STRUCTURE GEOTECHNICAL REPORT
SPRINGFIELD AVENUE BRIDGE OVER
NORTH FORK OF KENT CREEK
EX SN 101-0100, PR SN 101-0229
WINNEBAGO COUNTY, ILLINOIS

For

BLA, Inc.

333 Pierce Road, Suite 200

Itasca, IL 60143

Submitted by

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Original Report: September 30, 2021
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Technical Report Documentation Page

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11. Abstract

A new, three-span bridge will replace the existing bridge carrying Springfield Avenue over the North Fork of Kent Creek in Winnebago County, Illinois. The proposed structure will have a back-to-back of abutments length of 124.7 feet and an out-to-out width of 43.7 feet. The proposed abutment cap base elevations will be 739.5 to 740.4 feet, while the pier cap base elevations will be established at 728.4 feet. This report provides geotechnical recommendations for the design and construction of the proposed approach embankments, approach slabs, and bridge foundations.

The existing Springfield Road embankments consist primarily of sand and clay loam soils. Beneath the embankments, the general lithologic profile includes medium dense sand and gravel outwash overlying dense sand and gravel. The deepest foundation soils include soft to stiff silty loam. Dolostone bedrock was indicated at elevations of about 695.0 to 683.0 feet. The groundwater level was measured at elevations ranging from 728 to 730 feet and the design groundwater elevation is 730 feet.

The approach embankments will undergo less than 0.4 inches of long-term settlement. Global stability analyses at the embankments indicate factors of safety exceeding the IDOT minimum requirement of 1.5. The maximum factored bearing resistance for the approach slab footings is 3,500 psf above the stiff to very stiff clay loam embankment soils.

The bridge abutments and pier could be supported on driven piles. Driven 14-inch to 16-inch MSP will provide 140 to 318 kips of factored resistance at lengths of 24 to 46 feet, while the HP10x42, HP12x53, HP12x63 and HP14x89 steel piles should be driven to maximum nominal bearing at lengths of 48 to 57 feet. Downdrag allowances will not be necessary, however due to scour of the sandy streambed soils scour losses are applied to the pier piles.

The bridge will be constructed under detour at stage construction will not be utilized. Removal of the existing abutments can be accomplished behind temporary steel sheet piling, if necessary. Construction of the piers will require a *Type 2 Cofferdam*, with the pier excavations requiring a minimum 3-foot thick sealcoat.

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WINNEBAGO COUNTY, ILLINOIS
FOR
BLA, INC.

1.0 INTRODUCTION

This report presents the results of our subsurface investigation, laboratory testing, geotechnical evaluations, and recommendations in support of the design and reconstruction of the Springfield Avenue Bridge over the North Fork of Kent Creek in Winnebago County, Illinois. On the USGS *Winnebago Quadrangle 7.5 Minute Series* map, the project is located in the NE ¼ of Section 8, Tier 44 N, Range 1E of the Third Principal Meridian (Exhibit 1).

The purpose of the investigation was to characterize the site soil and groundwater conditions, perform geotechnical analyses, and provide recommendations for the design and construction of the proposed bridge foundations and approach embankments.

1.1 Existing Structure and Ground Conditions

Based on the *General Plan and Elevation* drawing provided by BLA, Inc., Wang understands the existing bridge built in 1966 is a three span continuous steel beam structure founded on driven piling. The bridge is 114.3 feet long and has a total out-to-out width of 65.3 feet. The west half of the existing bridge is currently unused and closed to traffic. The existing side slopes and concrete slopewall are graded at 1:2 (V:H) with pedestrian paths crossing beneath the bridge on both sides between the abutments and piers.

The surrounding area is forested and undeveloped. Surface elevations at the site slope downward toward the North Fork of Kent Creek, from high elevations around 800 feet to low elevations of about 730 feet at the creek level. The Springfield Avenue roadway elevation varies from 750 to 745 feet and the pavement to the north and south of the bridge is in poor condition.

The bridge site has approximately 60 feet of overburden, with the youngest deposits consisting of poorly-sorted sand and gravel alluvial deposits of the Cahokia Formation resting over well-sorted glacial outwash sand and gravel of the Henry Formation. At the far south end of the bridge site, these granular deposits rest directly on top of bedrock, while the remainder of the site has silty diamicton of the Winnebago Formation unconformably covering the bedrock (Bauer et al. 1991, Hansel and Johnson 1996, Willman et al. 1971). This fine-grained, silty deposit has moderate plasticity, moderate strength, low to moderate density, and moderate moisture content. At mapped top elevations of about 680 to 690 feet the bedrock consists of medium- to thin-bedded Ordovician-age dolostone. The site is located about four miles west of the deep Rock Bedrock Valley along one of its many tributaries. No active faults are known in the area (McGarry 2000, Kolata 2005). No mining activity is known in the vicinity of the bridge.

1.2 Proposed Structure

The *GPE* indicates the existing bridge will be removed and replaced with a new, three-span bridge with integral abutments and solid wall piers. The new abutments will be constructed immediately behind the existing ones and that the piers will be offset to create a larger creek channel. The bridge will have a back-to-back of abutment length of 124.7 feet and an out-to-out width of 43.7 feet; the unused western half of the bridge will be permanently removed. The profile grade along Springfield Avenue will remain the same with side slopes and a riprap armored end slope extending down at 1:2 (V:H).

2.0 METHODS OF INVESTIGATION

The following sections outline the subsurface and laboratory investigations performed by Wang.

2.1 Field Investigation

The subsurface investigation consisted of four bridge borings, designated as B-1 through B-4, advanced by IDOT in January 2020. A scour boring, designated as HA-07, was advanced by Wang within the North Fork of Kent Creek as a hand auger boring in April 2021. The structure borings were drilled from elevations of 744.4 to 745.3 feet and were advanced to depths of 50 to 69 feet bgs. The scour boring was advanced from an elevation of 730.8 feet to a depth of 10 feet bgs. The as-drilled northings and eastings were provided on the IDOT boring logs, with the scour boring acquired with a mapping-grade GPS unit. Boring location data are presented in the *Boring Logs* (Appendix A) and the as-drilled boring locations are shown in the *Boring Location Plan* (Exhibit 3).

The hand auger boring was advanced with pneumatic drive and a 1.4 inch diameter GEOPROBE sampling sleeves. At the hand auger location field boring logs, prepared and maintained by a Wang field engineer, included lithological descriptions, and visual-manual soil (IDH Textural) classifications. Structure Boring B-2 provides bedrock core log information.

2.2 Laboratory Testing

The hand auger samples were tested in the laboratory for moisture content (AASHTO T265). A particle size (AASHTO T88) analysis was performed on a selected streambed sample. Field visual descriptions of the soil samples were verified in the laboratory and index tested soils were classified according to the IDH Soil Classification System. The laboratory test results are shown in the *Boring Logs* (Appendix A) and in the *Laboratory Test Results* (Appendix B).

3.0 INVESTIGATION RESULTS

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

Our subsurface investigation results fit into the local geologic context. The borings drilled in the project area revealed the native sediments consisting primarily of sand and gravel overlying silty diamicton and dolostone bedrock. The streambed consists of 99% sand and gravel within the top 10 feet.

3.1 Lithological Profile

Surface conditions, including pavement thicknesses along Springfield Avenue, are not included in the soil borings provided by IDOT. In descending order, the general lithologic succession encountered beneath the pavement or topsoil includes: 1) stiff to very stiff sandy to clay loam; 2) loose to dense sand and gravel; 3) soft to stiff silty loam; and 4) strong, very poor to poor quality dolostone.

1) Stiff to very stiff sandy to clay loam

The existing Springfield Avenue approach embankments are made up of about 13 to 16 feet of stiff to very stiff sandy to clay loam. The loamy embankment soil has unconfined compressive strength (Q_u) values of 1.2 to 3.9 tsf and moisture content values of 10 to 27%. The top 3 to 4 feet below the surface are sandy, with the soils grading to more clay loam within the core of the embankment.

2) Loose to dense sand and gravel

Beneath the embankment, at elevations of 734 to 729 feet, the borings advanced through loose to medium dense fine sand and gravel. This granular soil layer has highly variable N-values, ranging from 9 to 70 blows per foot of penetration, likely due to the gravel fraction. The N-values are primarily loose to medium dense at about 9 to 24 blows per foot until an elevation of approximately 713 feet, where they increase noticeably into the dense range greater than 30 blows per foot. At the piers and south abutment, this layer has a thickness of about 15 to 27 feet; however it extends to the termination depth of Boring B-3 drilled at the north abutment.

3) Soft to stiff silty loam

At elevations of 716 to 707 feet, the pier and south abutment borings encountered soft to stiff, gray silty loam extending to the top of bedrock. This layer, which is also occasionally described as silty clay or clay loam, has Qu values of 0.4 to 2.3 tsf and moisture content values of 19 to 27%. Despite the low, soft Q_u designations, the silty loam has N-values of 7 to 20 blows per foot of penetration, and averages about 13 blows per foot in the medium dense range.

4) Strong, very poor to poor quality dolostone

The borings indicate auger refusal at elevations of 690 to 683 feet (50.0 to 62.5 feet bgs). Borings B-1, B-3, and B-4 were terminated at these elevation and we assume this refusal is the top of sound bedrock, as there are no bedrock cores at these locations. Boring B-2 cored strong, very poor to poor quality, slightly to moderately weathered dolostone bedrock beginning at an elevation of 685 feet. The rock quality designation (RQD) ranges from 0 to 42%.

3.2 Groundwater Conditions

Groundwater was encountered while drilling at elevations of 728 to 730 feet, which is consistent with the water surface elevation of Kent Creek. For the purpose of analysis, the design groundwater elevation is considered at elevation 730 feet.

4.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

Geotechnical evaluations and recommendations for the approach embankments, approach slabs, and substructure foundations are included in the following sections. The existing profile grade along Springfield Avenue will not be adjusted. The approach embankments will have side and end slopes graded at 1:2 (V:H), similar to the existing approach embankment side slopes. Wang recommends

supporting the substructures on driven piles. The piles should be either large thickness, concrete-filled metal shell piles (MSP) or steel H-piles. Due to large deposits of granular soils and associated groundwater, drilled shaft foundations are not recommended.

4.1 Seismic Design Considerations

The seismic site class was determined in accordance with the IDOT *Geotechnical Manual* (IDOT 2020a). The soils within the top 100 feet have a weighted average N value of 53 blows/foot (Method C controlling), and the results classify the site in the Seismic Site Class C. The project location belongs to the Seismic Performance Zone 1 (IDOT 2020a). The seismic spectral acceleration parameters recommended for design in accordance with the AASHTO *LRFD Bridge Design Specifications* (AASHTO 2020) are summarized in Table 1. Liquefaction analysis is not required for sites located in Seismic Performance Zone 1.

Table 1: Recommended Seismic Design Parameters

Spectral Acceleration Period (sec)	Spectral Acceleration Coefficient[1] (% g)	Site Factors	Design Spectrum for Site Class C[2] (% g)
0.0	PGA= 3.7	F_{pga}= 1.2	**A_s= 4.5**
0.2	S_s= 8.0	F_a= 1.2	**S_{DS}= 9.6**
1.0	S_1= 3.2	F_v= 1.7	**S_{D1}= 5.5**

1) Spectral acceleration coefficients based on Site Class C

2) Site Class C Spectrum to be included on plans; $A_s = PGA*F_{pga}$; $S_{DS}= S_s*F_a$; $S_{D1}= S_1*F_v$

4.2 Scour Considerations

Based on the TSL provided by BLA, the abutment end slopes will be armored with riprap, therefore the scour elevations are placed at the proposed abutment base elevations. A hydraulic report is being prepared for the channel. We recommend a D_{50} value of 3.5 mm for the analysis at the piers and no reduction in the scour elevations. The Q100, Q200, Design and Check scour elevations are provided in Table 2. The design high water elevation (DHWE) is 739.77 feet and the Estimated Water Surface Elevation (EWSE) within the channel is 735.69 feet. The streambed elevation is approximately 730 to 731 feet. Based on the scour elevations provided, we anticipate that scour reductions will be necessary for deep foundations at the piers.

Table 2: Project Design Scour Elevations

	North Abutment (feet)	Pier 1 (feet)	Pier 2 (feet)	South Abutment (feet)	Item 113
Q100 Elevation (feet)	738.06	724.43	723.63	738.29	5
Q200 Elevation (feet)	738.06	721.84	721.04	738.29	
Design Elevation (feet)	738.06	724.43	723.63	738.29	
Check Elevation (feet)	738.06	721.84	721.04	738.29	

4.3 Approach Embankments and Slabs

Wang has performed evaluations of the settlement and global stability of the approach embankments. The proposed grade along Springfield Avenue will not be changed from the existing pavement elevation of 746 to 747 feet The approach embankments at both abutments will have side slopes graded at 1:2 (V: H), as will the riprap armored end slopes. The end slopes extend horizontally out beyond the piers to provide replacements for the pedestrian paths.

