engineer** Gerald E. Koylass, S.E.	**Contact Phone Number** (312) 946-8600

10. Abstract

A new bridge will be constructed over Fox River as part of the new Longmeadow Parkway Bridge Corridor. This report provides geotechnical recommendations for the design and construction of the proposed bridge structure. The bridge structure will be 1307'-3" long back-to-back abutments with 8 spans. Wang obtained 18 structure borings, 2 at each substructure.

On the western bank of the Fox River, the soils generally encountered 6 inches to 4.5 feet of dark brown to black silty clay loam topsoil followed by 2.5 to 11 feet of loose to very dense, gravelly sand with cobbles overlies medium stiff to hard, brown and gray, clay loam, with occasional lenses of sand and interbedded layers of sandy clay. Bedrock was encountered at approximate elevation 658 feet NGVD.

On the eastern bank of the Fox River, the soils generally encountered 4 to 18 inches of brown to black loam, silty loam, and silty clay loam topsoil followed by very loose to medium dense silty loam to loam, very soft to hard silty clay to silty clay loam, and very soft sandy clay ranging in thickness of 4 to 8.5 feet. Loose to very dense, gravelly sand to sand ranging from 2.5 to 32.5 feet thick followed by stiff to hard, clay loam extend to boring termination depth or auger refusal on weathered bedrock. Bedrock was encountered between elevation 656 feet and 661 feet NGVD.

The proposed bridge structure is recommended to be supported on H-piles. There will not be downdrag loads. The report provides pile design data and geotechnical soil parameters for pile analysis under lateral load.

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TABLE OF CONTENTS

Wang Engineering

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

STRUCTURE GEOTECHNICAL REPORT
LONGMEADOW PARKWAY OVER FOX RIVER
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KANE COUNTY DIVISION OF TRANSPORTATION

FOR

MCDONOUGH ASSOCIATES INC.

1.0 INTRODUCTION

Kane County Division of Transportation planned a new access across the Fox River. This new roadway corridor referred to as "Longmeadow Parkway Bridge Corridor" extends 5.2 miles from Huntley Road (1-mile west of Randall Road) on the west to Illinois Route 62 on the east and generally follows township section lines in northern Kane County. The proposed roadway will traverse the communities of Algonquin, Carpentersville, Barrington Hills and unincorporated Kane County. The new roadway will cross Boyer Road, Randall Road, Sleepy Hollow Road, Illinois Route 31, Old Bolz Road, Illinois Route 25 and Illinois Route 62. The project corridor is shown in Exhibit 1.

This report presents the results of Wang Engineering, Inc. (Wang) subsurface investigation, laboratory testing, and geotechnical evaluation for the proposed bridge over Fox River. The engineering analyses and recommendations are based on IDOT 2009 Bridge Manual and 2010 AASHTO LRFD Bridge Design Specifications. The bridge is situated immediately northwest of the city of Carpentersville, in Kane County, Illinois. On the USGS "Crytal lake" quadrangle Map, the proposed structure is located in the ¼ southeast of section 3 and ¼ southwest of section 2 , Tier 42 North, Range 8 East. A *Site Location Map* is presented as Exhibit 2.

2.0 PROJECT DESCRIPTION

The project includes a new bridge over the Fox River. The proposed roadway cross-section will consist of two-lanes in each direction separated by a landscaped median area. The median area will be utilized at intersections as left turn lanes. Traffic signals will be installed at all major intersection locations. Other work included in the project consists of bike path construction, open space preservation, drainage and floodplain storage.

The following structures are included in the project.

- Bridge over Fox River
- Two parallel retaining walls immediately west of the bridge (Brunner property)
- Two parallel retaining walls immediately east of the bridge(Carpentersville Quarry)

- One retaining wall west of Illinois Route 31 (Lathrop property), and
- One retaining wall immediately west of Sleepy Hollow Road.

This Structure Geotechnical report (SGR) addresses the investigation and recommendations for the Bridge over Fox River. The SGR for other structures will be prepared separately.

3.0 EXISTING AND PROPOSED STRUCTURE

There are no existing highway structures at or nearby proposed bridge location. There is no existing subsurface information available. Based on the drawings provided by McDonough Associates, Inc. (MAI), the proposed bridge begins at approximately Station 2205+62.61 (West Abutment) and ends at Station 2218+62.20 (East Abutment). The proposed bridge will be a 8-span structure with three units. Units 1 (Span 1 on the west side) and Unit 3 (Spans 5 through 8 on the east side) will have prestressed concrete 72-inch bulb-T beams and Unit 2 (Spans 2 through 4 in the middle) will have steel plate girders with web depths varying from 96-inch to 144-inch; with cast-in-place concrete deck. The bridge will carry four 12-foot lanes in each direction with a 6-foot sidewalk and 10-foot wide bikeway on outside shoulders as well as a 4-foot median. The structure will be 84'-5" back of curb to back of curb and 1307'-3" long back-to-back abutments. The structure will require three spans to cross the Fox River. Two piers will be located in the river. Both the abutments and piers 1, 3, 4, 5 and 7 are expansion type and piers 2 and 6 will be fixed. The abutments are proposed to be stub type abutments. The span lengths measured along the Proposed Grade Line (PGL) and the substructure locations are shown in Exhibit 5, *Boring Location Plan.*

The preliminary estimated substructure LRFD factored loads were not available at the time of report.

4.0 PURPOSE AND SCOPE

The purpose of our investigation was to determine the subsurface soil and groundwater level conditions within this project area that would form a basis for foundation and earthwork design recommendations. Specifically, the scope of the investigation was as follows:

- To investigate by means of exploratory borings, the subsurface soils and ground water level conditions at the site to depths that will be influenced by the proposed construction;
- To evaluate from laboratory tests, the physical properties of the soils and rocks underlying the site that will influence foundation design and construction;
- To provide recommendations and data for the design and installation of foundations, including the suitable foundation type or types, bearing capacity, the elevation or elevations at which the foundations should be established, and the estimated foundation settlement;
- To provide recommendations relative to construction operations and special design techniques that may be required; and
- To provide a report summarizing the results of our studies, conclusions, and

recommendations.

5.0 GEOLOGIC SETTING

The project area is located in the northeastern part of Kane County, in the communities of Algonquin, Carpentersville, South Barrington, and unincorporated Kane County. On the USGS "Crystal Lake" and "Barrington" quadrangle maps, the investigated area runs west to east across the southern portion of sections 1 through 5 and northern portion of sections 7 through 12 of T 42 N, R 8 E (see Exhibit 1).

The following review of the published geologic data is meant to place within a regional framework the results of our subsurface investigation and, thus, to confirm their general reliability. For the study of the regional geologic framework, Wang considered northeastern Illinois area in general and northeastern Kane County in particular. The maps in Exhibit 3 illustrate the *Site and Regional Geology.*

5.1 Bedrock Geology

The bedrock surface represents a significant unconformity in Kane County. Roughly 400 million year old bedrock is buffed below younger glacial drift deposited less than 500,000 years ago. The uppermost bedrock unit in the area consists of nearly horizontal Silurian and Ordovician age dolomites (Curry, 2005, Dey et al., 2004). The Ordovician age dolomites tend to be softer and shaly where as the Silurian age dolomites tend to be harder. The bedrock top in the project area lies at about 620 to 680 feet elevation (NGDV) (Curry, 2005).

5.2 Glacial Cover

During the Michigan Subepisode (26,000 to 11,000 B.P.) of the Wisconsin glaciation, at the southern fringe of the Laurentide Ice Sheet, the Lake Michigan lobe extended over northeastern and north-central Illinois (Hansel and Johnson, 1996). Multiple advances and retreats of the glacial ice created a series of arcuate end moraine ridges consisting of glacial till. Meltwater from the glaciers carried and deposited sand and gravel within, along, and away from the moraines as outwash till. In low areas, meltwater deposited free grained lake deposits.

The project site is located along the generally north to south trending Barlina Moraine to the west and the Woodstock Moraine to the east. The Barlina Moraine contains deposits of diamicton and sorted sediments associated with the Yorkville Member and Batestown Member of the Lemont Formation intercalated with lenses and layers of sorted sands and gravels of the Henry Formation overlying thick deposits of the Tiskilwa Formation. Multiple advances and retreats of the ice front in the area account for the layers in the moraine. The Woodstock Moraine contains deposits associated with the Haeger Member of the Lemont Formation intercalated with Henry Formation deposits overlying thick deposits of the Tiskilwa Formation.

Descriptions of the various formations and members (Hansel and Johnson, 1996, Dey et al., 2004, and Curry, 1995):

- Haeger Member (Lemont Formation) diamicton is light gray to gray, calcareous, and coarse textured (sandy loam) with lenses of sand, gravel, silt, and clay.
- Batestown Member (Lemont Formation) diamicton is dark gray to gray (brown to olive brown when oxidized), friable (when dry), sandy to silty loam and loam and contains abundant interbeds of sand and gravel.
- The Yorkville Member (Lemont Formation) diamicton is gray, fine-grained silty clay to silty clay loam and contains lenses of sand and gravel.
- The Henry Formation contains layered sands and gravels with lenses of silt and clay.
- The Tiskilwa Formation is a reddish-brown to gray medium textured (clay loam to loam) diamicton, and contains a matrix texture of clay loam to loam.

The moraines are separated by the lower lying Fox River Valley (see Exhibit 3). Large volumes of meltwater associated with the deposition of the Woodstock Moraine eroded portions of the Barlina Moraine to the west and the underlying Tiskilwa Formation to widen the present day Fox River Valley. This meltwater deposited thick accumulations of sand and gravel outwash (Henry Formation) in the form of terraces and point bars.

Subsequent retreat of the glacial front to the east resulted thin accumulations of wind-blown silts (loess) on the moraines. Numerous kettles that were present on the Barlina and Woodstock Moraines were filled in with fine grained sands and silt. Periodic flooding along the Fox River deposited organic rich, fine grained sediments associated with the Cahokia Formation (Dey et al., 2004 and Curry, 2005).

Our subsurface investigation results fit into the local geologic context. The borings drilled in the project area revealed that the native sediments at the project site consist of brown (weathered) to gray clayey diamicton with sand and silt lenses and thick accumulations of sand and gravel outwash deposits.

6.0 METHODS OF INVESTIGATION

6.1 Subsurface Investigation

Our subsurface investigation consisted of 18 structure borings, S-092 through S-109, drilled between April 19, 2005 and July 11, 2005. The borings were drilled to depths ranging from 50 to 90 feet below ground surface (bgs). Boring locations are shown in Exhibits 4 and 5. The boring locations were stacked in the field by Engineering Enterprises, Inc. (EEI, subconsultant to McDonough Associates, Inc.) based on the plans provided by the Design Consultant, MAI.

There was no existing subsurface soil data available during this investigation.

An All Terrain Vehicle (ATV) -mounted drilling rig, equipped with hollow stem augers, was used to advance and maintain an open borehole. Soil sampling was performed according to AASHTO T 206-87, "Penetration Test and Split Barrel Sampling of Soils." The soil was sampled at 2.5 feet intervals to a depth of 30 feet and at 5-foot interval thereafter. Samples collected from each sampling interval were placed in sealed glass jars. Below the refusal depth, rock coring was performed in Borings S-097, S-098, and S-103, using NX-size coring equipment.

The drilling operations were supervised by a Wang field geologist/engineer, who classified the soils and rock encountered in the borings, maintained a field log of borings, and obtained soil samples for later visual examination and laboratory testing. He also supervised the standard penetration tests and recorded the results of the rock coring operations. The unconfined compressive strengths of cohesive soil samples were obtained using Rimac Spring Tester. The field logs were reviewed and edited based on reexamination of the soil samples and rock cores in our laboratory.

Stations and offsets for the boring locations were also provided by EEI. Some of the borings were relocated in the field by Wang from their originally intended locations due to the access problem or refusal encountered at shallower depth. As-drilled boring locations and elevations are included in the boring logs (Appendix A) and on the soil profiles (Exhibits 6A and 6B). Rock core photographs for each run are also included in Appendix A.

Groundwater elevations were measured while drilling and at completion of each boring. At each boring location, the boreholes were backfilled with soil cuttings and bentonite chips upon completion and the surface was restored as much as possible to its original condition.

6.2 Laboratory Testing

Soil samples and rock cores obtained by Wang in the field were transported to our in-house laboratory in Lombard, Illinois. The testing program included water content (AASHTO T 265-93), particle-size analysis (AASHTO T 88-97), and Atterberg limits (AASHTO T 89-96 and AASHTO T 90-96) determinations. The samples were classified according to the AASHTO system. The results of laboratory testing are presented on the attached boring logs, the laboratory test worksheets and on the soil profiles.

7.0 RESULTS OF FIELD AND LABORATORY INVESTIGATIONS

7.1 Subsurface Investigation

Detailed descriptions of the subsurface conditions encountered in the borings are presented on the attached boring logs (Appendix A) and soil profiles (Exhibit 6A and 6B). Please note that the strata contact lines shown on logs and profiles represent approximate boundaries between soil types. The actual transition between soil types in the field may be different in horizontal and vertical directions.

Borings S-092 through S-097 were drilled on the western bank of the Fox River whereas Borings S-098 through S-109 were drilled along the eastern bank of the Fox River. All borings were drilled from existing ground elevations.

Fox River Western Bank

Generally, the soils encountered on the western bank of the Fox River consisted of 6 inches to 4 feet of dark brown to black silty clay loam topsoil. Below the topsoil, 2.5 to 11 feet of loose to very dense, gravelly sand with cobbles overlies medium stiff to hard, brown and gray, clay loam, with occasional lenses of sand and interbedded layers of sandy clay. Borings S-092, S-93 and S-95 terminated in the clay loam. Borings S-094 and S-096 terminated in very dense, gravelly sand or weathered bedrock. Boring S-097 encountered auger refusal at 67.5 feet bgs.

Bedrock was encountered in Boring S-097 at approximate elevation 658 feet NGVD. Two five foot bedrock cores were obtained using an NX-sized double walled core barrel. The bedrock consisted of very strong, white to gray with green hue, moderately weathered, fossiliferous, finely crystalline limestone, laminated to thinly bedded with narrow to moderately wide joint spacing, with vugs and channelized porosity. Table 1 summarizes the coring results.

Table 1: Coring Results Western Bank

Boring	Core Run	Depth, ft. Elevation, ft.	Length of Run, ft.	Recovery percent	RQD percent
S-97	1	67.5 to 72.5 658.3-653.8	5	97	19
	2	72.5 to 77.5 653.8-648.3	5	100	26

Fox River Eastern Bank

Generally, the soils encountered on the eastern bank of the Fox River consisted of 4 to 18 inches of brown to black loam, silty loam, and silty clay loam topsoil. Below the topsoil was very loose to medium dense silty loam to loam, very soft to hard silty clay to silty clay loam, and very soft sandy clay ranging in thickness of 4 to 8.5 feet. Fill soil consisting of loose to medium dense, gravelly, sand and sandy loam, with stiff to very stiff, clay loam to silty clay, and loose to medium dense, loam of thickness for 10 to 15 feet (Borings S-108 and S-109). Below these two layers the borings encountered loose to very dense, gravelly sand to sand ranging from 2.5 to 32.5 feet thick. Below the gravelly sand and sand layer, stiff to hard, clay loam with occasional lenses of silty clay, silt, and sand extend to boring termination depth or auger refusal on top of weathered bedrock.

Bedrock was encountered between elevation 656 feet and 661 feet NGVD. Bedrock cores were obtained in two borings using an NX-sized double walled core barrel. The bedrock consisted of very strong, white to gray with green hue, moderately weathered, fossiliferous, finely crystalline limestone, laminated to thinly bedded with narrow to moderately wide joint spacing, with vugs and channelized porosity. The Table 2 summarizes the coring results.

Table 2: Coring Results Eastern Bank

Boring	Core Run	Depth, ft. Elevation, ft.	Length of Run, ft.	Recovery percent	RQD percent
S-098	1	69.0-74.5 656.3-650.5	4.5	99	33
	2	74.5-79.5 650.5-645.8	5	96	31
	3	79.5-84.5 645.8-640.8	5	95	36
	4	84.5-89.5 640.8-635.8	5	95	53
S-103	1	72.0-77.0 656.8-651.8	5	88	40

7.2 Groundwater Conditions

While drilling, groundwater was encountered between depths of 3.75 and 67 feet bgs, whereas at drilling completion groundwater was at 4 to 41 feet bgs. Borings (S-096 through S-107) within the river banks encountered groundwater at depths ranging from 3.75 to 13 feet bgs while drilling and from 4 to 41 feet bgs at completion of drilling. We expect that the groundwater levels will fluctuate seasonally and with Fox River surface water level.

7.3 Seismic Design Considerations

The Seismic Site Class was determined using a procedure developed by IDOT (AGMU Memo 09.1). We recommend Site Class D for seismic design. Wang estimates the minimum factor of safety (FOS) against liquefaction for the saturated medium dense to dense granular soils encountered in the borings is greater than the IDOT required FOS of 1.0. The seismic spectral acceleration parameters recommended for design in accordance with the 2008 *Interim Revisions* of the AASHTO *LRFD Design Specifications* are summarized in Table 3 (AASHTO, 2008).

Table 3: Seismic Design Parameters

Spectral Acceleration Period (sec)	Spectral Acceleration Coefficient[1] (% g)	Site Factors	Design Spectrum for Site Class D[2] (% g)
0.0	PGA= 4.2	F_{pga}= 1.6	**A_s= 6.8**
0.2	Ss= 9.0	F_a= 1.6	**S_{DS}= 14.4**
1.0	S_1= 3.4	F_v= 2.4	**S_{D1}= 8.2**

1) Base spectral acceleration coefficients from AASHTO, 2008

2) Site Class D values to be presented on plans (A_s = PGA*F_{pga}; S_{DS}= Ss*F_a; S_{D1}= S_1*F_v)

Considering seismic design spectrum values shown in Table 3 and Site Class of D; and based on Table 3.15.2-1 and Figure 2.3.10-3 in the IDOT Bridge Manual IDOT 2009), the Seismic Performance Zone is 1.

7.4 Mining Activity

There was no coal mining activity in the Kane County in the past; and no active coal mines and coal resources are identified by the Illinois State Geological Survey.

8.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

The geotechnical evaluations and recommendations for the substructure foundations, the approach embankments, approach slabs and stage construction considerations are included in the following sections. Wang has evaluated possible foundation types that can be considered for the support of the proposed bridge structure. It is understood that the bridge structure is proposed to be supported on pile supported stub abutments.

8.1 Approach Embankment and Slab

As per bridge plans and cross sections prepared by MAI dated March 14, 2011, it is understood that the new embankment fill up to 22.5 feet will be placed behind the east abutment and 3 and 5.5 feet of new fill will be placed behind the west abutment.

8.1.1 Settlement

Because the relative high embankment planned on the east side, we performed settlement evaluation for the new embankment to be placed behind the at east abutment. A computer program FoSSA v2.0 (Foundation Stress and Settlement Analysis) was used for assessing stresses and settlements under embankment. Soil parameters required for elastic settlement evaluation and for consolidation settlement analysis were estimated from the soil index properties using various well known published correlations. We estimate settlement of the embankment at the east abutment is on the order of 2 inches, approximately 1.1 inches from the granular soils and 0.9 inches from the cohesive soils. The total settlement at the west abutment is anticipated to be less than 0.4 inches.

The elastic (immediate) settlement of the granular soils and consolidation (long-term) settlement of the cohesive soil layers are expected to occur. Most of the settlement is expected to be occurring at the same rate as the construction of the embankment progresses. We estimate that by end of embankment construction at the east abutment, the remaining foundation settlement to be about 0.4 inches. There will be negligible downdrag on the piles. We did not consider any allowances for the downdrag loads on the piles. We recommend that the pile installation and pavement construction for the roadway should be delayed as much as possible after construction completion of the approach embankment. This requirement should be included in the project construction contract.

8.1.2 Global Stability

The global stability of the side and end slopes were analyzed based on the subsurface soil conditions encountered in the borings and the slope information provided in the TSL. The side and end slopes were considered at 3:1 (H:V) and 2:1(H:V), respectively. Analyses were performed with SLIDE v5 computer software. The minimum FOS calculated are 1.63 for side slopes at the east abutment, 3.51 for the end slope and 4.39 for the side slope at the west abutment greater than the IDOT required FOS of 1.5. Therefore, we recommend a slope of 2:1(H:V) or flatter with slope surface protection. Details of the Global Stability Analysis with the critical failure surfaces and results are presented in Appendix C.

8.2 Structure Foundations

Wang has evaluated various possible foundation types that can be considered for the support of the proposed bridge structure. As per IDOT Bridge Manual (IDOT 2009), the completely new bridge structure should be designed following AASHTO LRFD Bridge Design Specifications.

A shallow foundation consisting of spread footing would not be suitable considering the low soil bearing capacity and potential differential settlement concern between the substructures. Due to variable nature of the soil conditions, we do not recommend considering drilled shafts established in soil. Foundation system consisting of drilled shafts socketed into the bedrock can be considered, however, it may not be economical compare to driven piles. It is our opinion that a driven pile foundation system will be appropriate to support the substructures. The most economical pile size should be selected.

8.2.1 Scour Considerations

If the bottoms of the substructures are established at design scour elevations, no reduction in the design scour amount for the foundation design will be required. As per TSL plans, the design high water elevation (DHWE) is 729.21 feet and the streambed elevation is 716.0 feet. Estimated Water Surface Elevation (EWSE) was not available at the time of this report. The design scour elevations as per TSL plan are shown in the Table 4. Based on the soil conditions, we do not recommend any reductions in the final design scour amount.

