# Illinois Department of Transportation

## Memorandum

| | | |
|---|---|---|
| **To:** | Carl Puzey | Attn: Brad Hessing |
| **From:** | Michael A. Short | By: Jeremy Brown |
| **Subject:** | Structure Geotechnical Report Disposition * | |
| **Date:** | March 19, 2021 | |

* SN: 046-0161
Route: FAP 41
Section: (12)BR
County: Kankakee
Contract No.: 66F88

Attached is the Structure Geotechnical Report for the subject project.

This letter is to provide revisions to the disposition for SN: 046-0161 which was submitted to the Bureau of Bridges and Structures for review by Jeremy Brown (IDOT D3 Geotechnical Engineer). There were concerns with the revisions in the disposition which are addressed in this letter. These revisions are being provided by Jeremy Brown.

1. It is no longer recommended to drive H-piles to refusal in bedrock. There were concerns with being able to achieve the required 10-foot embedment by driving the piles due to some hard, silty clay and shale layers below the proposed structure.

2. Additional soil borings were conducted along with rock cores sampled at each proposed abutment. Based on the information provided in the attached soil boring and rock core logs, H-piles socketed in rock are recommended for the proposed structure foundations with the following design recommendations.

| Location | Bottom of Abut. Elevation | Top of Rock Elevation | Estimated Pile Length | Rock Socket Diameter | Rock Socket Depth |
|---|---|---|---|---|---|
| West Abutment | 611.69 | 594.60 | ~~22.09 feet~~ 25 feet | 30 inch | ~~3 feet~~ 5 feet |
| East Abutment | 611.78 | 581.20 | ~~41.58 feet~~ 44 feet | 30 inch | ~~9 feet~~ 11 feet |

JB 5/22/21

*Revisions were made based on comments from BBS

The limestone rock samples retrieved were tightly jointed and had very high compressive strength, which exceeded that of concrete strength. The AASTHO design manual suggests using the value of concrete compressive strength if this situation arises. I used a conservative strength estimate of 4,000 psi for the concrete compressive strength. The first 6-feet of rock that was sampled at the east abutment was found to be a poor-quality black shale. This layer was ignored when running the resistance calculations. Due to the high compressive strength of the limestone layers, the required socket depth is relatively small. It is recommended to drill the sockets to a depth of ~~3~~-feet into the underlying limestone layers at each abutment, which requires drilling through the 6-foot shale layer at the east abutment. The side resistance provided by socketing 3-feet into limestone is more than ~~double~~ the factored resistance required per H-pile and that doesn't take into consideration any tip resistance, which is more than the side resistance.

:bs/Roadway Geotech Report #66970

Per the comments from the Bureau of Bridges and Structures, it is recommended to drill the sockets to a depth of 5-feet into the underlying limestone layer at each abutment. The depth was increased 2-feet due to the weathered condition of the limestone at the top of the layer. At the east abutment, the 5-feet into limestone is in addition to drilling 6-feet through shale for a total socket length of 11-feet. Extra attention is required while drilling the sockets for the east abutment and the elevation should be recorded when the limestone is encountered. Take note that the strength of the 2-feet of weathered limestone was not used in the calculation for the factored side resistance available. The factored side resistance available was calculated to be 452 Kips using a depth of 3-feet into the limestone and a resistance factor of 0.55.

The Bureau of Bridges and Structures provided the following procedure for backfilling the socketed piles for the piles at both abutments.

- Concrete in rock socket shall continue to 6 inches above the top of the socket elevation.
- Instead of 10 feet of CLSM immediately below the abutment cap, it shall be 10 feet of bentonite.
- CLSM shall be used to fill between the socket concrete and bentonite.

046-0161 (046-0032 Exist)

West Abutment

Top of Rock = 594.60

RQD 0'-5' = 30

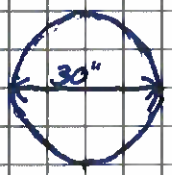
Lowest $Q_u$ = 618 TSF = 1236 KSF

Side Resistance

$\frac{q_s}{2.12} = 1.0\sqrt{\frac{576}{2.12}}$

$q_s$ = 34.9 KSF

34.9 x 7.85 = 274 Kips/FT




C = 2.5 D

C = 7.85'

Tip Resistance

274 x 3' = 822 Kips

$A = \pi(1.25)^2$

$A = 4.91$ SF

JB 5-22-21

822 Kips x 0.55 = 452 Kips
Factored Resistance Available

$q_p$ = 2.5(576)

$q_p$ = 1440 KSF

1440 x 4.91 = 7070 Kips

7070 x 0.5 = 3535 Kips - Factored Resistance

Concrete $Q_u$ = 4000 PSI = 576 KSF

1236 > 576

East Abutment

Top of Rock = 581.20

RQD 6'-13' = 29

Lowest $Q_u$ = 873 TSF = 1746 KSF

Side Resistance

$\frac{q_s}{2.12} = 1.0\sqrt{\frac{576}{2.12}}$

$q_s$ = 34.9 KSF

1746 > 576

Tip Resistance

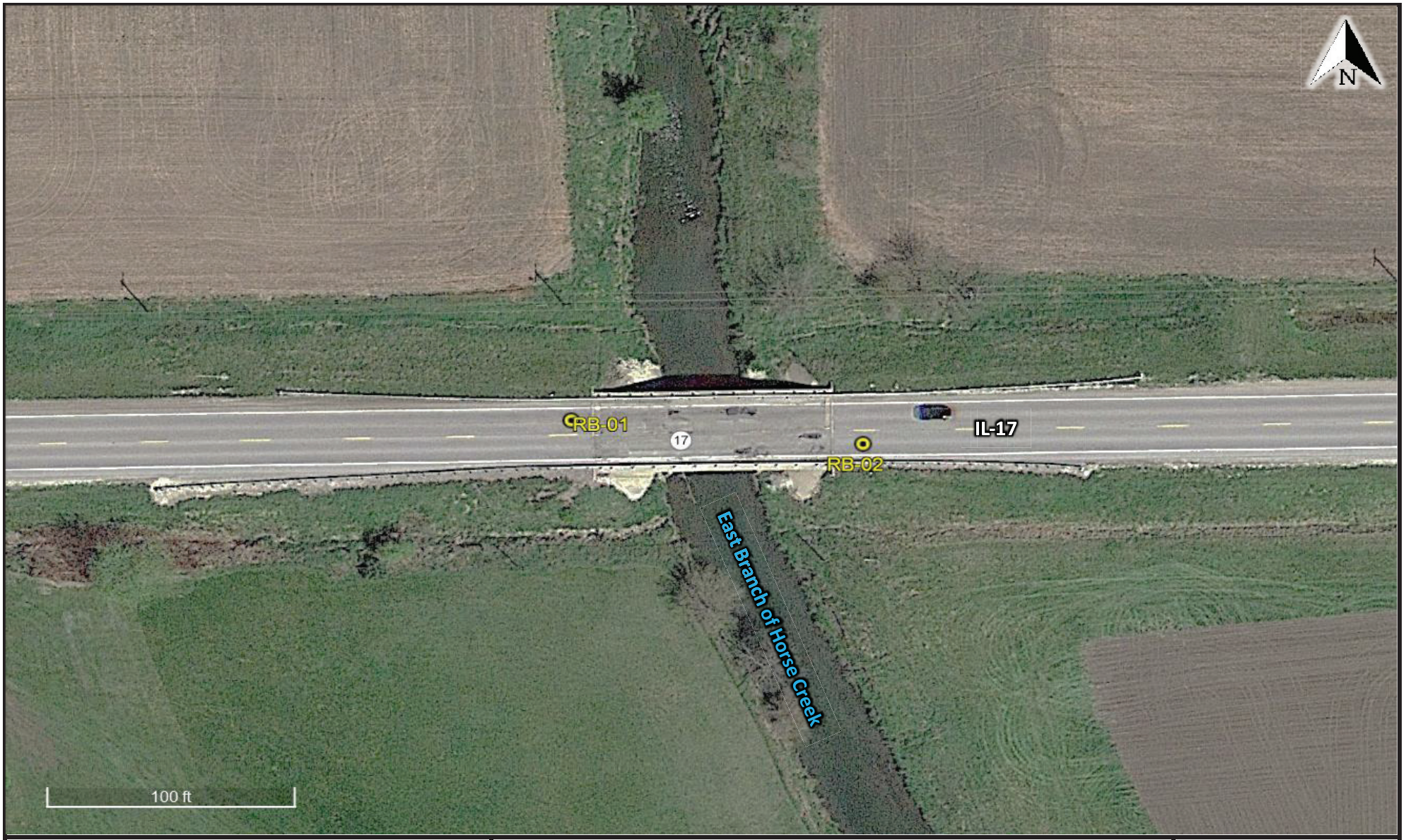
$q_p$ = 2.5(576)

$q_p$ = 1440 KSF

1440 x 4.91 = 7070 Kips

7070 x 0.5 = 3535 Kips - Factored Resistance

Resistances to be used were calculated using side resistance at a depth of 3 feet into Limestone




rubino ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

| | |
|---|---|
| **Project Name:** | PTB 197-022 WO 6 |
| **Project Location:** | IL-17 over East Branch of Horse Creek<br>Kankakee County, Illinois |
| **Client:** | **IDOT** |
| **Rubino Project # :** | G21.055 |

**Boring Location Plan**

rubino ENGINEERING INC.

# SOIL BORING LOG



Date 3/10/21

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** WB lane of IL-17 west of Horse Creek **LOGGED BY** J.I.

**SECTION** 12-BR **LOCATION** SE 1/4 **SEC.** 4, **TWP.** 30N, **RNG.** 10E, 3rd **PM**
**LAT:** 41.1171133 **LONG:** -88.0940300

**COUNTY** Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** RB-01
**Station** 965+26
**Offset** 9.5LT
**Ground Surface Elev.** 618.60 ft

**Surface Water Elev.** 603.91 ft
**Stream Bed Elev.** 602.06 ft

**Groundwater Elev.:**
**First Encounter** 23.5 ft ▼
**Upon Completion** N/A ft
**After** N/A **Hrs.** N/A ft

| | | DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) |
|---|---|---|---|---|---|
| Approximately 6 inches of ASPHALT | 618.10 | | | | |
| Approximately 12 inches of CONCRETE | 617.10 | | 6 | | 12 |
| Approximately 12 inches of SUBBASE STONE | 616.10 | | 5 | | |
| | | | 5 | | |
| FILL: brown sand, trace fines | | | | | |
| | | | 3 | | 15 |
| | | | 4 | | |
| | | -5 | 5 | | |
| | 612.10 | | 5 | 0.7 | 20 |
| FILL: black and gray silty clay, little to some sand and gravel | | | 4 | B | |
| | | | 4 | | |
| | 609.60 | | 2 | | 31 |
| Medium stiff, black silty CLAY, trace sand and gravel | | | 2 | | |
| | | -10 | 3 | | |
| | 607.10 | | 4 | 1.2 | 18 |
| Stiff to very stiff, gray silty CLAY, little sand, trace gravel | | | 4 | B | |
| | | | 6 | | |
| | | | 2 | 2.2 | 24 |
| | | | 3 | B | |
| | | -15 | 4 | | |
| | | | 4 | 4.4 | 25 |
| | | | 7 | S | |
| *3-inch wet clay layer, visible organics, observed at approximately 17 feet below existing grade* | | | 8 | | |
| | 599.60 | | 5 | | 24 |
| | | | 11 | | |
| | | -20 | 14 | | |

| | | DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) |
|---|---|---|---|---|---|
| Very stiff to very hard, gray SILTY CLAY LOAM, little sand, some gravel | | | | | |
| **Auger refusal at approximately 24 feet below existing grade.** *(continued)* | | | 32 | | 10 |
| *Large rock/cobble encountered at approximately 20½ feet below existing grade* | | | 27 | | |
| | | | 28 | | |
| *Limestone fragments observed at approximately 23 feet below existing grade* ▼ | 594.60 | | | | |
| Borehole continued with rock coring. | | -25 | | | |
| | | -30 | | | |
| | | -35 | | | |
| | | -40 | | | |

**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)**

# ROCK CORE LOG

Date 3/10/21

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** WB lane of IL-17 west of Horse Creek **LOGGED BY** J.I.

**SECTION** 12-BR **LOCATION** SE 1/4 **SEC.** 4, **TWP.** 30N, **RNG.** 10E, 3rd **PM**
**LAT:** 41.1171133 **LONG:** -88.0940300

**COUNTY** Kankakee **CORING METHOD** 5 foot double tube NX

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** RB-01
**Station** 965+26
**Offset** 9.5LT
**Ground Surface Elev.** 618.60 ft

**CORING BARREL TYPE & SIZE** NX
**Core Diameter** 2 in
**Top of Rock Elev.** 594.60 ft
**Begin Core Elev.** 594.60 ft

| | DEPTH (ft) | CORE (#) | RECOVERY (%) | R.Q.D. (%) | CORE TIME (min/ft) | STRENGTH (tsf) |
|---|---|---|---|---|---|---|
| Borehole continued with rock coring<br>Gray LIMESTONE, poor, strong field strength, aphanitic, and pitted<br>Depth 25½ feet: Moisture Content: 5%, Dry Density: 156 pcf Depth<br>24 ft 10 inches: Moisture Content: 5%, Dry Density: 156 pcf | 594.60<br>-25 | 1 | 90 | 30 | | 822<br>618 |
| Gray LIMESTONE, fair, strong field strength, aphanitic, thinly bedded, pitted | 589.44<br>-30 | 2 | 100 | 67 | | |
| Depth 33 ½ feet: Moisture Content: 4%, Dry Density: 158 pcf<br>Depth 33 ¾ feet: Moisture Content: 3%, Dry Density: 158 pcf | 584.10 | | | | | 1157<br>1574 |
| Gray to blueish gray LIMESTONE, good, strong field strength, aphanitic, thinly bedded, pitted | -35<br>579.10 | 3 | 97 | 80 | | |
| End of Boring | -40 | | | | | |

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

rubino ENGINEERING INC.

# SOIL BORING LOG



Date 3/12/21

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** EB lane of IL-17 east of Horse Creek **LOGGED BY** J.I.