4.3.1 Settlement

With no anticipated change in profile grade and predominantly granular soils, we estimate the settlement along the Springfield Avenue bridge replacement will be less than 0.4 inches. There are no downdrag considerations required at the abutments.

4.3.2 Global Stability

The global stability of the approach embankment side slopes was analyzed at the critical sections based on the soil profile described in Section 3.1 and the information provided in the GPE. The minimum required FOS for both short (undrained) and long-term (drained) conditions is 1.5 (IDOT 2012). *Slide2* evaluation exhibits employing the Bishop Simplified method of analysis are shown in Appendix C. The FOS values meet the minimum requirement.

4.3.3 Approach Slabs

The approach slabs will be supported on shallow slab footings (IDOT 2012). Based on the soil conditions revealed in Borings B-2 and B-3, the approach footings will be supported mainly on the stiff to very stiff clay loam. We estimate the slab footing will be supported on foundation soils with a maximum factored bearing resistance of 3,500 psf calculated for a geotechnical resistance factor (Φ_b) of 0.45 (AASHTO 2017). Settlement of the approach footing is will be minimal.

4.4 Structure Foundations

The foundation soils consist of stiff to very stiff clayey soil embankments followed by generally medium dense sand and gravel, dense sand and gravel, and soft to stiff silty loam. Dolostone bedrock will be encountered approximately 40 to 55 feet below the abutment base elevations and 33 to 45 feet below the pier footing elevations. Wang recommends supporting both the integral abutments and piers on driven metal shell piles (MSP) or driven steel H-piles.

The preliminary loading information provided by BLA indicates the abutments will include 7 piles with service loads of 110 kips and **factored loads of 160 kips**. The piers will also have 7 piles, with service loads of 130 kips and **factored loads of 180 kips**. The proposed abutment cap bases are set at 737.98 feet at the north and 738.75 feet at the south. The pier base caps are both set at 728.4 feet.

4.4.1 Driven Piles

IDOT specifies the maximum nominal required bearing (R_{NMAX}) for each pile and states the factored resistance available (R_F) for steel H-piles and MSP should be based on a geotechnical resistance factor (ϕ_G) of 0.55 (IDOT 2012). Nominal tip and side resistance were estimated using the methods and empirical equations presented in the latest *IDOT Geotechnical Pile Design Guide* (IDOT 2020). Based on the preliminary loads provided by BLA and the proposed width of the substructure, we anticipate that the design load may vary between approximately 140 to 180 kips at the abutments and 160 to 200 kips at the piers.

Both IDOT (2020a) and AASHTO (2021) standards require downdrag loading to be applied to piles with greater than 0.4 inch of relative settlement along the sides. We estimate that less than 0.4 inch of settlement will remain following the construction of the embankment and subsequent pile driving. We estimate that downdrag allowances will not be required for the abutment piles. At the pier, the preliminary Q200 scour losses are accounted for in the pile length evaluations.

The foundation soils within 10.0 feet below the abutment pile cap elevations consist of stiff to very stiff clay loam with average Q_u values of 1.7 to 2.4 tsf in accordance with BBS Sheet 145. In accordance with the *All Bridge Designers Memo 19.8* (IDOT 2019), all available pile sizes have expansion lengths greater than the structure expansion length and are suitable for use with integral abutments without precoring.

The R_F, R_N, estimated pile tip elevations, and pile lengths for 14-inch diameter MSP with 0.312-inch thick shells, 16-inch diameter MSP with 0.375-inch thick shells, HP10x42, HP12x53, and HP12x63, and HP14x89 steel H-piles are summarized in Tables 3, 4, and 5. Pile lengths assume a 2-foot pile embedment into the abutment pile caps and a 1-foot embedment into the pier caps.

Table 3: Estimated Pile Lengths and Tip Elevations for 14-inch Dia. MSP with 0.312-inch walls

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
North Abutment Boring B-2	737.98	255	0	0	140	48	692
		291	0	0	160	50	691
		327	0	0	180	50	691
		570 (R_{Nmax})	0	0	314	50	691
South Abutment Boring B-3	738.75	255	0	0	140	24	718
		291	0	0	160	27	715
		327	0	0	180	28	714
		570 (R_{Nmax})	0	0	314	29	713
Pier 1 Boring B-4	728.37	356	36	0	160	25	701
		393	36	0	180	32	691
		430	36	0	200	36	684
		570 (R_{Nmax})	36	0	277	38	683
Pier 2 Boring B-1	728.37	316	14	0	160	28	701
		353	14	0	180	38	691
		389	14	0	200	45	684
		570 (R_{Nmax})	14	0	299	46	683

Table 4: Estimated Pile Lengths and Tip Elevations for 16-inch Dia. MSP with 0.375-inch walls

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
North Abutment Boring B-2	737.98	255	0	0	140	38	703
		291	0	0	160	48	693
		327	0	0	180	50	691
		782 (R_{Nmax})	0	0	359	50	691
South Abutment Boring B-3	738.75	255	0	0	140	24	718
		291	0	0	160	24	718
		327	0	0	180	25	717
		782 (R_{Nmax})	0	0	359	30	712
Pier 1 Boring B-4	728.37	365	41	0	160	21	708
		402	41	0	180	24	705
		438	41	0	200	30	699
		782 (R_{Nmax})	41	0	318	38	691
Pier 2 Boring B-1	728.37	320	16	0	160	22	707
		356	16	0	180	25	704
		393	16	0	200	33	696
		782 (R_{Nmax})	16	0	343	46	683

Table 5: Estimated Pile Lengths and Tip Elevations for Steel Piles Driven to R_{Nmax}

Substructure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Pile Size	Maximum Nominal Bearing, R_N (kips)	Factored Geotechnical Losses (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
North Abutment Boring B-2	737.98	HP10x42	335	0	184	57	685
		HP12x53	418	0	227	57	685
		HP12x63	497	0	273	58	684
		HP14x89	705	0	388	58	684
South Abutment Boring B-3	738.75	HP10x42	335	0	184	47	695
		HP12x53	418	0	230	47	695
		HP12x63	497	0	273	47	695
		HP14x89	705	0	388	48	694
Pier 1 Boring B-4	728.37	HP10x42	335	0	184	39	690
		HP12x53	418	0	230	39	690
		HP12x63	497	0	273	39	690
		HP14x89	705	0	388	40	689
Pier 2 Boring B-1	728.37	HP10x42	335	0	184	46	683
		HP12x53	418	0	230	46	683
		HP12x63	497	0	273	46	683
		HP14x89	705	0	388	47	682

4.4.2 Lateral Loading

Lateral loads on the piles should be analyzed for maximum moments and lateral deflections. Recommended lateral soil modulus and strain parameters required for analysis via the p-y curve method are included in Table 6.

Table 6: Recommended Soil Parameters for Lateral Load Analysis

Soil Description Avg Elevation Limits	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, Φ (°)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
Stiff to V Stiff CLAY LOAM Abut Base to 730 feet	120	1800	0	1000	0.6
Loose to M Dense SAND and GRAVEL EL 730 feet to 714 feet	58 (submerged)	0	32	70	--
Dense SAND and GRAVEL EL 714 feet to 707 feet	63 (submerged)	0	36	110	--
Soft to Stiff SILTY LOAM EL 707 feet to TOR	58 (submerged)	0	30	40	--

4.5 Stage Construction

The bridge will be reconstructed under a detour of Springfield Avenue and stage construction will not be utilized. The existing abutments and piers will need to be removed to a depth of at least two feet below the final grade elevation. Based on the geometry shown in the GPE, the proposed substructure piles will not be in conflict with the existing piles; therefore, the existing piles can be cut off at the 2-foot depth and remain in place.

Excavations of up about 7 to 8 feet at the abutment and 3 to 4 feet at the piers will be required and we recommend shoring excavation lines that cannot be sloped at 1:1.5 (V:H) with cantilever steel sheeting. We estimate temporary steel sheet piling designed using the charts included in the *IDOT Design Guide-Simplified Temporary Sheet Piling Design Charts* is feasible (IDOT 2020a) down to an elevation of about 714 feet, where the soil borings encountered dense sand and gravel. This limitation will likely not impact construction at the abutments, but depending on the final temporary shoring requirements, the piers may require the pay item *Temporary Soil Retention System*.

The TSL plan shows permanent steel sheet piling at the west corners of both abutments where the unused western half of the existing bridge is being removed. The walls will have maximum total retained heights of approximately 5 feet. We recommend designing the sheet pile walls based on the parameters shown in Table 7.

Table 7: Long-term (Drained) Geotechnical Parameters for Design of Steel Sheet Piling

Soil Description Avg Depth Limit bgs	Unit Weight, γ (pcf)	Drained Shear Strength Properties		Earth Pressure Coefficients	
		Cohesion (psf)	Friction Angle (°)	Active Pressure	Passive Pressure
Stiff to V Stiff CLAY LOAM Abut Base to 730 feet	120	100	30	0.33	3.00
Loose to M Dense SAND and GRAVEL EL 730 feet to 714 feet	58 (submerged)	0	32	0.31	3.26
Dense SAND and GRAVEL EL 714 feet to 707 feet	63 (submerged)	0	36	0.26	3.85
Soft to Stiff SILTY LOAM EL 707 feet to TOR	58 (submerged)	0	30	0.33	3.00

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

Vegetation, surface topsoil, and debris should be cleared and stripped where the structure will be placed. If unstable or unsuitable materials are exposed during excavation, they should be removed and replaced with compacted structural fill as described in Section 5.3.

5.2 Excavation, Dewatering, 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. Any slope that cannot be graded at 1:1.5 (V:H) should be properly shored with steel sheeting or temporary soil retention systems (IDOT 2020).

During the subsurface investigation, the groundwater was encountered at a design elevation of 730 feet behind the proposed abutments. The EWSE within the creek is 735.7 feet. The groundwater will not affect the construction of the proposed abutments or removal of the existing abutments. At the pier, however, surface water control will be necessary. The EWSE is greater than 6 feet higher than the base of the proposed pier cap, and we therefore recommend a *Type 2 Cofferdam* be proposed for the construction of the new pier and placement of the proposed end slope riprap. The excavations

proposed at the piers will require a seal coat with a minimum thickness of 3 feet, while the remaining work along the slopewalls and banks will not require a sealcoat.

5.3 Filling and Backfilling

Fill material used to attain final design elevations should be pre-approved, compacted, cohesive or granular soil conforming to Section 204, *Borrow and Furnished Excavation* (IDOT 2016). The fill material should be free of organic matter and debris and should be placed in lifts and compacted according to Section 205, *Embankment* (IDOT 2016).

Backfill materials for the abutments and piers must be pre-approved by the Resident Engineer. To backfill the abutments, we recommend porous granular material conforming to the requirements specified in the IDOT Supplemental Special and Recurring Special Provisions, *Granular Backfill for Structures* (IDOT 2020b).

5.4 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.

5.5 Pile Installation

The driven piles shall be furnished and installed according to the requirements of IDOT Section 512, *Piling* (IDOT 2016). Wang recommends performing one test pile at each substructure location. Wang does not anticipate the need for pile shoes.

6.0 QUALIFICATIONS

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

It has been a pleasure to assist BLA, 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.