Table 4: Design Scour Elevations

Substructure	Design Scour Elevation (feet)
West Abutment	762.12
Pier 1	751.63
Pier 2	719.87
Pier 3	718.49
Pier 4	718.91
Pier 5	721.74
Pier 6	719.85
Pier 7	724.47
East Abutment	741.25

8.2.2 Downdrag Loads

We recommend that the piles should be installed in precored holes though the new embankment fills to avoid the downdrag load due to settlement occurring from within the new embankment fill. The bottom of the precored hole should be as shown in Table 5.

Table 5: Precored Holes Depth

Substructure	West Abutment	East Abutment
Bottom of Precored Hole Elevation (feet)	770.5 Eastbound 767.5 Westbound	741.0 Eastbound 741.5 Westbound

The sections of the pile through the precored holes in the newly placed embankment were not considered in providing vertical pile load carrying capacity. Precoring is recommended to avoid downdrag load on piles due to settlement of the newly placed embankment fill.

8.2.3 Driven Piles

Driving metal shell cast-in-place (MSCIP) piles through very dense granular soils will be difficult and could damage the pile toe and cause deformation at the pile head. Therefore, we do not recommend MSCIP concrete piles for the substructures. We recommend driven H-piles foundation be considered. Several H-piles sections for the foundations should be considered. Driven H-pile foundations could be designed for various capacities. The pile capacity will be developed in skin friction between the pile surface and the soils above the tip with some end bearing capacity at the tip.

Based on borings information, the top of the bedrock range from approximate Elevations 654.8 to 658.3 feet, except at the east abutment is anticipated to be at approximate Elevation 665.0 feet. Thus the pile length from the bottom of the pile cap to top of the bedrock would range from 95 to 105 feet for the abutments and 65 to 95 feet for the piers. We estimated that driving H-piles to top of bedrock will not be necessary because the Maximum Required Bearing (NRB) will be obtained before reaching top of the bedrock for most of the piles.

The estimated pile lengths at each substructure for various pile sizes and capacities are shown in Table 6 through Table 9. Pile capacities other than shown in the tables can be provided if required during the design.

Table 6: Estimated Pile Lengths and Tip Elevations for HP12x53 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
West Abutment (S-092 and	762.12	200	110	28	735.1
		220	121	31	732.1

Table 6: Estimated Pile Lengths and Tip Elevations for HP12x53 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
S-093)		240	132	33	730.1
		260	143	35	728.1
		280	154	37	726.1
		300	165	39	724.1
		320	176	42	721.1
		340	187	44	719.1
		360	198	47	716.1
		380	209	49	714.1
		400	220	52	711.1
		419	230	55	708.1
Pier 1 (S-094 and S-095)	744.63	200	110	26	719.6
		220	121	29	716.6
		240	132	31	714.6
		260	143	34	711.6
		280	154	36	709.6
		300	165	39	706.6
		320	176	42	703.6
		340	187	45	700.6
		360	198	47	698.6
		380	209	49	696.6
		400	220	52	693.6
		419	230	54	691.6

Table 6: Estimated Pile Lengths and Tip Elevations for HP12x53 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
Pier 2 (S-096 and S-097)	720.28	200	110	13	708.3
		220	121	14	707.3
		240	132	15	706.3
		260	143	16	705.3
		280	154	17	704.3
		300	165	19	702.3
		320	176	20	701.3
		340	187	23	698.3
		360	198	25	696.3
		380	209	28	693.3
		400	220	30	691.3
		419	230	32	689.3
Pier 3 (S-098 and S-099)	719.4	200	110	14	706.4
		220	121	15	705.4
		240	132	19	701.4
		260	143	21	699.4
		280	154	23	697.4
		300	165	25	695.4
		320	176	26	694.4
		340	187	28	692.4
		360	198	30	690.4
		380	209	32	688.4
		400	220	34	686.4

Table 6: Estimated Pile Lengths and Tip Elevations for HP12x53 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		419	230	36	684.4
Pier 4 (S-100 and S-101)	719.53	200	110	19	701.5
		220	121	22	698.5
		240	132	24	696.5
		260	143	26	694.5
		280	154	27	693.5
		300	165	29	691.5
		320	176	31	689.5
		340	187	32	688.5
		360	198	35	685.5
		380	209	37	683.5
		400	220	39	681.5
		419	230	41	679.5
Pier 5 (S-102 and S-103)	722.36	200	110	13	710.4
		220	121	19	704.4
		240	132	22	701.4
		260	143	25	698.4
		280	154	36	687.4
		300	165	39	684.4
		320	176	42	681.4
		340	187	44	679.4
		360	198	46	677.4

Table 6: Estimated Pile Lengths and Tip Elevations for HP12x53 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		380	209	48	675.4
		400	220	50	673.4
		419	230	52	671.4
Pier 6 (S-104 and S-105)	720.47	200	110	5	716.5
		220	121	6	715.5
		240	132	6	715.5
		260	143	6	715.5
		280	154	7	714.5
		300	165	7	714.5
		320	176	8	713.5
		340	187	9	712.5
		360	198	11	710.5
		380	209	11	710.5
		400	220	12	709.5
		419	230	12	709.5
Pier 7 (S-106 and S-107)	725.09	200	110	12	714.1
		220	121	13	713.1
		240	132	14	712.1
		260	143	14	712.1
		280	154	16	710.1
		300	165	16	710.1
		320	176	19	707.1

Table 6: Estimated Pile Lengths and Tip Elevations for HP12x53 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		340	187	23	703.1
		360	198	25	701.1
		380	209	27	699.1
		400	220	29	697.1
		419	230	32	694.1
East Abutment (S-108 and S-109)	741.25	200	110	21	721.3
		220	121	23	719.3
		240	132	32	710.3
		260	143	34	708.3
		280	154	36	706.3
		300	165	38	704.3
		320	176	39	703.3
		340	187	40	702.3
		360	198	41	701.3
		380	209	43	699.3
		400	220	45	697.3
		419	230	46	696.3

Table 7: Estimated Pile Lengths and Tip Elevations for HP12x63 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
West Abutment (S-092 and S-093)	762.12	280	154	37	726.1
		300	165	39	724.1
		320	176	41	722.1
		340	187	44	719.1
		360	198	46	717.1
		380	209	49	714.1
		400	220	51	712.1
		420	231	54	709.1
		440	242	57	706.1
		460	253	61	702.1
		480	264	63	700.1
		497	273	65	698.1
Pier 1 (S-094 and S-095)	744.63	280	154	36	709.6
		300	165	38	707.6
		320	176	41	704.6
		340	187	44	701.6
		360	198	47	698.6
		380	209	49	696.6
		400	220	51	694.6
		420	231	53	692.6
		440	242	55	690.6
		460	253	58	687.6

Table 7: Estimated Pile Lengths and Tip Elevations for HP12x63 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		480	264	60	685.6
		497	273	62	683.6
Pier 2 (S-096 and S-097)	720.28	280	154	17	704.3
		300	165	19	702.3
		320	176	20	701.3
		340	187	23	698.3
		360	198	25	696.3
		380	209	27	694.3
		400	220	29	692.3
		420	231	31	690.3
		440	242	33	688.3
		460	253	35	686.3
		480	264	38	683.3
		497	273	39	682.3
Pier 3 (S-098 and S-099)	719.4	280	154	22	698.4
		300	165	24	696.4
		320	176	26	694.4
		340	187	28	692.4
		360	198	30	690.4
		380	209	32	688.4
		400	220	34	686.4
		420	231	35	685.4
		440	242	37	683.4

Table 7: Estimated Pile Lengths and Tip Elevations for HP12x63 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		460	253	38	682.4
		480	264	40	680.4
		497	273	41	679.4
Pier 4 (S-100 and S-101)	719.53	280	154	27	693.5
		300	165	29	691.5
		320	176	30	690.5
		340	187	32	688.5
		360	198	34	686.5
		380	209	37	683.5
		400	220	39	681.5
		420	231	41	679.5
		440	242	42	678.5
		460	253	44	676.5
		480	264	46	674.5
		497	273	47	673.5
Pier 5 (S-102 and S-103)	722.36	280	154	35	688.4
		300	165	38	685.4
		320	176	41	682.4
		340	187	44	679.4
		360	198	46	677.4
		380	209	48	675.4
		400	220	50	673.4

Table 7: Estimated Pile Lengths and Tip Elevations for HP12x63 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		420	231	52	671.4
		440	242	54	669.4
		460	253	56	667.4
		480	264	57	666.4
		497	273	59	664.4
Pier 6 (S-104 and S-105)	720.47	280	154	7	714.5
		300	165	7	714.5
		320	176	8	713.5
		340	187	8	713.5
		360	198	12	709.5
		380	209	14	707.5
		400	220	16	705.5
		420	231	19	702.5
		440	242	22	699.5
		460	253	26	695.5
		480	264	30	691.5
		497	273	32	689.5
Pier 7 (S-106	725.09	280	154	16	710.1
		300	165	16	710.1
		320	176	17	709.1
		340	187	23	703.1
		360	198	24	702.1

Table 7: Estimated Pile Lengths and Tip Elevations for HP12x63 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
and S-107)		380	209	27	699.1
		400	220	29	697.1
		420	231	31	695.1
		440	242	34	692.1
		460	253	35	691.1
		480	264	36	690.1
		497	273	38	688.1
East Abutment (S-108 and S-109)	741.25	280	154	36	706.3
		300	165	37	705.3
		320	176	39	703.3
		340	187	40	702.3
		360	198	41	701.3
		380	209	43	699.3
		400	220	44	698.3
		420	231	46	696.3
		440	242	47	695.3
		460	253	49	693.3
		480	264	51	691.3
		497	273	52	690.3

Table 8: Estimated Pile Lengths and Tip Elevations for HP14x73 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
West Abutment (S-092 and S-093)	762.12	360	198	40	723.1
		380	209	41	722.1
		400	220	44	719.1
		420	231	46	717.1
		440	242	48	715.1
		460	253	50	713.1
		480	264	52	711.1
		500	275	55	708.1
		520	286	58	705.1
		540	297	60	703.1
		560	308	62	701.1
		578	318	64	699.1
Pier 1 (S-094 and S-095)	744.63	360	198	39	706.6
		380	209	42	703.6
		400	220	44	701.6
		420	231	46	699.6
		440	242	48	697.6
		460	253	50	695.6
		480	264	52	693.6
		500	275	54	691.6
		520	286	55	690.6
		540	297	57	688.6
		560	308	59	686.6

Table 8: Estimated Pile Lengths and Tip Elevations for HP14x73 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		578	318	61	684.6
Pier 2 (S-096 and S-097)	720.28	360	198	19	702.3
		380	209	20	701.3
		400	220	22	699.3
		420	231	24	697.3
		440	242	27	694.3
		460	253	28	693.3
		480	264	30	691.3
		500	275	32	689.3
		520	286	33	688.3
		540	297	35	686.3
		560	308	37	684.3
		578	318	39	682.3
Pier 3 (S-098 and S-099)	719.4	360	198	25	695.4
		380	209	26	694.4
		400	220	28	692.4
		420	231	29	691.4
		440	242	31	689.4
		460	253	32	688.4
		480	264	34	686.4
		500	275	35	685.4
		520	286	37	683.4
		540	297	38	682.4
		560	308	39	681.4

Table 8: Estimated Pile Lengths and Tip Elevations for HP14x73 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		578	318	41	679.4
Pier 4 (S-100 and S-101)	719.53	360	198	29	691.5
		380	209	30	690.5
		400	220	32	688.5
		420	231	34	686.5
		440	242	36	684.5
		460	253	38	682.5
		480	264	39	681.5
		500	275	41	679.5
		520	286	42	678.5
		540	297	44	676.5
		560	308	45	675.5
		578	318	46	674.5
Pier 5 (S-102 and S-103)	722.36	360	198	39	684.4
		380	209	41	682.4
		400	220	44	679.4
		420	231	45	678.4
		440	242	47	676.4
		460	253	49	674.4
		480	264	50	673.4
		500	275	52	671.4
		520	286	54	669.4
		540	297	55	668.4

Table 8: Estimated Pile Lengths and Tip Elevations for HP14x73 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		560	308	57	666.4
		578	318	58	665.4
Pier 6 (S-104 and S-105)	720.47	360	198	7	714.5
		380	209	8	713.5
		400	220	8	713.5
		420	231	10	711.5
		440	242	11	710.5
		460	253	12	709.5
		480	264	17	704.5
		500	275	19	702.5
		520	286	24	697.5
		540	297	25	696.5
		560	308	29	692.5
		578	318	31	690.5
Pier 7 (S-106 and S-107)	725.09	360	198	16	710.1
		380	209	17	709.1
		400	220	22	704.1
		420	231	24	702.1
		440	242	25	701.1
		460	253	28	698.1
		480	264	30	696.1
		500	275	32	694.1
		520	286	33	693.1

Table 8: Estimated Pile Lengths and Tip Elevations for HP14x73 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		540	297	35	691.1
		560	308	36	690.1
		578	318	37	689.1
East Abutment (S-108 and S-109)	741.25	360	198	37	705.3
		380	209	38	704.3
		400	220	39	703.3
		420	231	41	701.3
		440	242	42	700.3
		460	253	43	699.3
		480	264	44	698.3
		500	275	46	696.3
		520	286	47	695.3
		540	297	49	693.3
		560	308	50	692.3
		578	318	52	690.3

Table 9: Estimated Pile Lengths and Tip Elevations for HP14x89 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
West Abutment (S-092 and S-093)	762.12	440	242	47	716.1
		460	253	49	714.1
		480	264	51	712.1

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Table 9: Estimated Pile Lengths and Tip Elevations for HP14x89 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		500	275	54	709.1
		520	286	57	706.1
		540	297	59	704.1
		560	308	62	701.1
		580	319	64	699.1
		600	330	66	697.1
		620	341	68	695.1
		640	352	70	693.1
		660	363	72	691.1
		680	374	74	689.1
		705	388	76	687.1
Pier 1 (S-094 and S-095)	744.63	440	242	48	697.6
		460	253	49	696.6
		480	264	51	694.6
		500	275	53	692.6
		520	286	55	690.6
		540	297	57	688.6
		560	308	58	687.6
		580	319	60	685.6
		600	330	62	683.6
		620	341	63	682.6
		640	352	64	681.6
		660	363	64	681.6

Table 9: Estimated Pile Lengths and Tip Elevations for HP14x89 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		680	374	65	680.6
		705	388	65	680.6
Pier 2 (S-096 and S-097)	720.28	440	242	26	695.3
		460	253	28	693.3
		480	264	29	692.3
		500	275	31	690.3
		520	286	33	688.3
		540	297	35	686.3
		560	308	36	685.3
		580	319	38	683.3
		600	330	40	681.3
		620	341	42	679.3
		640	352	43	678.3
		660	363	45	676.3
		680	374	47	674.3
		705	388	49	672.3
Pier 3 (S-098 and S-099)	719.4	440	242	31	689.4
		460	253	32	688.4
		480	264	34	686.4
		500	275	35	685.4
		520	286	36	684.4
		540	297	38	682.4
		560	308	39	681.4
		580	319	40	680.4

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Table 9: Estimated Pile Lengths and Tip Elevations for HP14x89 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		600	330	41	679.4
		620	341	42	678.4
		640	352	43	677.4
		660	363	44	676.4
		680	374	45	675.4
		705	388	46	674.4
Pier 4 (S-100 and S-101)	719.53	440	242	35	685.5
		460	253	37	683.5
		480	264	39	681.5
		500	275	40	680.5
		520	286	42	678.5
		540	297	43	677.5
		560	308	45	675.5
		580	319	46	674.5
		600	330	47	673.5
		620	341	48	672.5
		640	352	50	670.5
		660	363	51	669.5
		680	374	52	668.5
		705	388	53	667.5
		440	242	46	677.4
		460	253	48	675.4
		480	264	50	673.4

Table 9: Estimated Pile Lengths and Tip Elevations for HP14x89 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
Pier 5 (S-102 and S-103)	722.36	500	275	52	671.4
		520	286	53	670.4
		540	297	55	668.4
		560	308	56	667.4
		580	319	58	665.4
		600	330	59	664.4
		620	341	61	662.4
		640	352	62	661.4
		660	363	63	660.4
		680	374	64	659.4
		705	388	65	658.4
Pier 6 (S-104 and S-105)	720.47	440	242	11	710.5
		460	253	14	707.5
		480	264	16	705.5
		500	275	19	702.5
		520	286	21	700.5
		540	297	25	696.5
		560	308	28	693.5
		580	319	30	691.5
		600	330	33	688.5
		620	341	35	686.5
		640	352	36	685.5
		660	363	38	683.5

Table 9: Estimated Pile Lengths and Tip Elevations for HP14x89 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		680	374	40	681.5
		705	388	42	679.5
Pier 7 (S-106 and S-107)	725.09	440	242	25	701.1
		460	253	27	699.1
		480	264	29	697.1
		500	275	31	695.1
		520	286	33	693.1
		540	297	34	692.1
		560	308	36	690.1
		580	319	37	689.1
		600	330	38	688.1
		620	341	39	687.1
		640	352	40	686.1
		660	363	42	684.1
		680	374	43	683.1
		705	388	45	681.1
East Abutment (S-109 and S-109)	741.25	440	242	41	701.3
		460	253	43	699.3
		480	264	44	698.3
		500	275	45	697.3
		520	286	47	695.3
		540	297	48	694.3
		560	308	50	692.3

Table 9: Estimated Pile Lengths and Tip Elevations for HP14x89 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		580	319	51	691.3
		600	330	53	689.3
		620	341	54	688.3
		640	352	56	686.3
		660	363	57	685.3
		680	374	59	683.3
		705	388	62	680.3

The soil immediately below the pile cap should not be considered as carrying any vertical load. The estimated lengths shown in the tables include one foot of embedment into the pile cap footing. The base of all pile footings should be established at a minimum depth of 4 feet below the finished grade for frost protection.

The most economical pile sizes should be selected. Precoring through embankment fill is recommended to avoid downdrag load on the piles and is discussed in the earlier section of the report. The maximum structural design capacity of the pile and the spacing should be as per IDOT Bridge Manual (IDOT 2009). One test pile should be identified on the plans at each substructure (total of 9 for the bridge structure) which should be installed prior to production pile installation. There is no need for a full scale load test. We recommend that the piles be installed with pile shoes.

8.2.4 Pile Resistance to Lateral Loads

Lateral loads on piles should be analyzed for maximum moments and lateral deflections. The geotechnical resistance factor of 1.0 should be used. No allowance should be made for the frictional resistance of the cap concrete on soil. The required lateral capacity can be obtained by increasing the pile size and/or number of piles. Battered piles can be considered to resist the lateral loads. The lateral load capacity analysis can be performed using computer program such as COMP 624P, L-pile, LATPILE or any other such program. The estimated soil parameters that may be used for the analysis of stresses and deflection under lateral loads are presented in Table 10. Group action should be considered in calculating total lateral load resistance of the substructures.

Table 10: Recommended Soil Parameters for Lateral Load Pile Analysis

Soil Type (Layer)	Total Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, Φ (°)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
Very Loose Sand (Pre-core fill for abutment piles)	115	0	28	10	--
Medium Stiff Cohesive Soils (Qu 0.5 to 0.99 tsf)	120	750	0	100	1
Stiff Cohesive Soils (Qu 1.0 to 1.99 tsf)	120	1500	0	500	0.7
Very Stiff Cohesive Soils (Qu 2.0 to 3.99 tsf)	120	2500	0	750	0.6
Hard Cohesive Soils (Qu > 4.0 tsf)	125	4500	0	2000	0.45
Loose Granular Soils (N 4 to 9)	115	0	32	20	--
Medium Dense Granular Soils (N 10 to 29)	120	0	33	60	--
Dense Granular Soils (N 30 to 49)	125	0	35	120	--
Very Dense Granular Soils (N ≥ 50)	130	0	38	200	--

8.3 Stage Construction Considerations

Wang does not anticipate the need of temporary support because the bridge will be constructed in one stage. If any changes to the road closure or construction staging are made, Wang should be notified to provide revised recommendations.

9.0 CONSTRUCTION CONSIDERATIONS

9.1 Site Preparation

All vegetation, surface topsoil, and debris should be cleared and stripped where approach embankment fills and bridge substructures will be placed. The exposed subgrade should be proofrolled. To aid in locating unstable and unsuitable materials, the proofrolling should be observed by a qualified engineer. Any unstable or unsuitable materials should be removed and replaced with compacted structural fill as described in Section 9.3.

9.2 Excavation and Utilities

Excavations should be performed in accordance with local, State, and federal regulations. The potential effect of ground movements upon nearby utilities should be considered during construction.

No utility conflicts were identified that would impact the foundation design. However, the Contractor should ensure there are no utility conflicts with the final design and construction program.

9.3 Filling and Backfilling

Embankment fill required to attain the final design subgrade elevations should be in accordance with Section 205 of the IDOT Standard Specifications (IDOT 2007). All fill and backfill materials should be pre-approved by the site engineer. The fill should be free of organic materials and debris. The backfill behind the abutments should be in accordance with IDOT Bridge Manual (IDOT 2009).

Embankments should be constructed as early as possible in the project construction period in order to allow the embankments to adjust or settle under their own weight as much as possible prior to piles installation for the abutments. The piles installation should be delayed as much as possible after completion of the embankments to their full design heights.

9.4 Earthwork Operations

The required earthwork can be accomplished with conventional construction equipment. Moisture and traffic will cause deterioration of exposed subgrade soils. Precautions should be taken by the contractor to prevent water erosion of the exposed subgrade. A compacted subgrade will minimize water runoff erosion. Earth moving operations should be scheduled to not coincide with excessive cold or wet weather (early spring, late fall or winter). Any soil allowed to freeze or soften due to the standing water should be removed. Wet weather can cause problems with subgrade compaction. It is recommended that an experienced geotechnical engineer be retained to inspect the exposed subgrade, monitor earthwork operations, and provide material inspection services during the construction phase of this project.