**SECTION** 12-BR **LOCATION** SE 1/4 **SEC.** 4, **TWP.** 30N, **RNG.** 10E, 3rd **PM**

**LAT:** 41.1170807 **LONG:** -88.0936023

**COUNTY** Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** RB-02
**Station** 966+44
**Offset** 4.5RT
**Ground Surface Elev.** 618.70 ft

**Surface Water Elev.** 603.91 ft
**Stream Bed Elev.** 602.06 ft

**Groundwater Elev.:**
**First Encounter** 21 ft ▼
**Upon Completion** N/A ft
**After** N/A **Hrs.** N/A ft

| | DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) |
|---|---|---|---|---|
| Approximately 4 inches of ASPHALT 618.37<br>Approximately 10 inches of CONCRETE 617.45<br>Approximately 10 inches of SUBBASE STONE 616.62<br>FILL: brown sand, trace fines | | 3<br>3<br>3 | | 12 |
| 614.70<br>FILL: black and gray silty clay, little to some sand and gravel<br>*Some brown observed at approximately 6 feet below existing grade* | -5 | 4<br>4<br>3 | | 18 |
| | | 7<br>7<br>8 | 2.5 P | 9 |
| | -10 | 5<br>4<br>6 | | 16 |
| | | 4<br>5<br>8 | 4.5 P | 17 |
| 605.20<br>Very stiff, gray SILT to SILT LOAM, trace sand and gravel | -15 | 7<br>9<br>17 | 3.0 S | 14 |
| 602.70<br>Very stiff to hard, gray SILTY CLAY LOAM, little sand and gravel | | 9<br>16<br>22 | 3.0 S | 12 |
| *Some Gravel* | -20 | 10<br>17<br>21 | 4.5 P | 8 |
| Very stiff to hard, gray SILTY CLAY LOAM, little sand and gravel *(continued)* ▼ | | 19<br>30<br>21 | 4.5 P | 11 |
| 595.20<br>Very stiff to very hard, gray, laminated shaley CLAY to clayey SHALE, very dry | -25 | 8<br>11<br>17 | 6.5 S | 16 |
| | | 37<br>42<br>47 | 4.5 P | 13 |
| | -30 | 42<br>53<br>57 | 4.5 P | 10 |
| | | 50/3" | | 9 |
| *Very difficult drilling/chattering observed from approximately 31 to 37.5 feet below existing grade.* | -35 | | | |
| 581.20<br>**Auger refusal at approximately 37½ feet below existing grade.**<br>Borehole continued with rock coring. | -40 | | | |

**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)**

# ROCK CORE LOG

Date 3/12/21

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** EB lane of IL-17 east of Horse Creek **LOGGED BY** J.I.

**SECTION** 12-BR **LOCATION** SE 1/4 **SEC.** 4, **TWP.** 30N, **RNG.** 10E, 3rd **PM**
**LAT:** 41.1170807 **LONG:** -88.0936023

**COUNTY** Kankakee **CORING METHOD** 5 foot double tube NX

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** RB-02
**Station** 966+44
**Offset** 4.5RT
**Ground Surface Elev.** 618.70 ft

**CORING BARREL TYPE & SIZE** NX
**Core Diameter** 2 in
**Top of Rock Elev.** 581.20 ft
**Begin Core Elev.** 581.20 ft

| | | DEPTH (ft) | CORE (#) | RECOVERY (%) | R.Q.D. (%) | CORE TIME (min/ft) | STRENGTH (tsf) |
|---|---|---|---|---|---|---|---|
| Borehole continued with rock coring.<br>Dark gray to black SHALE, very poor, very weak to weak field strength, laminated, highly decomposed with interbedded lignite, with cohesive sediment infilling.<br>Limestone lense at bottom two feet of sample | 581.20 | | 1 | 87 | 0 | | |
| | | -40 | | | | | |
| | 575.20 | | | | | | |
| Gray LIMESTONE, poor, strong field strength, aphanitic, thinly bedded, pitted. | | | 2 | 78 | 29 | | |
| Depth 44 feet 4 inches: Moisture Content: 4%, Dry Density: 165 pcf | | -45 | | | | | 873 |
| Depth 46 feet: Moisture Content: 4%, Dry Density: 165 pcf | | | | | | | 2479 |
| | | -50 | | | | | |
| | 568.20 | | | | | | |
| End of Boring | | -55 | | | | | |

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

0 3 6 9 12 inches

rubino ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

| | |
|---|---|
| **Project Name:** | **PTB 197-022 WO 6** |
| **Project Location:** | IL-17 over East Branch of Horse Creek<br>Kankakee County, Illinois |
| **Client:** | **IDOT** |
| **Rubino Project # :** | G21.055 |

**RB-01 Run 1 & 2**
**Rock**
**Core**
**Photo**

0 3 6 9 12 inches

rubino ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

| | |
|---|---|
| **Project Name:** | **PTB 197-022 WO 6** |
| **Project Location:** | IL-17 over East Branch of Horse Creek<br>Kankakee County, Illinois |
| **Client:** | **IDOT** |
| **Rubino Project # :** | G21.055 |

**RB-01 Run 3**
**Rock**
**Core**
**Photo**

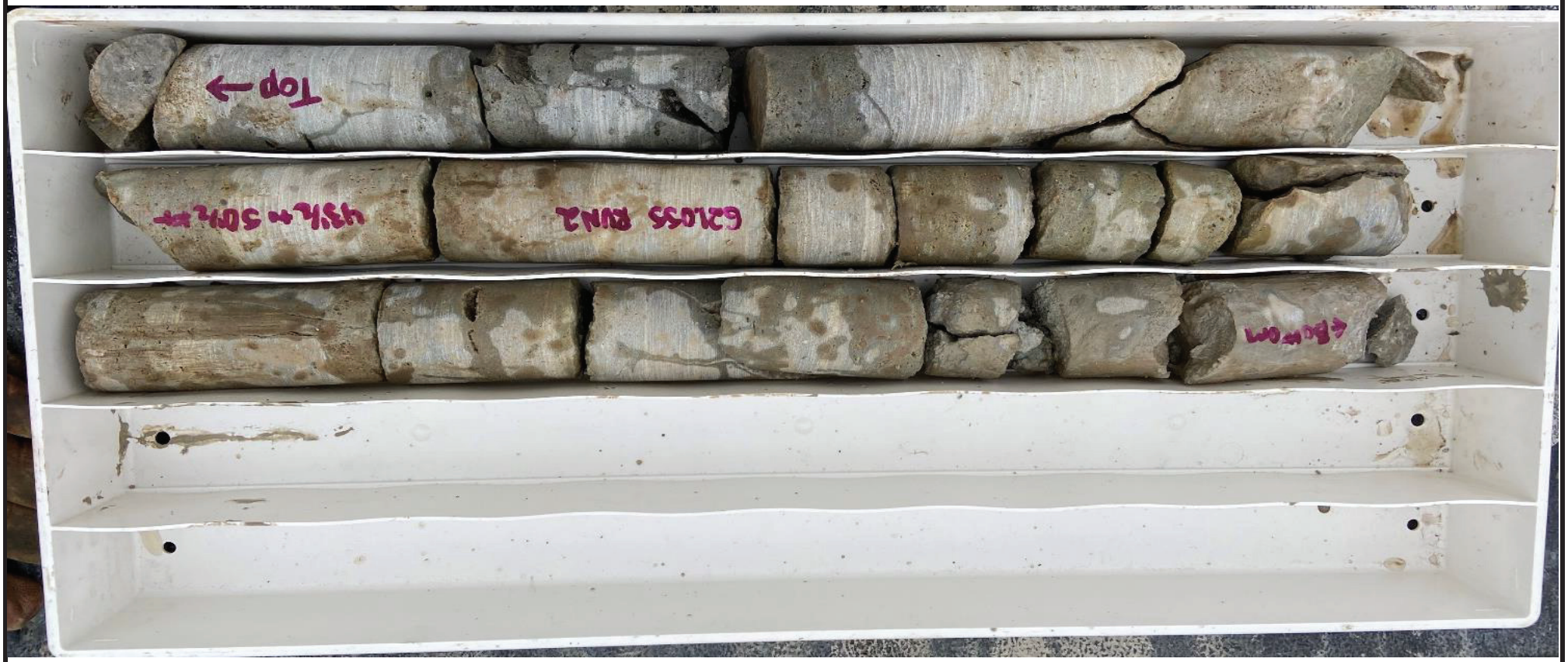
0 3 6 9 12 inches

rubino ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

| | |
|---|---|
| **Project Name:** | **PTB 197-022 WO 6** |
| **Project Location:** | IL-17 over East Branch of Horse Creek<br>Kankakee County, Illinois |
| **Client:** | **IDOT** |
| **Rubino Project # :** | G21.055 |

**RB-02 Run 1**
**Rock**
**Core**
**Photo**



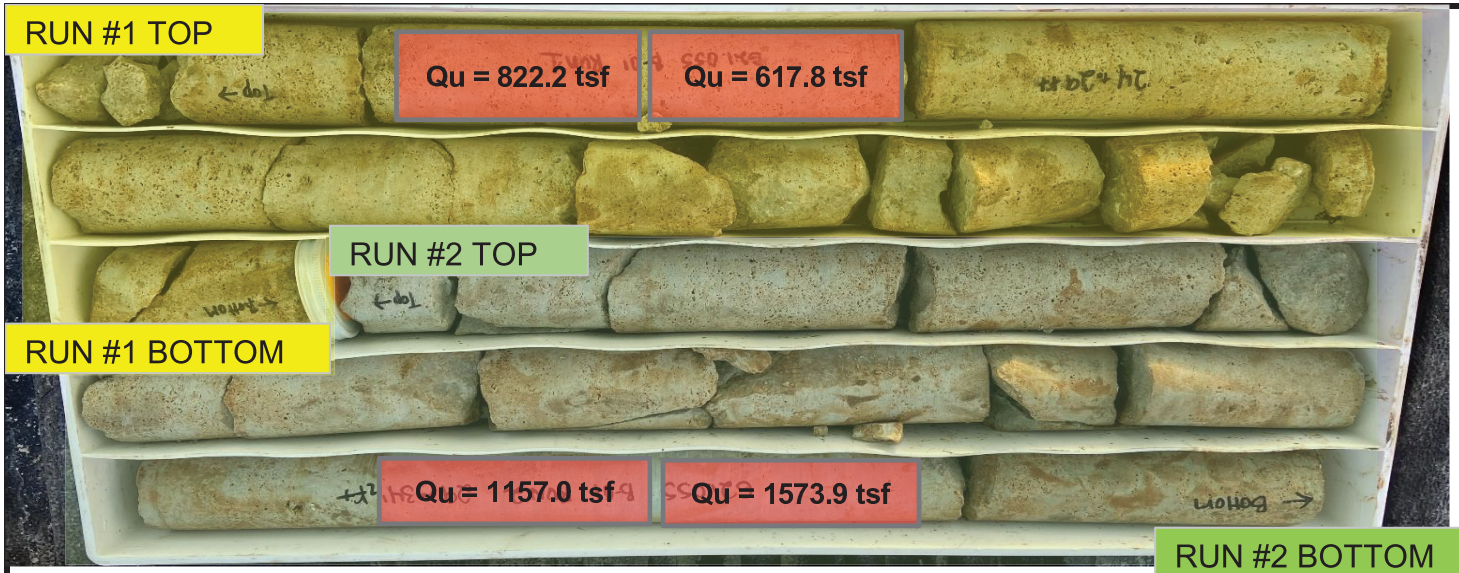

0 3 6 9 12 inches

rubino ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

| | |
|---|---|
| **Project Name:** | **PTB 197-022 WO 6** |
| **Project Location:** | IL-17 over East Branch of Horse Creek<br>Kankakee County, Illinois |
| **Client:** | **IDOT** |
| **Rubino Project # :** | G21.055 |

**RB-02 Run 2**
**Rock**
**Core**
**Photo**




RB-01 RUN #1
24 ft to 29.16 ft RECOVERY = 90%
RQD = 30%
Run 1 Qu Avg: 720 tsf

RB-01 RUN #2
29.16 ft to 34.5 ft
RECOVERY = 100%
RQD = 67%
Run 2 Qu Avg: 1,365 tsf

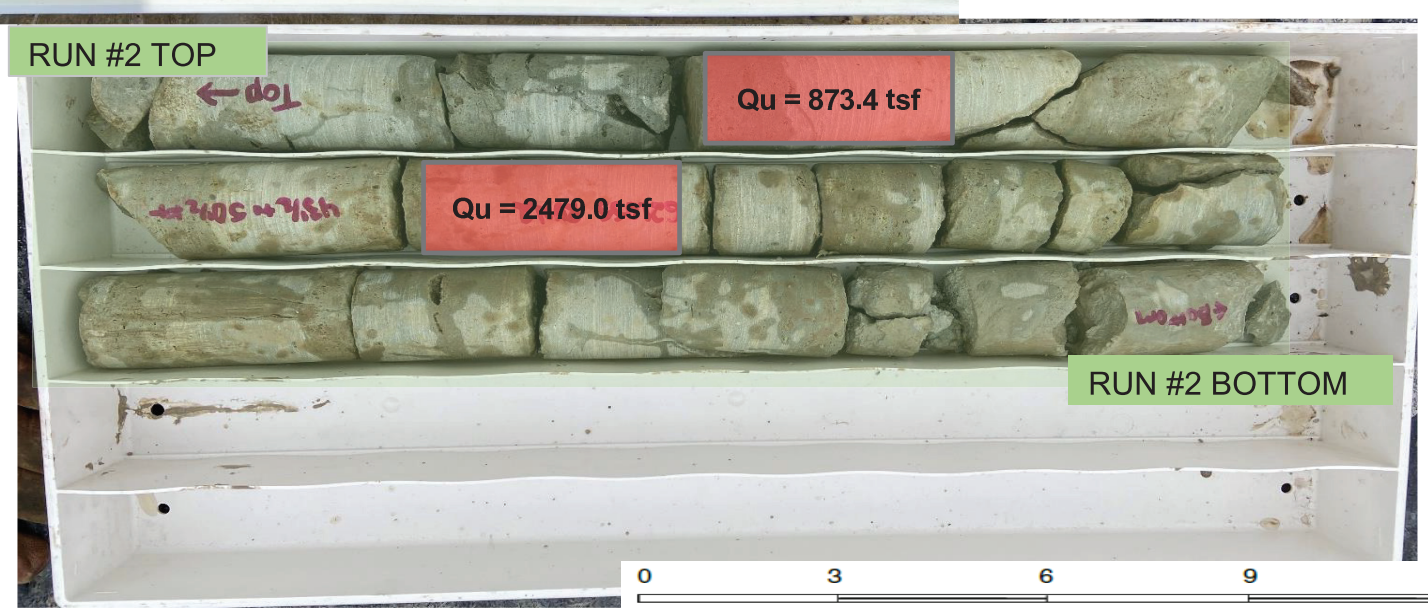
RB-01 RUN #3
34.5 ft to 39.5 ft
RECOVERY = 97%
RQD = 80%

rubino ENGINEERING INC.
425 Shepard Drive
Elgin, Illinois 60123

| | |
|---|---|
| **Project Name:** | PTB 197-022 WO 6 |
| **Project Location:** | IL-17 over East Branch of Horse Creek<br>Kankakee County, Illinois |
| **Client:** | **IDOT** |
| **Rubino Project # :** | G21.055 |

**RB-01**
**Rock Core**
**RQD**

RB-02 RUN #1
37.5 ft to 43.5 ft
RECOVERY = 87%
RQD = 0%




RB-02 RUN #2
43.5 ft to 50.5 ft
RECOVERY = 78%
RQD = 29%

rubino ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

| | |
|---|---|
| **Project Name:** | PTB 197-022 WO 6 |
| **Project Location:** | IL-17 over East Branch of Horse Creek<br>Kankakee County, Illinois |
| **Client:** | **IDOT** |
| **Rubino Project # :** | G21.055 |

**RB-02**
**Rock Core**
**RQD**

# Illinois Department of Transportation

## Memorandum

| | | | |
|---|---|---|---|
| **To:** | Carl Puzey | Attn: Brad Hessing | |
| **From:** | Michael A. Short | By: Jeremy Brown JB | |
| **Subject:** | Structure Geotechnical Report Disposition * | | |
| **Date:** | August 31, 2020 | | |

* SN: 046-0161
Route: FAP 41
Section: (12)BR
County: Kankakee
Contract No.: 66970

Attached is the Structure Geotechnical Report for the subject project.