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Corina T. Farez, P.G., P.E.
QC/QA Reviewer

REFERENCES

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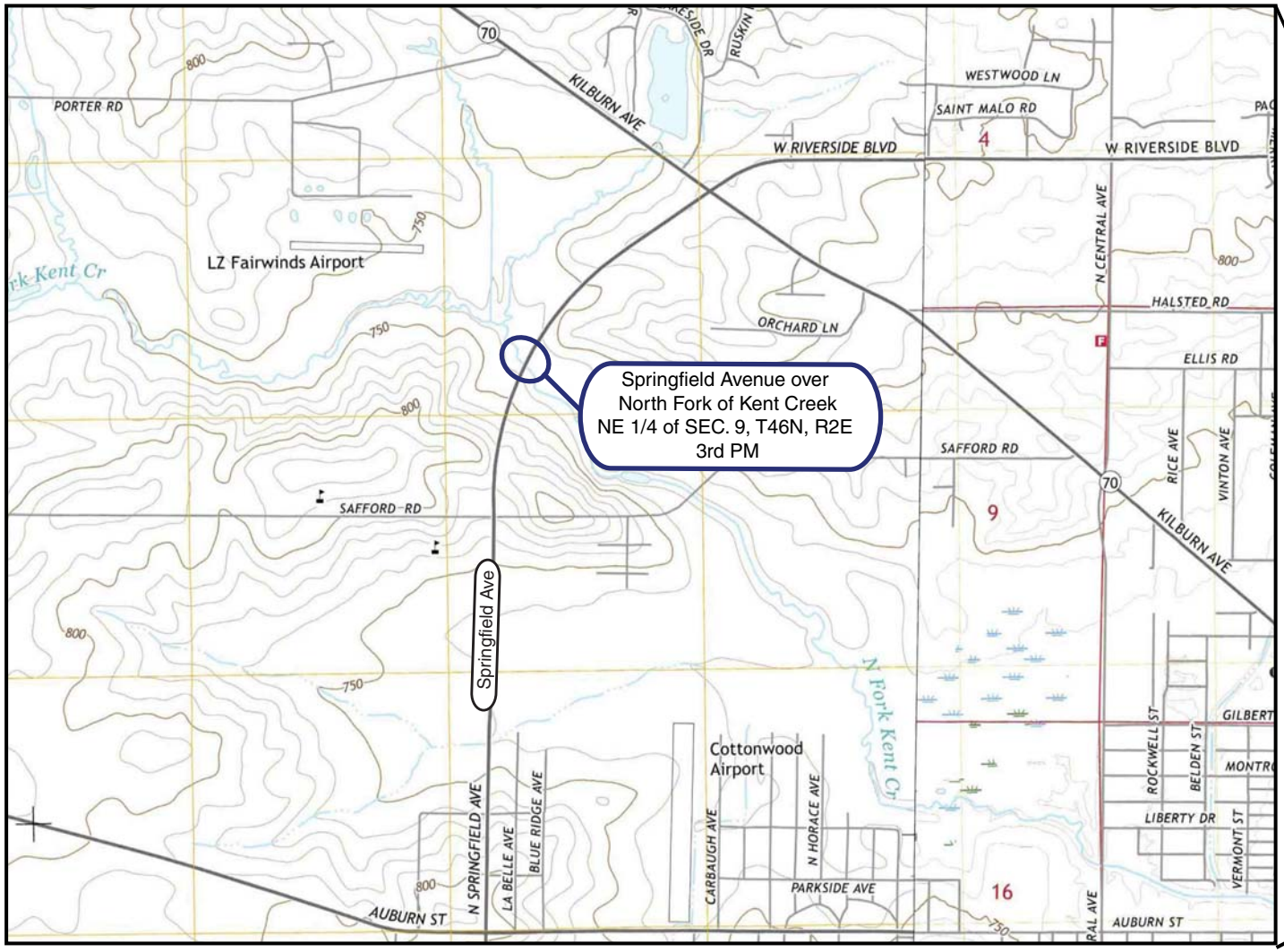
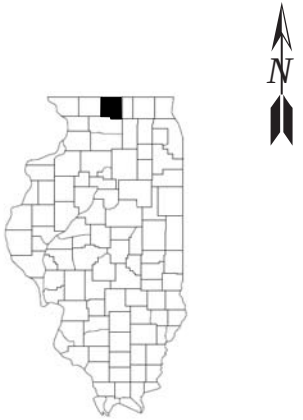
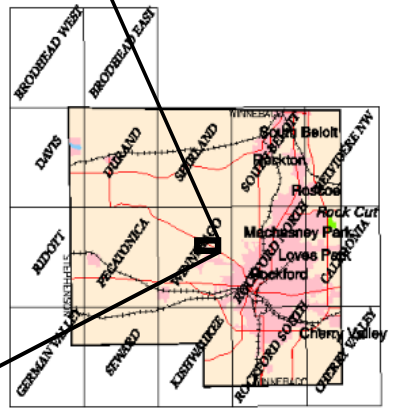
Phone (630) 953-9928
www.wangeng.com

EXHIBITS







0 0.5 1.0 Mile

SITE LOCATION MAP: SPRINGFIELD AVENUE BRIDGE OVER NORTH FORK OF KENT CREEK, SN 101-0100, WINNEBAGO COUNTY

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: N. Balakumaran CHECKED BY: M. Snider

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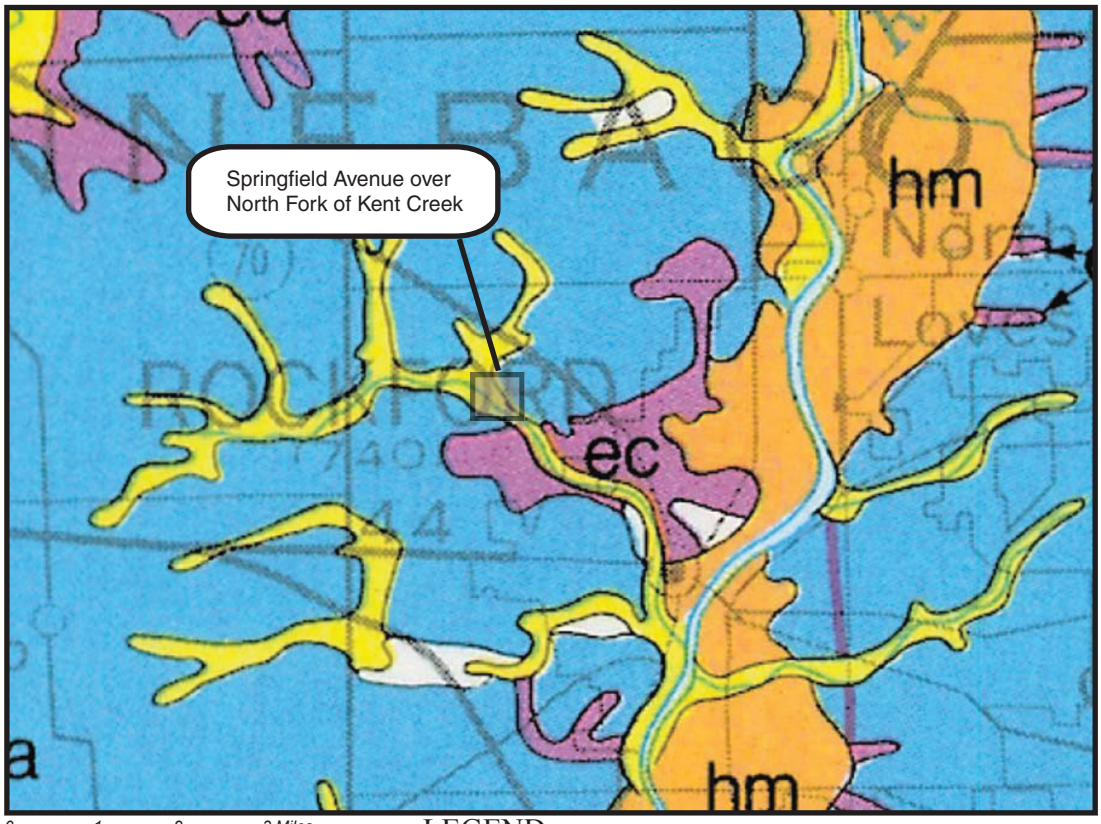
FOR BLA, INC. 165-06-01



(from Lineback, 1979)

SURFICIAL GEOLOGY

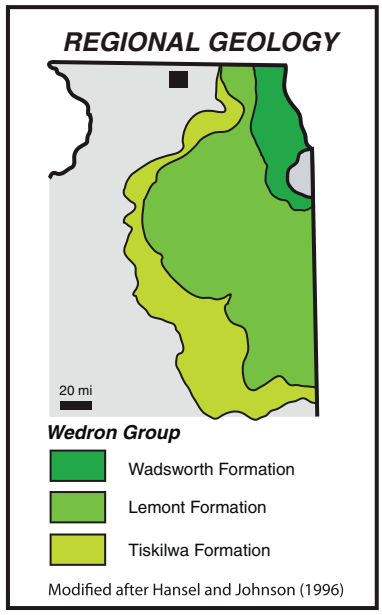
LEGEND

HUDSON EPISODE - (POSTGLACIAL)
(10,000 - 0 years Before Present)

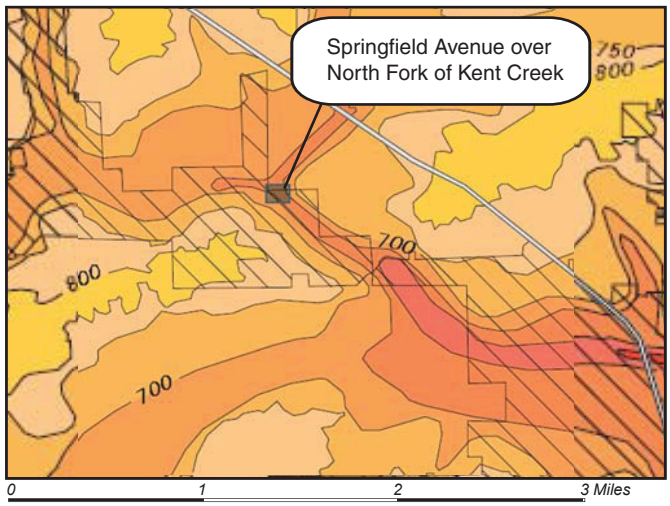
- Cahokia Alluvium, modern river and floodplain deposits
- Equality Member, lake sediments, largely silts and clay
- Makinaw Member, Henry Formation, well sorted sand and gravel glacial outwash deposits in valleys

WISCONSIN EPISODE - MASON GROUP
LAST GLACIATION (55,000 - 10,000 years B.P.)

- Argyle Till Member of Winnebago Formation, A very sandy and gravelly pinkish-tan or salmon till



TOP OF BEDROCK ELEVATION

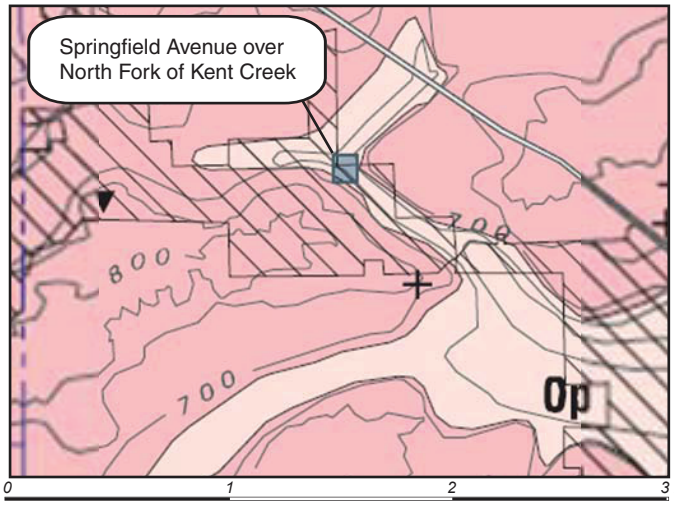


LEGEND

Elevations in feet above mean sea level

850 - 900	600 - 650
800 - 850	550 - 600
750 - 800	500 - 550
700 - 750	450 - 500
650 - 700	Less than 450

BEDROCK GEOLOGY



LEGEND

- Galena Group, Dolomite; brown and gray; coarse grained; primarily pure; 250 feet thick;
- Plattville Group, Dolomite; brown and gray; fine to very fine grained; 0 to 130 feet thick

SITE AND REGIONAL GEOLOGY: SPRINGFIELD AVENUE OVER NORTH FORK OF KENT CREEK, SN 101-0100, WINNEBAGO Co.

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

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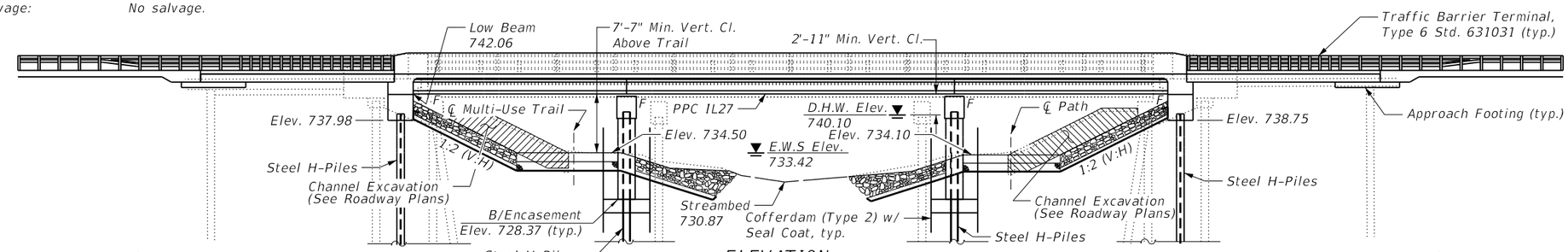
FOR BLA, INC. | 165-06-01