9.5 Pile Installation

Piles should be installed in accordance with Section 512 of the IDOT Standard Specifications and Special Provisions. The length of the test pile should be at least 10 feet longer than the estimated length of the piles. The diameter of the precored hole should be 20" and 24" for the H-pile size of 12-inch and 14-inch sections respectively. The holes should be preaugered or precored for piles which are to be driven through dense to very dense granular soils containing cobbles and boulders. The boring logs show depths of dense to very dense granular soils and containing cobbles and boulders. The depth to preauger or precored hole should be based on the contractor's means and method.

9.6 Cofferdam

As per TSL Plans, pier will be a pile bent supported on three rows of piles and water at the project site is expected to be less than 10 feet deep. Therefore cofferdam and seal coat will not be necessary for construction of the river pier. Excavation required can be performed in accordance with IDOT Special Provision "Underwater Structure Excavation Protection". Cofferdams will be required if the pile supported footings are 10 feet or more below Estimated Water Surface Elevation (EWSE). EWSE was not available at the time of this report.

10.0 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 Exhibits 4 and 5. 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 the bridge are planned, we should be timely informed so that our recommendations can be adjusted accordingly.

It has been a pleasure to assist McDonough Associates Inc. 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.

Mohammed A. Kothawala, P.E., D.GE
Senior Geotechnical Engineer

Jerry W.H. Wang, PhD., P.E.
Principal

REFERENCES

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Bardet, J.-P., 1997, Experimental Soil Mechanics, Prentice-Hall, Inc.

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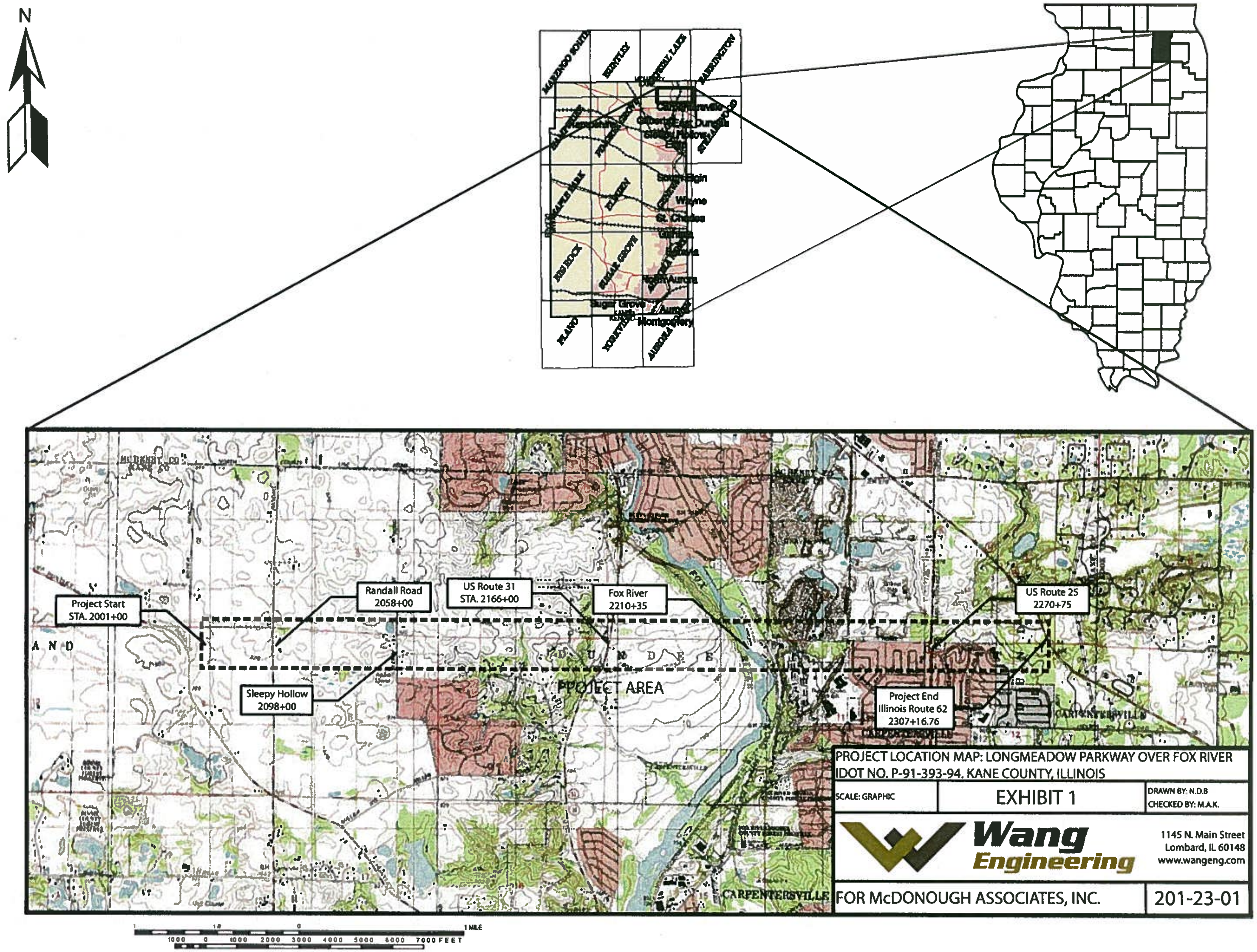
ISGS May 2000. *Directory of Coal Mines in Illinois, La Salle County*. ISGS.

EXHIBITS



PROJECT LOCATION MAP: LONGMEADOW PARKWAY OVER FOX RIVER
IDOT NO. P-91-393-94. KANE COUNTY, ILLINOIS

SCALE: GRAPHIC

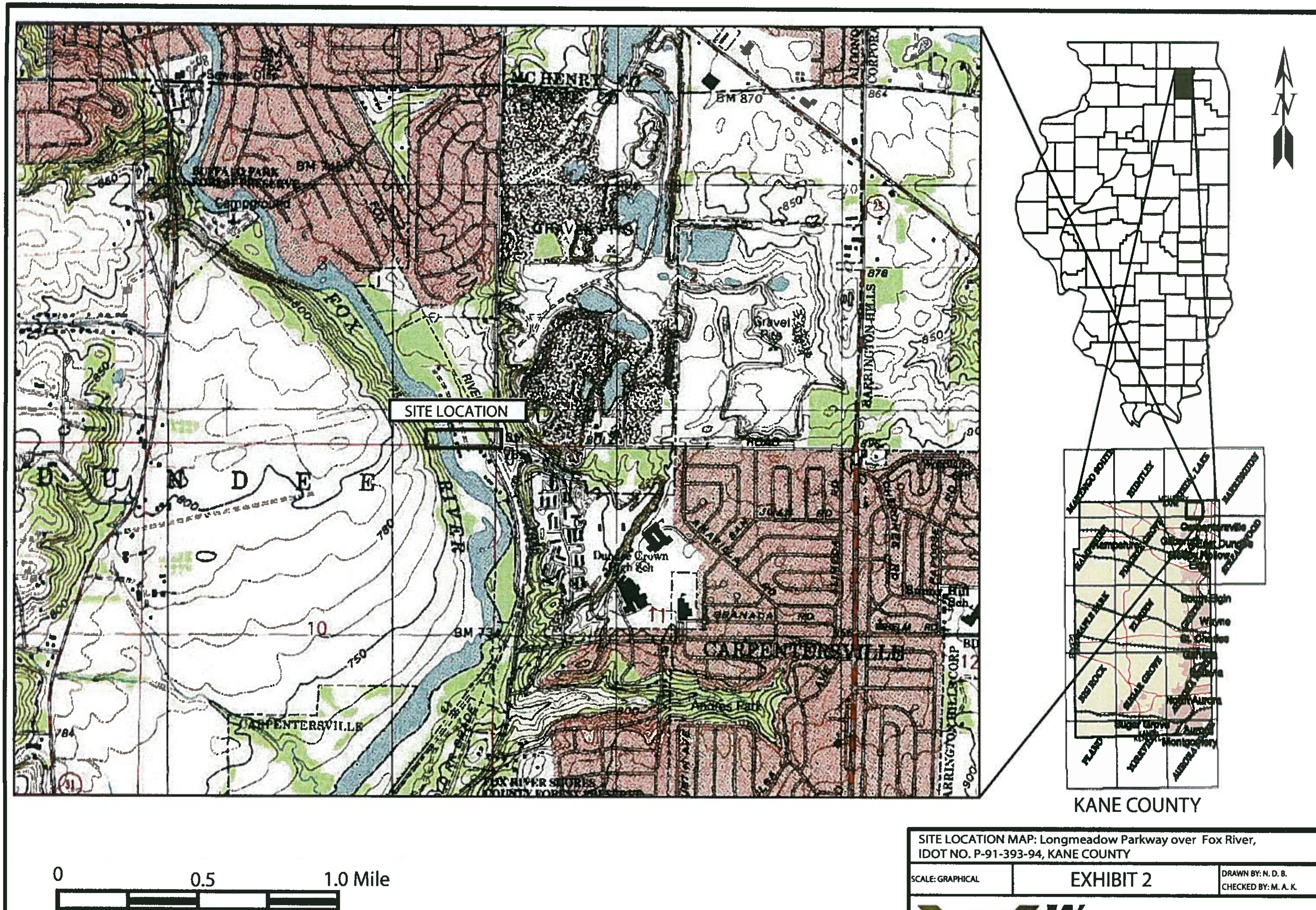
EXHIBIT 1

DRAWN BY: N.D.B
CHECKED BY: M.A.K.

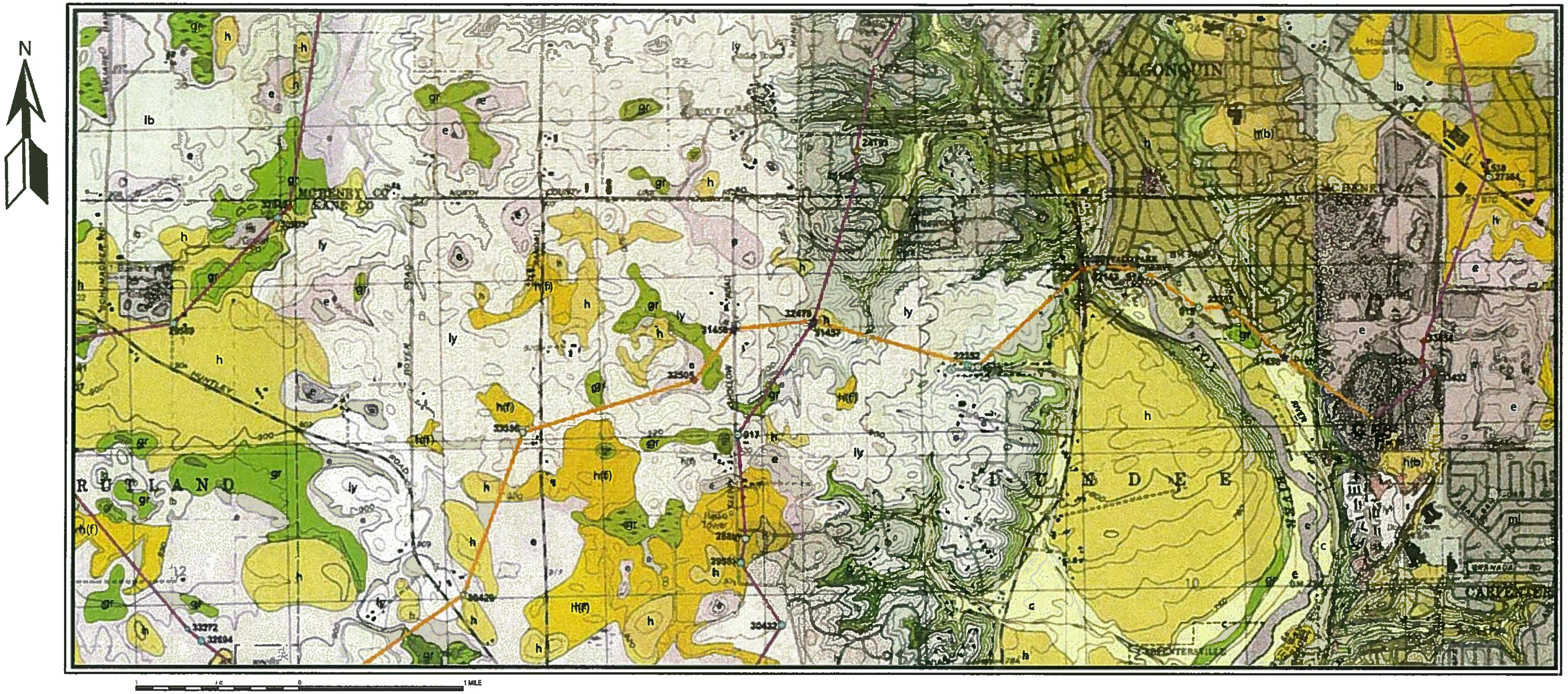
Wang Engineering
1145 N. Main Street
Lombard, IL 60148
www.wangeng.com

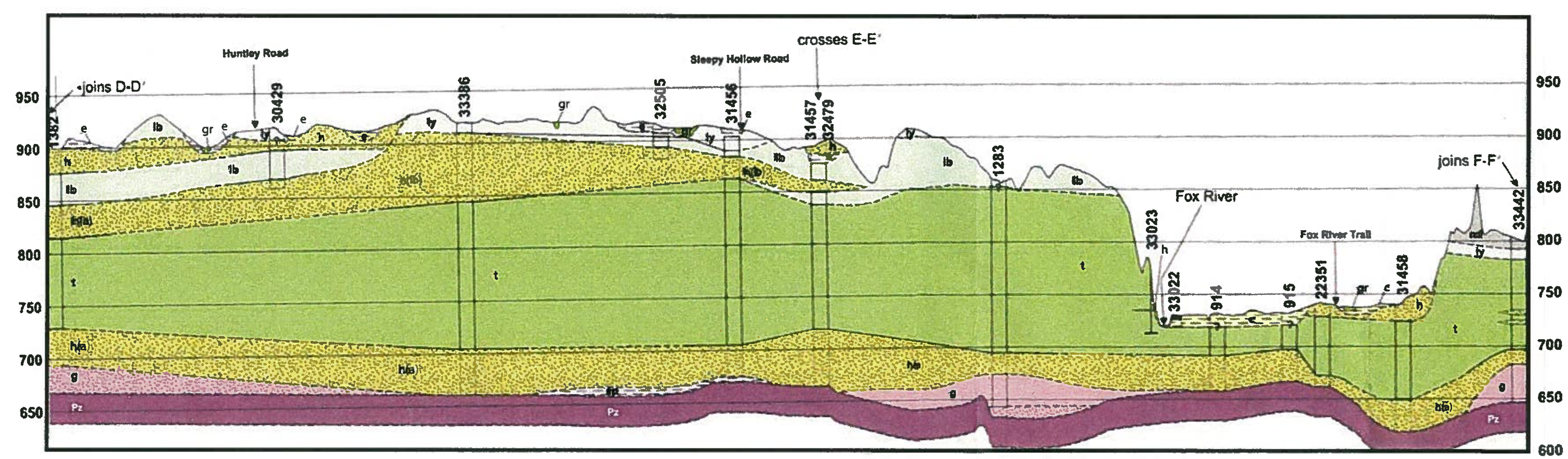
FOR McDONOUGH ASSOCIATES, INC.

201-23-01

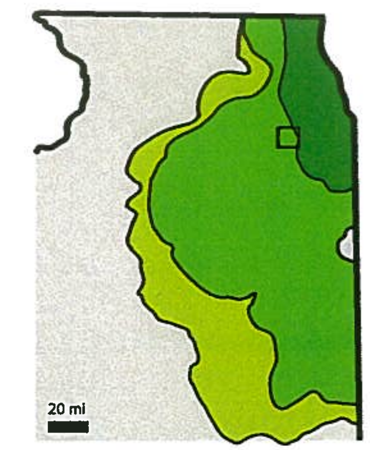


SITE LOCATION MAP: Longmeadow Parkway over Fox River, IDOT NO. P-91-393-94, KANE COUNTY		
SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: N. D. B. CHECKED BY: M. A. K.
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR MCDONOUGH ASSOCIATES, INC.		201-23-01





REGIONAL GEOLOGY



Wedron Group

- Wadsworth Formation
- Lemont Formation
- Tiskilwa Formation

Modified after Hansel and Johnson (1996)

LITHOGRAPHIC UNITS

Quarternary Deposits

ml — Made land

Hudson Episode (postglacial)

gr — **Grayslake Peat**
Peat and muck; including interbedded sand, silty clay, and marl.
Decomposed wetland vegetation and sediment.

c — **Cahokia Formation**
Sand and gravel, well-sorted sand, and lenses of peat adjacent to streams, grading laterally to organic-rich, fossiferous silt and clay
Floodplain sediment.

Hudson and Wisconsin Episode

e, ep — **Equality Formation, Mason Group**
Slit, clay, and fine sand; layered to massive; fossiliferous in many places.
Lake deposits in kettles and some valleys tributary to the fox river.

Wisconsin Episode

h — **Henry Formation, Mason Group**
Sand and gravel, or sand; contains lenses of silt and clay, or diamiction
Outwash Deposits along valleys and beyond former glacier margins.

h(f) — **Henry Formation (fine facies), Mason Group**
Fine to medium sand; uniform to layered; with lenses of fossillierous silt and loam diamiction at base. Lake sediment; slope deposits.

lh — **Haeger Member, Lemont Formation, Wedron Group**
Diamiction, sandy loam to loam; dolomite rich; includes lenses and layers of sand and gravel.
Till and debris flow deposits.

ly — **Yorkville Member, Lemont Formation, Wedron Group**
Diamicton' silty clay, silty clay loam, and clay with thick lenses of sand and gravel
Till and debris flow deposits where surficial; proglacial
lake sediment and till where burried by the Haegar Member

lb — **Batestown Member, Lemont Formation, Wedron Group**
Sandy loam to loam with abundant cobbles; includes continuous layers of sand and gravel
Till and debris flow deposits.

h(b) — **Henry Formation, Mason Group**
Assigned to the Beverly Tongue (hb) where buried by the tne Haeger Member.

t — **Tiskilwa Formation**
Diamicton; loam to clay loam with lenses of sand and gravel.
Till and debris flow deposits.

h(a) — **Henry Formation, Mason Group**
Assigned to the Ashmore Tongue where burried by the Tiskilwa Formation.

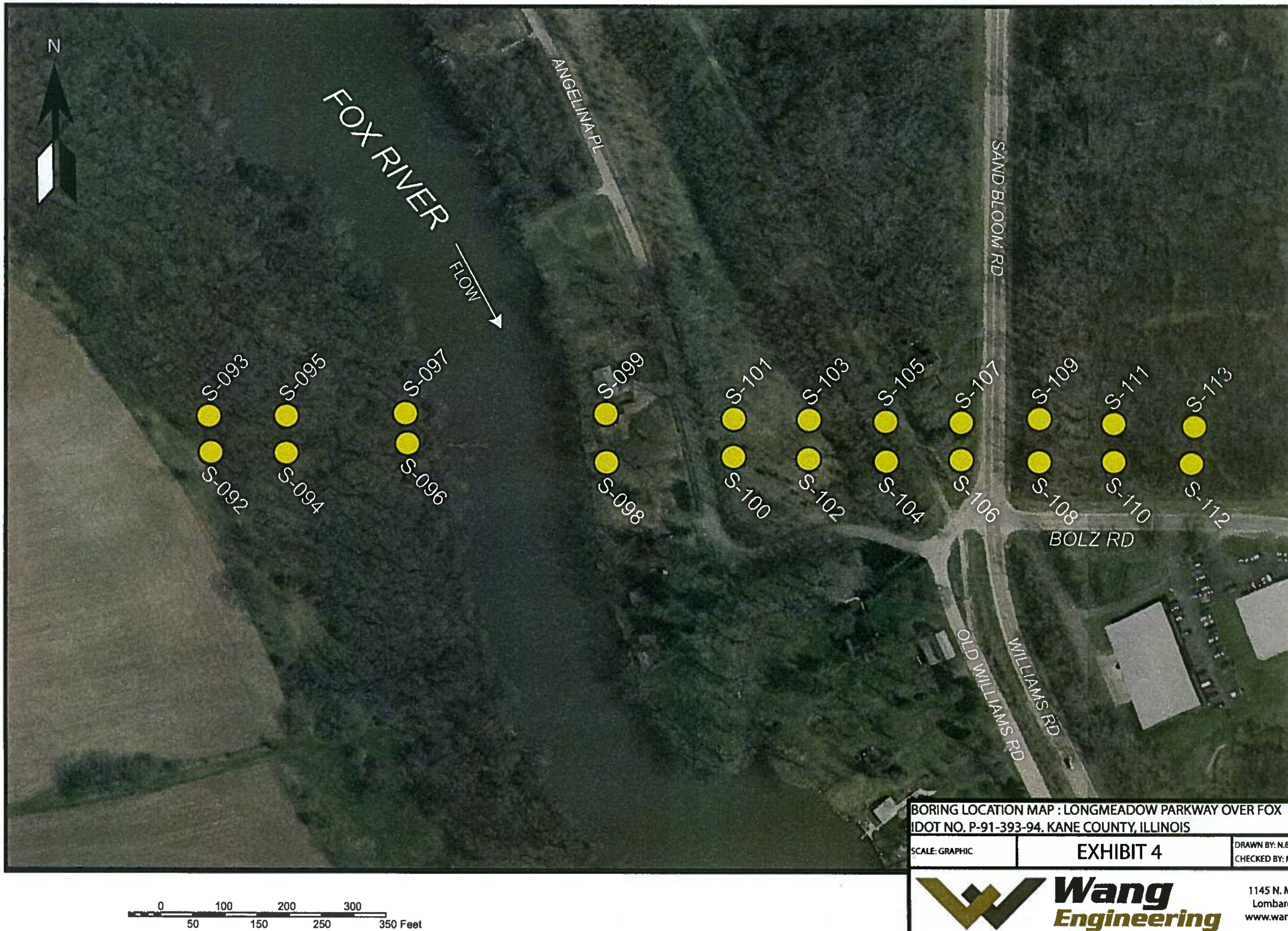
Illinois Episode

g — **Glasford Formation**
Diamicton; loam to sandy loam, bouldery with abundant lenses of coarse sand and gravel.
Till and debris flow deposits, outwash and lacustrine sediments.