This disposition is to provide revisions to the SGR for SN: 046-0161 which was submitted to the Bureau of Bridges and Structures for review by Mark Jones of McCleary Engineering. These revisions are being provided by Jeremy Brown (IDOT D3 Geotechnical Engineer). The first three responses below are direct responses to the speed letter that was provided from the Bridge Office. The remaining items are additional corrections that are being made.

1. It is no longer recommended to core to bedrock and socket the H-piles in rock. It is recommended to drive H-piles to refusal in the underlying limestone layer.

2. We have revised the Integral Abutment Feasibility Spreadsheet and have determined integral abutments are feasible without the need to precore. The updated spreadsheet is attached.

3. Rock sockets are no longer recommended for the proposed H-piles. It is recommended to drive H-piles to refusal in bedrock utilizing pile shoes. We have updated the IDOT Static Method of Estimating Pile Length spreadsheet. Due to the similarity of the pile cutoff elevations and the subsurface conditions, the data from the east abutment is being used to represent both abutments. Due to the consistency of the top of rock elevations, it is recommended to not include test piles, but instead to assume a pile length of 30 feet (26 feet plus 4 feet for variation in top or rock elevations).

4. We have updated the Seismic Site Class Determination Spreadsheet. The updated spreadsheet is attached.

5. There was an error found in one of the boring logs in the original report. The updated boring logs are attached.

If you have any questions, please contact Jeremy Brown at 815-433-7098.

JB:bs/StructureGeotechReport_#66970_083120

Illinois Department of Transportation

# IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Abutments (2019)
REFERENCE BORING ========== 01 sta 967+18 16LT
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 613.59 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 611.59 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1920 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 38.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 395.57 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 148.34 KIPS

***MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses***

| Maximum Nominal Req'd Bearing of Pile | Maximum Nominal Req.d Bearing of Boring | Maximum Factored Resistance Available in Boring | Maximum Pile Driveable Length in Boring |
|---|---|---|---|
| **335** KIPS | **288** KIPS | **158** KIPS | **27** FT. |

PILE TYPE AND SIZE ========== Steel HP 10 X 42
Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area========= 0.086 SQFT.

| BOT. OF LAYER ELEV. (FT.) | LAYER THICK. (FT.) | UNCONF. COMPR. STRENGTH (TSF.) | S.P.T. N VALUE (BLOWS) | GRANULAR OR ROCK LAYER DESCRIPTION | NOMINAL PLUGGED SIDE RESIST. (KIPS) | NOMINAL PLUGGED END BRG. RESIST. (KIPS) | NOMINAL PLUGGED TOTAL RESIST. (KIPS) | NOMINAL UNPLUG'D SIDE RESIST. (KIPS) | NOMINAL UNPLUG'D END BRG. RESIST. (KIPS) | NOMINAL UNPLUG'D TOTAL RESIST. (KIPS) | NOMINAL REQ'D BEARING (KIPS) | FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS) | FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS) | FACTORED RESISTANCE AVAILABLE (KIPS) | ESTIMATED PILE LENGTH (FT.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 608.68 | 2.91 | 1.50 | 3 | | 9.2 | | 28.3 | 13.6 | | ***16.0*** | 16 | 0 | 0 | 9 | 5 |
| 606.18 | 2.50 | 2.00 | 7 | | 9.6 | 19.1 | 37.9 | 14.1 | 2.4 | ***30.1*** | 30 | 0 | 0 | 17 | 7 |
| 604.18 | 2.00 | 2.00 | 3 | | 7.7 | 19.1 | 76.1 | 11.3 | 2.4 | ***45.3*** | 45 | 0 | 0 | 25 | 9 |
| 601.68 | 2.50 | 5.20 | 12 | | 17.1 | 49.6 | 89.4 | 25.2 | 6.3 | ***70.1*** | 70 | 0 | 0 | 39 | 12 |
| 599.18 | 2.50 | 4.80 | 13 | | 17.1 | 45.8 | 108.5 | 25.2 | 5.8 | ***95.6*** | 96 | 0 | 0 | 53 | 14 |
| 596.68 | 2.50 | 5.00 | 14 | | 17.1 | 47.7 | 141.9 | 25.2 | 6.0 | ***122.9*** | 123 | 0 | 0 | 68 | 17 |
| 594.18 | 2.50 | 6.70 | 20 | | 17.1 | 63.9 | ***138.3*** | 25.2 | 8.1 | 145.5 | 138 | 0 | 0 | 76 | 19 |
| 591.68 | 2.50 | | 34 | Hard Till | 3.1 | 43.2 | 180.8 | 4.5 | 5.5 | ***155.0*** | 155 | 0 | 0 | 85 | 22 |
| 589.18 | 2.50 | | 65 | Hard Till | 8.1 | 82.6 | 253.8 | 11.9 | 10.5 | ***175.2*** | 175 | 0 | 0 | 96 | 24 |
| 588.68 | 0.50 | | 116 | Hard Till | 4.7 | 147.5 | 258.5 | 7.0 | 18.7 | ***182.1*** | 182 | 0 | 0 | 100 | 25 |
| 588.18 | 0.50 | | 116 | Hard Till | 4.7 | 147.5 | 263.2 | 7.0 | 18.7 | ***189.1*** | 189 | 0 | 0 | 104 | 25 |
| 587.68 | 0.50 | | 116 | Hard Till | 4.7 | 147.5 | 267.9 | 7.0 | 18.7 | ***196.0*** | 196 | 0 | 0 | 108 | 26 |
| 587.18 | 0.50 | | 116 | Hard Till | 4.7 | 147.5 | 272.7 | 7.0 | 18.7 | ***203.0*** | 203 | 0 | 0 | 112 | 26 |
| 586.68 | 0.50 | | 116 | Hard Till | 4.7 | 147.5 | 892.7 | 7.0 | 18.7 | ***287.8*** | 288 | 0 | 0 | 158 | 27 |
| 586.18 | 0.50 | | 600 | Hard Till | 124.7 | 762.8 | 1017.4 | 183.6 | 96.5 | ***471.4*** | ~~471~~ | ~~0~~ | ~~0~~ | ~~259~~ | ~~27~~ |
| 585.68 | 0.50 | | 600 | Hard Till | 124.7 | 762.8 | 1142.1 | 183.6 | 96.5 | ***655.0*** | ~~655~~ | ~~0~~ | ~~0~~ | ~~360~~ | ~~28~~ |
| 585.18 | 0.50 | | 600 | Hard Till | 124.7 | 762.8 | ***673.6*** | 183.6 | 96.5 | 763.6 | ~~674~~ | ~~0~~ | ~~0~~ | ~~370~~ | ~~28~~ |
| 584.68 | 0.50 | | | Limestone | 41.1 | 169.5 | ***714.7*** | 60.5 | 21.5 | 824.1 | ~~715~~ | ~~0~~ | ~~0~~ | ~~393~~ | ~~28.9~~ |
| 584.18 | 0.50 | | | Limestone | 41.1 | 169.5 | ***755.8*** | 60.5 | 21.5 | 884.6 | ~~756~~ | ~~0~~ | ~~0~~ | ~~416~~ | ~~29.4~~ |
| 583.68 | 0.50 | | | Limestone | 41.1 | 169.5 | ***796.9*** | 60.5 | 21.5 | 945.1 | ~~797~~ | ~~0~~ | ~~0~~ | ~~438~~ | ~~29.9~~ |
| 583.18 | 0.50 | | | Limestone | 41.1 | 169.5 | ***838.0*** | 60.5 | 21.5 | 1005.6 | ~~838~~ | ~~0~~ | ~~0~~ | ~~461~~ | ~~30.4~~ |
| 582.68 | 0.50 | | | Limestone | 41.1 | 169.5 | ***879.1*** | 60.5 | 21.5 | 1066.2 | ~~879~~ | ~~0~~ | ~~0~~ | ~~484~~ | ~~30.9~~ |
| 582.18 | 0.50 | | | Limestone | 41.1 | 169.5 | ***920.2*** | 60.5 | 21.5 | 1126.7 | ~~920~~ | ~~0~~ | ~~0~~ | ~~506~~ | ~~31.4~~ |
| 581.68 | 0.50 | | | Limestone | 41.1 | 169.5 | ***961.3*** | 60.5 | 21.5 | 1187.2 | ~~961~~ | ~~0~~ | ~~0~~ | ~~529~~ | ~~31.9~~ |
| 581.18 | 0.50 | | | Limestone | 41.1 | 169.5 | ***1002.4*** | 60.5 | 21.5 | 1247.7 | ~~1002~~ | ~~0~~ | ~~0~~ | ~~551~~ | ~~32.4~~ |
| 580.68 | 0.50 | | | Limestone | 41.1 | 169.5 | ***1043.6*** | 60.5 | 21.5 | 1308.3 | ~~1044~~ | ~~0~~ | ~~0~~ | ~~574~~ | ~~32.9~~ |
| 580.18 | 0.50 | | | Limestone | | 169.5 | | | 21.5 | | | | | | |

Illinois Department of Transportation

# INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

**GENERAL DATA**

| | | | | | |
|---|---|---|---|---|---|
| STRUCTURE NUMBER | 046-0161 using 2019 boring data | | TOTAL STRUCTURE LENGTH | 103.00 | FT |
| STRUCTURE TYPE | SIMPLE-SPAN | | | | |
| STRUCTURE SKEW | 0 | DEGREES | | | |
| SUPER. DATA IN REFERENCE TO SUB. DATA | ABUT 2 | | | | |

**SUPERSTRUCTURE DATA (END OR MAIN SPAN)**

| | | |
|---|---|---|
| BEAM TYPE | CONCRETE BEAM | |
| CONCRETE BEAM | IL45-2438 | |
| BEAM F'C | 8.5 | KSI |
| BEAM SPACING PERP. TO CL | 6.50 | FT |
| SLAB THICKNESS | 8.00 | IN |
| SLAB F'C | 4.00 | KSI |

**SUPERSTRUCTURE DATA (ADJACENT SPAN)**

| | | |
|---|---|---|
| | | KSI |
| BEAM SPACING PERP. TO CL | | FT |

**ABUTMENT #1 DATA**

| | | |
|---|---|---|
| ABUTMENT NAME | West | |
| ABUTMENT REFERENCE BORING | Boring 2 (1958) | |
| BOTTOM OF ABUTMENT ELEVATION | 611.59 | FT |
| ESTIMATED NUMBER OF PILES AT ABUT. | 6 | |
| PILE SPACING PERP. TO CL | 7 | FT |

**ABUTMENT #2 DATA**

| | | |
|---|---|---|
| ABUTMENT NAME | East | |
| ABUTMENT REFERENCE BORING | Boring 1 (2019) | |
| BOTTOM OF ABUTMENT ELEVATION | 611.68 | FT |
| ESTIMATED NUMBER OF PILES AT ABUT. | 6 | |
| PILE SPACING PERP. TO CL | 7 | FT |

**SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1**

| *BOT. OF LAYER ELEV. (FT)* | *LAYER THICKNESS (FT)* | *UNCONFINED COMPRESSIVE STRENGTH (TSF)* | *N S.P.T. VALUE (BLOWS/12 IN.)* | *Qu EQUIV. FOR N VALUE (TSF)* |
|---|---|---|---|---|
| 609.00 | 2.59 | 1.6 | | |
| 606.50 | 2.50 | 1.4 | | |
| 603.50 | 3.00 | 4.1 | | |
| 601.59 | 1.91 | 4.7 | | |
| | | | | |
| | | | | |
| | | | | |

10.00 FT = TOTAL DEPTH ENTERED

**SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2**

| *BOT. OF LAYER ELEV. (FT)* | *LAYER THICKNESS (FT)* | *UNCONFINED COMPRESSIVE STRENGTH (TSF)* | *N S.P.T. VALUE (BLOWS/12 IN.)* | *Qu EQUIV. FOR N VALUE (TSF)* |
|---|---|---|---|---|
| 611.18 | 0.50 | 2.0 | | |
| 608.68 | 2.50 | 1.5 | | |
| 606.18 | 2.50 | 2.0 | | |
| 604.18 | 2.00 | 2.00 | | |
| 601.68 | 2.50 | 5.20 | | |
| | | | | |
| | | | | |