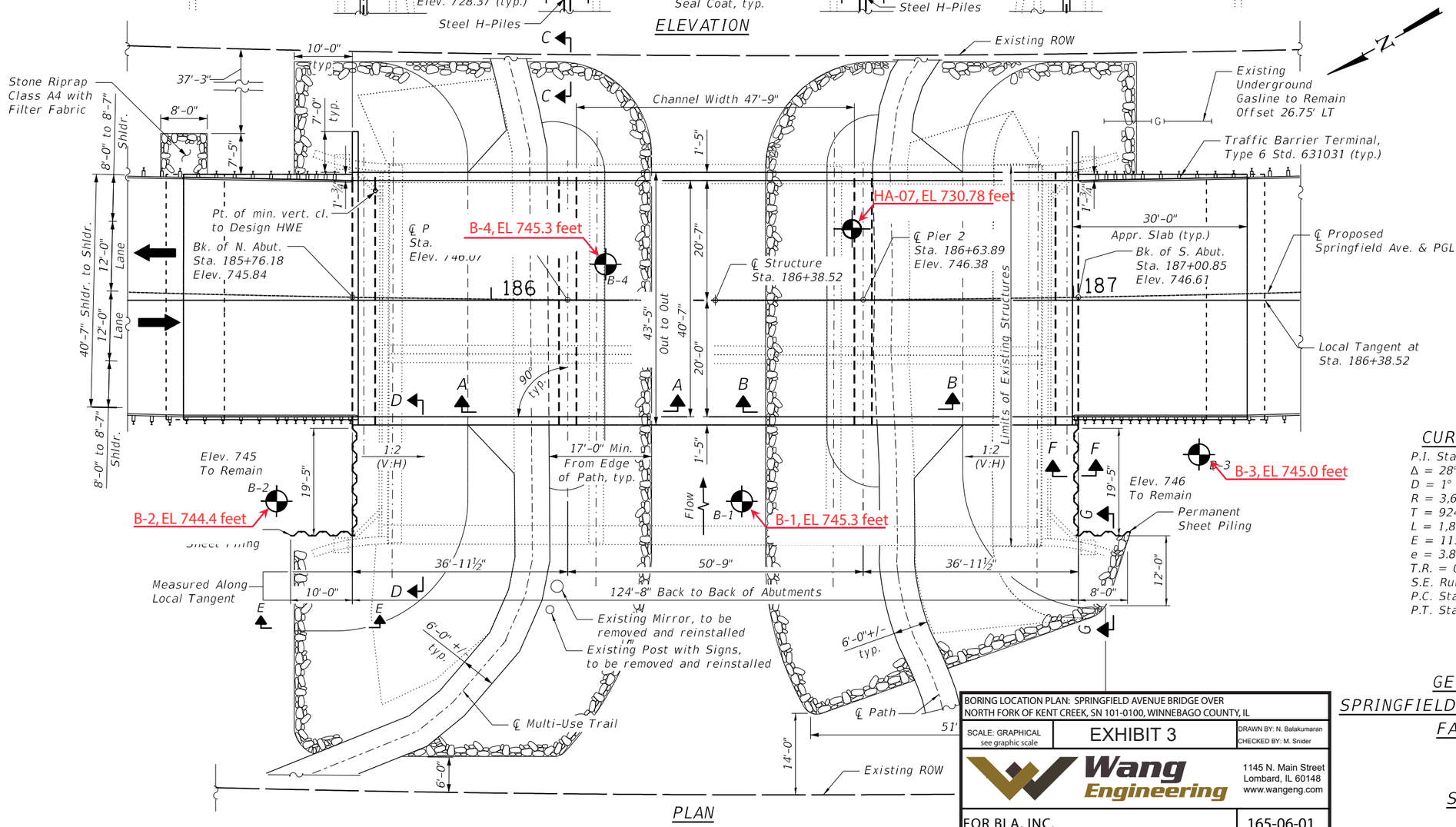
Benchmark: *Cut cross in existing bridge deck, near ℄ span at west shoulder, Elevation 746.275*

Existing Structure: *Structure No. 101-0100 was originally constructed in 1959, F.A.S. Route 1058. It consists of non-composite three-span continuous steel beam bridge. The structure is 32'-8" from outside the east parapet to the centerline longitudinal joint and 65'-4" out to out of parapets full structure width, with the west half unused. It is 114'-4" along the centerline back to back abutments. The bridge will be closed and traffic will be detoured.*

Salvage: *No salvage.*



ELEVATION



PLAN

HIGHWAY CLASSIFICATION

Springfield Avenue – FAP 0525
Functional Class: Other Principal Arterial
ADT: 8,550 (2017); 10,850 (2044)
ADTT: 419 (2017); 532 (2044)
DHV: 1,085
Design Speed: 60 m.p.h.
Posted Speed: 55 m.p.h.
2 -Way Traffic
Directional Distribution: 50/50

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.055g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.096g
Soil Site Class = C

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

LOADING HL-93

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

DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi (Substructure)
f'c = 4,000 psi (Superstructure)
fy = 60,000 psi (Reinforcement)

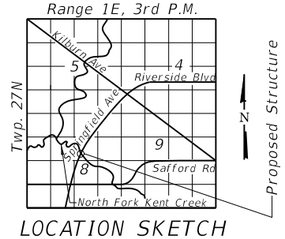
PRECAST PRESTRESSED UNITS

f'c = 8,500 psi
f'ci = 6,500 psi
fpu = 270,000 psi (0.6" ∅ low lax. strands)
fpbt = 202,300 psi (0.6" ∅ low lax. strands)

Notes:
For Sections A-A thru C-C, see sheet 2 of 3.
For Views D-D and E-E and Sections F-F and G-G, see Sheet 3 of 3.

CURVE DATA

P.I. Sta. = 183+75.65
Δ = 28° 25' 36" (LT)
D = 1° 34' 11"
R = 3,650.00'
T = 924.49'
L = 1,810.90'
E = 115.26'
e = 3.8
T.R. = 0.00'
S.E. Run = 100.00'
P.C. Sta. = 174+51.16
P.T. Sta. = 192+62.06



LOCATION SKETCH

BORING LOCATION PLAN: SPRINGFIELD AVENUE BRIDGE OVER NORTH FORK OF KENT CREEK, SN 101-0100, WINNEBAGO COUNTY, IL

SCALE: GRAPHICAL see graphic scale | EXHIBIT 3 | DRAWN BY: N. Balakumaran CHECKED BY: M. Snider

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GENERAL PLAN & ELEVATION
SPRINGFIELD AVE OVER N. FORK OF KENT CREEK
FAP 0525 – SECTION 111BR
WINNEBAGO COUNTY
STATION 186+38.52
STRUCTURE NO. 101-0229

BLA, Inc.

USER NAME =	DESIGNED - KP	REVISED -
	CHECKED - PD	REVISED -
PLOT SCALE =	DRAWN - KP	REVISED -
PLOT DATE =	CHECKED - PD	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

TOTAL SHEETS 1 OF 3 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
525	111BR	WINNEBAGO	3	1
		CONTRACT NO. 64P06		
		ILLINOIS	FED. AID PROJECT	

MODEL: Default
FILE NAME: W:\191-170 IDOT IL 251 & Springfield\Springfield\CADD Sheets\Structural\TSL\111BR_Springfield_TSL_SHT-01_General Plan.dgn
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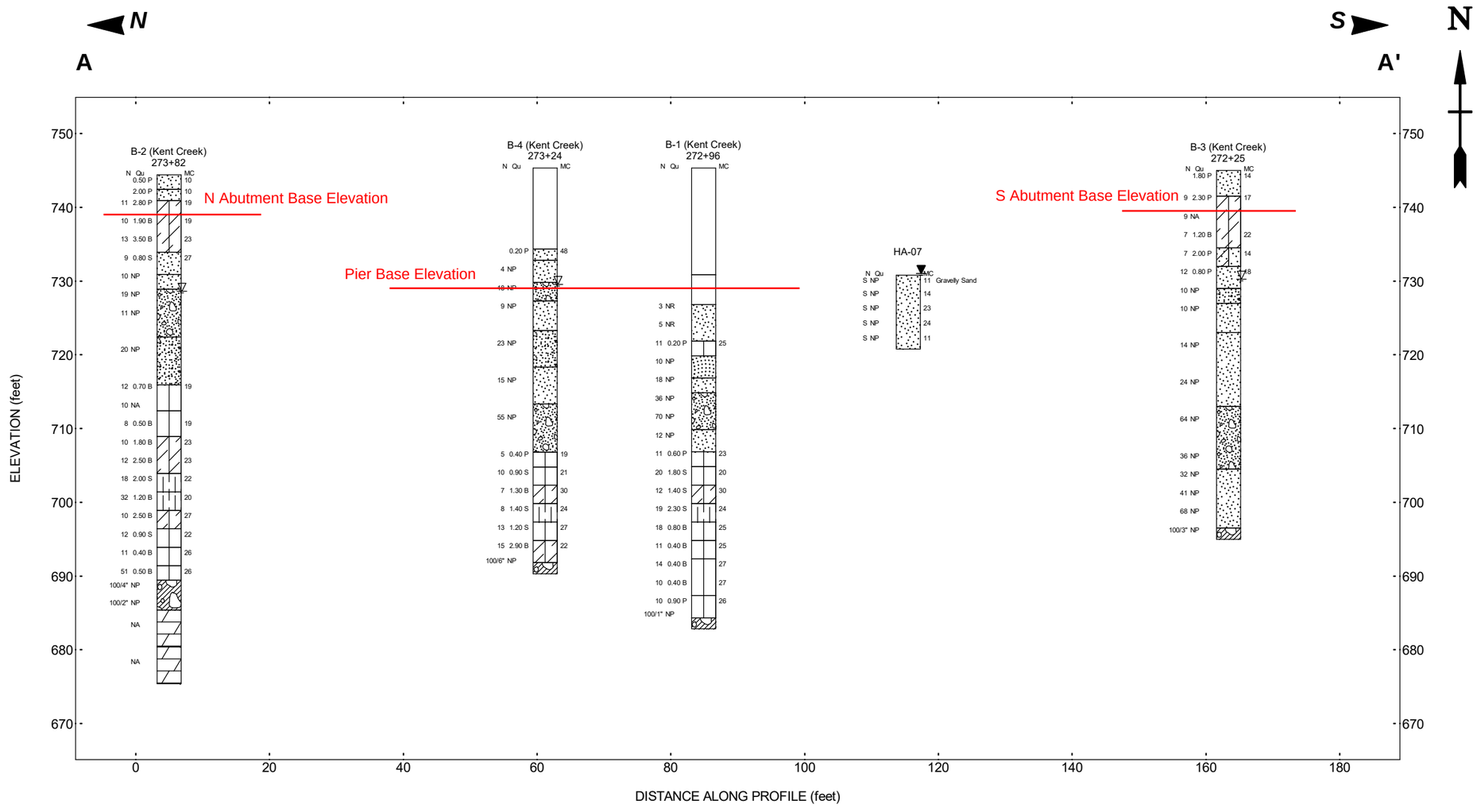
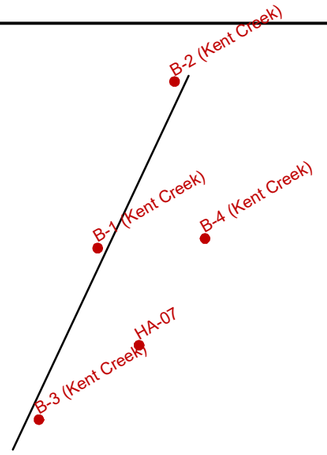


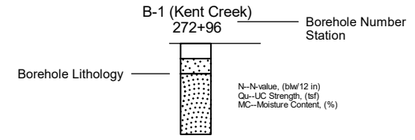
Lithology Graphics

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



Site Map Scale 1 inch equals 65 feet

Explanation:



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

0 — 18

Horizontal Scale (feet)

Vertical Exaggeration: 1x

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Soil Profile A-A'
Springfield Avenue over
North Fork of Kent Creek

WEI SINCE 1982

District 2 Bridges, PTB 194/ 025-01
Winnebago County, Illinois

JOB NUMBER	PLATE NUMBER
165-06-01	EXHIBIT 4

WEI 11X17 165061.GPJ WANGENG.GDT 9/23/21

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APPENDIX A

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 1/13/20

ROUTE FAP 525 (Springfield Ave) **DESCRIPTION** P92-004-20 Bridge over Kent Creek, 0.5 mi S of IL 70 **LOGGED BY** W. Garza

SECTION 111BR **LOCATION** Rockford, NE8, **SEC.** , **TWP.** 44N, **RNG.** 1E

COUNTY Winnebago **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME-75 Automatic

STRUCT. NO. 101-0100
Station

Latitude 42° 18' 28.78" **Northing** 2,056,420.2160
Longitude -89° 08' 38.00" **Easting** 2,573,234.9583

BORING NO. B-1
Station 272+96
Offset 21.00ft Lt of CL
Ground Surface Elev. 745.34 ft

Surface Water Elev. 731.79 ft
Stream Bed Elev. 730.09 ft
Groundwater Elev.:
First Encounter ft
Upon Completion Wash ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
				Bridge Deck				
						3		
						3		
						2		
					721.84			
						4		
				VERY SOFT gray SILT		4	0.2	25.0
-5					720.34	7	P	
				LOOSE/MEDIUM tan FINE SAND		6		
						5		
					717.84	5		
				MEDIUM tan MEDIUM SAND with MEDIUM GRAVEL		4		
						7		
-10					715.34	-30 11		
				DENSE tan SANDY GRAVEL		10		
						12		
				36" Wash	712.84	24		
732.34				Top H20				
				VERY DENSE tan SANDY GRAVEL		33		
730.84				Stream Bed		35		
-15					710.34	-35 35		
				6" Wash				
				MEDIUM tan FINE SAND		7		
						5		
						7		
726.84					706.84			
	2			No Recovery SAND?		4		
	1			MEDIUM gray SILTY LOAM with SAND LENS		4	0.6	23.0
-20	2				705.34	-40 7	P	
				No Recovery SAND? *(continued)*				