Paleozoic Bedrock

Pz — **Kankakee and Joliet Formations (Silurian); Maquoketa Group**
Dolomite with chert lenses; gray to yellowish brown, fossiliferous, vuggy; also shaly dolomite and brown shale.

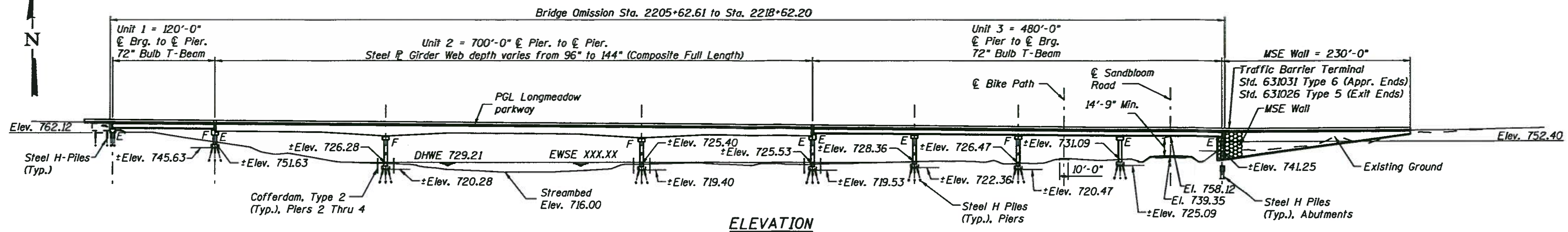
SITE AND REGIONAL GEOLOGY: LONGMEADOW PARKWAY OVER FOX RIVER. IDOT NO. P-91-393-94. KANE COUNTY, ILLINOIS		
SCALE: GRAPHIC	EXHIBIT 3	DRAWN BY: N.O.B CHECKED BY: M.A.K.
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR McDONOUGH ASSOCIATES, INC.		201-23-01



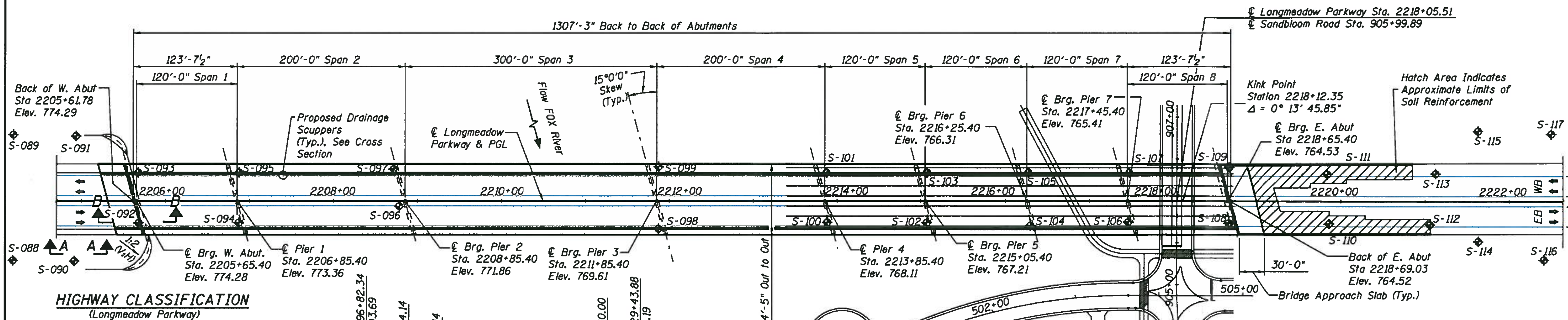
BORING LOCATION MAP : LONGMEADOW PARKWAY OVER FOX RIVER IDOT NO. P-91-393-94. KANE COUNTY, ILLINOIS		
SCALE: GRAPHIC	EXHIBIT 4	DRAWN BY: N.B.D. CHECKED BY: M.A.K.
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR McDONOUGH ASSOCIATES, INC.		201-23-01

Bench Mark: Chis. " □ " S.E. COR. CONC. SLAB.
The INT. of ILL. 31 and Miller Rd. go N. 0.9 MI ± to Mark.
Elev. 806.34

Existing Structure: None



ELEVATION



PLAN

HIGHWAY CLASSIFICATION

(Longmeadow Parkway)
Functional Class: Minor Arterial
ADT: 30,000 (2040)
ADTT: 1,200 (2020)
DHV: 2,400 (2040)
Design Speed: 50 m.p.h.
Posted Speed: 45 m.p.h.
Two-Way Traffic
Directional Distribution: 50/50

LOADING HL-93

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

DESIGN SPECIFICATIONS

2010 AASHTO LRFD Bridge Design Specifications Including 2010 Interims

DESIGN STRESSES

FIELD UNITS

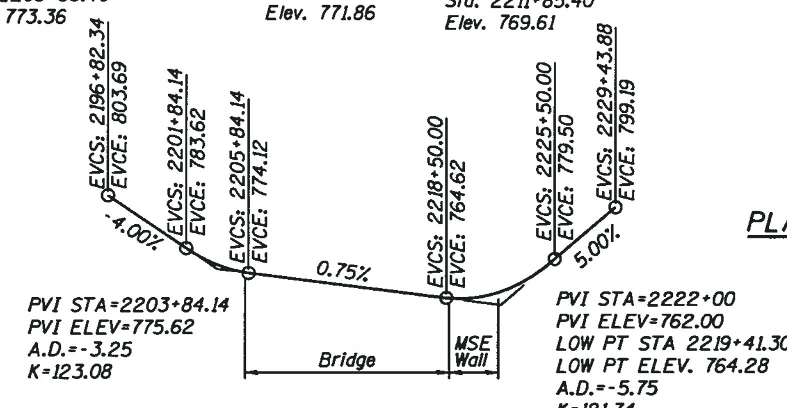
f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

PRECAST PRESTRESSED UNITS

f'c = 6,000 psi
fpu = 270,000 psi (low lax. strands)

SEISMIC DATA

Seismic Performance Zone (SPZ)=1
Design Spectral Acceleration at 1.0 sec. (S_{D1})=8.2
Design Spectral Acceleration at 0.2 sec. (S_{DS})=14.4
Soil Site Class = D



PROFILE GRADE

(Along Longmeadow Parkway)

LEGEND

◈ Soil Boring Location

WATERWAY INFORMATION

Drainage Area = 1364 sq. mi. Low Grade Elev. n/a ● n/a

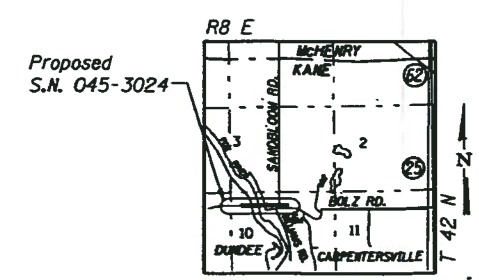
Flood	Freq. Yr.	Q C.F.S.	Opening Sq. Ft. Exist.	Opening Sq. Ft. Prop.	Nat. H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
	10	5775	-	2853	727.67	0.00	0.00	0.00	727.67
Design	50	8345	-	3990	729.21	0.00	0.00	0.00	729.21
Base	100	10095	-	4688	730.09	0.00	0.00	0.00	730.09
Overtopping	-	-	-	-	-	-	-	-	-
Max. Calc.	500	12525	-	5643	731.17	0.00	0.01	0.00	731.18

DESIGN SCOUR ELEVATION TABLE

Design Scour Elevation (ft.)	W. Abut.	Pier 1	Pier 2	Pier 3	Pier 4	Pier 5	Pier 6	Pier 7	E. Abut.
	762.12	751.63	719.87	718.49	718.91	721.74	719.85	724.47	741.25

HIGHWAY CLASSIFICATION

(Sandbloom Road)
Functional Class: Local
ADT: 2,814 (2004)
ADTT: 2,814 (2004)
DHV: 422 (2004)
Design Speed: 40 m.p.h.
Posted Speed: 35 m.p.h.
Two-Way Traffic
Directional Distribution: 57/43



LOCATION SKETCH

GENERAL PLAN & ELEVATION

LONGMEADOW PARKWAY OVER FOX RIVER

SEC 94-00215-01-ES

KANE COUNTY

STATION 2210+35.40

SN. 045-3024

BORING LOCATION PLAN: LONGMEADOW PARKWAY OVER FOX RIVER, IDOT NO. P-91-393-94, KANE COUNTY, ILLINOIS

EXHIBIT 5

DRAWN BY: N.D.B
CHECKED BY: M.A.K

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

FOR McDONOUGH ASSOCIATES, INC. **201-23-01**

McDonough Associates Inc.
Engineers / Architects
180 East Randolph Street Chicago, Illinois 60601

FILE NAME = $FILEL$	USER NAME =	DESIGNED -	REVISED -
		CHECKED -	REVISED -
	PLOT SCALE =	DRAWN -	REVISED -
	PLOT DATE =	CHECKED -	REVISED -

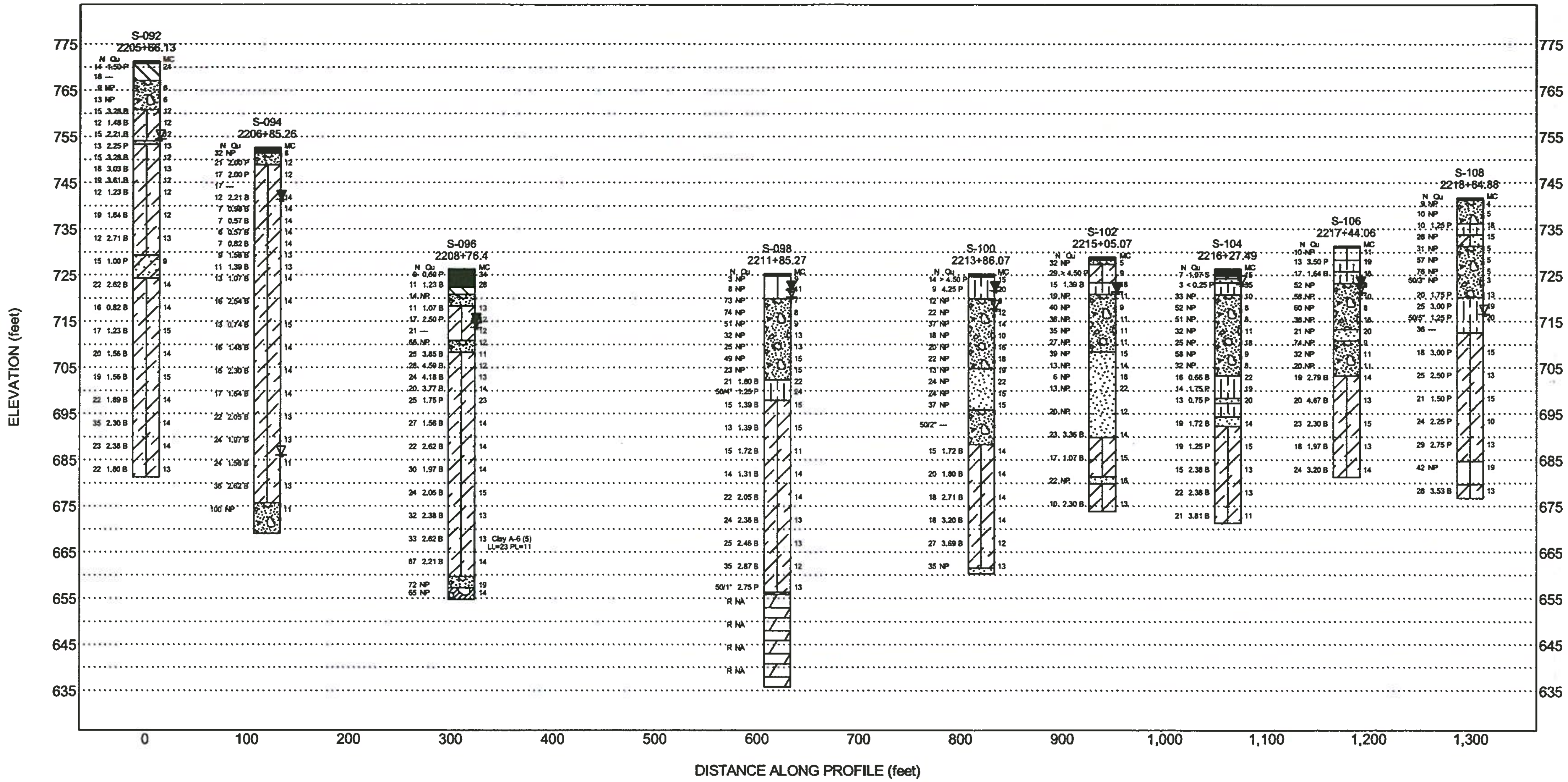
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 3 SHEETS

SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
94-00215-01 ES	KANE		

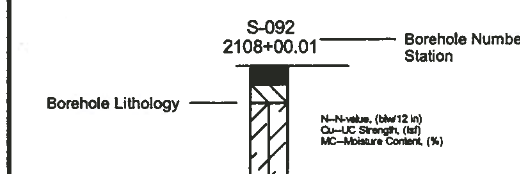
CONTRACT NO.

ILLINOIS FED. AID PROJECT



Site Map Scale 1 inch equals 475 feet

Explanation:

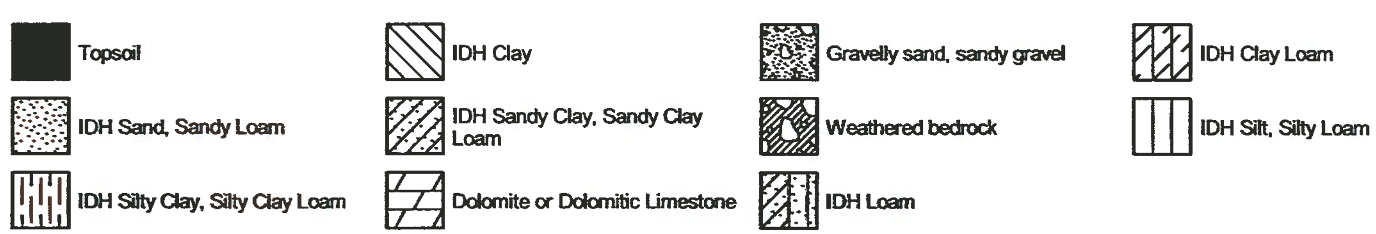


Water Level Reading at time of drilling.

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

Vertical Exaggeration: 4.5x

Lithology Graphics



Wang Engineering, Inc.
1145 N Main Street
Lombard, IL 60148

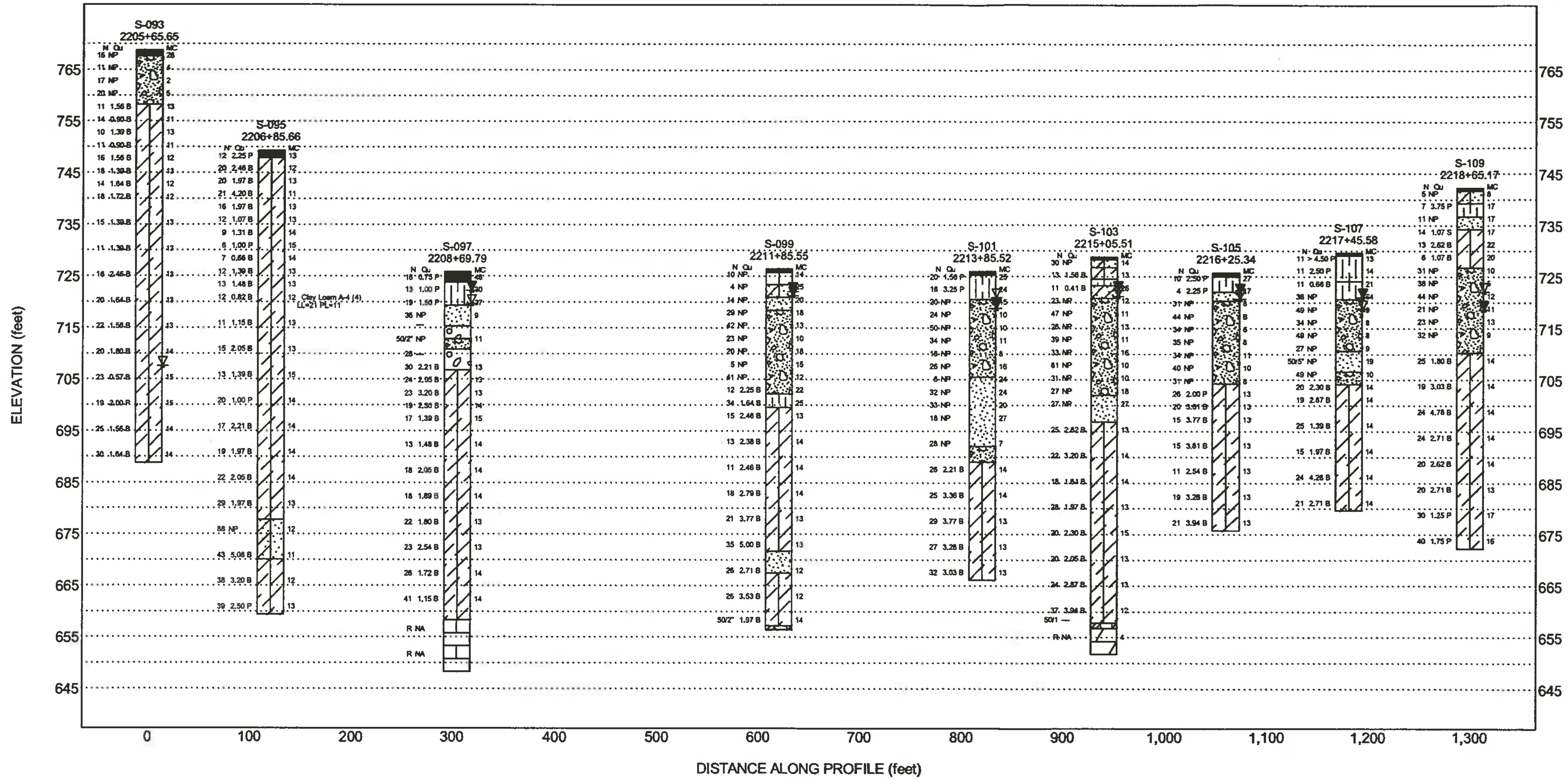
Subsurface Soil data Profile

WEI SINCE 1982

Longmeadow Parkway over Fox River
Kane County, Illinois

JOB NUMBER	PLATE NUMBER
201-23-01	EXHIBIT 6A

WEI 11X17 2012301.GPJ WANGENG.GDT 3/31/11



N

Site Map Scale 1 inch equals 475 feet

Explanation:

S-093 — Borehole Number
2108+00.01 — Station
Borehole Lithology
N—N-value, (blw/12 in)
Qu—UC Strength, (tsf)
MC—Moisture Content, (%)

Water Level Reading at time of drilling.