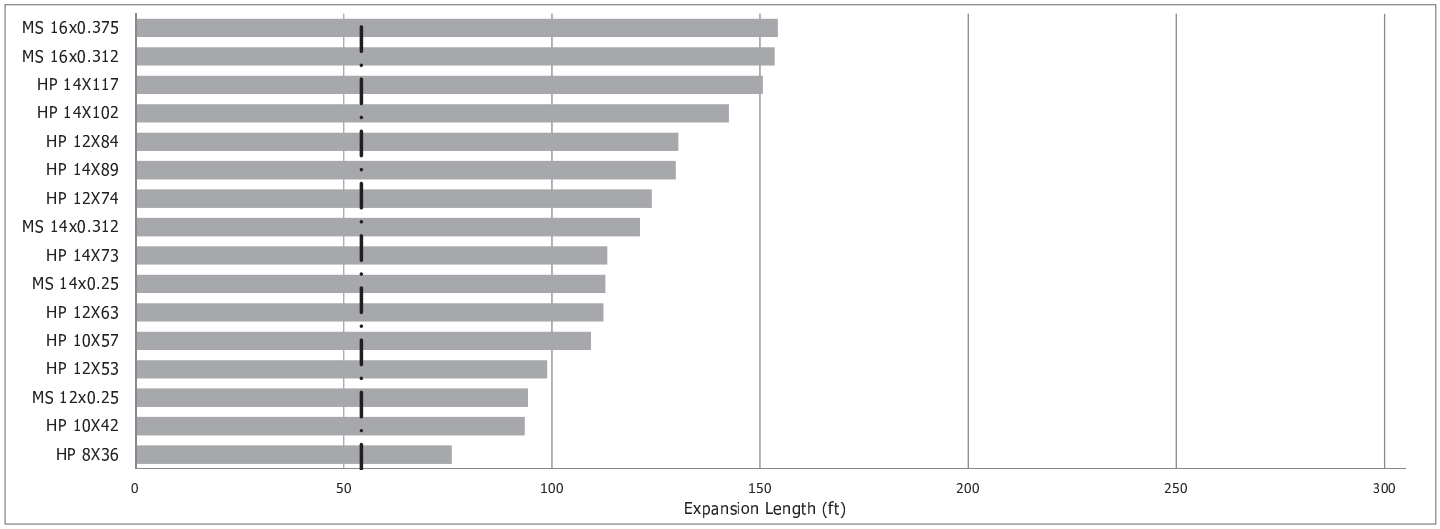
10.00 FT = TOTAL DEPTH ENTERED

| | | | | | |
|---|---|---|---|---|---|
| WEIGHTED AVERAGE Qu FOR ABUTMENT #1 | 2.89 | TSF | WEIGHTED AVERAGE Qu FOR ABUTMENT #2 | 2.68 | TSF |
| PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*2.89]) | 1.72 | | PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*2.68]) | 1.54 | |

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.72*6*0+1.54*6*103]/[1.72*6+1.54*6] = 48.77 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.54*6*0+1.72*6*103]/[1.54*6+1.72*6] = 54.23 FT

## ABUT 2 (East) - EXPANSION LENGTH LIMIT CHART - 0 DEG. SKEW




— · — · · = *Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration.*
*(Note: The same size pile should be used at both abutments.)*

Illinois Department of Transportation

# SEISMIC SITE CLASS DETERMINATION

PROJECT TITLE=====SN: 046-0161

## Substructure 1

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents) | 611.59 | ft. |
| Pile or Shaft Dia. | 12 | inches |
| Boring Number | B-2 (1958) | |
| Top of Boring Elev. | 615.4 | ft. |
| Approximate Fixity Elev. | 605.59 | ft. |

**Individual Site Class Definition:**

N (bar): 60 (Blows/ft.) Soil Site Class C
$N_{ch}$ (bar): NA (Blows/ft.) NA
$s_u$ (bar): 3.94 (ksf) Soil Site Class C <----Controls

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|
| | 614.0 | 1.40 | 8 | 1.00 | |
| | 611.5 | 2.50 | 8 | 1.00 | |
| | 609.0 | 2.50 | 10 | 1.60 | |
| | 606.5 | 2.50 | 6 | 1.40 | B |
| 2.1 | 603.5 | 3.00 | 14 | 4.10 | B |
| 4.6 | 601.0 | 2.50 | 65 | 4.70 | B |
| 7.1 | 598.5 | 2.50 | 67 | 6.10 | B |
| 10.4 | 595.2 | 3.30 | 64 | 3.90 | B |
| 14.6 | 591.0 | 4.20 | 65 | 3.90 | R |
| 100.0 | 505.6 | 85.40 | 65 | 3.90 | |

## Substructure 2

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents) | 611.68 | ft. |
| Pile or Shaft Dia. | 12 | inches |
| Boring Number | B-01 (2019) | |
| Top of Boring Elev. | 618.68 | ft. |
| Approximate Fixity Elev. | 605.68 | ft. |

**Individual Site Class Definition:**

N (bar): 48 (Blows/ft.) Soil Site Class D
$N_{ch}$ (bar): NA (Blows/ft.) NA
$s_u$ (bar): 4.47 (ksf) Soil Site Class C <----Controls

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|
| | 616.2 | 2.50 | 8 | 1.00 | |
| | 613.7 | 2.50 | 8 | 1.00 | B |
| | 611.2 | 2.50 | 7 | 2.00 | B |
| | 608.7 | 2.50 | 3 | 1.50 | |
| | 606.2 | 2.50 | 7 | 2.00 | B |
| 1.5 | 604.2 | 2.00 | 3 | 2.00 | B |
| 4.0 | 601.7 | 2.50 | 12 | 5.20 | |
| 6.5 | 599.2 | 2.50 | 13 | 4.80 | B |
| 9.0 | 596.7 | 2.50 | 14 | 5.00 | |
| 11.5 | 594.2 | 2.50 | 20 | 6.70 | B |
| 14.0 | 591.7 | 2.50 | 34 | 7.20 | |
| 16.5 | 589.2 | 2.50 | 65 | 4.50 | |
| 19.0 | 586.7 | 2.50 | 116 | 4.50 | |
| 20.5 | 585.2 | 1.50 | 600 | 4.50 | R |
| 100.0 | 505.7 | 79.50 | 600 | 4.50 | |

## Substructure 3

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents) | | ft. |
| Pile or Shaft Dia. | | inches |
| Boring Number | | |
| Top of Boring Elev. | | ft. |
| Approximate Fixity Elev. | | ft. |

**Individual Site Class Definition:**

N (bar): (Blows/ft.) NA
$N_{ch}$ (bar): (Blows/ft.) NA
$s_u$ (bar): (ksf) NA

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|

## Substructure 4

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents) | | ft. |
| Pile or Shaft Dia. | | inches |
| Boring Number | | |
| Top of Boring Elev. | | ft. |
| Approximate Fixity Elev. | | ft. |

**Individual Site Class Definition:**

N (bar): (Blows/ft.) NA
$N_{ch}$ (bar): (Blows/ft.) NA
$s_u$ (bar): (ksf) NA

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|

## Global Site Class Definition: Substructures 1 through 2

N (bar): 54 (Blows/ft.) Soil Site Class C
$N_{ch}$ (bar): (Blows/ft.) NA, H < 0.1*H (Total)
$s_u$ (bar): 4.21 (ksf) Soil Site Class C <----Controls

**Illinois Department of Transportation**
Division of Highways
IDOT

# SOIL BORING LOG

**Date** 8/1/58

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** IL 17 over East Branch of Horse Creek, 0.2 miles East of Herscher Road **LOGGED BY** W. Carter

**SECTION** 12-BR **LOCATION** NW 1/4, **SEC.** 4, **TWP.** 30N, **RNG.** 10E, 3rd **PM**,
**Latitude** , **Longitude**

**COUNTY** Kankakee **DRILLING METHOD** **HAMMER TYPE**

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** 1
**Station** 966+39
**Offset** 15.0 ft Rt.
**Ground Surface Elev.** 615.80 ft

**Surface Water Elev.** ft
**Stream Bed Elev.** ft

**Groundwater Elev.:**
**First Encounter** ft
**Upon Completion** ft
**After** Hrs. ft

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) | Description |
|---|---|---|---|---|
| | | | | Medium Black Silty Clay |
| 614.00 | | | | |
| | | | | Loose Dark Brown Clayey Silty Sand |
| -5 | | | | |
| | 4 | | | |
| 609.50 | | | | |
| | | | | Stiff Brown Sandy Clay |
| | 8 | Lost | | |
| 607.00 | | | | |
| | | | | Very Stiff Gray Sandy Clay Till |
| -10 | | | | |
| | 32 | Ruptured | | |
| 604.00 | | | | |
| | | | | Brittle Hard Gray Sandy Clay Till |
| | 91 | 5.8 | | |
| -15 | | | | |
| | 140 | 4.1 | | |
| | 88 | 5.6 | | |
| -20 | | | | |

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) | Description |
|---|---|---|---|---|
| | 63 | 5.1 | | Brittle Hard Gray Sandy Clay Till *(continued)* |
| 594.00 | | | | |
| | | | | Hard Gray Limey Clay |
| | 78 | 4.5 | | |
| -25 | | | | |
| 590.00 | 100 | 4.1 | | |
| | | | | End of Boring |
| -30 | | | | |
| -35 | | | | |
| -40 | | | | |

SOIL BORING 046-0032.GPJ IL_DOT.GDT 9/4/20

**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)**

**BBS, form 137 (Rev. 8-99)**

**Illinois Department of Transportation**
Division of Highways
IDOT

# SOIL BORING LOG

**Date** 9/8/19

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** IL 17 over East Branch of Horse Creek, 0.2 miles East of Herscher Road **LOGGED BY** Larry Myers

**SECTION** 12-BR **LOCATION** SE 1/4, **SEC.** 32, **TWP.** 31N, **RNG.** 10E, 3rd **PM**, **Latitude** 41.117155, **Longitude** -88.093349

**COUNTY** Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** 01
**Station** 967+18
**Offset** 16.0 ft Lt.
**Ground Surface Elev.** 618.68 ft

**Surface Water Elev.** 603.91 ft
**Stream Bed Elev.** 602.06 ft

**Groundwater Elev.:**
**First Encounter** 605.7 ft ▼
**Upon Completion** Dry ft
**After** ____ **Hrs.** ____ ft

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) | Soil Description |
|---|---|---|---|---|
| | | | | Augered Shoulder Stone, Asphalt, Brown Sandy Clay Loam Till Fill, White CA 6 Fill |
| 613.68 | | | | |
| -5 | 3 | | | Very Stiff Brown Silty Loam Fill |
| | 4<br>3 | 2.0<br>P | 17 | |
| 611.18 | | | | |
| | 2 | | | Stiff Black Silty Clay / Silty Clay Loam with Organics |
| | 1<br>2 | 1.5<br>P | 22 | |
| -10 | | | | |
| | 2 | | | |
| | 3<br>4 | 2.0<br>P | 22 | |
| 606.18 | | | | |
| | 1 | | | Stiff to Very Stiff Brown & Gray Silty Clay Loam Till ▼ |
| | 1<br>2 | 2.0<br>P | 22 | |
| 604.18 | | | | |
| -15 | 3 | | | Hard Gray Silty Clay with Layers of Gray Silt |
| | 5<br>7 | 5.2<br>S | 16 | |
| | 5 | | | |
| | 6<br>7 | 4.8<br>S | 20 | |
| 599.18 | | | | |
| -20 | | | | |

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) | Soil Description |
|---|---|---|---|---|
| | 5 | | | Hard Gray Silty Clay Loam Till with Limestone Fragments / Pieces & Silt Layers *(continued)* |
| | 6<br>8 | 5.0<br>S | 11 | |
| | 14 | | | |
| | 8<br>12 | 6.7<br>S | 16 | |
| 594.18 | | | | |
| -25 | 12 | | | Hard Gray Silt / Loam with Carbonized Organics - Very Dense (Borderline Shale) |
| | 16<br>18 | 7.2<br>S | 13 | |
| | 12 | | | |
| | 25<br>40 | >4.5<br>P | 13 | |
| -30 | | | | |
| | 24 | | | |
| | 49<br>67 | >4.5<br>P | 11 | |
| | 48 | | | |
| 585.18 | 100/2" | >4.5<br>P | 10 | |
| | | | | Auger Refusal @ 33.5 Ft. Assumed Limestone Surface End of Boring |
| -35 | | | | |
| -40 | | | | |

SOIL BORING 046-0032.GPJ IL_DOT.GDT 9/4/20

**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)**

**BBS, form 137 (Rev. 8-99)**

**Illinois Department of Transportation**
Division of Highways
IDOT

# SOIL BORING LOG

**Date** 8/1/58

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** IL 17 over East Branch of Horse Creek, 0.2 miles East of Herscher Road **LOGGED BY** W. Carter

**SECTION** 12-BR **LOCATION** SE 1/4, **SEC.** 32, **TWP.** 31N, **RNG.** 10E, 3rd **PM**,
**Latitude** , **Longitude**

**COUNTY** Kankakee **DRILLING METHOD** _____ **HAMMER TYPE** _____

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** 2
**Station** 965+27
**Offset** 18.0 ft Lt.
**Ground Surface Elev.** 615.40 ft

**Surface Water Elev.** _____ ft
**Stream Bed Elev.** _____ ft

**Groundwater Elev.:**
**First Encounter** _____ ft
**Upon Completion** _____ ft
**After** _____ **Hrs.** _____ ft

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) |
|---|---|---|---|
| Stiff Black and Brown Silty Sandy Clay | | | |
| -5 | 10 | 1.6 | |
| | | | |
| | 6 | 1.4 | |
| 606.50 | | | |
| Hard Gray Clay Till | | | |
| -10 | 14 | 4.1 | |
| 603.50 | | | |
| Hard Gray Silty Till | | | |
| | 65 | 4.7 | |
| 601.00 | | | |
| Hard Gray Sandy Clay Till | | | |
| -15 | 67 | 6.1 | |
| 598.50 | | | |
| Brittle Very Stiff Gray Sandy Clay Till | | | |
| | 64 | 3.9 | |
| -20 | | | |

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) |
|---|---|---|---|
| 595.20 | | | |
| Gray Broken Limestone | | | |
| 591.00 | | | |
| End of Boring | | | |
| -25 | | | |
| -30 | | | |
| -35 | | | |
| -40 | | | |

SOIL BORING 046-0032.GPJ IL_DOT.GDT 9/4/20

**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)**

**BBS, form 137 (Rev. 8-99)**

**Illinois Department of Transportation**
Division of Highways
IDOT

# SOIL BORING LOG

**Date** 8/1/58

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** IL 17 over East Branch of Horse Creek, 0.2 miles East of Herscher Road **LOGGED BY** W. Carter

**SECTION** 12-BR **LOCATION** NW 1/4, **SEC.** 4, **TWP.** 30N, **RNG.** 10E, 3rd **PM**,
**Latitude** , **Longitude**

**COUNTY** Kankakee **DRILLING METHOD** **HAMMER TYPE**

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** 3
**Station** 965+59
**Offset** 40.0 ft Rt.
**Ground Surface Elev.** 612.60 ft