Northing and Easting were calculated using the ILHP-WF coordinate system

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 1/13/20

ROUTE FAP 525 (Springfield Ave) DESCRIPTION P92-004-20 Bridge over Kent Creek, 0.5 mi S of IL 70 LOGGED BY W. Garza

SECTION 111BR LOCATION Rockford, NE8, SEC. , TWP. 44N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME-75 Automatic

STRUCT. NO. 101-0100
Station

Latitude 42° 18' 28.78" Northing 2,056,420.2160
Longitude -89° 08' 38.00" Easting 2,573,234.9583

BORING NO. B-1
Station 272+96
Offset 21.00ft Lt of CL
Ground Surface Elev. 745.34 ft

Surface Water Elev. 731.79 ft
Stream Bed Elev. 730.09 ft

Groundwater Elev.:
First Encounter ft
Upon Completion Wash ft
After ____ Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
STIFF gray SILTY LOAM		7 8 12	1.8 S	20.0
	702.84			
STIFF gray CLAY LOAM		5 6 6	1.4 S	30.0
	700.34 -45			
VERY STIFF gray SILTY CLAY		6 8 11	2.3 S	24.0
	697.84			
MEDIUM gray SILTY LOAM		6 8 10	0.8 B	25.0
	695.34 -50			
SOFT gray SILT		4 5 6	0.4 B	25.0
	692.84			
SOFT gray SILTY LOAM		4 5 9	0.4 B	27.0
	690.34 -55			
SOFT gray SILTY LOAM		2 4 6	0.4 B	27.0
	687.84			
MEDIUM gray SILTY LOAM		2 4 6	0.9 P	26.0
	-60			
MEDIUM gray SILTY LOAM *(continued)*	684.34			
VERY DENSE tan WEATHERED LIMESTONE		100 for 1"		
Auger refusal @ 62.5'	682.84			
End of Boring				
	-65			
	-70			
	-75			
	-80			

Northing and Easting were calculated using the ILHP-WF coordinate system

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 1/14/20

ROUTE FAP 525 (Springfield Ave) **DESCRIPTION** P92-004-20 Bridge over Kent Creek, 0.5 mi S of IL 70 **LOGGED BY** W. Garza

SECTION 111BR **LOCATION** Rockford, NE8, **SEC.** , **TWP.** 44N, **RNG.** 1E

COUNTY Winnebago **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME-75 Automatic

STRUCT. NO. 101-0100
Station

Latitude 42° 18' 29.49" **Northing** 2,056,492.7837
Longitude -89° 08' 37.54" **Easting** 2,573,268.4436

BORING NO. B-2
Station 273+82
Offset 20.00ft Lt of CL of bridge
Ground Surface Elev. 744.41 ft

Surface Water Elev. 731.79 ft
Stream Bed Elev. 730.09 ft
Groundwater Elev.:
First Encounter 728.4 ft ▼
Upon Completion Wash ft
After ____ **Hrs.** ____ ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
MEDIUM brown SANDY LOAM				0.5 P	10.0
	742.41				
VERY STIFF brown SANDY LOAM				2.0 P	10.0
	740.91				
VERY STIFF brown CLAY LOAM			5 5 6	2.8 P	19.0
	739.41	-5			
STIFF brown CLAY LOAM			2 4 6	1.9 B	19.0
	736.91				
VERY STIFF gray CLAY LOAM			4 5 8	3.5 B	23.0
	734.41	-10			
MEDIUM black SANDY LOAM with SAND LENS			4 4 5	0.8 S	27.0
	730.91				
LOOSE/MEDIUM gray MEDIUM SAND			1 5 5		
	729.41	-15			
▼ MEDIUM tan SANDY GRAVEL			6 9 10		
	726.91				
MEDIUM tan SANDY GRAVEL			7 4 7		
	724.41	-20			
5' Run					
	720.91				
MEDIUM tan COARSE CLEAN SAND			7 9 11		
	719.41	-25			
5' Run 18" Wash					
	715.91				
MEDIUM gray SILT			8 5 7	0.7 B	19.0
	714.41	-30			
No Recovery			2 4 6		
	711.91				
MEDIUM gray SILTY LOAM with SAND LENS			3 3 5	0.5 B	19.0
	709.41	-35			
STIFF gray CLAY LOAM			3 5 5	1.8 B	23.0
	706.91				
VERY STIFF gray CLAY LOAM			4 5 7	2.5 B	23.0
	704.41	-40			

Northing and Easting were calculated using the ILHP-WF coordinate system

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 1/14/20

ROUTE FAP 525 (Springfield Ave) DESCRIPTION P92-004-20 Bridge over Kent Creek, 0.5 mi S of IL 70 LOGGED BY W. Garza

SECTION 111BR LOCATION Rockford, NE8, SEC. , TWP. 44N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME-75 Automatic

STRUCT. NO. 101-0100
Station

Latitude 42° 18' 29.49" Northing 2,056,492.7837
Longitude -89° 08' 37.54" Easting 2,573,268.4436

BORING NO. B-2
Station 273+82
Offset 20.00ft Lt of CL of bridge
Ground Surface Elev. 744.41 ft

Surface Water Elev. 731.79 ft
Stream Bed Elev. 730.09 ft

Groundwater Elev.:
First Encounter 728.4 ft ▼
Upon Completion Wash ft
After ____ Hrs. ____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
STIFF gray SILTY CLAY		6 8 10	2.0 S	22.0
	701.91			
STIFF gray SILTY LOAM		10 14 18	1.2 B	20.0
Wash	699.41 -45			
VERY STIFF gray CLAY LOAM		4 4 6	2.5 B	27.0
	696.91			
MEDIUM gray SILTY LOAM		5 5 7	0.9 S	22.0
	694.41 -50			
SOFT gray SILTY LOAM		3 5 6	0.4 B	26.0
Wash	691.91			
MEDIUM gray SILTY LOAM		4 7 44	0.5 B	26.0
Bottom 1" 40 BLOW WLS	689.41 -55			
VERY DENSE tan WEATHERED LIMESTONE		100 for 4"		
	686.91			
VERY DENSE tan WEATHERED LIMESTONE				
	685.41	100 for 2"		
Borehole continued with rock coring.	-60			

Northing and Easting were calculated using the ILHP-WF coordinate system

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

ROCK CORE LOG

Date 1/14/20

ROUTE FAP 525 (Springfield Ave) DESCRIPTION P92-004-20 Bridge over Kent Creek, 0.5 mi S of IL 70 LOGGED BY W. Garza

SECTION 111BR LOCATION Rockford, NE8, SEC. , TWP. 44N, RNG. 1E

COUNTY Winnebago CORING METHOD Diamond bit core barrel

CORING BARREL TYPE & SIZE NQZ, 3.0"

STRUCT. NO. 101-0100
Station

Core Diameter 2 in
Top of Rock Elev. 689.41 ft
Begin Core Elev. 685.41 ft

BORING NO. B-2
Station 273+82
Offset 20.00ft Lt of CL of bridge
Ground Surface Elev. 744.41 ft

Latitude 42° 18' 29.49"
Longitude -89° 08' 37.54"
Northing 2,056,492.7837
Easting 2,573,268.4436

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Dolostone: hard, tan to light gray with dark gray banding in lower 1.5 ft, thin bedded, intensely fractured along horizontal bedding planes with minor pitting No testable segments	685.41 680.41	-60	1	100	0	7	
Dolostone: hard, gray to tan with dark gray banding in upper 1.0 ft, thin to medium bedding, moderate fracturing along horizontal bedding planes with some vertical fractures T.S.F. - 680.41 to 679.86	675.41	-65	2	100	42	2.2	775.0
End of Boring		-70 -75					

Northing and Easting were calculated using the ILHP-WF coordinate system

Color pictures of the cores Yes
Cores will be stored for examination until construction
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 1/29/20

ROUTE FAP 525 (Springfield Ave) DESCRIPTION P92-004-20 Bridge over Kent Creek, 0.5 mi S of IL 70 LOGGED BY W. Garza

SECTION 111BR LOCATION Rockford, NE8, SEC. , TWP. 44N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME-75 Automatic

STRUCT. NO. 101-0100
Station

Latitude 42° 18' 28.04" Longitude -89° 08' 38.35"
Northing 2,056,345.5562 Easting 2,573,209.3433

BORING NO. B-3
Station 272+25
Offset 12.00ft Lt of CL
Ground Surface Elev. 745.00 ft

Surface Water Elev. 731.00 ft
Stream Bed Elev. 730.09 ft

Groundwater Elev.:
First Encounter 730.0 ft ▼
Upon Completion Wash ft
After ____ Hrs. ____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
STIFF light brown SANDY LOAM with GRAVEL			1.8 P	14.0
	741.50			
VERY STIFF gray CLAY LOAM	-5	1 4 5	2.3 P	17.0
	740.00			
No Recovery		4 4 5		
	737.50			
STIFF gray CLAY LOAM	-10	2 3 4	1.2 B	22.0
	735.00			
MEDIUM/STIFF gray LOAM with SAND LENS		2 3 4	2.0 P	14.0
	732.50			
MEDIUM gray SANDY LOAM	▼-15	2 6 6	0.8 P	18.0
	729.00			
LOOSE/MEDIUM gray MEDIUM COARSE SAND		1 4 6		
	727.50			
LOOSE/MEDIUM light brown FINE SAND	-20	2 5 5		
	725.00			
5' Run				
	721.50			
MEDIUM light brown MEDIUM COARSE SAND with SILT LENS	-25	5 5 9		
	720.00			
5' Run				
	716.50			
MEDIUM light brown MEDIUM COARSE SAND	-30	14 15 9		
	715.00			
5' Run Wash				
	711.50			
VERY DENSE tan SANDY GRAVEL	-35	23 25 39		
	710.00			
5' Run Wash				
	706.50			
DENSE tan SANDY GRAVEL Wash	-40	21 19 17		
	705.00			

Northing and Easting were calculated using the ILHP-WF coordinate system

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 1/29/20

ROUTE FAP 525 (Springfield Ave) DESCRIPTION P92-004-20 Bridge over Kent Creek, 0.5 mi S of IL 70 LOGGED BY W. Garza

SECTION 111BR LOCATION Rockford, NE8, SEC. , TWP. 44N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME-75 Automatic

STRUCT. NO. 101-0100
Station

Latitude 42° 18' 28.04" Northing 2,056,345.5562
Longitude -89° 08' 38.35" Easting 2,573,209.3433

BORING NO. B-3
Station 272+25
Offset 12.00ft Lt of CL
Ground Surface Elev. 745.00 ft

Surface Water Elev. 731.00 ft
Stream Bed Elev. 730.09 ft

Groundwater Elev.:
First Encounter 730.0 ft ▼
Upon Completion Wash ft
After ____ Hrs. ____ ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
DENSE tan FINE SAND			14		
			14		
Wash			18		
	702.50				
DENSE tan FINE SAND			10		
			15		
Wash			26		
	700.00	-45			
VERY DENSE tan FINE SAND			12		
			27		
Wash			41		
	697.50				
VERY DENSE tan WEATHERED LIMESTONE			10		
			13		
Auger refusal @ 50'	695.00	-50	100 for 3"		
End of Boring					
		-55			
		-60			

Northing and Easting were calculated using the ILHP-WF coordinate system

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 1/31/20

ROUTE FAP 525 (Springfield Ave) DESCRIPTION P92-004-20 Bridge over Kent Creek, 0.5 mi S of IL 70 LOGGED BY W. Garza

SECTION 111BR LOCATION Rockford, NE8, SEC. , TWP. 44N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME-75 Automatic

STRUCT. NO. 101-0100
Station

Latitude 42° 18' 28.81" Northing 2,056,424.4226
Longitude -89° 08' 37.38" Easting 2,573,281.7098

BORING NO. B-4
Station 273+24
Offset 20.00ft Rt of CL
Ground Surface Elev. 745.30 ft

Surface Water Elev. ft
Stream Bed Elev. ft
Groundwater Elev.:
First Encounter 729.3 ft
Upon Completion Wash ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Bridge deck				
	-5			
	-10			
735.30 Ground				
734.30 VERY SOFT brown SANDY LOAM with 6.2% organics			0.2 P	48.0
732.80 LOOSE gray FINE SAND		1 2 2		
730.30	-15			
▼ MEDIUM light gray SANDY GRAVEL		4 8 10		
727.80 LOOSE tan FINE SAND		6 4 5		
725.30	-20			
5' Run				
Wash				
721.80 MEDIUM tan CLEAN MEDIUM COARSE SAND		3 9 14		
720.30	-25			
5' Run				
716.80 MEDIUM tan FINE SAND		1 5 10		
715.30	-30			
5' Run				
Wash				
711.80 VERY DENSE tan SANDY GRAVEL		6 21 34		
710.30	-35			
5' Run				
706.80 SOFT gray SILTY LOAM		1 2 3	0.4 P	19.0
705.30	-40			