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

0 — 130
Horizontal Scale (feet)

Vertical Exaggeration: 5x

Lithology Graphics

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

Wang Engineering, Inc.
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Lombard, IL 60148

Subsurface Soil Data Profile

WEI SINCE 1982

Longmeadow Parkway over Fox River
Kane County, Illinois

JOB NUMBER	PLATE NUMBER
201-23-01	EXHIBIT 6B

WEI 11X17 2012301.GPJ WANGENG.GDT 3/31/11

APPENDIX A

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-092

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 771.32 ft
North: 1993515.22 ft
East: 998239.46 ft
Station: 2205+66.13
Offset: 30.03R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
770.8	6-inch thick, black SILTY CLAY LOAM --TOPSOIL--					
	Stiff, brown and black CLAY		1	3 6 8	1.50 P	24
767.1	Loose to medium dense, brown GRAVELLY SAND, with cobbles	5	2	9 10 8	—	
			3	4 4 5	NP	6
		10	4	3 6 7	NP	6
760.8	Stiff to very stiff, brown and gray CLAY LOAM		5	5 7 8	3.28 B	12
		15	6	3 5 7	1.48 B	12
			7	3 6 9	2.21 B	12
754.1	Medium dense, brown, fine SAND					
753.3	Stiff to very stiff, gray CLAY LOAM	20	8	8 6 7	2.25 P	13
			9	3 7 8	3.28 B	12
		25	10	5 8 10	3.03 B	13
			11	4 9 10	3.61 B	12
		30	12	4 4 8	1.23 B	12
		35	13	4 8 11	1.64 B	12
		40	14	3 5 7	2.71 B	13
729.3	Stiff, gray SANDY CLAY	45	15	3 8 7	1.00 P	9
724.3	Medium stiff to very stiff, gray CLAY LOAM	50	16	8 10 12	2.62 B	14

GENERAL NOTES

Begin Drilling 04-19-2005 Complete Drilling 04-20-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&L Logger W. Wang Checked by J. Kasnick
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling ▽ 17.25 ft
At Completion of Drilling ▼ DRY
Time After Drilling NA
Depth to Water ▼ NA

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

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-092

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 771.32 ft
North: 1993515.22 ft
East: 998239.46 ft
Station: 2205+66.13
Offset: 30.03R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	X	17	4 7 9	0.82 B	14
		60	X	18	5 7 10	1.23 B	15
		65	X	19	5 8 12	1.56 B	14
		70	X	20	7 9 10	1.56 B	15
		75	X	21	6 10 12	1.89 B	14
		80	X	22	10 12 23	2.30 B	14
		85	X	23	7 9 14	2.38 B	14
681.3		90	X	24	7 10 12	1.80 B	13
	Boring terminated at 90.00 ft						
		95					
		100					

GENERAL NOTES

Begin Drilling 04-19-2005 Complete Drilling 04-20-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&L Logger W. Wang Checked by J. Kasnick
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling ▽ 17.25 ft
At Completion of Drilling ▼ DRY
Time After Drilling NA
Depth to Water ▽ NA

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

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1145 N Main Street
Lombard, IL 60148
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Fax: 630 953-9938

BORING LOG S-093

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 768.78 ft
North: 1993575.25 ft
East: 998238.61 ft
Station: 2205+65.65
Offset: 30.00L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	14-inch thick, medium dense, black LOAM					
767.6	--TOPSOIL--					
	Medium dense, brown GRAVELLY SAND		1	5 8 8	NP	28
		5	2	5 5 6	NP	4
			3	5 9 8	NP	2
		10	4	2 7 13	NP	5
758.3	Medium stiff to very stiff, gray CLAY LOAM		5	3 4 7	1.56 B	13
		15	6	4 6 8	0.90 B	11
			7	2 4 6	1.39 B	13
		20	8	3 4 7	0.90 B	11
			9	4 5 11	1.56 B	12
		25	10	5 6 12	1.39 B	13
			11	4 6 8	1.64 B	12
		30	12	4 7 9	1.72 B	12
		35	13	5 5 10	1.39 B	13
		40	14	3 4 7	1.39 B	13
		45	15	5 7 9	2.46 B	13
		50	16	5 8 12	1.64 B	13

GENERAL NOTES

Begin Drilling: 05-10-2005 Complete Drilling: 05-10-2005
Drilling Contractor: PRECON DRILLING Drill Rig: CME-75 ATV
Driller: K&J Logger: J. Kosloski Checked by: J. Kasnick
Drilling Method: 3.25-inch HSA

WATER LEVEL DATA

While Drilling: 61.50 ft
At Completion of Drilling: DRY
Time After Drilling: NA
Depth to Water: NA

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

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
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Fax: 630 953-9938

BORING LOG S-093

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 768.78 ft
North: 1993575.25 ft
East: 998238.61 ft
Station: 2205+65.65
Offset: 30.00L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	17	5 10 12	1.56 B	13
		60	18	5 8 12	1.80 B	14
	—@ 60.5' to 63.0' - Possible SAND layer					
		65	19	5 9 14	0.57 B	15
		70	20	5 8 11	2.00 P	15
		75	21	6 11 14	1.56 B	14
688.8		80	22	8 13 17	1.64 B	14
	Boring terminated at 80.00 ft					
		85				
		90				
		95				
		100				

GENERAL NOTES

Begin Drilling: 05-10-2005 Complete Drilling: 05-10-2005
Drilling Contractor: PRECON DRILLING Drill Rig: CME-75 ATV
Driller: K&J Logger: J. Kosloski Checked by: J. Kasnick
Drilling Method: 3.25-inch HSA

WATER LEVEL DATA

While Drilling ▽ 61.50 ft
At Completion of Drilling ▼ DRY
Time After Drilling NA
Depth to Water ▼ NA

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

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BORING LOG S-094

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 752.64 ft
North: 1993516.01 ft
East: 998358.59 ft
Station: 2206+85.26
Offset: 29.96R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	14-inch thick, black SILTY CLAY LOAM --TOPSOIL--					
751.4	Medium dense, brown GRAVELLY SANDY LOAM		1	9 13 19	NP	8
748.9	Medium stiff to very stiff, brown to gray CLAY LOAM with interbedded sand lenses		2	13 11 10	2.00 P	12
		5	3	5 5 12	2.00 P	12
			4	5 6 11	—	
		10	5	2 5 7	2.21 B	14
			6	2 3 4	0.98 B	14
		15	7	2 3 4	0.57 B	14
			8	2 3 3	0.57 B	14
		20	9	1 3 4	0.82 B	14
			10	4 4 5	1.56 B	13
		25				

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			11	4 4 7	1.39 B	13
		30	12	3 5 8	1.07 B	14
		35	13	5 7 9	2.54 B	14
		40	14	2 5 8	0.74 B	15
		45	15	4 7 9	1.48 B	14
		50	16	3 6 10	2.30 B	14

GENERAL NOTES

Begin Drilling 05-13-2005 Complete Drilling 05-16-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger W. Wang Checked by J. Kasnick
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling 67.00 ft
At Completion of Drilling 11.60 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: 630 953-9938

BORING LOG S-094

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 752.64 ft
North: 1993516.01 ft
East: 998358.59 ft
Station: 2206+85.26
Offset: 29.96R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	17	4 7 10	1.64 B	14
		60	18	8 9 13	2.05 B	13
		65	19	7 9 15	1.97 B	13
		70	20	6 10 14	1.56 B	11
		75	21	11 16 20	2.62 B	13
675.6	Very dense, brown GRAVELLY SAND					
		80	22	22 40 60	NP	11
669.1	Boring terminated at 83.50 ft					
		85				
		90				
		95				
		100				

GENERAL NOTES

Begin Drilling 05-13-2005 Complete Drilling 05-16-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger W. Wang Checked by J. Kasnick
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling ∇ 67.00 ft
At Completion of Drilling ▼ 11.60 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: 630 953-9938

BORING LOG S-095

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 749.36 ft
North: 1993576.04 ft
East: 998358.63 ft
Station: 2206+85.66
Offset: 30.06L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	18-inch thick, medium stiff, black SILTY CLAY LOAM					
747.9	--TOPSOIL--					
	Medium stiff to hard, brown to gray CLAY LOAM		1	4 5 7	2.25 P	13
		5	2	5 8 12	2.46 B	12
			3	4 7 13	1.97 B	13
		10	4	5 10 11	4.20 B	11
			5	4 6 10	1.97 B	13
		15	6	4 4 8	1.07 B	13
			7	2 3 6	1.31 B	14
		20	8	3 3 5	1.00 P	15
			9	3 4 3	0.66 B	14
		25	10	2 4 8	1.39 B	13
			11	3 6 7	1.48 B	13
	--A-4 (4)-- --LL=21%, PL=11%-- GRAVEL=6.6% SAND=24.1% SILT=42.0% CLAY=27.2%	30	12	4 5 7	0.82 B	12
		35	13	4 6 5	1.15 B	13
		40	14	3 6 9	2.05 B	13
		45	15	3 6 7	1.39 B	15
		50	16	5 8 12	1.00 P	14

GENERAL NOTES

Begin Drilling 05-12-2005 Complete Drilling 05-13-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger W. Wang Checked by J. Kasnick
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling: DRY
At Completion of Drilling: DRY
Time After Drilling: NA
Depth to Water: NA

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

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-095

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 749.36 ft
North: 1993576.04 ft
East: 998358.63 ft
Station: 2206+85.66
Offset: 30.06L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	17	5 7 10	2.21 B	14
		60	18	6 7 12	1.97 B	14
		65	19	8 9 13	2.05 B	14
		70	20	8 13 16	1.97 B	13
677.9	Very dense, gray SANDY LOAM to LOAM					
		75	21	9 39 49	NP	12
670.1	Very stiff to hard, gray CLAY LOAM, with interbedded sand lenses	80	22	11 22 21	5.08 B	11
		85	23	6 15 23	3.20 B	12
659.4		90	24	12 16 23	2.50 P	13
	Boring terminated at 90.00 ft					
		95				
		100				

GENERAL NOTES

Begin Drilling: 05-12-2005 Complete Drilling: 05-13-2005
Drilling Contractor: PRECON DRILLING Drill Rig: CME-75 ATV
Driller: K&J Logger: W. Wang Checked by: J. Kasnick
Drilling Method: 3.25-inch HSA

WATER LEVEL DATA

While Drilling: DRY
At Completion of Drilling: DRY
Time After Drilling: NA
Depth to Water: NA

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

Wang Engineering

wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-096

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 726.29 ft
North: 1993536.94 ft
East: 998549.60 ft
Station: 2208+76.4
Offset: 10.17R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	Soft to stiff, black and brown SILTY CLAY LOAM --TOPSOIL--		1	2 4 5	0.50 P	34
722.3	Stiff, brown and gray CLAY		2	2 5 6	1.23 B	28
		5				
720.8	Medium dense, brown GRAVELLY SAND		3	8 6 8	NP	
718.3	Stiff to very stiff, brown to gray CLAY LOAM		4	4 4 7	1.07 B	13
		10				
			5	5 7 10	2.50 P	12
			6	9 11 10	---	12
		15				
710.8	Very dense, gray GRAVELLY SAND		7	21 30 36	NP	12
708.3	Stiff to hard, gray CLAY LOAM to CLAY		8	7 11 14	3.85 B	11
		20				
			9	8 10 18	4.59 B	12
			10	6 11 13	4.18 B	13
		25				
			11	6 8 12	3.77 B	14
			12	7 12 13	1.75 P	23
		30				
			13	7 12 15	1.56 B	14
		35				
			14	6 9 13	2.62 B	14
		40				
			15	17 12 18	1.97 B	14
		45				
			16	8 9 15	2.05 B	15
		50				

GENERAL NOTES

Begin Drilling 05-16-2005 Complete Drilling 05-17-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger T. Rickey Checked by J. Kasnick
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling ▽ 13.00 ft
At Completion of Drilling ▼ 41.00 ft
Time After Drilling 24 hrs hours
Depth to Water ▼ 12.00 ft

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

BORING LOG S-096

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 726.29 ft
North: 1993536.94 ft
East: 998549.60 ft
Station: 2208+76.4
Offset: 10.17R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	17	8 13 19	2.38 B	13
	--A-6 (5)-- --LL=23%, PL=11%-- GRAVEL=5.3% SAND=23.4% SILT=41.1% CLAY=30.2%	60	18	7 15 18	2.62 B	13
		65	19	7 17 50	2.21 B	14
659.8	Medium dense GRAVEL, with sand					
657.3	Weathered LIMESTONE	70	20	11 19 53	NP	19
			21	42 28 37	NP	14
654.8	--AUGUR REFUSAL-- Boring terminated at 71.50 ft					
		75				

GENERAL NOTES

Begin Drilling 05-16-2005 Complete Drilling 05-17-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger T. Rickey Checked by J. Kasnick
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling 13.00 ft
At Completion of Drilling 41.00 ft
Time After Drilling 24 hrs hours
Depth to Water 12.00 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: 630 953-9938

BORING LOG S-097

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 725.83 ft
North: 1993581.20 ft
East: 998542.73 ft
Station: 2208+69.79
Offset: 34.12L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	24-inch thick, medium stiff, black and brown SILTY CLAY LOAM --TOPSOIL--					
723.8	Stiff, black and brown SILTY CLAY LOAM		1	4 7 11	0.75 P	48
		5	2	4 6 7	1.00 P	30
719.3	Dense, red, brown and black SAND, with gravel		3	4 6 13	1.50 P	37
		10	4	11 17 19	NP	9
715.3	COBBLES and BOULDERS		5		---	
712.8	Very dense, brown GRAVELLY SAND, with cobbles		6	25 50/2"	NP	11
710.8	COBBLES and BOULDERS	15	7	21 17 11	---	
706.8	Stiff to very stiff, dark brown to gray CLAY LOAM, with interbedded sand lenses	20	8	7 11 19	2.21 B	13
			9	5 11 13	2.95 B	13
		25	10	5 10 13	3.20 B	13
			11	4 8 11	2.30 B	14
		30	12	4 7 10	1.39 B	15
		35	13	5 6 7	1.48 B	14
		40	14	4 7 11	2.05 B	14
		45	15	4 8 10	1.89 B	14
		50	16	4 10 12	1.80 B	13

GENERAL NOTES

Begin Drilling 05-17-2005 Complete Drilling 05-18-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger T. Rickey Checked by J. Kasnick
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling ▽ 6.50 ft
At Completion of Drilling ▼ 4.00 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: 630 953-9938

BORING LOG S-097

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 725.83 ft
North: 1993581.20 ft
East: 998542.73 ft
Station: 2208+69.79
Offset: 34.12L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	17	4 10 13	2.54 B	13
		60	18	7 10 16	1.72 B	14
		65	19	5 26 15	1.15 B	14
658.3	--AUGER REFUSAL--					
	Very strong, white to gray with green hue, moderately weathered, fossiliferous, finely crystalline LIMESTONE, laminated to thinly bedded with narrow to moderately wide joint spacing, with vugs and channelized pores. RUN 1: 67.5 to 72.5 feet Recovery = 97% RQD = 19%	70	1	CORE		
	RUN 2: 72.5 to 77.5 feet Recovery = 100% RQD = 26%	75	2	CORE		
648.3	Boring terminated at 77.50 ft					

GENERAL NOTES

Begin Drilling: 05-17-2005 Complete Drilling: 05-18-2005
Drilling Contractor: PRECON DRILLING Drill Rig: CME-75 ATV
Driller: K&J Logger: T. Rickey Checked by: J. Kasnick
Drilling Method: 3.25-inch HSA

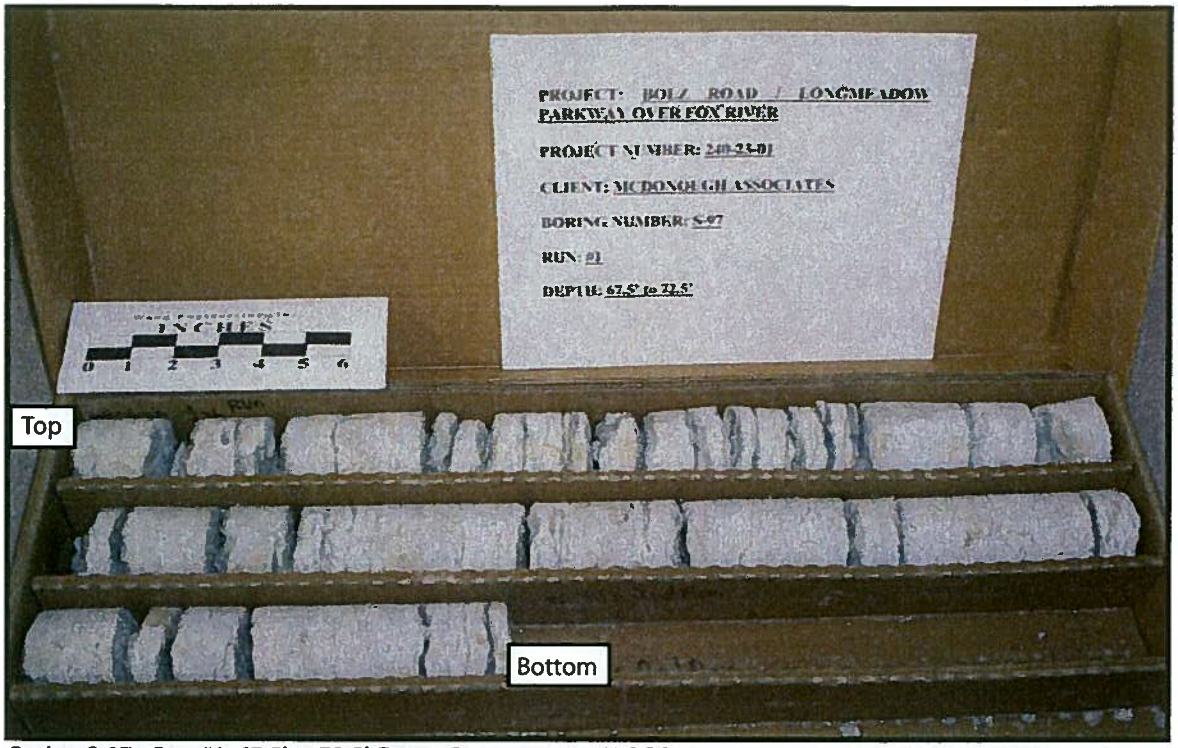
WATER LEVEL DATA

While Drilling: 6.50 ft
At Completion of Drilling: 4.00 ft
Time After Drilling: NA
Depth to Water: NA

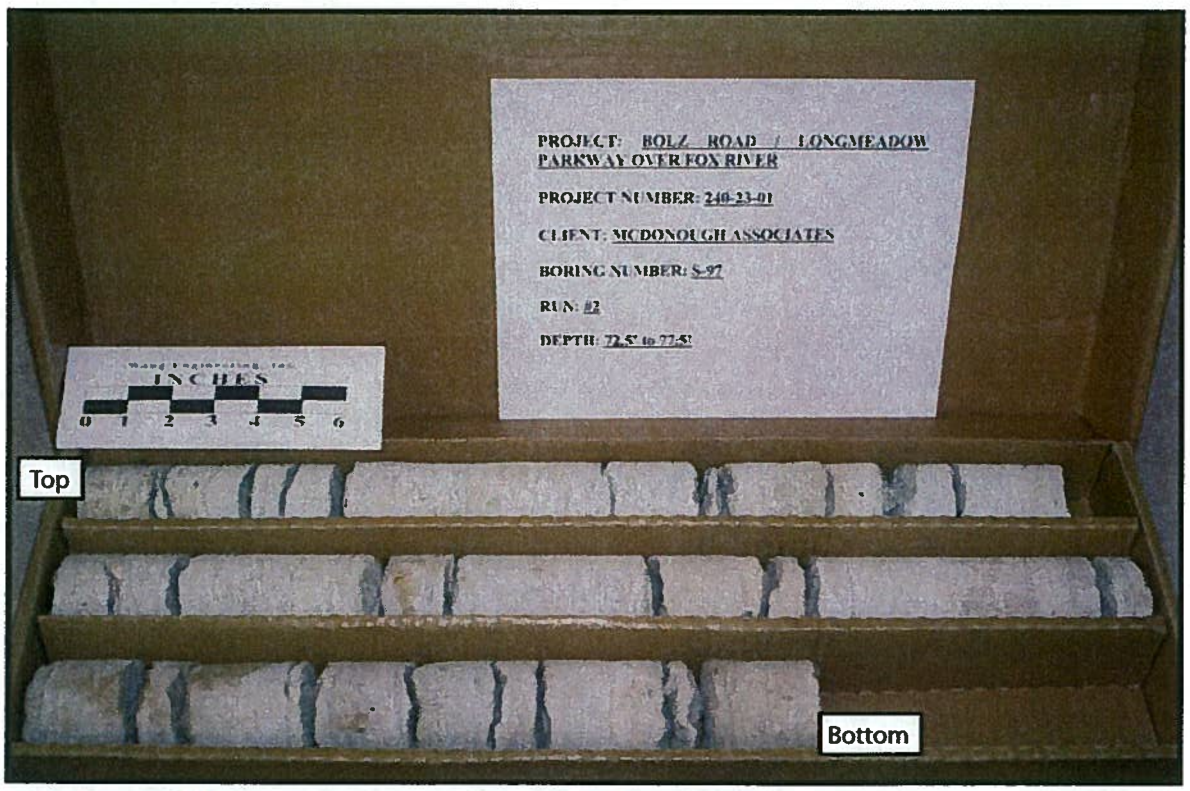
The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 2012301.GPJ WANGENG.GDT 3/29/11

Bolz Road / Longmeadow Parkway Over the Fox River



Boring S-97; Run #1 67.5' to 72.5' Deep; Recovery = 97% RQD = 99%



Boring S-97; Run #2 72.5' to 77.5' Deep; Recovery = 100% RQD = 26%

	BORING S-097 ROCK CORE	Drawn by: Brian Fugiel
Wang Engineering, Inc. Geotechnical Consulting Engineers		1145 N. Main St. Lombard, Illinois 60148 630 953-9928
For McDonough Associates		201-23-01

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-098

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 725.34 ft
North: 1993511.85 ft
East: 998858.63 ft
Station: 2211+85.27
Offset: 37.12R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
724.8	6-inch thick, gray SANDY CLAY LOAM --TOPSOIL--					
	Very loose to loose, brown and gray SILTY LOAM		1	4 2 1	NP	9
		5	2	2 2 4	NP	11
719.8	Medium dense to very dense, brown GRAVELLY SAND		3	17 33 40	NP	7
		10	4	21 37 37	NP	8
			5	41 19 32	NP	9
		15	6	12 17 15	NP	13
			7	2 5 20	NP	13
		20	8	10 20 29	NP	15
			9	4 8 15	NP	15
702.3	Stiff, gray SILTY CLAY	25	10	6 11 10	1.80 B	22
			11	64 50/4"	1.25 P	24
697.8	Stiff to very stiff, brown CLAY LOAM	30	12	6 7 8	1.39 B	15
		35	13	4 6 7	1.39 B	15
		40	14	5 6 9	1.72 B	11
		45	15	5 6 8	1.31 B	14
		50	16	6 11 11	2.05 B	14

GENERAL NOTES

Begin Drilling: 06-30-2005 — Complete Drilling: 06-30-2005
Drilling Contractor: PRECON DRILLING — Drill Rig: CME-75 ATV
Driller: K&J — Logger: K. Anderson — Checked by: B. Fugiel
Drilling Method: 3.25-inch HSA

WATER LEVEL DATA

While Drilling: 5.50 ft
At Completion of Drilling: 4.00 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: 630 953-9938