**Surface Water Elev.** ft
**Stream Bed Elev.** ft

**Groundwater Elev.:**
**First Encounter** ft
**Upon Completion** ft
**After** Hrs. ft

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) | Material |
|---|---|---|---|---|
| | | | | Stiff to Very Stiff Black and Brown Silty Sandy Clay |
| -5 | | | | |
| 604.00 | | | | |
| | | | | Hard Gray Silty Till |
| -10 | | | | |
| | 55 | 7.0 | | |
| 600.50 | | | | |
| | | | | Hard Gray Sandy Clay Till |
| | 49 | 4.3 | | |
| 598.50 | | | | |
| | | | | Very Stiff Gray Sandy Very Stoney Till |
| -15 | | | | |
| | 57 | 3.1 | | |
| 595.20 | | | | |
| | | | | Gray Limestone |
| -20 | | | | |
| | | | | Gray Limestone *(continued)* |
| 591.20 | | | | |
| | | | | End of Boring |
| -25 | | | | |
| -30 | | | | |
| -35 | | | | |
| -40 | | | | |

SOIL BORING 046-0032.GPJ IL_DOT.GDT 9/4/20

**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)**

**BBS, form 137 (Rev. 8-99)**

**Illinois Department of Transportation**
Division of Highways
IDOT

# SOIL BORING LOG

**Date** 8/1/58

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** IL 17 over East Branch of Horse Creek, 0.2 miles East of Herscher Road **LOGGED BY** W. Carter

**SECTION** 12-BR **LOCATION** SE 1/4, **SEC.** 32, **TWP.** 31N, **RNG.** 10E, 3rd **PM**,
**Latitude** , **Longitude**

**COUNTY** Kankakee **DRILLING METHOD** **HAMMER TYPE**

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** 4
**Station** 966+09
**Offset** 33.0 ft Lt.
**Ground Surface Elev.** 611.20 ft

**Surface Water Elev.** ft
**Stream Bed Elev.** ft

**Groundwater Elev.:**
**First Encounter** ft
**Upon Completion** ft
**After** Hrs. ft

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) | Description |
|---|---|---|---|---|
| | | | | Stiff Dark Brown Silty Clay |
| 610.00 | | | | |
| | | | | Very Stiff Mottled Clay |
| 607.00 | | | | |
| -5 | | | | Dense Yellow Sandy Silt |
| 605.50 | | | | |
| | | | | Hard Gray Silty Till |
| -10 | | | | |
| 599.50 | | | | |
| | | | | Very Stiff Gray Sandy Till |
| | | 3.2 | | |
| | 41 | 6.5 | | |
| -15 | 156 | | | |
| 596.00 | | | | |
| | | | | Hard Gray Limestone |
| 592.00 | | | | |
| -20 | | | | End of Boring |

SOIL BORING 046-0032.GPJ IL_DOT.GDT 9/4/20

**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)**

## Pile Design Table for Abutments (2019) utilizing Boring #01 sta 967+18 16LT

| Nominal Required Bearing (Kips) | Factored Resistance Available (Kips) | Estimated Pile Length (Ft.) |
|---|---|---|
| **Steel HP 8 X 36** | | |
| 236 | 130 | 27 |
| **Steel HP 10 X 42** | | |
| 203 | 112 | 26 |
| 288 | 158 | 27 |
| **Steel HP 10 X 57** | | |
| 211 | 116 | 26 |
| 323 | 178 | 27 |
| **Steel HP 12 X 53** | | |
| 243 | 134 | 26 |
| 349 | 192 | 27 |
| **Steel HP 12 X 63** | | |
| 251 | 138 | 26 |
| 375 | 206 | 27 |
| **Steel HP 12 X 74** | | |
| 257 | 141 | 26 |
| 402 | 221 | 27 |
| **Steel HP 12 X 84** | | |
| 262 | 144 | 26 |
| 425 | 234 | 27 |
| 650 | 357 | 27 |
| **Steel HP 14 X 73** | | |
| 267 | 147 | 25 |
| 277 | 152 | 25 |
| 287 | 158 | 26 |
| 297 | 163 | 26 |
| 441 | 243 | 27 |
| **Steel HP 14 X 89** | | |
| 266 | 146 | 24 |
| 276 | 152 | 25 |
| 286 | 157 | 25 |
| 296 | 163 | 26 |
| 306 | 168 | 26 |
| 480 | 264 | 27 |
| **Steel HP 14 X 102** | | |
| 235 | 129 | 22 |
| 273 | 150 | 24 |
| 283 | 155 | 25 |
| 293 | 161 | 25 |
| 303 | 167 | 26 |
| 313 | 172 | 26 |
| 511 | 281 | 27 |
| 778 | 428 | 27 |
| **Steel HP 14 X 117** | | |
| 241 | 132 | 22 |
| 281 | 155 | 24 |
| 291 | 160 | 25 |
| 301 | 166 | 25 |
| 312 | 171 | 26 |
| 322 | 177 | 26 |
| 548 | 301 | 27 |
| 817 | 449 | 27 |
| **Precast 14"x 14"** | | |
| 209 | 115 | 14 |

Illinois Department of Transportation

This SGR has been updated. See memo dated 8/31/2020 for changes.

# Abbreviated Structure Geotechnical Report

**Original Report Date:** 6/25/2020 **Proposed SN:** 046-0161 **Route:** FAP 41 (IL 17)
**Revised Date:** **Existing SN:** 046-0032 **Section:** 12-BR
**Geotechnical Engineer:** Mark Jones of McCleary Engineering **County:** Kankakee
**Structural Engineer:** William Vegrzyn of V3 Companies **Contract:** 66970

**Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing):** The proposed structure SN046-0161 carries IL 17 over the east branch of Horse Creek. The structure is a single span bridge with integral abutments, no skew, with an out to out superstructure width of 38.83 ft. and a back to back abutment length of 103.0 ft. The estimated total factored loading at the abutments is 1920 kips. The abutments will be supported by steel piles set in limestone.

**Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot):** The existing structure SN 046-0032 is a three-span bridge on open abutments supported on piling. The piers are on spread footings.

Four (4) borings were available from August 1958, these borings all show a similar stratigraphy with Limestone beginning around elevation 595.0 ft. Boring 1 has a ground surface elevation of 615.80 ft and a depth of 25.8 ft. The upper 1.5 ft of the boring is Silty Clay, below the Silty Clay is a loose Clayey Silty Sand down to an elevation of 609.5 ft. From 609.5 ft. to 594.0 ft is a stiff to hard Sandy Clay Till. Boring 1 is terminated at 590.0 ft. in a 100+ blow count hard limey Clay.

Boring 2 has a ground surface elevation of 615.4 ft. and a depth of 24.4 ft. The first 8.9 ft. of the boring is a stiff Silty Sandy Clay. From 606.5 ft. to 595.2 ft. is alternating layers of hard Silty Clay Till and Sandy Clay Till. Boring 2 encountered broken Limestone at 595.2 ft. and is terminated at 591.0 ft. in Limestone.

Boring 3 has a ground surface elevation of 612.6 ft and a depth of 21.4 ft. The first 8.6 ft of the boring is a stiff to very stiff Silty Sandy Clay. From 604.0 ft. to 595.2 ft. is alternating layers of hard Silty Till and Sandy Clay Till. Boring 3 encountered gray Limestone at 595.2 ft and is terminated at 591.2 ft.

Boring 4 has a ground surface elevation of 611.2 ft and a depth of 19.2 ft. The upper 4.2 ft is a stiff to very stiff Silty Clay to Clay, below this layer is 1.5 ft of dense Sandy Silt. From 605.5 ft. to 596.0 ft. is a 6 ft. of hard Silty Till on top of 3.5 ft of very stiff Sandy Till. Boring 4 encountered hard gray Limestone at 596.0 ft and is terminated at 592.0 ft.

In August 2019 one additional boring, B-01, was taken ±84 ft. east of the proposed east abutment. Boring 01 (2019) has a ground surface elevation of 618.68 ft. and a depth of 33.5 ft. Soils were consistent with the 1958 borings above an elevation of ±594 to 596 ft. The 1958 borings reported no groundwater; the 2019 boring reported water at 605.7 ft., but dry upon completion. In Boring 01, under 7.5 ft. of Sandy Clay Loam Till fill and Silty Loam fill was stiff to hard Silty Clay, Silty Clay Loam, and Silty Clay Loam Till down to an elevation of 594.18 ft. The final 9.0 ft. reported in the boring, above an assumed Limestone surface at 585.18, is hard Gray Silt / Loam with carbonized Organics – very dense (borderline Shale). The final 9 ft. had blow counts above 34 and $Q_u s > 4.5$ tsf.

Boring 1 (1958) is the closest to Boring 01 (2019) and reported 4 ft. of hard gray limey Clay above the end of boring at 590.0 ft. The other 3 1958 borings, further west, all reported broken Limestone or Limestone in the 4 ft. above the end of boring ±591 to 592 ft. There are no cores or pictures of the Limestone. The author feels the ± 6 to 7 foot difference in the top of assumed limestone in the 2019 boring and the 1958 end of boring elevations could partially be due to the different sampling methods used today. However due to the fact we do have 5 borings which indicate a limestone bedrock near the surface, the decision has been made to use 585.2 as the bedrock elevation for both abutments. Any variation in the elevation should be obvious when they drive the test pile.

**Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary:** Any rise in the profile at the abutments is expected to be minimal. The existing embankment is over 60 years old, settlement should have already occurred. There is expected to be little or no settlement. When the BCR becomes availible it will be reviewed to identify any existing settlement problems.

**Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary:** There are no cross sections this time, however with minimal grade change anticipated, fill slope angles will remain the same. The end slopes being only ±6 ft. tall and the very stiff to hard soils in the area will result in stable side slopes.

**Indicate at each substructure, the 100-year and 200-year total scour depths in the Hydraulics report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations:** No scour was accounted for at the abutments per IDOT Policy. Spill through abutments shall be protected by riprap or slope wall in accordance to the Bridge Manual.

| Event/Limit State | Design Scour Elevations (ft.) | | Item 113 |
|---|---|---|---|
| | W. Abut | E. Abut. | |
| Q100 | - | - | 8 |
| Q200 | - | - | |
| Design | 611.59 | 611.68 | |
| Check | 611.59 | 611.68 | |

**Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable:** This site has a seismic site class of "C", the seismic performance zone (SPZ)=1. The SDS= 0.128 g and an $S_{D1}$=0.073 g. Due to the $S_{D1}$ being is less than 0.15 g, a liquefaction analysis was not performed.

**Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed:** Data from the four September 2019 Boring is more complete than the 1958 borings and is considered representative of the soils in the vicinity. Boring 01 was used to populate the data fields in the Estimated Pile Length spreadsheets.

Integral Abutment Feasibility (BBS 145) spreadsheets are also included. Information from both the 1958 and 2019 borings was used to populate the fields in the spreadsheet. Pre-cored shafts with a diameter of 24 inches, backfilled with bentonite, would allow for the required movement to use integral abutments at this location.

We recommend the use of H-piles. Due to the hard soils and shallow bedrock, we recommend coring to bedrock with the piles socketed in rock. One test pile is recommended at the west abutment. A table providing pile resistance and lengths for various recommended sizes is included in this report. This table was generated using no geotechnical loses associated with scour, liquification or consolidation. A full set of pile length spreadsheets for all the applicable sizes and wall thickness of metal shell piles are included in the appendix.

Assumptions used for the pile length analysis include:

- Bottom of West and East Abutment Elevations = 611.0 ft.
- The total factored loading for the abutments is 1920 kips.
- The pile cutoff allows for a 2 ft. embedment into the concrete for the abutments,
- No other geotechnical loses were accounted for in this analysis.
- Top of Limestone elevation = 585.18

| Both Abutments, using Boring 01 (2019) | | | | Both Abutments, using Boring 01 (2019) | | |
|---|---|---|---|---|---|---|
| Nominal Required Bearing (kips) | Factored Resistance Available (kips) | Estimated Pile Length (Ft.) | | Nominal Required Bearing (kips) | Factored Resistance Available (kips) | Estimated Pile Length (Ft.) |
| Steel HP 10 x 42 | | | | Steel HP 12 x 53 | | |
| | | | | | | |
| | | | | | | |
| 172 | 95 | 24 | | 207 | 114 | 24 |
| 285 | 157 | 26 | | 346 | 190 | 26 |
| 335 | 184 | 28 | | 418 | 230 | 28 |
| Steel HP 12x 63 | | | | Steel HP 14 x 73 | | |
| | | | | | | |
| | | | | | | |
| 214 | 118 | 24 | | 253 | 139 | 24 |
| 371 | 204 | 26 | | 437 | 240 | 26 |
| 497 | 273 | 28 | | 578 | 318 | 28 |
| Steel HP 14 x 89 | | | | | | |
| | | | | | | |
| | | | | | | |
| 262 | 144 | 24 | | | | |
| 476 | 262 | 26 | | | | |
| 705 | 388 | 28 | | | | |

**Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat:** The E.W.S.E. is 606.0 ft., no in stream work is anticipated during the construction of the abutments, therefore there is no need for a cofferdam.

**Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns:** At this time, we anticipate the structure to be built under staged construction conditions, therefore, Temporary Soil Retention will be required at the stage line. From the data Shown in the boring logs, driving sheet piling to the design embedment would not be possible: we recommend a Temporary Soil Retention System. The substructures shall be removed as per Section 501 of the 2016 IDOT Standard Specifications for Road And Bridge Construction.

Prepared by Mark E. Jones of McCleary Engineering
MarkJ@McClearyEngineering.com

Illinois Professional Engineer
License No.062 043271 Exp. 11/2021

Benchmark: BM 111: Chiseled "X" on top of the NE wingwall of SN 046-0032; Elev. 619.12, Sta. 966+33.28, offset 17.89' Lt.

Existing Structure: SN 046-0032 was originally constructed in 1959 as S.B.I. Route 17, Section 12-BR at Station 965+84.5. The existing 3-span reinforced concrete slab superstructure is supported by open pile bent abutments on steel H-piles and tapered solid wall piers on spread footings. The outer spans are 29'-0" and the middle span is 36'-6" with no skew. The back-to-back of abutments measure 98'-0" and the out-to-out width is 36'-4". The existing structure will be removed and replaced utilizing staged construction.

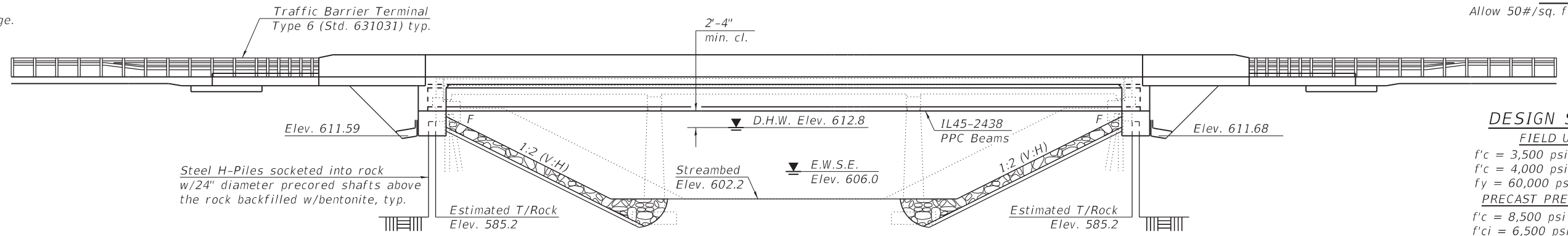
No salvage.