Northing and Easting were calculated using the ILHP-WF coordinate system

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 1/31/20

ROUTE FAP 525 (Springfield Ave) **DESCRIPTION** P92-004-20 Bridge over Kent Creek, 0.5 mi S of IL 70 **LOGGED BY** W. Garza

SECTION 111BR **LOCATION** Rockford, NE8, **SEC.** , **TWP.** 44N, **RNG.** 1E

COUNTY Winnebago **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME-75 Automatic

STRUCT. NO. 101-0100
Station

Latitude 42° 18' 28.81" **Northing** 2,056,424.4226
Longitude -89° 08' 37.38" **Easting** 2,573,281.7098

BORING NO. B-4
Station 273+24
Offset 20.00ft Rt of CL
Ground Surface Elev. 745.30 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 729.3 ft ▼
Upon Completion Wash ft
After Hrs. ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
MEDIUM gray SILTY LOAM			3 5 5	0.9 S	21.0
	702.80				
STIFF gray CLAY LOAM			1 3 4	1.3 B	30.0
Wash	700.30	-45			
STIFF gray SILTY CLAY			0 2 6	1.4 S	24.0
Wash	697.80				
STIFF gray SILTY LOAM			3 6 7	1.2 S	27.0
Wash	695.30	-50			
VERY STIFF gray CLAY LOAM			2 8 7	2.9 B	22.0
Wash					
	691.80				
VERY DENSE tan WEATHERED LIMESTONE			10 100 for 6"		
Auger refusal @ 55'	690.30	-55			
End of Boring					
		-60			

Northing and Easting were calculated using the ILHP-WF coordinate system

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

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

BORING LOG HA-07

WEI Job No.: 165-06-01

Client: **BLA, Inc.**
Project: **District 2 Bridges, PTB 194/ 025-01**
Location: **Winnebago County, Illinois**

Datum: NAVD 88
Elevation: 730.78 ft
North: 2056377.95 ft
East: 2573252.99 ft
Station:
Offset:

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Gray to brown, fine to coarse, Gravelly SAND; saturated			1	PUSH	NP	11
		--% Gravel = 55.7%--						
		--% Sand = 43.4%--						
		--% Silt & Clay = 1.0%--			2	PUSH	NP	14
			5		3	PUSH	NP	23
		--few silt seams--			4	PUSH	NP	24
					5	PUSH	NP	11
	720.8		10					
		Boring terminated at 10.00 ft						
			15					
			20					

GENERAL NOTES

Begin Drilling: **04-27-2021** Complete Drilling: **04-27-2021**
Drilling Contractor: **Wang Testing Service** Drill Rig:
Driller: **K&A** Logger: **M. Rojo** Checked by: **M.Snider**
Drilling Method: **1" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

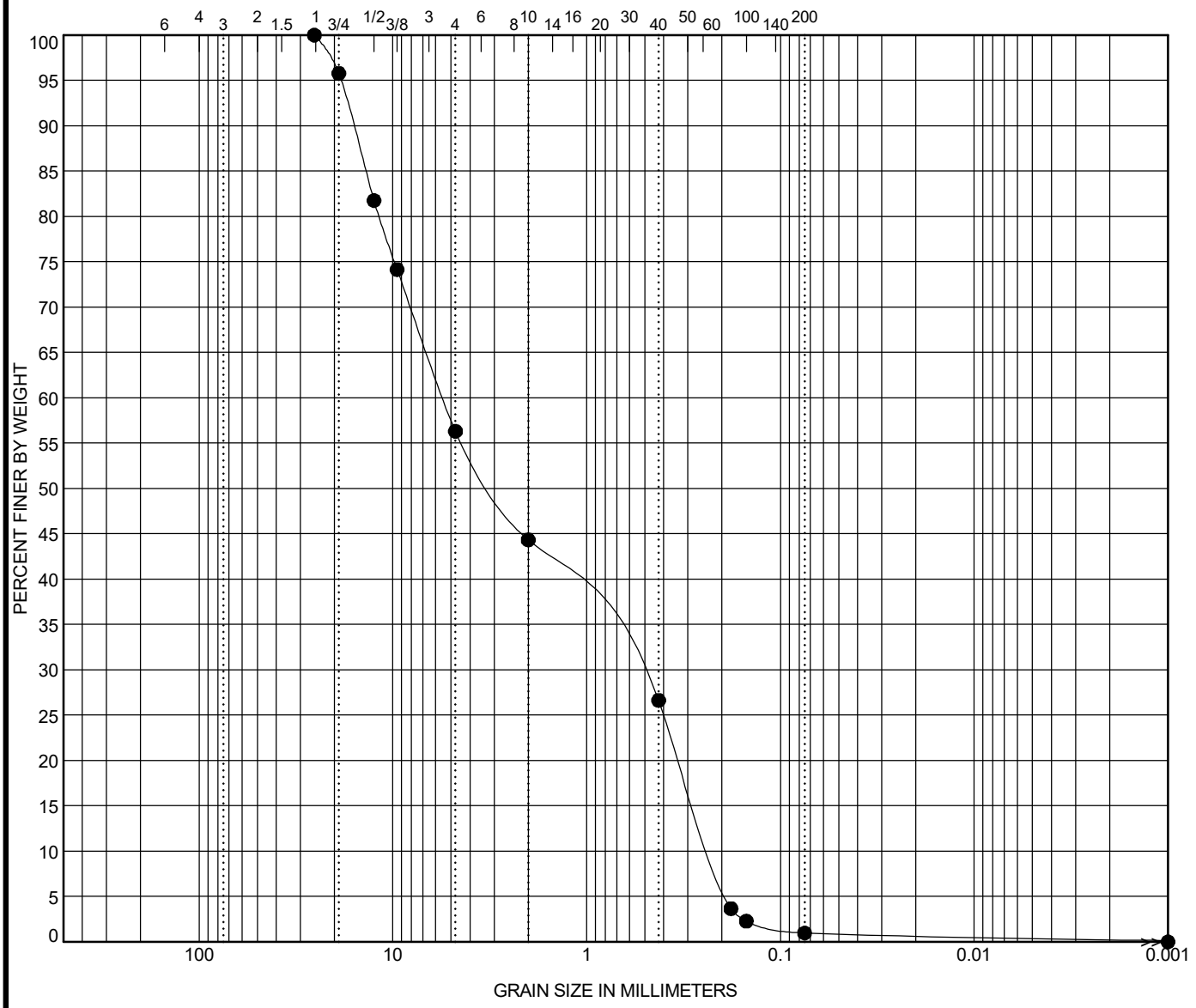
While Drilling: **0.00 ft**
At Completion of Drilling: **0.00 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

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

WANGENGINC 1650601.GPJ WANGENG.GDT 9/30/21

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

APPENDIX B



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
● **HA-07#1**	**0.0 ft**	**Gravelly Sand**				**0.26**	**24.03**

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **HA-07#1**	**0.0 ft**	**25.4**	**5.482**	**0.571**	**0.228**	**55.7**	**43.4**	**0.5**	**1.0** **0.5**

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

GRAIN SIZE DISTRIBUTION

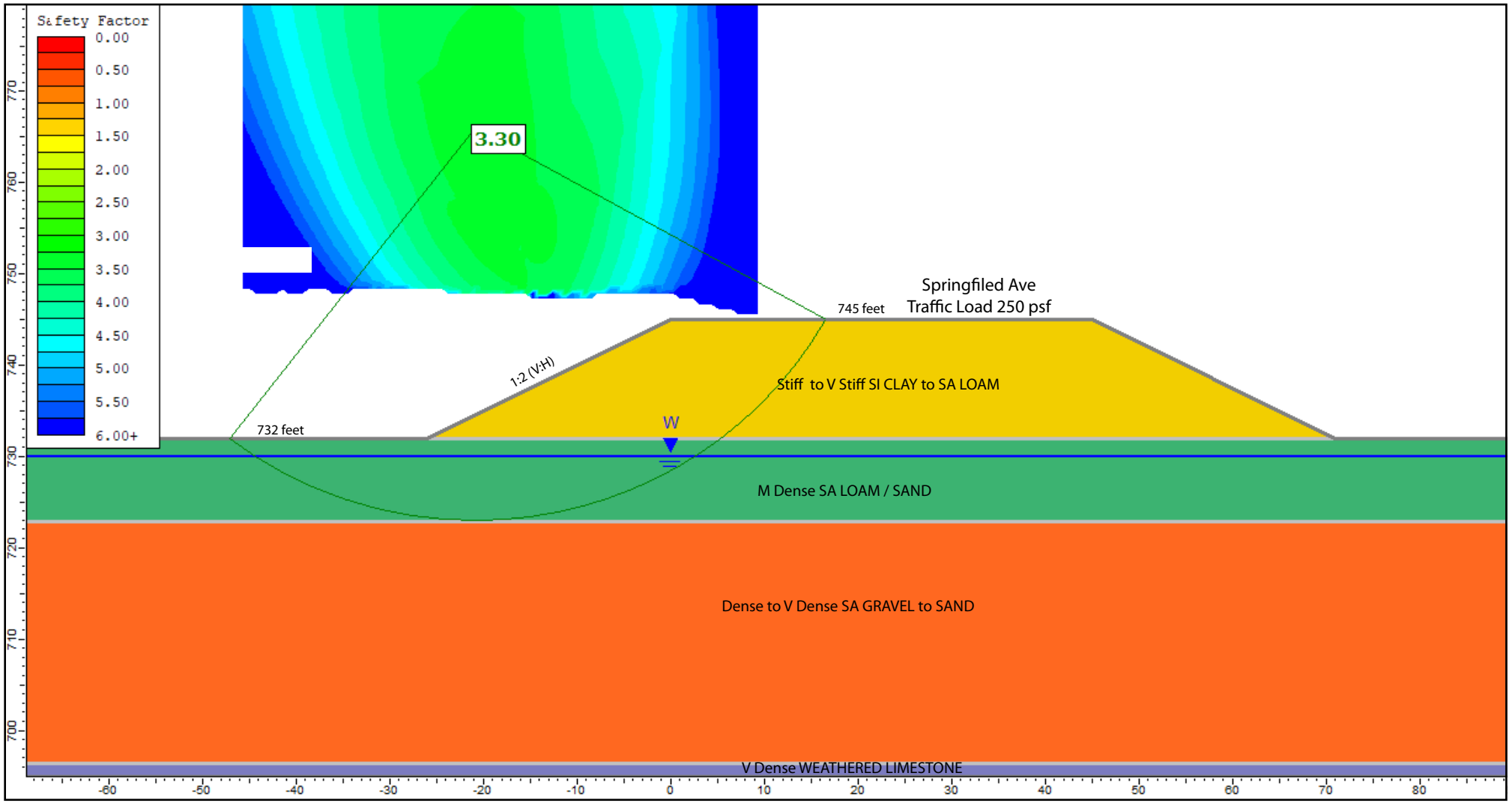
Project: District 2 Bridges, PTB 194/ 025-01