BORING LOG S-098

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 725.34 ft
North: 1993511.85 ft
East: 998858.63 ft
Station: 2211+85.27
Offset: 37.12R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	17	7, 11, 13	2.38 B	13
		60	18	6, 12, 13	2.46 B	13
		65	19	6, 13, 22	2.87 B	12
656.3			20	9, 50/1"	2.75 P	13
655.8	--WEATHERED BEDROCK-- --AUGER REFUSAL--	70				
	Very strong, bluish green, finely crystalline, thinly bedded, moderatley weathered DOLOMITIC LIMESTONE, with vuggy porosity, channel porostiy and frequent fractures --RECOVERY =99%-- --RQD=33%--		1	CORE		
650.8	Very strong, gray, finely crystalline, thinly laminated to thinly bedded, slight to moderately weathered DOLOMITIC LIMESTONE, with vuggy porosity --RECOVERY=96%-- --RQD=31%--	75	2	CORE		
645.8	Very strong, gray, finely crystalline, thinly bedded, slightly weathered DOLOMITIC LIMESTONE, with vuggy porosity --RECOVERY=95%-- --RQD=36%--	80	3	CORE		
640.8	Very strong, gray, fine crystalline, thinly laminated, slightly weathered DOLOMITIC LIMESTONE, with vuggy porosity and channel porosity --RECOVERY=95%-- --RQD=53%--	85	4	CORE		
635.8	Boring terminated at 89.50 ft	90				
		95				
		100				

GENERAL NOTES

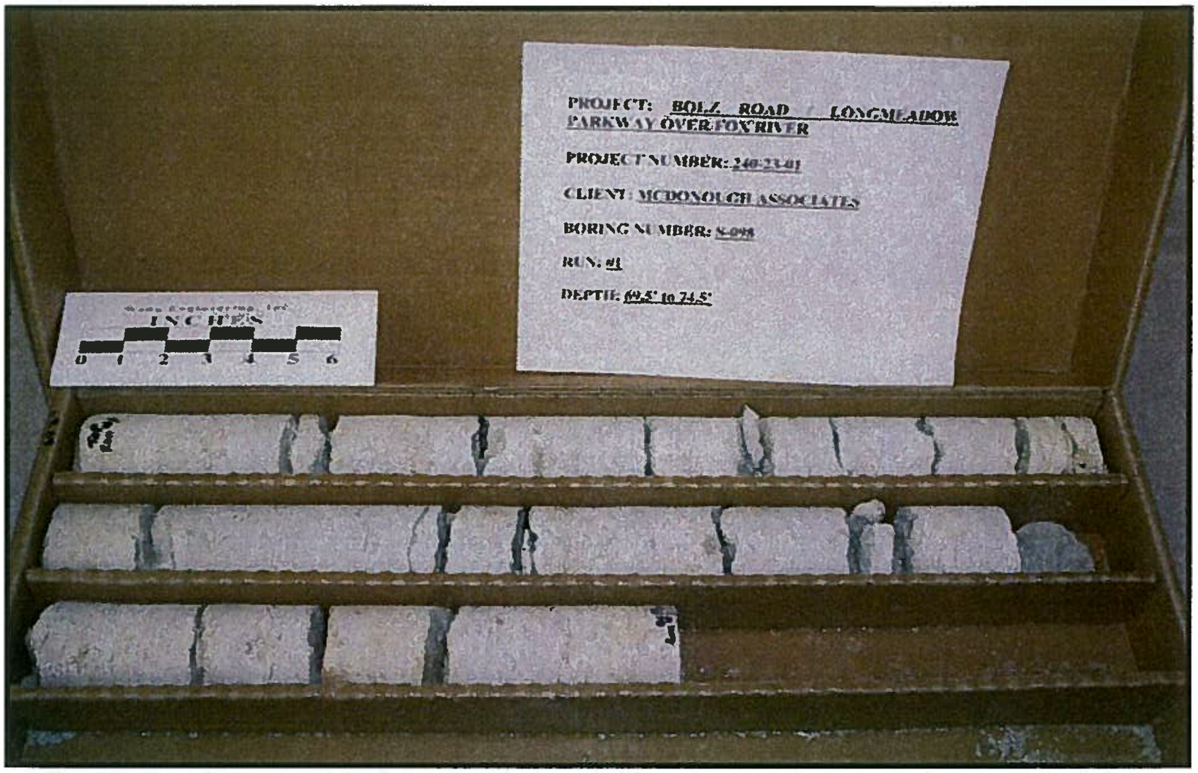
Begin Drilling 06-30-2005 Complete Drilling 06-30-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger K. Anderson Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

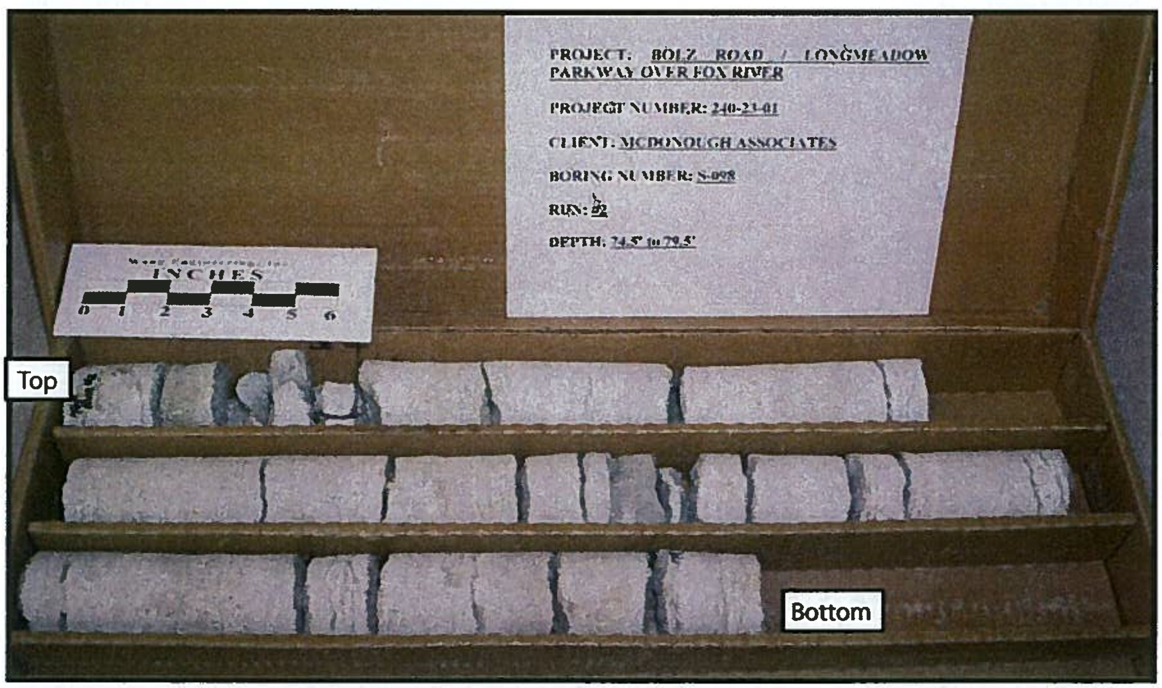
While Drilling ▽ 5.50 ft
At Completion of Drilling ▼ 4.00 ft
Time After Drilling NA
Depth to Water ▼ NA

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

Bolz Road / Longmeadow Parkway Over the Fox River



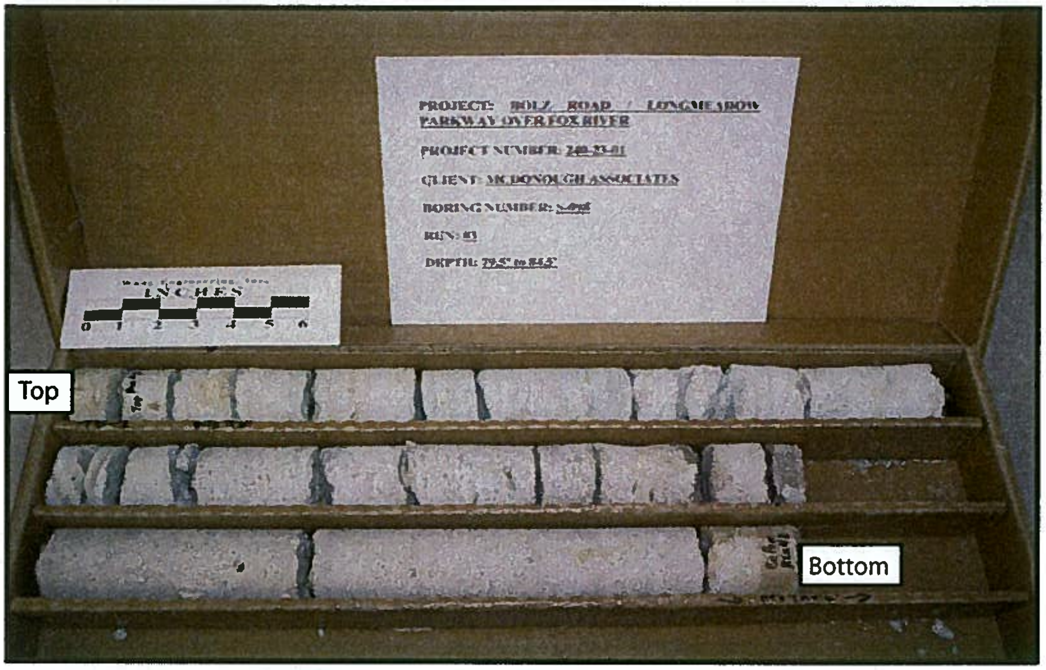
Boring S-098; Run #1 69.5' to 74.5' Deep; Recovery = 99% RQD = 33%



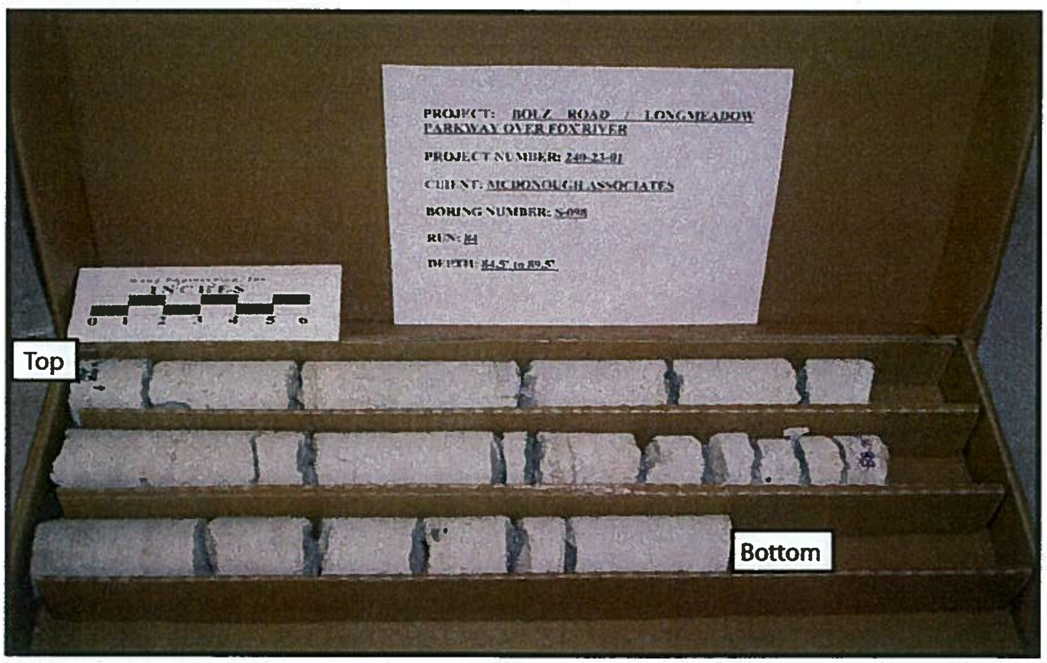
Boring S-098; Run #2 74.5' to 79.5' Deep; Recovery = 96% RQD = 31%

	BORING S-098 ROCK CORE	Drawn by: Brian Fugiel
Wang Engineering, Inc. Geotechnical Consulting Engineers		1145 N. Main St. Lombard, Illinois 60148 630 953-9928
For McDonough Associates		201-23-01

Bolz Road / Longmeadow Parkway Over the Fox River



Boring S-098; Run #2 79.5' to 84.5' Deep; Recovery = 95% RQD = 36%



Boring S-098; Run #4 84.5' to 89.5' Deep; Recovery = 95% RQD = 53%

	BORING S-098 ROCK CORE	Drawn by: Brian Fugiel
Wang Engineering, Inc. Geotechnical Consulting Engineers		1145 N. Main St. Lombard, Illinois 60148 630 953-9928
For McDonough Associates		201-23-01

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-099

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 726.44 ft
North: 1993585.81 ft
East: 998858.47 ft
Station: 2211+85.55
Offset: 36.83L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
725.8	8-inch thick, dark brown SILTY CLAY --TOPSOIL--					
	Medium dense, black and brown SILTY LOAM		1	16 6 4	NP	14
723.4	Loose, brown and gray LOAM		2	6 2 2	NP	25
720.9	Medium dense, brown, medium SAND	5	3	6 7 7	NP	20
718.4	Loose to dense, brown GRAVELLY SAND		4	4 15 14	NP	18
		10	5	12 22 20	NP	13
			6	5 12 11	NP	10
		15	7	4 9 11	NP	18
			8	3 2 3	NP	15
		20	9	11 18 23	NP	12
702.2	Stiff to very stiff, gray SILTY	25	10	3 5 7	2.25 B	22

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	CLAY, with interbedded sand and silt lenses					
699.6	Very stiff to hard, gray CLAY LOAM		11	2 16 18	1.64 B	25
		30	12	4 6 9	2.46 B	13
		35	13	3 6 7	2.38 B	14
		40	14	3 5 6	2.46 B	14
		45	15	5 8 10	2.79 B	14
		50	16	7 9 12	3.77 B	13

GENERAL NOTES

Begin Drilling 07-01-2005 Complete Drilling 07-01-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller S&J Logger J. Kasnick Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling 5.50 ft
At Completion of Drilling 4.75 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: 630 953-9938

BORING LOG S-099

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 726.44 ft
North: 1993585.81 ft
East: 998858.47 ft
Station: 2211+85.55
Offset: 36.83L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			17	6 / 11 / 24	5.00 B	13
671.7	Dense, gray, fine to medium SAND	55				
667.4	Stiff to very stiff, brown CLAY LOAM		18	6 / 10 / 16	2.71 B	12
		60				
			19	6 / 12 / 14	3.53 B	12
		65				
657.2	--WEATHERED BEDROCK--		20	5 / 50/2"	1.97 B	14
656.4	--AUGER REFUSAL--	70				
	Boring terminated at 70.00 ft					
		75				

GENERAL NOTES

Begin Drilling 07-01-2005 Complete Drilling 07-01-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller S&J Logger J. Kasnick Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling 5.50 ft
At Completion of Drilling 4.75 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: 630 953-9938

BORING LOG S-100

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 725.32 ft
North: 1993520.74 ft
East: 999059.38 ft
Station: 2213+86.07
Offset: 29.44R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
724.7	7-inch thick, brown LOAM --TOPSOIL--					
	Hard, dark brown and black SILTY CLAY to CLAY LOAM with cinders --FILL--		1	6 7 7	4.50 P	15
		5	2	7 4 5	4.25 P	20
719.8	Medium dense to dense, brown and gray GRAVELLY SAND		3	4 3 9	NP	9
		10	4	5 9 13	NP	12
			5	5 11 26	NP	14
		15	6	9 9 9	NP	10
			7	6 9 11	NP	16
		20	8	5 8 14	NP	18
704.8	Medium dense, brown, medium SAND with interbedded clay loam lenses		9	4 4 9	NP	19
		25	10	6 9 15	NP	22
			11	6 9 15	NP	15
			12	8 20 17	NP	15
695.8	Dense to very dense, gray GRAVELLY SAND, with boulders and cobbles	30				
			13	50/2"	---	
		35				
688.3	Stiff to very stiff, gray CLAY LOAM					
		40	14	15 6 9	1.72 B	14
		45	15	4 7 13	1.80 B	14
		50	16	5 7 11	2.71 B	14

GENERAL NOTES

Begin Drilling: 07-05-2005 Complete Drilling: 07-05-2005
Drilling Contractor: PRECON DRILLING Drill Rig: CME-75 ATV
Driller: S&R Logger: J. Kasnick Checked by: B. Fugiel
Drilling Method: 3.25-inch HSA

WATER LEVEL DATA

While Drilling: 8.00 ft
At Completion of Drilling: 4.00 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: 630 953-9938

BORING LOG S-100

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 725.32 ft
North: 1993520.74 ft
East: 999059.38 ft
Station: 2213+86.07
Offset: 29.44R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	17	5 6 12	3.20 B	14
		60	18	10 12 15	3.69 B	12
661.6	Dense, gray SANDY LOAM		19	8 17 18	NP	13
660.3	Boring terminated at 65.00 ft	65				
		70				
		75				

GENERAL NOTES

Begin Drilling 07-05-2005 Complete Drilling 07-05-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller S&R Logger J. Kasnick Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling 8.00 ft
At Completion of Drilling 4.00 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: 630 953-9938

BORING LOG S-101

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 726.07 ft
North: 1993579.98 ft
East: 999058.47 ft
Station: 2213+85.52
Offset: 29.80L

Elevation (ft)	Soil and Rock Description	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
725.3	9-inch thick, brown LOAM --TOPSOIL--					
	Stiff to very stiff, dark brown and black SILTY CLAY --FILL--		1	11 10 10	1.50 P	25
		5	2	6 7 9	3.25 P	24
720.6	Medium dense to very dense, brown GRAVELLY SAND		3	2 11 9	NP	15
		10	4	4 11 13	NP	10
			5	13 27 23	NP	10
		15	6	10 14 20	NP	11
			7	6 7 9	NP	8
		20	8	6 10 16	NP	16
705.6	Loose to dense, brown, medium SAND		9	2 4 4	NP	24
		25	10	6 13 19	NP	24
			11	8 14 19	NP	20
		30	12	5 6 12	NP	27
692.1	Medium dense, gray GRAVELLY SAND	35	13	5 8 20	NP	7
689.1	Very stiff, gray CLAY LOAM	40	14	7 10 16	2.21 B	14
		45	15	11 12 13	3.36 B	14
		50	16	7 14 15	3.77 B	13

GENERAL NOTES

Begin Drilling 07-05-2005 Complete Drilling 07-05-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger J. Kasnick Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling ▽ 5.50 ft
At Completion of Drilling ▼ 7.50 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: 630 953-9938

BORING LOG S-101

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 726.07 ft
North: 1993579.98 ft
East: 999058.47 ft
Station: 2213+85.52
Offset: 29.80L

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			55		17	8 12 15	3.28 B	13
	666.1		60		18	9 15 17	3.03 B	13
		Boring terminated at 60.00 ft						
			65					
			70					
			75					

GENERAL NOTES

Begin Drilling 07-05-2005 Complete Drilling 07-05-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger J. Kasnick Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling 5.50 ft
At Completion of Drilling 7.50 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: 630 953-9938

BORING LOG S-102

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 728.90 ft
North: 1993520.93 ft
East: 999178.38 ft
Station: 2215+05.07
Offset: 29.97R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
728.3	7-inch thick TOPSOIL --TOPSOIL--					
727.4	Dense, brown GRAVELLY SANDY LOAM --FILL--		1	9 17 15	NP	5
	Hard, brown CLAY LOAM --FILL--	5	2	8 14 15	>4.50 P	9
723.4	Stiff, black, brown, and gray SILTY CLAY --FILL--		3	5 4 11	1.39 B	18
720.9	Medium dense to dense, brown and gray GRAVELLY SAND	10	4	4 6 13	NP	11
			5	8 20 20	NP	9
		15	6	7 15 21	NP	11
			7	6 16 19	NP	11
		20	8	11 10 17	NP	11
708.4	Loose to dense, brown, fine to coarse SAND		9	12 21 18	NP	15
		25	10	3 4 9	NP	14
			11	2 3 3	NP	18
		30	12	3 4 9	NP	22
		35	13	4 8 12	NP	12
689.9	Stiff to very stiff, gray CLAY LOAM	40	14	4 9 14	3.36 B	14
		45	15	7 8 9	1.07 B	15
681.4	Medium dense, brown, medium SAND					
679.9	Very stiff, gray CLAY LOAM	50	16	8 9 13	NP	16

GENERAL NOTES

Begin Drilling: 07-06-2005 Complete Drilling: 07-06-2005
Drilling Contractor: PRECON DRILLING Drill Rig: CME-75 ATV
Driller: S&J Logger: J. Kasnick Checked by: B. Fugiel
Drilling Method: 3.25-inch HSA

WATER LEVEL DATA

While Drilling: 8.00 ft
At Completion of Drilling: 7.80 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: 630 953-9938

BORING LOG S-102

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 728.90 ft
North: 1993520.93 ft
East: 999178.38 ft
Station: 2215+05.07
Offset: 29.97R

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
				X	17	1 3 7	2.30 B	13
	673.9		55					
		Boring terminated at 55.00 ft						
			60					
			65					
			70					
			75					

GENERAL NOTES

Begin Drilling	07-06-2005
Complete Drilling	07-06-2005
Drilling Contractor	PRECON DRILLING
Drill Rig	CME-75 ATV
Driller	S&J
Logger	J. Kasnick
Checked by	B. Fugiel
Drilling Method	3.25-inch HSA

WATER LEVEL DATA

While Drilling	8.00 ft
At Completion of Drilling	7.80 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: 630 953-9938