## DESIGN SPECIFICATIONS

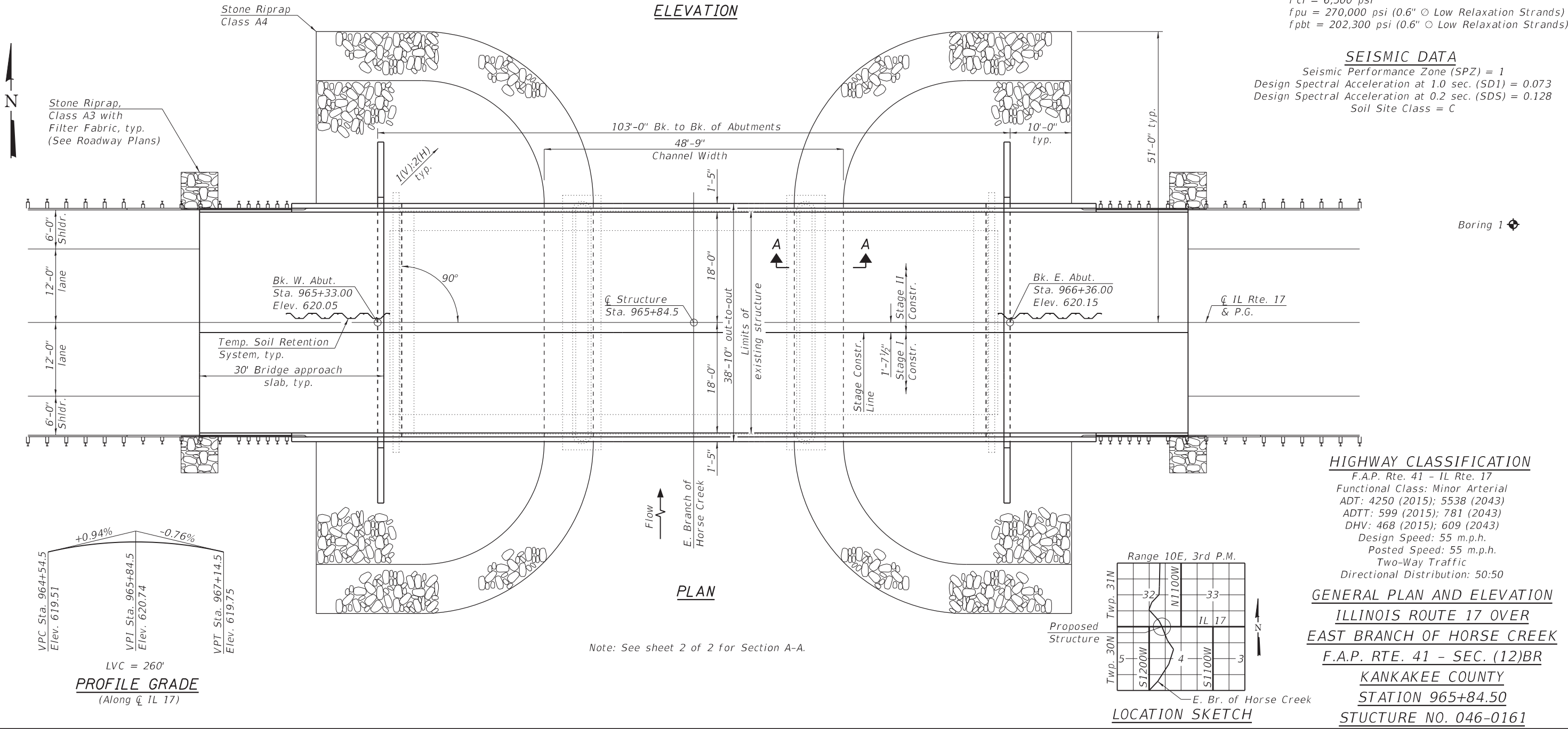
2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

## LOADING HL-93

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




## ELEVATION




## PLAN

Note: See sheet 2 of 2 for Section A-A.




LVC = 260'

## PROFILE GRADE

(Along ℄ IL 17)




## LOCATION SKETCH

Boring 1

## DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi
f'c = 4,000 psi (Superstructure Concrete)
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 Relaxation Strands)
fpbt = 202,300 psi (0.6" ○ Low Relaxation Strands)

## SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.073
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.128
Soil Site Class = C

## HIGHWAY CLASSIFICATION

F.A.P. Rte. 41 - IL Rte. 17
Functional Class: Minor Arterial
ADT: 4250 (2015); 5538 (2043)
ADTT: 599 (2015); 781 (2043)
DHV: 468 (2015); 609 (2043)
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

# GENERAL PLAN AND ELEVATION
# ILLINOIS ROUTE 17 OVER
# EAST BRANCH OF HORSE CREEK
# F.A.P. RTE. 41 - SEC. (12)BR
# KANKAKEE COUNTY
# STATION 965+84.50
# STUCTURE NO. 046-0161


V3 Companies
7325 Janes Avenue
Woodridge, IL 60517
630.724.9200 phone
630.724.9202 fax
www.v3co.com


| | | | | | |
|---|---|---|---|---|---|
| USER NAME = ____ | DESIGNED - B. Vegrzyn | REVISED - ____ | STATE OF ILLINOIS<br>DEPARTMENT OF TRANSPORTATION | | |
| | CHECKED - D. Greifzu | REVISED - ____ | | | |
| PLOT SCALE = ____ | DRAWN - B. Vegrzyn | REVISED - ____ | | | |
| PLOT DATE = ____ | CHECKED - D. Greifzu | REVISED - ____ | | | |

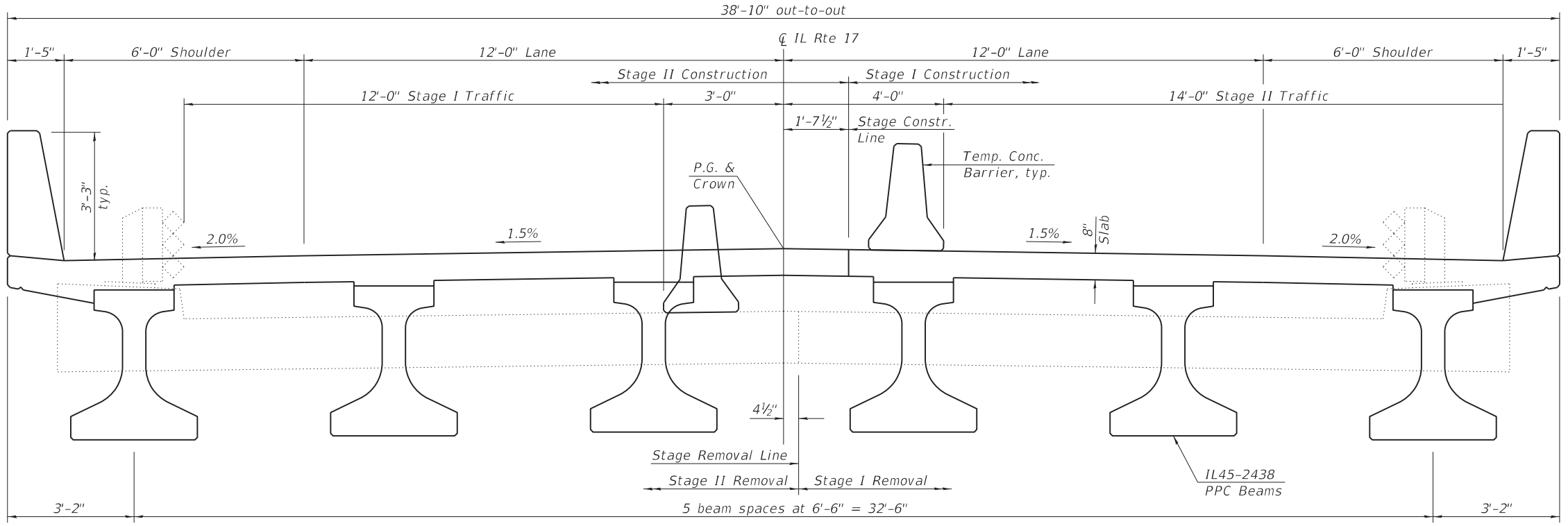
SHEET 1 OF 2 SHEETS

| F.A.P. RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
|---|---|---|---|---|
| 41 | (12)BR | Kankakee | | |

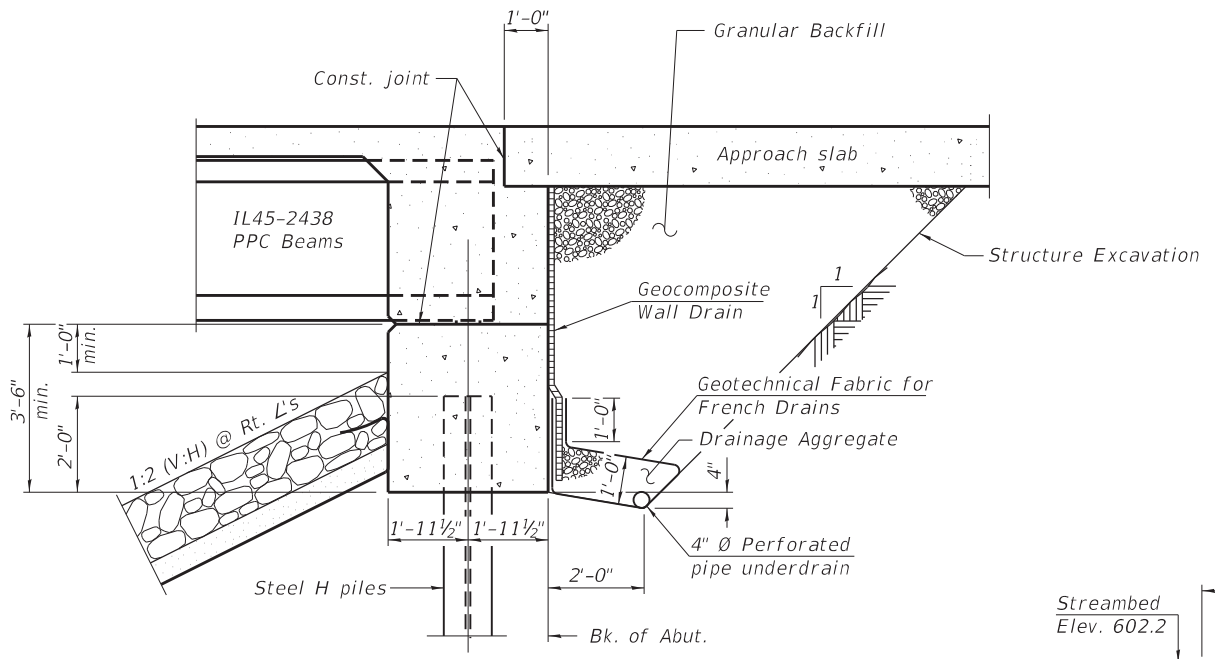
CONTRACT NO. 66970

ILLINOIS | FED. AID PROJECT

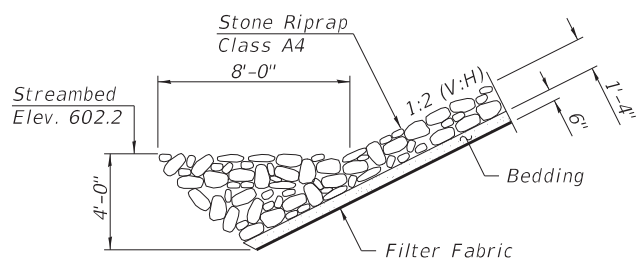
MODEL:
FILE NAME:
6/18/2020 4:53:23 PM




## CROSS SECTION
(Looking East)




## SECTION THRU INTEGRAL ABUTMENT




## SECTION A-A

## WATERWAY INFORMATION

Drainage Area=27.1 sq.mi.

Existing Overtopping Elev.=617.56 @ Sta. 975+00
Proposed Overtopping Elev.=617.56 @ Sta. 975+00

| Flood | Freq. Yr. | Q C.F.S. | Opening Ft² Exist. | Opening Ft² Prop. | Nat. H.W.E. | Head - Ft. Exist. | Head - Ft. Prop. | Headwater El. Exist. | Headwater El. Prop. |
|---|---|---|---|---|---|---|---|---|---|
| | 10 | 1350 | 434 | 683 | 612.1 | 0.2 | 0.1 | 612.3 | 612.3 |
| Design | 50 | 2040 | 475 | 739 | 612.8 | 0.4 | 0.2 | 613.1 | 613.0 |
| Base | 100 | 2350 | 494 | 767 | 613.1 | 0.5 | 0.2 | 613.5 | 613.3 |
| Scour Check | 200 | 2668 | 512 | 792 | 613.3 | 0.5 | 0.3 | 613.9 | 613.6 |
| Max. Calc. | 500 | 3100 | 535 | 823 | 613.7 | 0.7 | 0.4 | 614.4 | 614.0 |

10 Year velocity through existing structure = 3.1 ft./sec.
10 Year velocity through proposed structure = 2.0 ft./sec.

## DESIGN SCOUR ELEVATION TABLE

| Event / Limit State | Design Scour Elevations (ft.) W. Abut. | E. Abut. | Item 113 |
|---|---|---|---|
| Q100 | 611.59 | 611.68 | 8 |
| Q200 | 611.59 | 611.68 | |
| Design | 611.59 | 611.68 | |
| Check | 611.59 | 611.68 | |

# DETAILS
# ILLINOIS ROUTE 17 OVER EAST BRANCH OF HORSE CREEK
# F.A.P. RTE. 41 - SEC. (12)BR
# KANKAKEE COUNTY
# STATION 965+84.50
# STUCTURE NO. 046-0161

V3 Companies
7325 Janes Avenue
Woodridge, IL 60517
630.724.9200 phone
630.724.9202 fax
www.v3co.com

MODEL:
FILE NAME:
6/18/2020 4:54:30 PM

| | | | |
|---|---|---|---|
| USER NAME = ____ | DESIGNED - B. Vegrzyn | REVISED - ____ | |
| | CHECKED - D. Greifzu | REVISED - ____ | |
| PLOT SCALE = ____ | DRAWN - B. Vegrzyn | REVISED - ____ | |
| PLOT DATE = ____ | CHECKED - D. Greifzu | REVISED - ____ | |