Location: Winnebago County, Illinois

Number: 165-06-01

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

APPENDIX C



Undrained Analysis, South Abutment Side Slope, Reference Boring: B-3

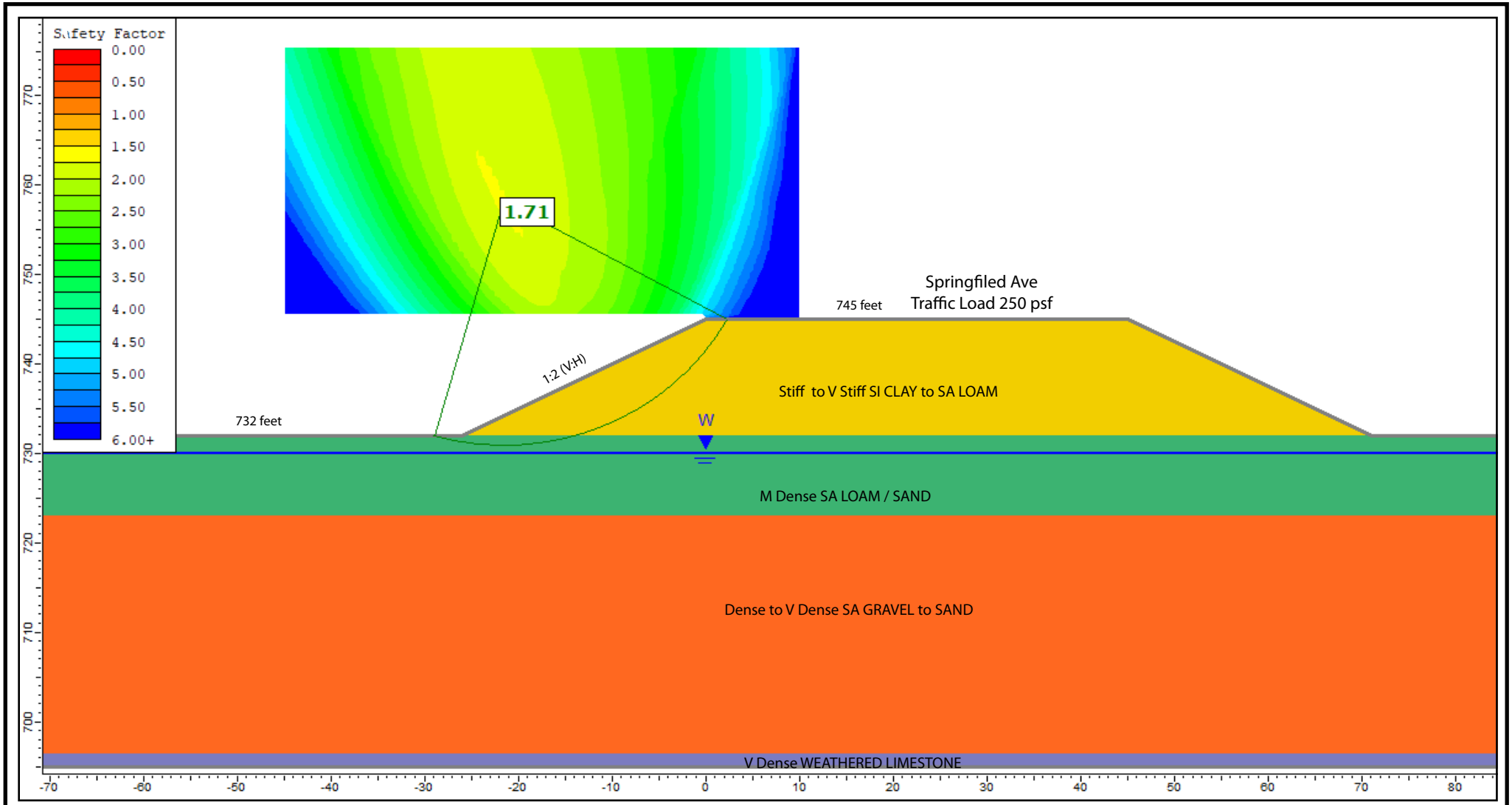
Layer ID	Description	Total Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Stiff to V Stiff SI CLAY to SA LOAM	120	1800	0
2	M Dense SA LOAM to SAND	120	0	30
3	Dense to V Dense SA GRAVEL	125	0	36
4	V Dense WEATHERED BEDROCK	130	0	36

GLOBAL STABILITY: SPRINGFILED AVENUE OVER N. FORK OF KENT CREEK, SN 101-0100, WINNEBAGO COUNTY, ILLINOIS

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

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

FOR BLA, INC. | 165-06-01



Drained Analysis, South Abutment Side Slope, Reference Boring: B-3

Layer ID	Description	Total Unit Weight (pcf)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	Stiff to V Stiff SI CLAY to SA LOAM	120	100	30
2	M Dense SA LOAM to SAND	120	0	30
3	Dense to V Dense SA GRAVEL	125	0	36
4	V Dense WEATHERED BEDROCK	130	0	36

GLOBAL STABILITY: SPRINGFILED AVENUE OVER N. FORK OF KENT CREEK, SN 101-0100, WINNEBAGO COUNTY, ILLINOIS

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

Wang Engineering
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FOR BLA, INC. | 165-06-01

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Phone (630) 953-9928
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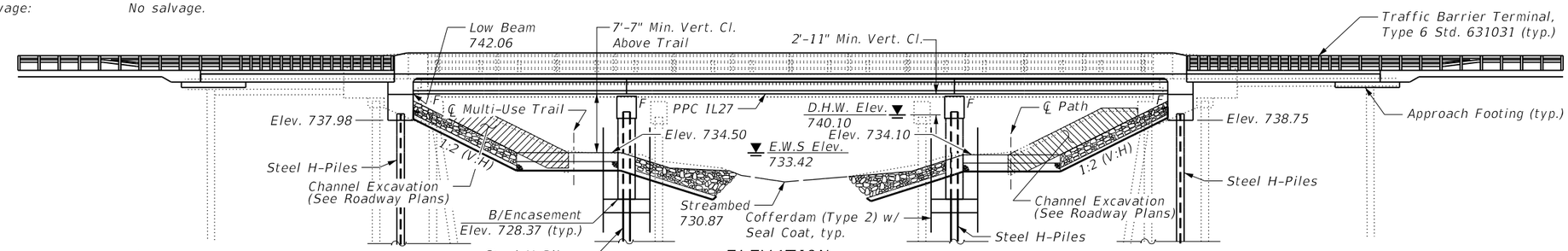
APPENDIX D

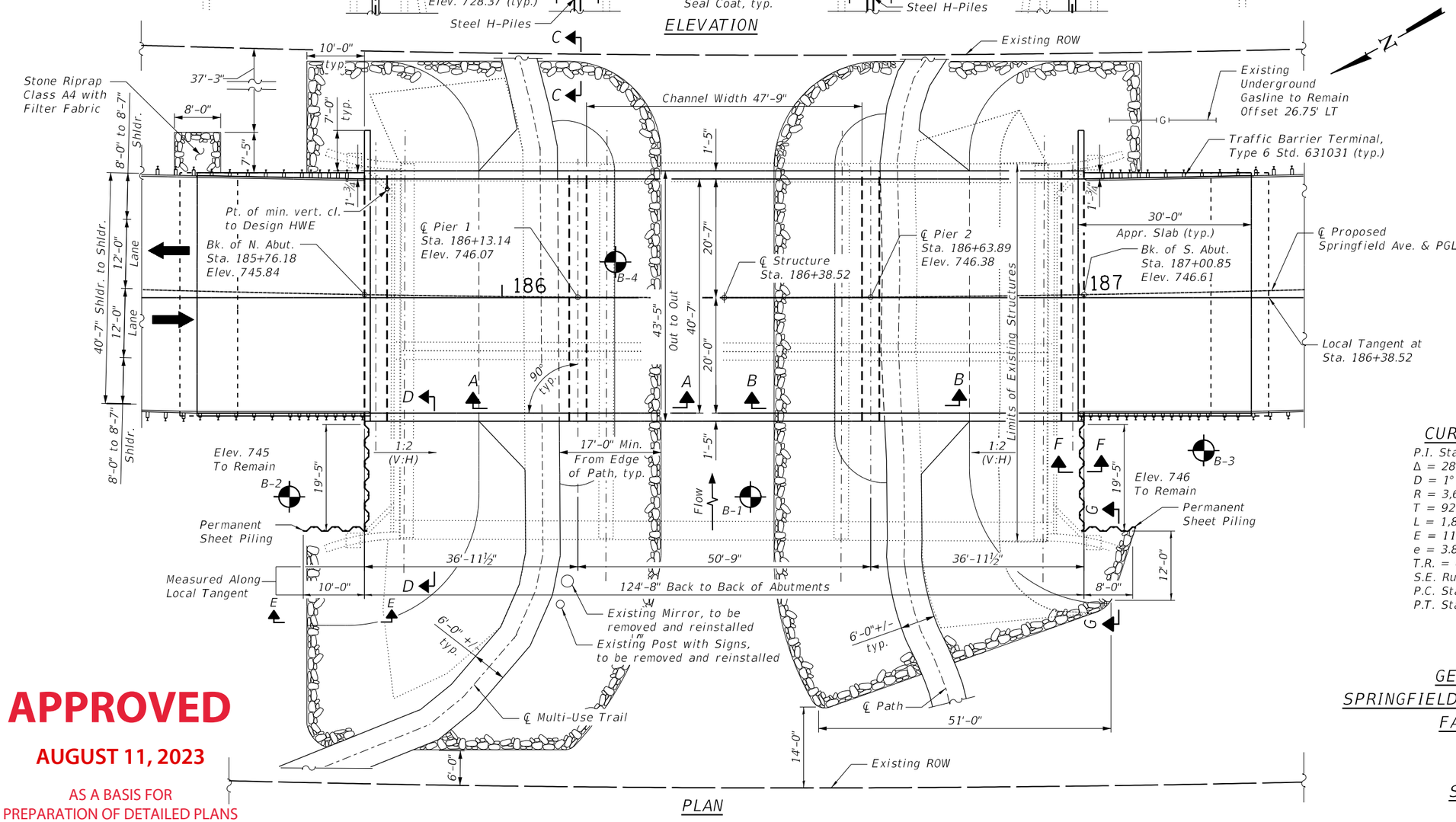
Benchmark: *Cut cross in existing bridge deck, near ℄ span at west shoulder, Elevation 746.275*

Existing Structure: *Structure No. 101-0100 was originally constructed in 1959, F.A.S. Route 1058. It consists of non-composite three-span continuous steel beam bridge. The structure is 32'-8" from outside the east parapet to the centerline longitudinal joint and 65'-4" out to out of parapets full structure width, with the west half unused. It is 114'-4" along the centerline back to back abutments. The bridge will be closed and traffic will be detoured.*

Salvage: *No salvage.*



ELEVATION



PLAN

HIGHWAY CLASSIFICATION

Springfield Avenue – FAP 0525
Functional Class: Other Principal Arterial
ADT: 8,550 (2017); 10,850 (2044)
ADTT: 419 (2017); 532 (2044)
DHV: 1,085
Design Speed: 60 m.p.h.
Posted Speed: 55 m.p.h.
2 -Way Traffic
Directional Distribution: 50/50

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.055g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.096g
Soil Site Class = C

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

LOADING HL-93

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

DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi (Substructure)
f'c = 4,000 psi (Superstructure)
fy = 60,000 psi (Reinforcement)

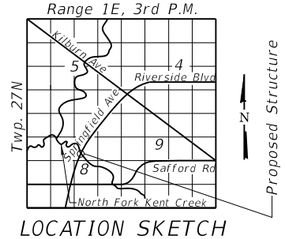
PRECAST PRESTRESSED UNITS

f'c = 8,500 psi
f'ci = 6,500 psi
fpu = 270,000 psi (0.6" ∅ low lax. strands)
fpbt = 202,300 psi (0.6" ∅ low lax. strands)

Notes:
For Sections A-A thru C-C, see sheet 2 of 3.
For Views D-D and E-E and Sections F-F and G-G, see Sheet 3 of 3.

CURVE DATA

P.I. Sta. = 183+75.65
Δ = 28° 25' 36" (LT)
D = 1° 34' 11"
R = 3,650.00'
T = 924.49'
L = 1,810.90'
E = 115.26'
e = 3.8
T.R. = 0.00'
S.E. Run = 100.00'
P.C. Sta. = 174+51.16
P.T. Sta. = 192+62.06



LOCATION SKETCH

GENERAL PLAN & ELEVATION
SPRINGFIELD AVE OVER N. FORK OF KENT CREEK
FAP 0525 – SECTION 111BR
WINNEBAGO COUNTY
STATION 186+38.52
STRUCTURE NO. 101-0229

APPROVED

AUGUST 11, 2023

AS A BASIS FOR PREPARATION OF DETAILED PLANS

BLA, Inc.	USER NAME =	DESIGNED - KP	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION			
		CHECKED - PD	REVISED -				
	PLOT SCALE =	DRAWN - KP	REVISED -				
	PLOT DATE =	CHECKED - PD	REVISED -		TOTAL SHEETS 1 OF 3 SHEETS		

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
525	111BR	WINNEBAGO	3	1
		CONTRACT NO. 64P06		
		ILLINOIS	FED. AID PROJECT	

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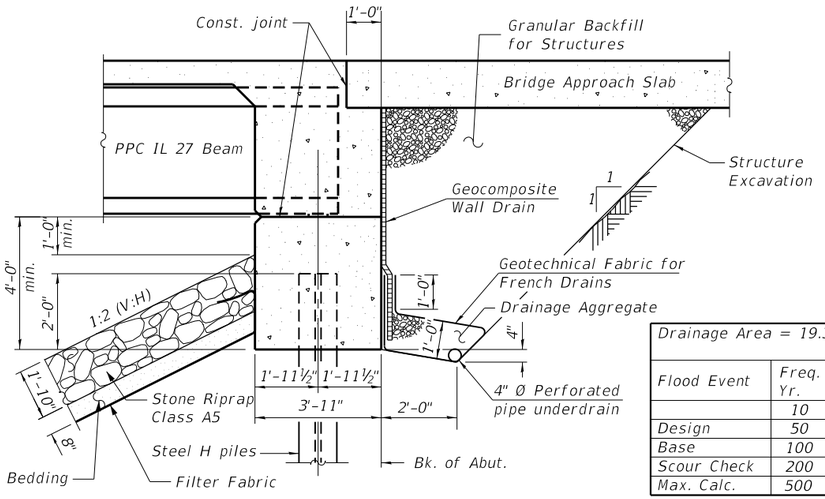