BORING LOG S-103

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 728.83 ft
North: 1993580.85 ft
East: 999178.46 ft
Station: 2215+05.51
Offset: 29.95L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
728.3	6-inch thick, brown SILTY LOAM --TOPSOIL--					
726.8	Dense, black anf brown LOAM with cinders --FILL--		1	11 15 15	NP	14
724.6	Stiff, brown CLAY LOAM --FILL--		2	4 6 7	1.56 B	13
723.3	Stiff, black SILTY CLAY --FILL--	5				
720.8	Soft, black, brown, and gray gravelly SANDY CLAY		3	3 4 7	0.41 B	26
	Medium dense to very dense, brown GRAVELLY SAND		4	7 10 13	NP	12
		10	5	13 20 27	NP	11
		15	6	9 13 13	NP	13
			7	10 18 21	NP	11
		20	8	11 16 17	NP	16
			9	20 24 37	NP	10
		25	10	8 13 18	NP	10
702.1	Medium dense, brown, medium SAND		11	16 11 16	NP	18
		30	12	7 12 15	NP	27
696.8	Stiff to very stiff, gray CLAY LOAM		13	7 11 14	2.62 B	13
		35	14	8 10 12	3.20 B	14
		40	15	5 8 10	1.64 B	14
		45	16	7 15 13	1.97 B	13
		50				

GENERAL NOTES

Begin Drilling 07-05-2005 Complete Drilling 07-06-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger J. Kasnick Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling 8.00 ft
At Completion of Drilling 6.80 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: 630 953-9938

BORING LOG S-103

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 728.83 ft
North: 1993580.85 ft
East: 999178.46 ft
Station: 2215+05.51
Offset: 29.95L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	17	7 9 11	2.30 B	15
		60	18	6 9 11	2.05 B	13
		65	19	6 10 14	2.87 B	13
		70	20	12 18 19	3.94 B	12
657.8	--WEATHERED BEDROCK--		21	50/1	---	
656.8	--AUGER REFUSAL--					
	Very strong, gray, finely crystalline, thinly bedded, moderatley weathered DOLOMITIC LIMESTONE, with vuggy porosity and frequent	75	1	CORE		4

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	fractures --RECOVERY =87.5%-- --RQD=40%--					
651.8	Boring terminated at 77.00 ft					
		80				
		85				
		90				
		95				
		100				

GENERAL NOTES

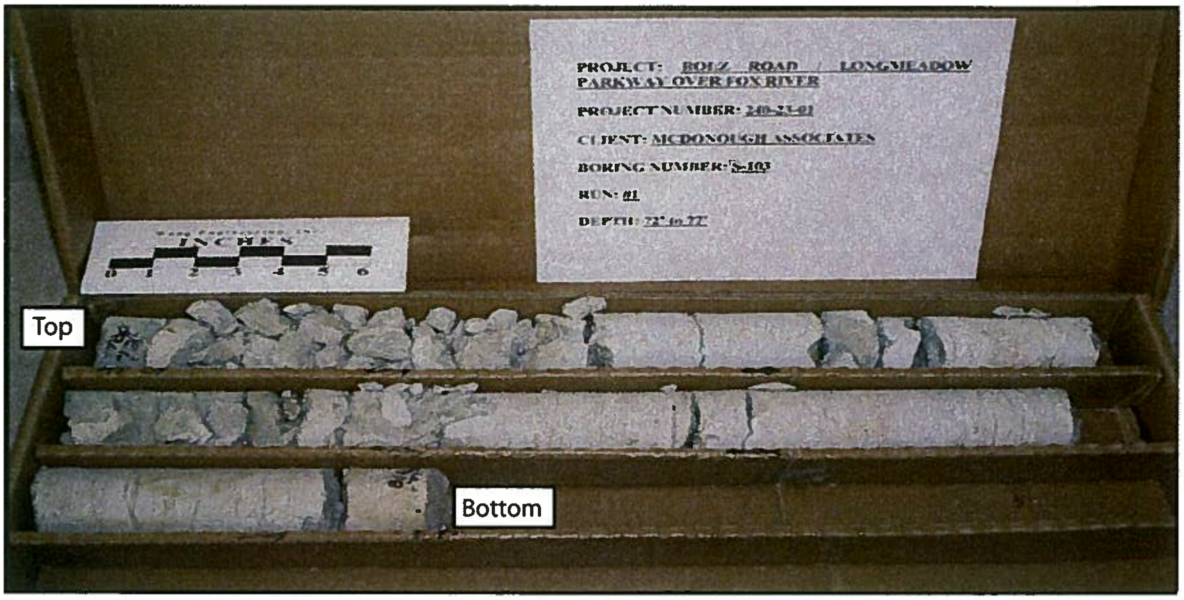
Begin Drilling 07-05-2005 Complete Drilling 07-06-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger J. Kasnick Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling ∇ 8.00 ft
At Completion of Drilling ▼ 6.80 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.

Bolz Road / Longmeadow Parkway Over the Fox River



Boring S-103; Run #1 72' to 77' Deep; Recovery = 88% RQD = 40%

	BORING S-103 ROCK CORE	Drawn by: Brian Fugiel
Wang Engineering, Inc. Geotechnical Consulting Engineers		1145 N. Main St. Lombard, Illinois 60148 630 953-9928
For McDonough Associates		201-23-01

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-104

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 726.33 ft
North: 1993518.51 ft
East: 999300.82 ft
Station: 2216+27.49
Offset: 33.12R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	18-inch thick, black SILTY LOAM					
724.8	--TOPSOIL--					
724.3	Stiff, brown and black CLAY LOAM		1	4 3 4	1.07 S	15
723.3	Loose, gray SANDY LOAM					
	Very soft, gray SILTY CLAY LOAM with shells	5	2	1 2 1	< 0.25 P	35
720.8	Medium dense to very dense, brown GRAVELLY SAND		3	12 16 17	NP	10
		10	4	12 20 32	NP	8
			5	13 20 31	NP	8
		15	6	4 14 18	NP	11
			7	5 10 15	NP	18
		20	8	13 20 38	NP	9
			9	11 15 17	NP	8
703.3	Medium stiff to stiff, gray SILTY CLAY	25	10	5 7 9	0.66 B	22
			11	5 7 7	1.75 P	19
698.3	Medium dense, gray, fine SAND					
697.3	Medium stiff, gray SILTY CLAY with interbedded sand lenses	30	12	3 5 8	0.75 P	20
694.3	Medium dense, brown, fine SANDY LOAM					
692.3	Stiff to very stiff, gray CLAY LOAM	35	13	2 11 8	1.72 B	14
		40	14	7 8 11	1.25 P	15
		45	15	4 5 10	2.38 B	13
		50	16	6 9 13	2.38 B	13

GENERAL NOTES

Begin Drilling 07-07-2005 Complete Drilling 07-08-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller S&J Logger J. Kasnick Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling 3.75 ft
At Completion of Drilling DRY
Time After Drilling NA
Depth to Water NA

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

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-104

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 726.33 ft
North: 1993518.51 ft
East: 999300.82 ft
Station: 2216+27.49
Offset: 33.12R

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	671.3		55	X	17	8 9 12	3.61 B	11
		Boring terminated at 55.00 ft						
			60					
			65					
			70					
			75					

GENERAL NOTES

Begin Drilling: 07-07-2005
Complete Drilling: 07-08-2005
Drilling Contractor: PRECON DRILLING
Drill Rig: CME-75 ATV
Driller: S&J
Logger: J. Kasnick
Checked by: B. Fugiel
Drilling Method: 3.25-inch HSA

WATER LEVEL DATA

While Drilling: 3.75 ft
At Completion of Drilling: DRY
Time After Drilling: NA
Depth to Water: NA

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

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-105

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 725.81 ft
North: 1993581.79 ft
East: 999298.29 ft
Station: 2216+25.34
Offset: 30.17L

Elevation (ft)	Soil and Rock Description	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	10-inch thick, black SILTY LOAM --TOPSOIL--					
725.0	Very stiff, black and brown SILTY CLAY		1	3 5 5	2.50 P	27
722.1	Loose, gray, medium SAND	5	2	2 2 2	2.25 P	17
720.3	Dense, brown GRAVELLY SAND		3	7 15 16	NP	8
		10	4	9 20 24	NP	6
			5	7 13 21	NP	8
		15	6	6 15 20	NP	8
			7	5 15 19	NP	11
		20	8	5 19 21	NP	10
704.3	Very stiff, gray CLAY LOAM		9	8 17 14	NP	8
		25	10	18 15 11	2.00 P	13
			11	8 8 12	3.61 B	13
		30	12	4 5 10	3.77 B	13
		35	13	3 5 10	3.61 B	13
		40	14	2 3 8	2.54 B	13
		45	15	5 7 12	3.28 B	13
675.8		50	16	3 8 13	3.94 B	13

Boring terminated at 50.00 ft

GENERAL NOTES

Begin Drilling	07-06-2005
Complete Drilling	07-07-2005
Drilling Contractor	PRECON DRILLING
Drill Rig	CME-75 ATV
Driller	S&J
Logger	J. Kasnick
Checked by	B. Fugiel
Drilling Method	3.25-inch HSA

WATER LEVEL DATA

While Drilling	5.50 ft
At Completion of Drilling	4.25 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: 630 953-9938

BORING LOG S-106

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 731.32 ft
North: 1993523.14 ft
East: 999417.36 ft
Station: 2217+44.06
Offset: 29.19R

Elevation (ft)	Soil and Rock Description	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
731.0	4-inch thick, black SILTY LOAM --TOPSOIL--					
	Medium dense, brown and black SILTY LOAM --FILL--		1	6 5 5	NP	11
728.3	Very stiff, dark brown SILTY CLAY LOAM with cinders and brick --FILL--	5	2	5 7 6	3.50 P	19
725.8	Stiff, brown and gray SILTY CLAY with sand interbeds		3	6 8 9	1.64 B	16
723.3	Dense to very dense, brown GRAVELLY SAND, with cobbles		4	8 23 29	NP	8
		10	5	27 27 31	NP	10
		15	6	28 26 34	NP	8
			7	14 16 20	NP	16
713.3	Medium dense, brown SAND	20	8	6 9 12	NP	20
710.8	Medium dense to very dense, brown and gray GRAVELLY SAND		9	26 49 25	NP	9
		25	10	32 17 15	NP	11
			11	21 12 8	NP	11
703.3	Stiff to hard, gray CLAY LOAM	30	12	6 7 12	2.79 B	14
		35	13	6 8 12	4.67 B	13
		40	14	6 9 14	2.30 B	15
		45	15	5 6 12	1.97 B	13
681.3		50	16	8 10 14	3.20 B	14

Boring terminated at 50.00 ft

GENERAL NOTES

Begin Drilling: 07-07-2005 Complete Drilling: 07-07-2005
Drilling Contractor: PRECON DRILLING Drill Rig: CME-75 ATV
Driller: K&J Logger: J. Kasnick Checked by: B. Fugiel
Drilling Method: 3.25-inch HSA

WATER LEVEL DATA

While Drilling: 10.50 ft
At Completion of Drilling: 9.00 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: 630 953-9938

BORING LOG S-107

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 729.66 ft
North: 1993582.29 ft
East: 999418.53 ft
Station: 2217+45.58
Offset: 29.94L

Elevation (ft)	Soil and Rock Description	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
729.2	6-inch gray SILTY CLAY LOAM --TOPSOIL--					
	Medium stiff to hard, black, brown and gray SILTY CLAY to SILTY CLAY LOAM --FILL--		1	7 / 6 / 5	4.50 P	13
		5	2	5 / 5 / 6	2.50 P	14
724.2	Medium stiff, brown and gray SILTY CLAY LOAM with sand interbeds		3	4 / 5 / 6	0.66 B	21
720.7	Dense, brown GRAVELLY SAND	10	4	17 / 22 / 14	NP	64
			5	11 / 25 / 24	NP	9
		15	6	7 / 15 / 19	NP	8
			7	13 / 24 / 25	NP	8
710.7	Medium dense to very dense, gray, fine SAND	20	8	12 / 14 / 13	NP	9
			9	12 / 15 / 50/5"	NP	19
706.7	Dense, gray SANDY GRAVEL	25	10	4 / 21 / 28	NP	10
704.2	Stiff to hard, gray CLAY LOAM		11	5 / 8 / 12	2.30 B	14
		30	12	6 / 8 / 11	2.87 B	14
		35	13	5 / 10 / 15	1.39 B	14
		40	14	3 / 5 / 10	1.97 B	14
		45	15	5 / 9 / 15	4.26 B	14
679.7		50	16	2 / 7 / 14	2.71 B	14

Boring terminated at 50.00 ft

GENERAL NOTES

Begin Drilling 07-08-2005 Complete Drilling 07-08-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger K. Anderson Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling 11.25 ft
At Completion of Drilling 9.00 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: 630 953-9938

BORING LOG S-108

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 741.75 ft
North: 1993522.46 ft
East: 999538.07 ft
Station: 2218+64.88
Offset: 30.31R

SOIL AND ROCK DESCRIPTION

Elevation (ft)	Description
741.2	6-inch, black LOAM --TOPSOIL--
	Looose to medium dense, brown GRAVELLY SAND --FILL--
736.2	Stiff, brown SILTY CLAY LOAM --FILL--
733.7	Medium dense, brown and black LOAM --FILL--
731.2	Dense to very dense, brown GRAVELLY SAND
720.2	Stiff to very stiff, brown and gray SILTY CLAY
712.5	Stiff to very stiff, gray CLAY LOAM

Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
1	13, 5, 4	NP	4
2	12, 5, 5	NP	5
3	7, 5, 5	1.25 P	18
4	9, 6, 22	NP	15
5	1, 10, 21	NP	5
6	19, 26, 31	NP	5
7	50, 50, 26	NP	5
8	50/3"	NP	3
9	64, 10, 10	1.75 P	13
10	11, 8, 17	3.00 P	19
11	6, 18, 50/5"	1.25 P	20
12	12, 16, 20	—	
13	7, 7, 11	3.00 P	15
14	9, 11, 14	2.50 P	13
15	8, 11, 10	1.50 P	15
16	11, 10, 14	2.25 P	10

GENERAL NOTES

Begin Drilling: 07-11-2005 — Complete Drilling: 07-11-2005
Drilling Contractor: PRECON DRILLING — Drill Rig: CME-75 ATV
Driller: J&L — Logger: K. Anderson — Checked by: B. Fugiel
Drilling Method: 3.25-inch HSA

WATER LEVEL DATA

While Drilling: 25.50 ft
At Completion of Drilling: DRY
Time After Drilling: NA
Depth to Water: NA

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

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Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-108

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 741.75 ft
North: 1993522.46 ft
East: 999538.07 ft
Station: 2218+64.88
Offset: 30.31R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55	17	7 11 18	2.75 P	13
684.7	Dense, gray SILTY LOAM					
		60	18	15 22 20	NP	19
679.7	Very stiff, gray CLAY LOAM					
676.7		65	19	10 11 17	3.53 B	13
	Boring terminated at 65.00 ft					
		70				
		75				

GENERAL NOTES

Begin Drilling 07-11-2005 Complete Drilling 07-11-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller J&L Logger K. Anderson Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling ▽ 25.50 ft
At Completion of Drilling ▼ DRY
Time After Drilling NA
Depth to Water ▼ NA

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

Wang Engineering
wangeng@wangeng.com
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

BORING LOG S-109

WEI Job No.: 201-23-01

Client: McDonough Associates Inc.
Project: Longmeadow Parkway over Fox River
Location: Kane County, Illinois

Datum: NGVD
Elevation: 742.29 ft
North: 1993589.19 ft
East: 999538.22 ft
Station: 2218+65.17
Offset: 36.42L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
741.8	6-inch thick brown SANDY LOAM --TOPSOIL--					
	Loose, brown and black LOAM --FILL--		1	6 3 2	NP	8
739.3	Very stiff, brown SILTY CLAY --FILL--	5	2	3 3 4	3.75 P	17
736.8	Medium dense, gray SANDY LOAM --FILL--		3	3 5 6	NP	17
734.3	Stiff to very stiff, brown and black CLAY LOAM --FILL--	10	4	4 7 7	1.07 S	17
			5	3 5 8	2.62 B	22
		15	6	3 3 3	1.07 B	20
726.8	Medium dense to dense, brown and gray GRAVELLY SAND		7	9 11 20	NP	10
		20	8	8 13 25	NP	5
			9	16 19 25	NP	12
		25	10	4 8 13	NP	11
			11	5 11 12	NP	13
		30	12	10 13 19	NP	9
710.3	Stiff to hard, gray CLAY LOAM					
		35	13	15 11 14	1.80 B	14
		40	14	3 8 11	3.03 B	14
		45	15	6 10 14	4.76 B	14
		50	16	8 10 14	2.71 B	14

GENERAL NOTES

Begin Drilling 07-08-2005 Complete Drilling 07-11-2005
Drilling Contractor PRECON DRILLING Drill Rig CME-75 ATV
Driller K&J Logger K. Anderson Checked by B. Fugiel
Drilling Method 3.25-inch HSA

WATER LEVEL DATA

While Drilling ▽ 20.50 ft
At Completion of Drilling ▼ 24.00 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: 630 953-9938

BORING LOG S-109

WEI Job No.: 201-23-01

Client: **McDonough Associates Inc.**
Project: **Longmeadow Parkway over Fox River**
Location: **Kane County, Illinois**

Datum: NGVD
Elevation: 742.29 ft
North: 1993589.19 ft
East: 999538.22 ft
Station: 2218+65.17
Offset: 36.42L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		55		17	6 9 11	2.62 B	14
		60		18	6 7 13	2.71 B	13
		65		19	8 13 17	1.25 P	17
672.3		70		20	12 22 18	1.75 P	16
	Boring terminated at 70.00 ft						
		75					

GENERAL NOTES

Begin Drilling **07-08-2005** Complete Drilling **07-11-2005**
Drilling Contractor **PRECON DRILLING** Drill Rig **CME-75 ATV**
Driller **K&J** Logger **K. Anderson** Checked by **B. Fugiel**
Drilling Method **3.25-inch HSA**

WATER LEVEL DATA

While Drilling ∇ **20.50 ft**
At Completion of Drilling ▼ **24.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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

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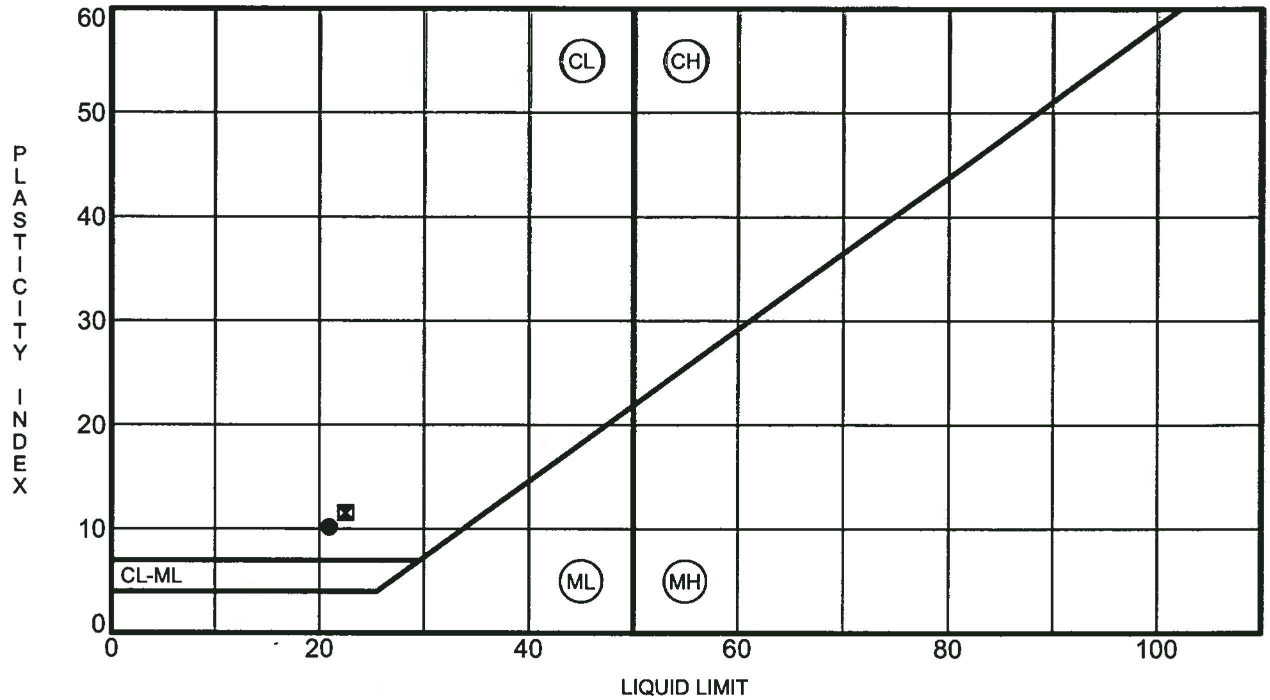
APPENDIX B



	Specimen Identification		LL	PL	PI	Fines	IDH Classification
●	S-095#12	28.5 ft	21	11	10	69	Clay Loam
⊠	S-096#18	58.5 ft	23	11	12	72	Clay

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Wang Engineering Inc
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