**STATE OF ILLINOIS**
**DEPARTMENT OF TRANSPORTATION**

SHEET 2 OF 2 SHEETS

| F.A.P. RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
|---|---|---|---|---|
| 41 | (12)BR | Kankakee | | |
| | | CONTRACT NO. 66970 | | |
| | ILLINOIS | FED. AID PROJECT | | |

This sheet is superseded by the revised boring logs. See memo dated 8/31/2020 for more information

**Illinois Department of Transportation**
Division of Highways
IDOT

# SOIL BORING LOG



Date 9/8/19

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** IL 17 over East Branch of Horse Creek, 0.2 miles East of Herscher Road **LOGGED BY** Larry Myers

**SECTION** 12-BR **LOCATION** SE 1/4, **SEC.** 32, **TWP.** 31N, **RNG.** 10E, 3rd **PM**, **Latitude** 41.117155, **Longitude** -88.093349

**COUNTY** Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** 01
**Station** 967+18
**Offset** 16.0 ft Lt.
**Ground Surface Elev.** 618.68 ft

**Surface Water Elev.** 603.91 ft
**Stream Bed Elev.** 602.06 ft

**Groundwater Elev.:**
**First Encounter** 605.7 ft ▼
**Upon Completion** Dry ft
**After** ____ **Hrs.** ____ ft

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) |
|---|---|---|---|
| Augered Shoulder Stone, Asphalt, Brown Sandy Clay Loam Till Fill, White CA 6 Fill | | | |
| 613.68 | | | |
| -5 | | | |
| Very Stiff Brown Silty Loam Fill | 3 | | |
| | 4<br>3 | 2.0<br>P | 17 |
| 611.18 | | | |
| Stiff Black Silty Clay / Silty Clay Loam with Organics | 2 | | |
| | 1<br>2 | 1.5<br>P | 22 |
| -10 | | | |
| | 2 | | |
| | 3<br>4 | 2.0<br>P | 22 |
| 606.18 | | | |
| Stiff to Very Stiff Brown & Gray Silty Clay Loam Till ▼ | 1 | | |
| | 1<br>2 | 2.0<br>P | 22 |
| 604.18 | | | |
| Hard Gray Silty Clay with Layers of Gray Silt | | | |
| -15 | 3 | | |
| | 5<br>7 | 5.2<br>S | 16 |
| | 5 | | |
| | 6<br>7 | 4.8<br>S | 20 |
| 599.18 | | | |
| -20 | | | |
| Hard Gray Silty Clay Loam Till with Limestone Fragments / Pieces & Silt Layers *(continued)* | 5 | | |
| | 6<br>8 | 5.0<br>S | 11 |
| | 14 | | |
| | 8<br>12 | 6.7<br>S | 16 |
| 594.18 | | | |
| -25 | | | |
| Hard Gray Silt / Loam with Carbonized Organics - Very Dense (Borderline Shale) | 12 | | |
| | 16<br>18 | 7.2<br>S | 13 |
| | 12 | | |
| | 25<br>40 | >4.5<br>P | 13 |
| -30 | | | |
| | 24 | | |
| | 49<br>67 | >4.5<br>P | 11 |
| | 48 | | |
| 585.18 | 100/2" | >4.5<br>P | 10 |
| Auger Refusal @ 33.5 Ft. Assumed Limestone Surface End of Boring | | | |
| -35 | | | |
| -40 | | | |

SOIL BORING 046-0032.GPJ IL_DOT.GDT 4/6/20

**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)**

This sheet is superseded by the revised boring logs. See memo dated 8/31/2020 for more information

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

# SOIL BORING LOG



Date 8/1/58

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** IL 17 over East Branch of Horse Creek, 0.2 miles East of Herscher Road **LOGGED BY** W. Carter

**SECTION** 12-BR **LOCATION** NW 1/4, **SEC.** 4, **TWP.** 30N, **RNG.** 10E, 3rd **PM**, **Latitude** , **Longitude**

**COUNTY** Kankakee **DRILLING METHOD** **HAMMER TYPE**

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** 1
**Station** 966+39
**Offset** 15.0 ft Rt.
**Ground Surface Elev.** 615.80 ft

**Surface Water Elev.** ft
**Stream Bed Elev.** ft

**Groundwater Elev.:**
**First Encounter** ft
**Upon Completion** ft
**After** Hrs. ft

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) | Material |
|---|---|---|---|---|
| | | | | Medium Black Silty Clay |
| 614.00 | | | | |
| | | | | Loose Dark Brown Clayey Silty Sand |
| -5 | | | | |
| | 4 | | | |
| 609.50 | | | | |
| | | | | Stiff Brown Sandy Clay |
| | 8 | Lost | | |
| 607.00 | | | | |
| | | | | Very Stiff Gray Sandy Clay Till |
| -10 | | | | |
| | 32 | Ruptured | | |
| 604.00 | | | | |
| | | | | Brittle Hard Gray Sandy Clay Till |
| | 91 | 5.8 | | |
| -15 | | | | |
| | 140 | 4.1 | | |
| | | | | |
| | 88 | 5.6 | | |
| -20 | | | | |

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) | Material |
|---|---|---|---|---|
| | 63 | 5.1 | | Brittle Hard Gray Sandy Clay Till *(continued)* |
| 594.00 | | | | |
| | | | | Hard Gray Limey Clay |
| | 78 | 4.5 | | |
| -25 | | | | |
| 590.00 | 100 | 4.1 | | |
| | | | | End of Boring |
| -30 | | | | |
| -35 | | | | |
| -40 | | | | |

SOIL BORING 046-0032.GPJ IL_DOT.GDT 10/31/19

**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)**

**BBS, form 137 (Rev. 8-99)**

This sheet is superseded by the revised boring logs. See memo dated 8/31/2020 for more information

**Illinois Department of Transportation**
Division of Highways
Illinois Department of Transportation

# SOIL BORING LOG



Date 8/1/58

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** IL 17 over East Branch of Horse Creek, 0.2 miles East of Herscher Road **LOGGED BY** W. Carter

**SECTION** 12-BR **LOCATION** SE 1/4, **SEC.** 32, **TWP.** 31N, **RNG.** 10E, 3rd **PM**,
**Latitude** , **Longitude**

**COUNTY** Kankakee **DRILLING METHOD** **HAMMER TYPE**

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** 2
**Station** 965+27
**Offset** 18.0 ft Lt.
**Ground Surface Elev.** 615.40 ft

**Surface Water Elev.** ft
**Stream Bed Elev.** ft

**Groundwater Elev.:**
**First Encounter** ft
**Upon Completion** ft
**After** Hrs. ft

| | DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) |
|---|---|---|---|---|
| Stiff Black and Brown Silty Sandy Clay | | | | |
| | -5 | 10 | 1.6 | |
| | | 6 | 1.4 | |
| 606.50 Hard Gray Clay Till | -10 | 14 | 4.1 | |
| 603.50 Hard Gray Silty Till | | 65 | 4.7 | |
| 601.00 Hard Gray Sandy Clay Till | -15 | 67 | 14.4 | |
| 598.50 Brittle Very Stiff Gray Sandy Clay Till | | 64 | 3.9 | |
| | -20 | | | |

| | DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) |
|---|---|---|---|---|
| 595.20 Gray Broken Limestone | | | | |
| 591.00 End of Boring | -25 | | | |
| | -30 | | | |
| | -35 | | | |
| | -40 | | | |

SOIL BORING 046-0032.GPJ IL_DOT.GDT 10/31/19

**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)**

This sheet is superseded by the revised boring logs. See memo dated 8/31/2020 for more information

**Illinois Department of Transportation**
Division of Highways
Illinois Department of Transportation

# SOIL BORING LOG



Date 8/1/58

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** IL 17 over East Branch of Horse Creek, 0.2 miles East of Herscher Road **LOGGED BY** W. Carter

**SECTION** 12-BR **LOCATION** NW 1/4, **SEC.** 4, **TWP.** 30N, **RNG.** 10E, 3rd **PM**,
**Latitude** , **Longitude**

**COUNTY** Kankakee **DRILLING METHOD** **HAMMER TYPE**

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** 3
**Station** 965+59
**Offset** 40.0 ft Rt.
**Ground Surface Elev.** 612.60 ft

**Surface Water Elev.** ft
**Stream Bed Elev.** ft

**Groundwater Elev.:**
**First Encounter** ft
**Upon Completion** ft
**After** Hrs. ft

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) | Description |
|---|---|---|---|---|
| | | | | Stiff to Very Stiff Black and Brown Silty Sandy Clay |
| -5 | | | | |
| 604.00 | | | | |
| | | | | Hard Gray Silty Till |
| -10 | | | | |
| | 55 | 7.0 | | |
| 600.50 | | | | |
| | | | | Hard Gray Sandy Clay Till |
| | 49 | 4.3 | | |
| 598.50 | | | | |
| | | | | Very Stiff Gray Sandy Very Stoney Till |
| -15 | | | | |
| | 57 | 3.1 | | |
| 595.20 | | | | |
| | | | | Gray Limestone |
| -20 | | | | |
| | | | | Gray Limestone *(continued)* |
| 591.20 | | | | |
| | | | | End of Boring |
| -25 | | | | |
| -30 | | | | |
| -35 | | | | |
| -40 | | | | |

SOIL BORING 046-0032.GPJ IL_DOT.GDT 10/31/19

**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)**

**BBS, form 137 (Rev. 8-99)**

This sheet is superseded by the revised boring logs. See memo dated 8/31/2020 for more information

**Illinois Department of Transportation**
Division of Highways
Illinois Department of Transportation

# SOIL BORING LOG



Date 8/1/58

**ROUTE** SBI-17 (IL 17) **DESCRIPTION** IL 17 over East Branch of Horse Creek, 0.2 miles East of Herscher Road **LOGGED BY** W. Carter

**SECTION** 12-BR **LOCATION** SE 1/4, **SEC.** 32, **TWP.** 31N, **RNG.** 10E, 3rd **PM**,
**Latitude** , **Longitude**

**COUNTY** Kankakee **DRILLING METHOD** **HAMMER TYPE**

**STRUCT. NO.** 046-0032 (Exist.)
**Station** 965+84.5

**BORING NO.** 4
**Station** 966+09
**Offset** 33.0 ft Lt.
**Ground Surface Elev.** 611.20 ft

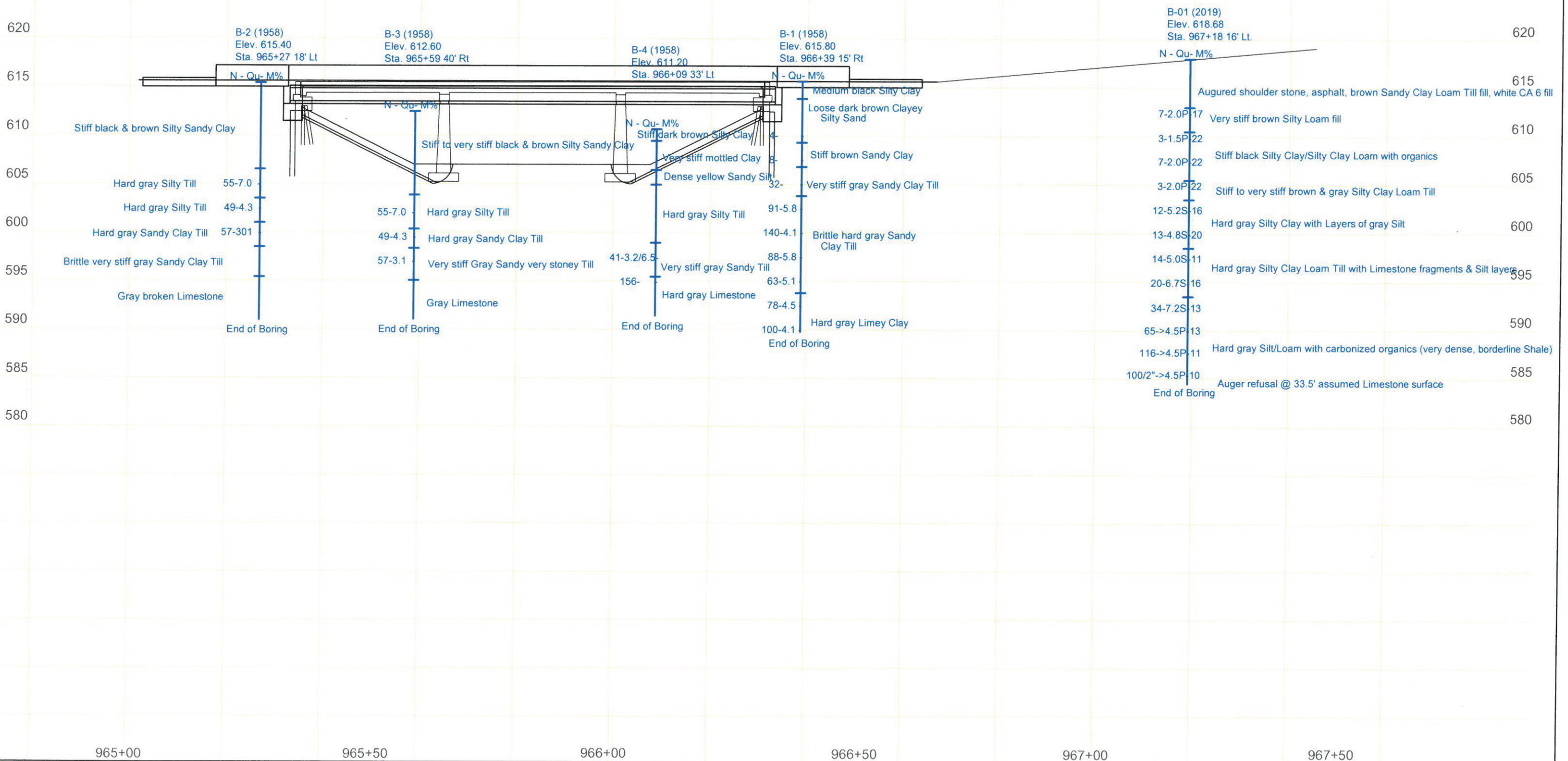
**Surface Water Elev.** ft
**Stream Bed Elev.** ft