SECTION THRU INTEGRAL ABUTMENT

DESIGN SCOUR ELEVATION TABLE

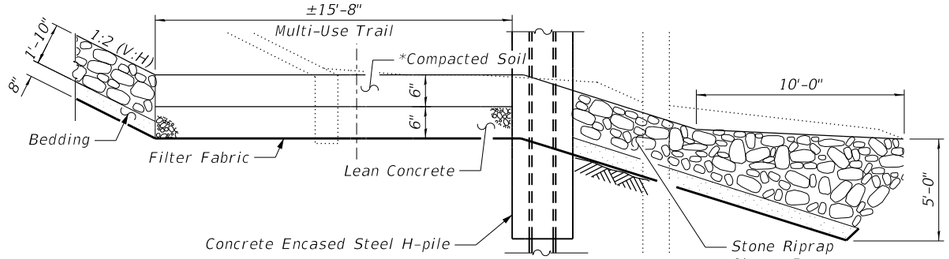
Design Storm	Design Scour Elevations (ft.) N. Abut.	Pier 1	Pier 2	S. Abut.	Item 113
Q100	738.06	724.43	723.63	738.29	5
Q200	738.06	721.84	721.04	738.29	
Design	738.06	724.43	723.63	738.29	
Check	738.06	721.84	721.04	738.29	

WATERWAY INFORMATION

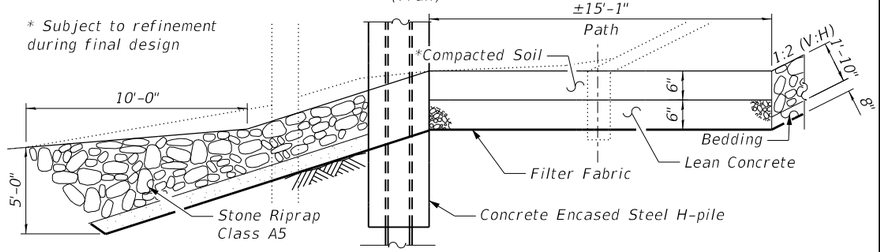
Drainage Area = 19.3 sq. mi.
Existing Overtopping Elev. = 745.08 at Sta. 184+00
Proposed Overtopping Elev. = 745.63 at Sta. 184+00

Flood Event	Freq. Yr.	Discharge Ft^3/s	Waterway Opening-ft^2 Exist.	Prop.	Natural H.W.E. ft.	Head – Ft. Exist.	Prop.	Headwater Elev. ft. Exist.	Prop.
	10	1,665	471	573	738.8	0.2	0.2	739.0	739.0
Design	50	2,982	596	718	740.1	0.5	0.4	740.6	740.5
Base	100	3,676	652	782	740.7	0.6	0.6	741.3	741.3
Scour Check	200	4,099	685	818	741.0	0.7	0.6	741.7	741.6
Max. Calc.	500	5,445	783	926	741.9	0.9	0.9	742.8	742.8

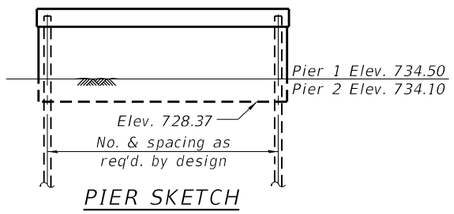
10-Year velocity through existing structure = 4.16 ft/s
10-Year velocity through proposed structure = 4.01 ft/s



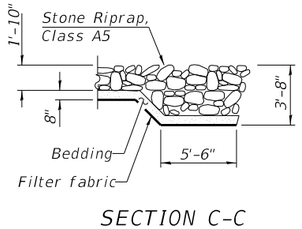
SECTION A-A
(Trail)



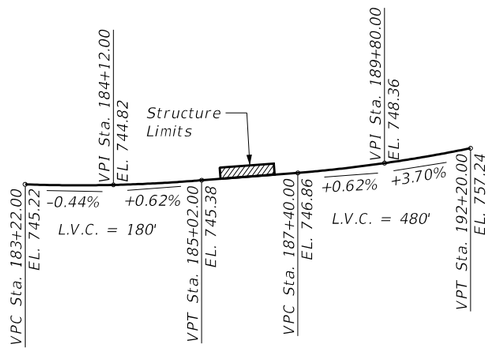
SECTION B-B
(Path)



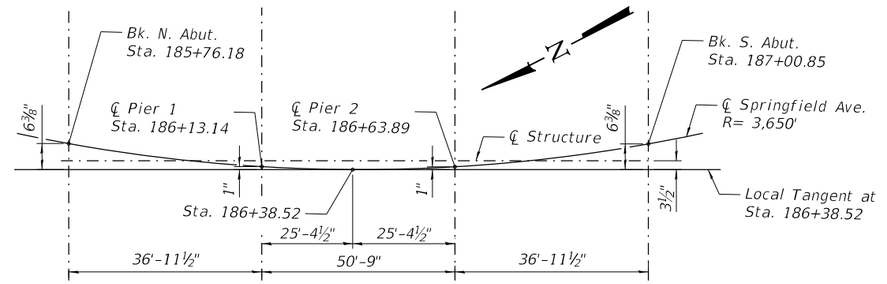
PIER SKETCH



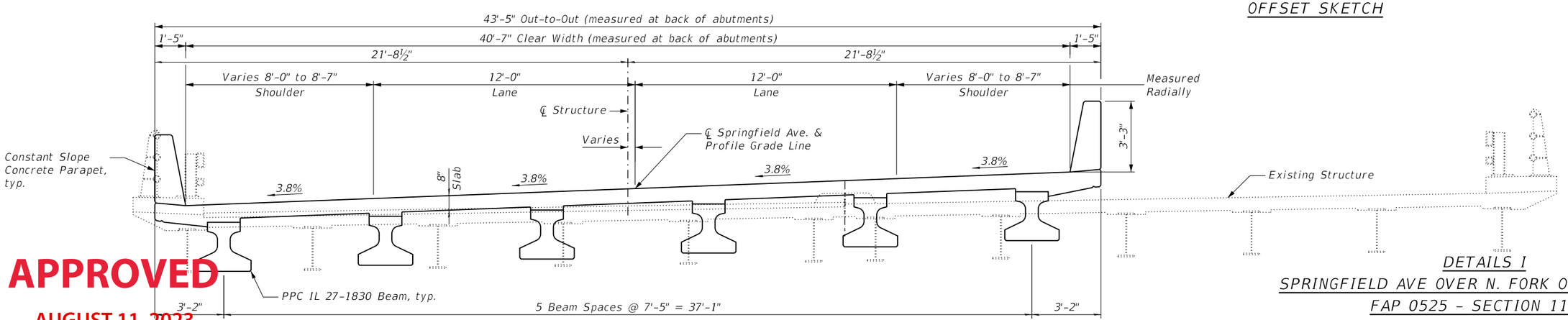
SECTION C-C



PROFILE GRADE
(Along ℄ Springfield Avenue)



OFFSET SKETCH



CROSS SECTION
(Looking South)
Measured perpendicular to ℄ Structure

APPROVED
AUGUST 11, 2023
AS A BASIS FOR
PREPARATION OF DETAILED PLANS

DETAILS I
SPRINGFIELD AVE OVER N. FORK OF KENT CREEK
FAP 0525 – SECTION 111BR
WINNEBAGO COUNTY
STATION 186+38.52
STRUCTURE NO. 101-0229

BLA, Inc.	USER NAME =	DESIGNED - KP	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	
		CHECKED - PD	REVISED -		
	PLOT SCALE =	DRAWN - KP	REVISED -		
	PLOT DATE =	CHECKED - PD	REVISED -		TOTAL SHEETS 2 OF 3 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
525	111BR	WINNEBAGO	3	2
		CONTRACT NO. 64P06		
	ILLINOIS	FED. AID PROJECT		

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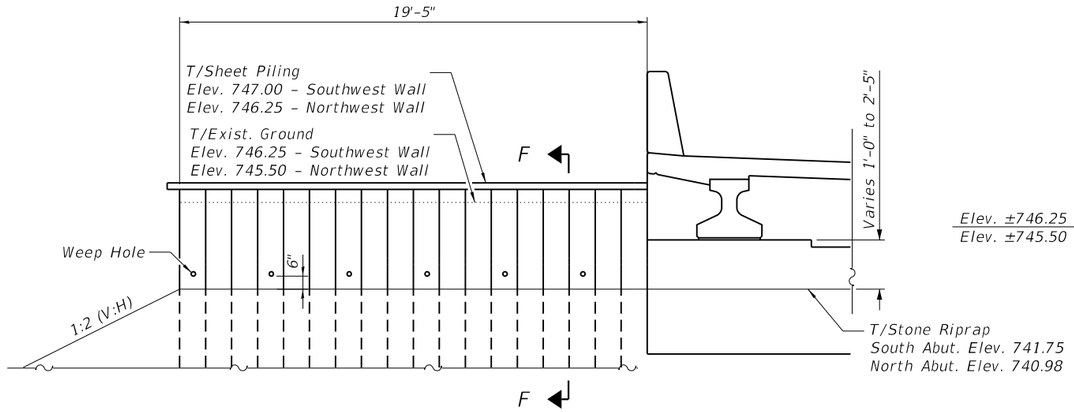
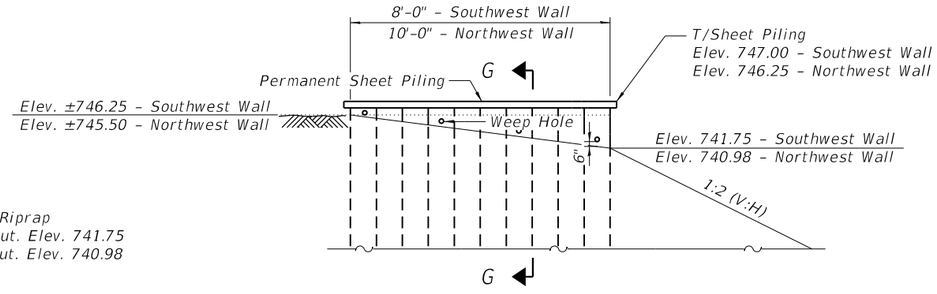
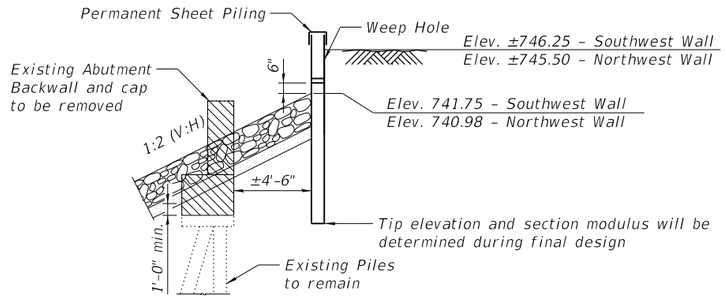


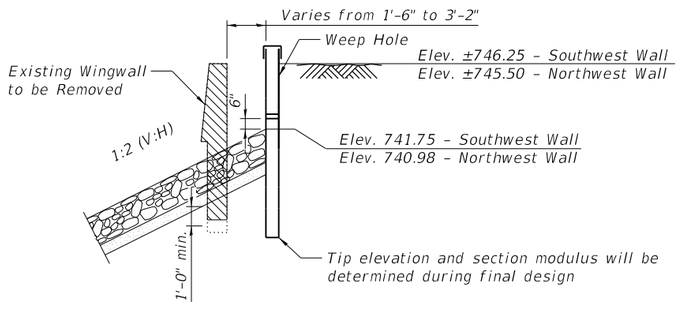
VIEW D-D



VIEW E-E



SECTION F-F



SECTION G-G

APPROVED

AUGUST 11, 2023

AS A BASIS FOR
PREPARATION OF DETAILED PLANS

DETAILS II
SPRINGFIELD AVE OVER N. FORK OF KENT CREEK
FAP 0525 - SECTION 111BR
WINNEBAGO COUNTY
STATION 186+38.52
STRUCTURE NO. 101-0229

MODEL: Default
FILE NAME: W:\191-170 IDOT IL 251 & Springfield\Springfield\CADD Sheets\Structural\TSL\111BR_Springfield_TSL_SHT-03_Sections & Details II.dgn
8/10/2023 1:56:34 PM

BLA, Inc.

USER NAME =	DESIGNED - KP	REVISED -
	CHECKED - PD	REVISED -
PLOT SCALE =	DRAWN - KP	REVISED -
PLOT DATE =	CHECKED - PD	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

TOTAL SHEETS 3 OF 3 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
525	111BR	WINNEBAGO	3	3
		CONTRACT NO. 64P06		
		ILLINOIS	FED. AID PROJECT	