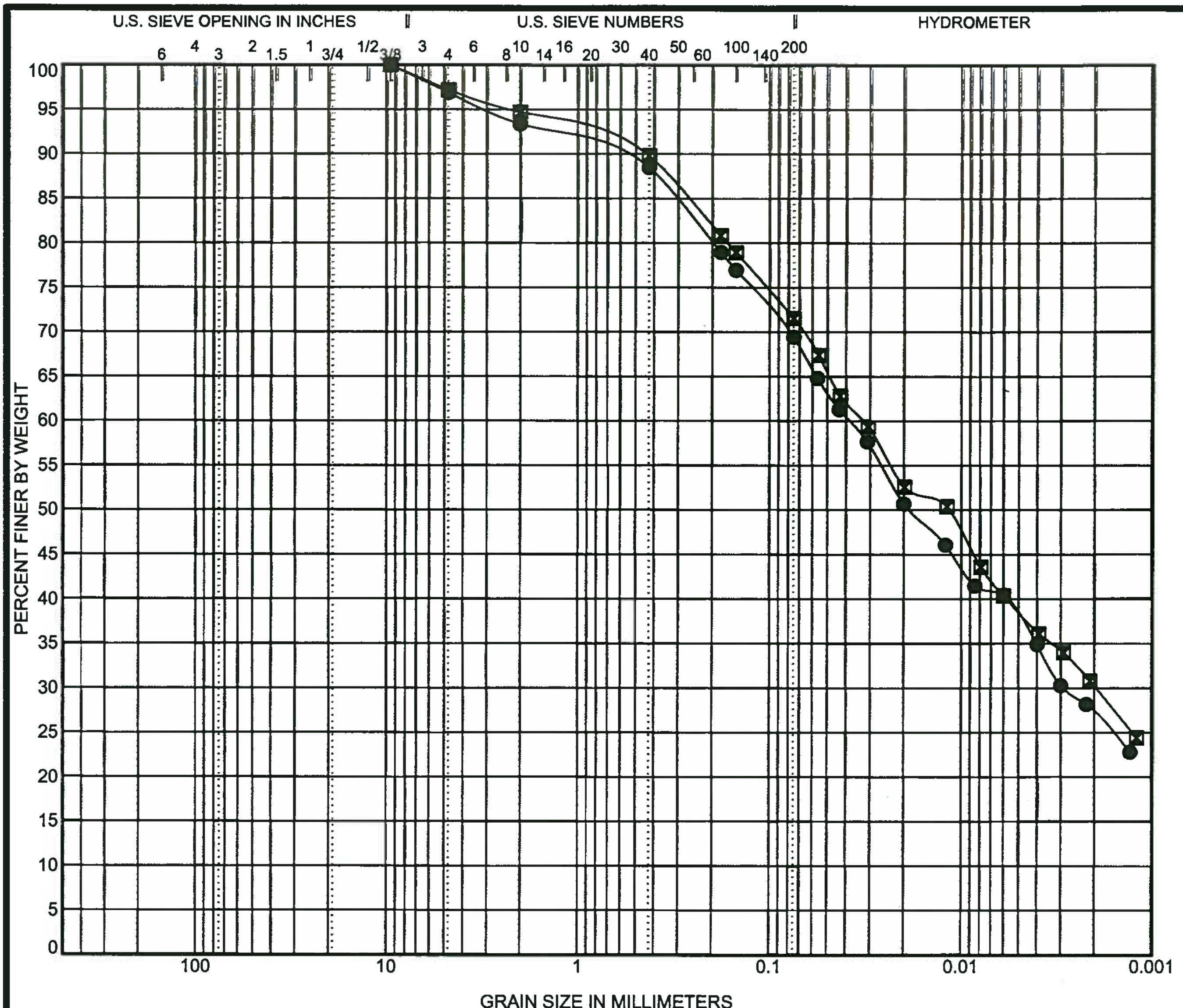
ATTERBERG LIMITS' RESULTS

Project: Longmeadow Parkway over Fox River

Location: Kane County, Illinois

Number: 201-23-01

WEI ATTERBERG LIMITS IDH 2012301.GPJ US LAB.GDT 3/29/11



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	S-095#12	28.5 ft	**Clay Loam**	21	11	10		
⊠	S-096#18	58.5 ft	**Clay**	23	11	12		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-095#12	28.5 ft	9.5	0.038	0.003		6.6	24.1	42.0	27.2
⊠	S-096#18	58.5 ft	9.5	0.033	0.002		5.3	23.4	41.1	30.2

WEI GRAIN SIZE IDH 2012301.GPJ US LAB.GDT 3/29/11

WEI SINCE 1982
Wang Engineering Inc
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

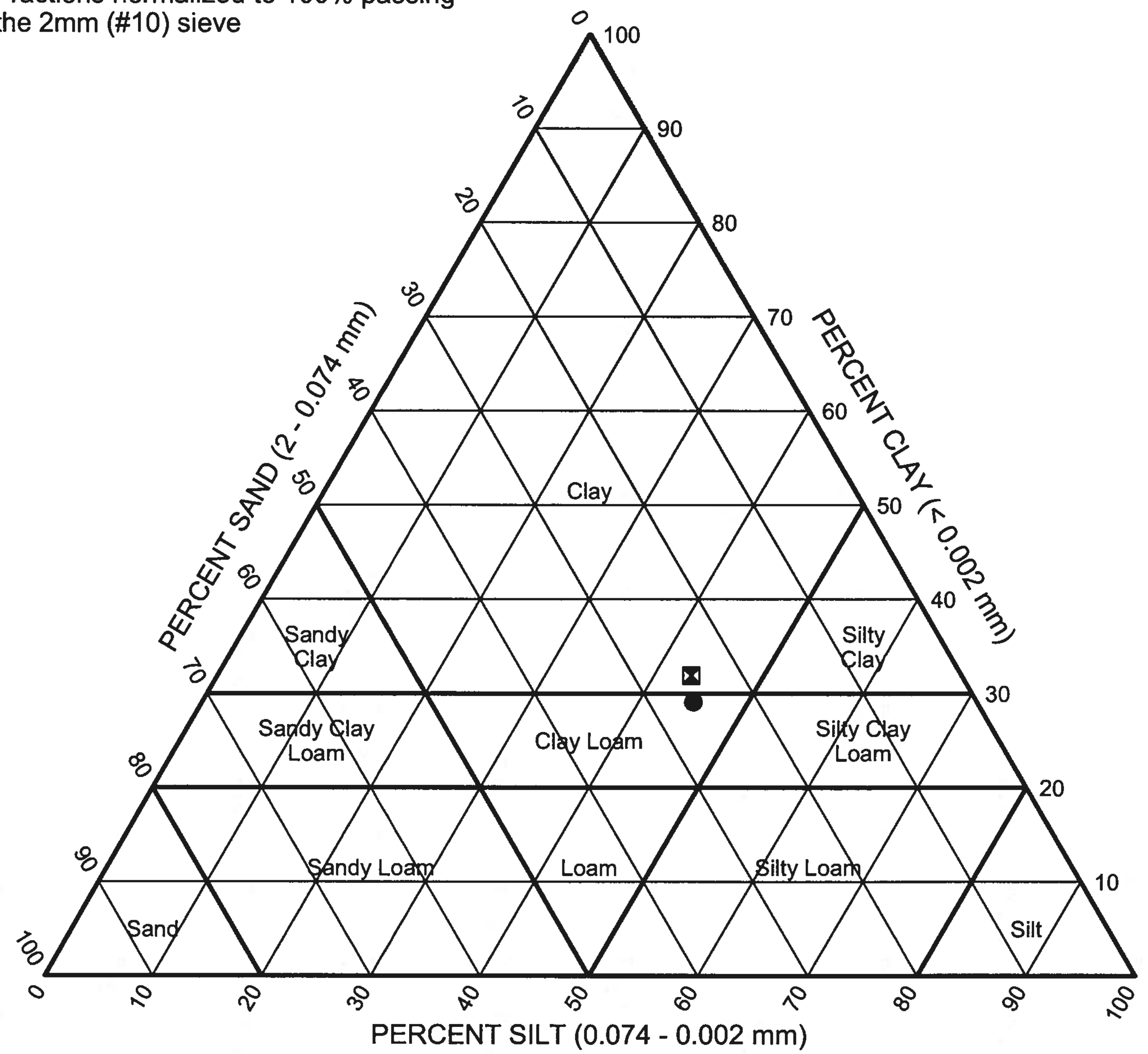
GRAIN SIZE DISTRIBUTION

Project: Longmeadow Parkway over Fox River

Location: Kane County, Illinois

Number: 201-23-01

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



	Sample	Depth (ft)	Sand (%)	Silt (%)	Clay (%)	Classification		
						IL DOT	AASHTO	ASTM
●	S-095#12	28.5	25.8	45.0	29.1	Clay Loam	A-4 (4)	CL
⊠	S-096#18	58.5	24.7	43.4	31.9	Clay	A-6 (5)	CL

WEI IDH 2012301.GPJ WANGENG.GDT 3/29/11

WEI SINCE 1982
Wang Engineering Inc
1145 N Main Street
Lombard, IL 60148
Telephone: 630 953-9928
Fax: 630 953-9938

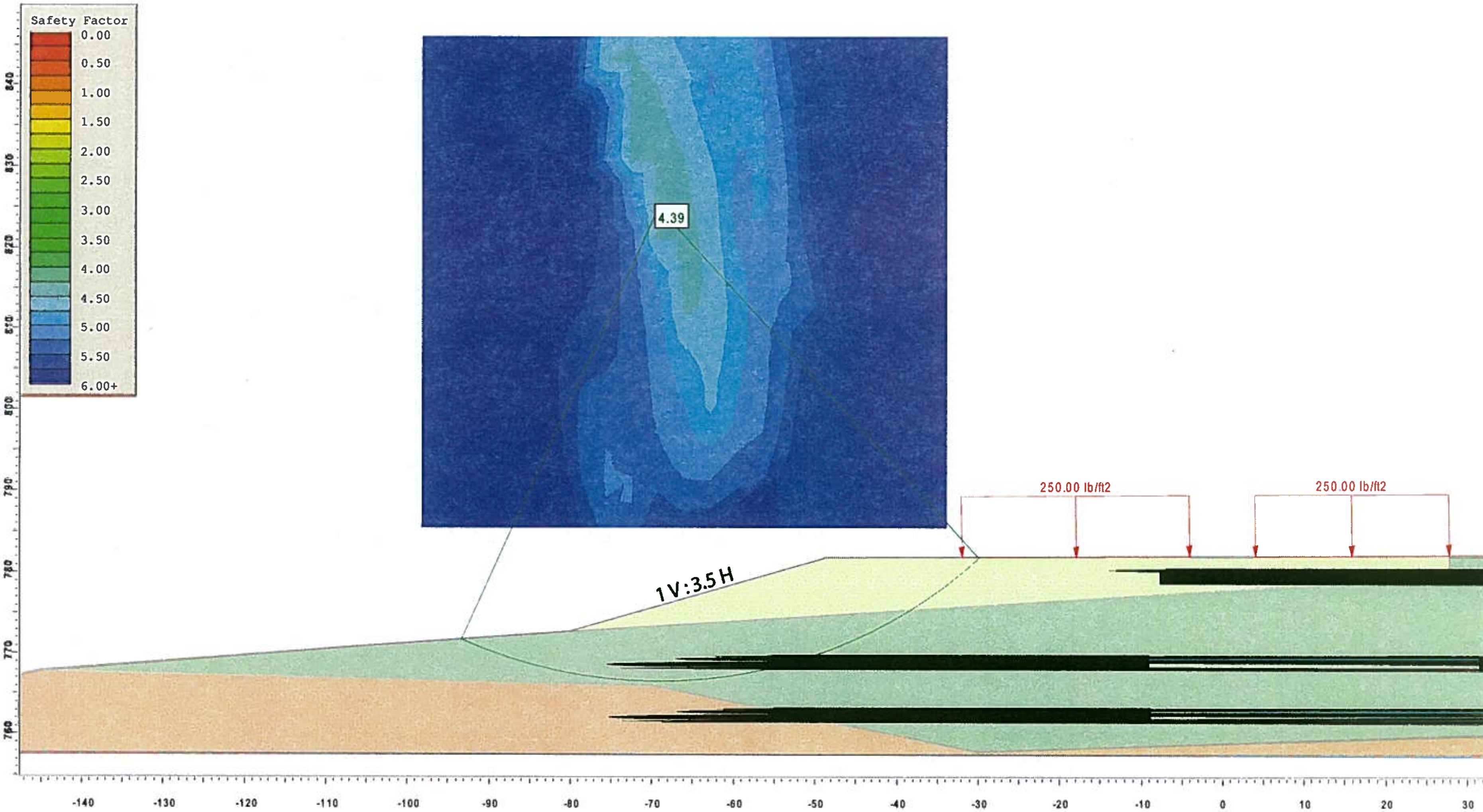
IDH Textural Classification Chart

Project: Longmeadow Parkway over Fox River

Location: Kane County, Illinois

Number: 201-23-01

APPENDIX C



[redacted]

IDOT NO. P-91-393-94, KANE COUNTY, ILLINOIS

[redacted]

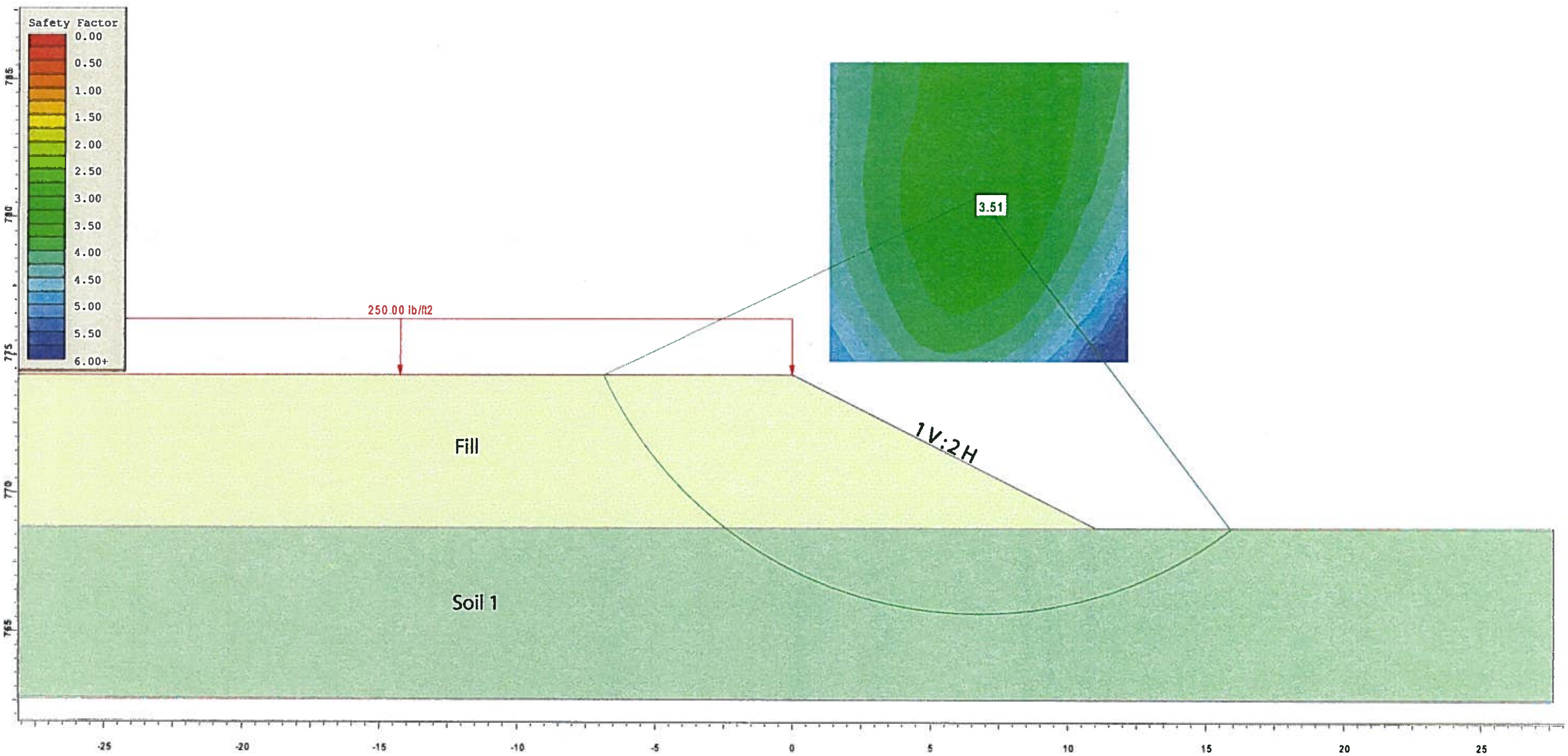
1145 N. Main Street

[redacted]

FOR McDONOUGH ASSOCIATES, INC.

201-23-01

WEST ABUTMENT
END SLOPE



SOIL PROPERTIES

Soil ID	Soil Type	Unit Weight (pcf)	Soil Parameter C_u (psf)	Soil Parameter ϕ (deg.)
Fill	Cohesive FILL	125	1000	0
1	Medium Dense GRAVELLY SAND	120	0	33
2	Stiff CLAY LOAM	120	1300	0

SLOPE STABILITY ANALYSIS: LONGMEADOW PARKWAY OVER FOX RIVER
IDOT NO. P-91-393-94. KANE COUNTY, ILLINOIS

SCALE: GRAPHIC | APPENDIX C-2 | DRAWN BY: A.A.K. CHECKED BY: M.A.K.

Wang Engineering
1145 N. Main Street
Lombard, IL 60148
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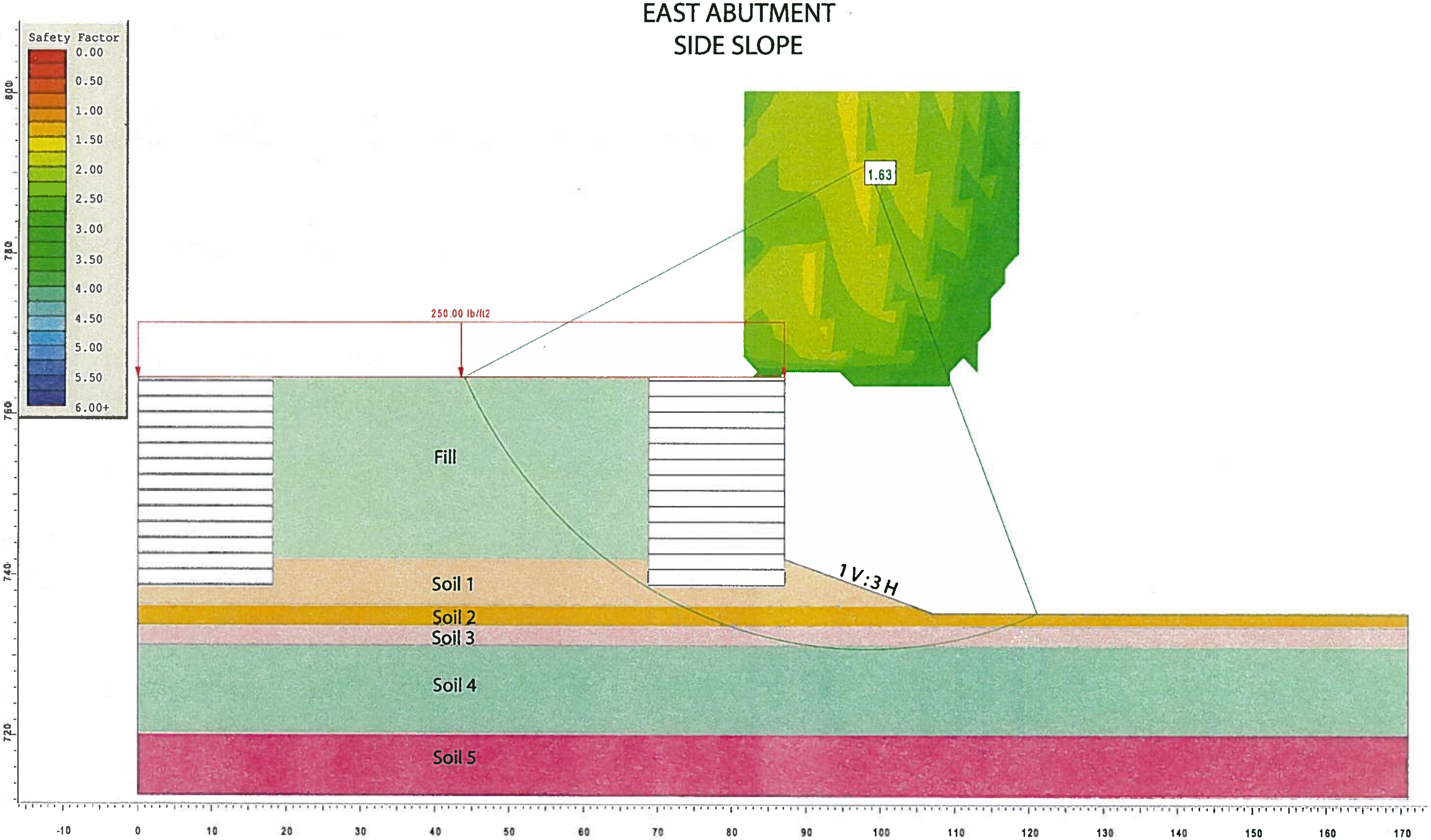
FOR McDONOUGH ASSOCIATES, INC. | 201-23-01

EAST ABUTMENT
SIDE SLOPE



SOIL PROPERTIES

Soil ID	Soil Type	Unit Weight (pcf)	Soil Parameter C_u (psf)	Soil Parameter ϕ (deg.)
Fill	Cohesive Fill	125	1000	0
1	Loose to Medium Dense GRAVELLY SAND FILL	120	0	32
2	Stiff SILTY CLAY LOAM FILL	120	1250	0
3	Medium Dense LOAM	120	0	31
4	Dense to Very Dense GRAVELLY SAND	125	0	35
5	Very Stiff SILTY CLAY	120	2000	0

SLOPE STABILITY ANALYSIS: LONGMEADOW PARKWAY OVER FOX RIVER
IDOT NO. P-91-393-94, KANE COUNTY, ILLINOIS

SCALE: GRAPHIC | APPENDIX C-3 | DRAWN BY: A.A.K. CHECKED BY: M.A.K.

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

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