**Groundwater Elev.:**
**First Encounter** ft
**Upon Completion** ft
**After** Hrs. ft

| DEPTH (ft) | BLOWS (/6") | UCS Qu (tsf) | MOIST (%) |
|---|---|---|---|
| Stiff Dark Brown Silty Clay | | | |
| 610.00 | | | |
| Very Stiff Mottled Clay | | | |
| 607.00 | | | |
| Dense Yellow Sandy Silt | | | |
| -5 | | | |
| 605.50 | | | |
| Hard Gray Silty Till | | | |
| -10 | | | |
| 599.50 | | | |
| Very Stiff Gray Sandy Till | | | |
| | | 3.2 | |
| | 41 | 6.5 | |
| -15 | 156 | | |
| 596.00 | | | |
| Hard Gray Limestone | | | |
| 592.00 | | | |
| End of Boring | | | |
| -20 | | | |

SOIL BORING 046-0032.GPJ IL_DOT.GDT 10/31/19

**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)**




| | | | | | |
|---|---|---|---|---|---|
| McCleary Engineering | Designed by: | Date: | Illinois Rte. 17 over East Branch of Horse Creek | Route | Section | County |
| | Drawn by: MLL | Date: 4-13-20 | | SBI-17 | 12-BR | Kankakee |
| | Checked by: | Date: | Scale = NA Sheet 1 of 1 Sta. _____ to Sta._____ | Bridge number: 046-0032 | | |

JSON Raw Data Headers

Save Copy Collapse All Expand All Filter JSON


```
request:
  date:                 "2020-06-06T19:56:28.935Z"
  referenceDocument:    "AASHTO-2009"
  status:               "success"
  url:                  "https://earthquake.usgs.gov/ws/designmaps/aashto-2009.json?latitude=41.117218&
                        longitude=-88.093843&siteClass=C&title=SN 046-0032 IL 17 over the E. branch of
                        Horse Creek"
  parameters:
    latitude:           41.117218
    longitude:          -88.093843
    siteClass:          "C"
    title:              "SN 046-0032 IL 17 over the E. branch of Horse Creek"
response:
  data:
    pga:                0.048
    fpga:               1.2
    as:                 0.057
    ss:                 0.107
    fa:                 1.2
    sds:                0.128
    s1:                 0.043
    fv:                 1.7
    sd1:                0.073
    sdc:                "A"
    ts:                 0.573
    t0:                 0.115
    twoPeriodDesignSpectrum:
      0:
        0:              0
        1:              0.057
      1:
        0:              0.025
        1:              0.073
      2:
        0:              0.05
        1:              0.088
      3:
        0:              0.1
        1:              0.119
      4:
        0:              0.115
        1:              0.128
      5:
        0:              0.15
        1:              0.128
      6:
```

Illinois Department of Transportation

This sheet is superseded by revised calculations. See memo dated 8/31/2020 for more information

# SEISMIC SITE CLASS DETERMINATION

PROJECT TITLE=====SN 046-0032

## Substructure 1

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents | 611 | ft. |
| Pile or Shaft Dia. | 12 | inches |
| Boring Number | B-01 (2019) | |
| Top of Boring Elev. | 618.68 | ft. |
| Approximate Fixity Elev. | 605 | ft. |

**Individual Site Class Definition:**

N (bar): 53 (Blows/ft.) Soil Site Class C
$N_{ch}$ (bar): NA (Blows/ft.) NA
$s_u$ (bar): 4.51 (ksf) Soil Site Class C <---Controls

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|
| | 616.2 | 2.50 | 8 | 1.00 | |
| | 613.7 | 2.50 | 8 | 1.00 | B |
| | 611.2 | 2.50 | 7 | 2.00 | B |
| | 608.7 | 2.50 | 3 | 1.50 | |
| | 606.2 | 2.50 | 7 | 2.00 | B |
| 0.8 | 604.2 | 2.00 | 3 | 2.00 | B |
| 3.3 | 601.7 | 2.50 | 12 | 5.20 | |
| 5.8 | 599.2 | 2.50 | 13 | 4.80 | B |
| 8.3 | 596.7 | 2.50 | 14 | 5.00 | |
| 10.8 | 594.2 | 2.50 | 20 | 6.70 | B |
| 13.3 | 591.7 | 2.50 | 34 | 7.20 | |
| 15.8 | 589.2 | 2.50 | 65 | 4.50 | |
| 18.3 | 586.7 | 2.50 | 116 | 4.50 | |
| 19.8 | 585.2 | 1.50 | 600 | 4.50 | R |
| 100.0 | 505.0 | 80.20 | 600 | 4.50 | |

## Substructure 2

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents | 611 | ft. |
| Pile or Shaft Dia. | 12 | inches |
| Boring Number | B-1 (1958) | |
| Top of Boring Elev. | 615.8 | ft. |
| Approximate Fixity Elev. | 605 | ft. |

**Individual Site Class Definition:**

N (bar): 96 (Blows/ft.) Soil Site Class C <---Controls
$N_{ch}$ (bar): NA (Blows/ft.) NA
$s_u$ (bar): 4.17 (ksf) Soil Site Class C

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|
| | 614.0 | 1.80 | 8 | 1.00 | B |
| | 612.0 | 2.00 | 8 | | |
| | 609.5 | 2.50 | 4 | | B |
| | 607.0 | 2.50 | 8 | | B |
| 1.0 | 604.0 | 3.00 | 32 | | B |
| 3.5 | 601.5 | 2.50 | 91 | 5.80 | |
| 6.0 | 599.0 | 2.50 | 140 | 4.10 | |
| 8.5 | 596.5 | 2.50 | 88 | 5.60 | |
| 11.0 | 594.0 | 2.50 | 63 | 5.10 | B |
| 13.0 | 592.0 | 2.00 | 75 | 4.50 | |
| 15.0 | 590.0 | 2.00 | 100 | 4.10 | B |
| 100.0 | 505.0 | 85.00 | 100 | 4.10 | R |

## Substructure 3

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents | 611 | ft. |
| Pile or Shaft Dia. | 12 | inches |
| Boring Number | B-2 (1958) | |
| Top of Boring Elev. | 615.4 | ft. |
| Approximate Fixity Elev. | 605 | ft. |

**Individual Site Class Definition:**

N (bar): 62 (Blows/ft.) Soil Site Class C
$N_{ch}$ (bar): NA (Blows/ft.) NA
$s_u$ (bar): 4.38 (ksf) Soil Site Class C <---Controls

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|
| | 613.5 | 1.90 | 8 | 1.00 | |
| | 611.5 | 2.00 | 8 | 1.00 | |
| | 609.0 | 2.50 | 10 | 1.60 | |
| | 606.5 | 2.50 | 6 | 1.40 | B |
| 1.5 | 603.5 | 3.00 | 14 | 4.10 | B |
| 4.0 | 601.0 | 2.50 | 65 | 4.70 | B |
| 6.5 | 598.5 | 2.50 | 67 | 4.40 | B |
| 9.8 | 595.2 | 3.30 | 64 | 3.90 | B |
| 12.0 | 593.0 | 2.20 | 65 | 4.40 | |
| 14.0 | 591.0 | 2.00 | 65 | 4.40 | R |
| 100.0 | 505.0 | 86.00 | 65 | 4.40 | |

## Substructure 4

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents | 611 | ft. |
| Pile or Shaft Dia. | 12 | inches |
| Boring Number | B-3 (1958) | |
| Top of Boring Elev. | 612.6 | ft. |
| Approximate Fixity Elev. | 605 | ft. |

**Individual Site Class Definition:**

N (bar): 60 (Blows/ft.) Soil Site Class C
$N_{ch}$ (bar): NA (Blows/ft.) NA
$s_u$ (bar): 3.89 (ksf) Soil Site Class C <---Controls

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|
| | 610.0 | 2.60 | 8 | 1.00 | |
| | 607.0 | 3.00 | 8 | 1.00 | |
| 1.0 | 604.0 | 3.00 | 8 | 1.00 | B |
| 3.0 | 602.0 | 2.00 | 55 | 7.00 | |
| 5.0 | 600.0 | 2.00 | 55 | 7.00 | B |
| 7.0 | 598.0 | 2.00 | 49 | 4.30 | B |
| 10.3 | 594.7 | 3.30 | 57 | 3.10 | B |
| 12.3 | 592.7 | 2.00 | 65 | 4.40 | |
| 14.3 | 590.7 | 2.00 | 65 | 4.40 | R |
| 100.0 | 505.0 | 85.70 | 65 | 4.40 | |

## Global Site Class Definition: Substructures 1 through 5

N (bar): 71 (Blows/ft.) Soil Site Class C
$N_{ch}$ (bar): (Blows/ft.) NA, H < 0.1*H (Total)
$s_u$ (bar): 4.28 (ksf) Soil Site Class C <---Controls

Illinois Department of Transportation

This sheet is superseded by revised calculations. See memo dated 8/31/2020 for more information

# SEISMIC SITE CLASS DETERMINATION

PROJECT TITLE=====

## Substructure 5

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents) | 611 | ft. |
| Pile or Shaft Dia. | 12 | inches |
| Boring Number | B-4 (1958) | |
| Top of Boring Elev. | 611.2 | ft. |
| Approximate Fixity Elev. | 605 | ft. |

**Individual Site Class Definition:**

N (bar): 85 (Blows/ft.) Soil Site Class C
$N_{ch}$ (bar): NA (Blows/ft.) NA
$s_u$ (bar): 4.48 (ksf) Soil Site Class C <----Controls

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|
| | 610.0 | 1.20 | 8 | 1.00 | B |
| | 607.0 | 3.00 | 8 | 1.00 | B |
| | 605.5 | 1.50 | 8 | 1.00 | B |
| 2.5 | 602.5 | 3.00 | 30 | | |
| 5.5 | 599.5 | 3.00 | 30 | | B |
| 7.0 | 598.0 | 1.50 | 41 | 3.20 | |
| 9.0 | 596.0 | 2.00 | 41 | 6.50 | B |
| 11.0 | 594.0 | 2.00 | 156 | 4.50 | |
| 13.0 | 592.0 | 2.00 | 156 | 4.50 | R |
| 100.0 | 505.0 | 87.00 | 156 | 4.50 | |

## Substructure 6

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents) | | ft. |
| Pile or Shaft Dia. | | inches |
| Boring Number | | |
| Top of Boring Elev. | | ft. |
| Approximate Fixity Elev. | | ft. |

**Individual Site Class Definition:**

N (bar): (Blows/ft.) NA
$N_{ch}$ (bar): (Blows/ft.) NA
$s_u$ (bar): (ksf) NA

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|

## Substructure 7

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents) | | ft. |
| Pile or Shaft Dia. | | inches |
| Boring Number | | |
| Top of Boring Elev. | | ft. |
| Approximate Fixity Elev. | | ft. |

**Individual Site Class Definition:**

N (bar): (Blows/ft.) NA
$N_{ch}$ (bar): (Blows/ft.) NA
$s_u$ (bar): (ksf) NA

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|

## Substructure 8

| | | |
|---|---|---|
| Base of Substruct. Elev. (or ground surf for bents) | | ft. |
| Pile or Shaft Dia. | | inches |
| Boring Number | | |
| Top of Boring Elev. | | ft. |
| Approximate Fixity Elev. | | ft. |

**Individual Site Class Definition:**

N (bar): (Blows/ft.) NA
$N_{ch}$ (bar): (Blows/ft.) NA
$s_u$ (bar): (ksf) NA

| Seismic Soil Column Depth (ft) | Bot. Of Sample Elevation | Sample Thick. (ft.) | N | Qu (tsf) | Layer Description Boundary |
|---|---|---|---|---|---|

This sheet is superseded by revised calculations. See memo dated 8/31/2020 for more information

Illinois Department of Transportation

# INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

**GENERAL DATA**

STRUCTURE NUMBER========== 046 0032 using 2019 boring data
TOTAL STRUCTURE LENGTH========== 103.00 FT
STRUCTURE TYPE ========== SIMPLE-SPAN
STRUCTURE SKEW========== 0 DEGREES
SUPER. DATA IN REFERENCE TO SUB. DATA ==== ABUT 2

| SUPERSTRUCTURE DATA (END OR MAIN SPAN) | | |
|---|---|---|
| BEAM TYPE ========== | CONCRETE BEAM | |
| CONCRETE BEAM ========== | IL45-2438 | |
| BEAM F'C ========== | 8.5 | KSI |
| BEAM SPACING PERP. TO CL ========== | 7.00 | FT |
| SLAB THICKNESS ========== | 8.00 | IN |
| SLAB F'C ========== | 4.00 | KSI |

| SUPERSTRUCTURE DATA (ADJACENT SPAN) | | |
|---|---|---|
| | | KSI |
| BEAM SPACING PERP. TO CL ========== | | FT |

| ABUTMENT #1 DATA | | |
|---|---|---|
| ABUTMENT NAME ========== | East | |
| ABUTMENT REFERENCE BORING ========== | Boring 01 (2019) | |
| BOTTOM OF ABUTMENT ELEVATION ========== | 611 | FT |
| ESTIMATED NUMBER OF PILES AT ABUT. ======= | 6 | |
| PILE SPACING PERP. TO CL ========== | 7 | FT |

| ABUTMENT #2 DATA | | |
|---|---|---|
| ABUTMENT NAME ========== | West | |
| ABUTMENT REFERENCE BORING========== | Boring 2(1958) | |
| BOTTOM OF ABUTMENT ELEVATION========== | 611 | FT |
| ESTIMATED NUMBER OF PILES AT ABUT.======= | 6 | |
| PILE SPACING PERP. TO CL ========== | 7 | FT |

**SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1**

| *BOT. OF LAYER ELEV. (FT)* | *LAYER THICKNESS (FT)* | *UNCONFINED COMPRESSIVE STRENGTH (TSF)* | *N S.P.T. VALUE (BLOWS/12 IN.)* | *Qu EQUIV. FOR N VALUE (TSF)* |
|---|---|---|---|---|
| 606.18 | 4.82 | 1.8 | | |
| 604.18 | 2.00 | 2.0 | | |
| 601.00 | 3.18 | 5.2 | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

10.00 FT = TOTAL DEPTH ENTERED

**SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2**

| *BOT. OF LAYER ELEV. (FT)* | *LAYER THICKNESS (FT)* | *UNCONFINED COMPRESSIVE STRENGTH (TSF)* | *N S.P.T. VALUE (BLOWS/12 IN.)* | *Qu EQUIV. FOR N VALUE (TSF)* |
|---|---|---|---|---|
| 606.50 | 4.50 | 1.5 | | |
| 603.50 | 3.00 | 4.1 | | |
| 601.00 | 2.50 | 4.7 | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1======: 2.92 TSF
WEIGHTED AVERAGE Qu FOR ABUTMENT #2======: 3.08 TSF

PILE STIFFNESS MODIFIER FOR ABUTMENT #1
= 1/(1.45-[0.3*2.92])========== 1.74

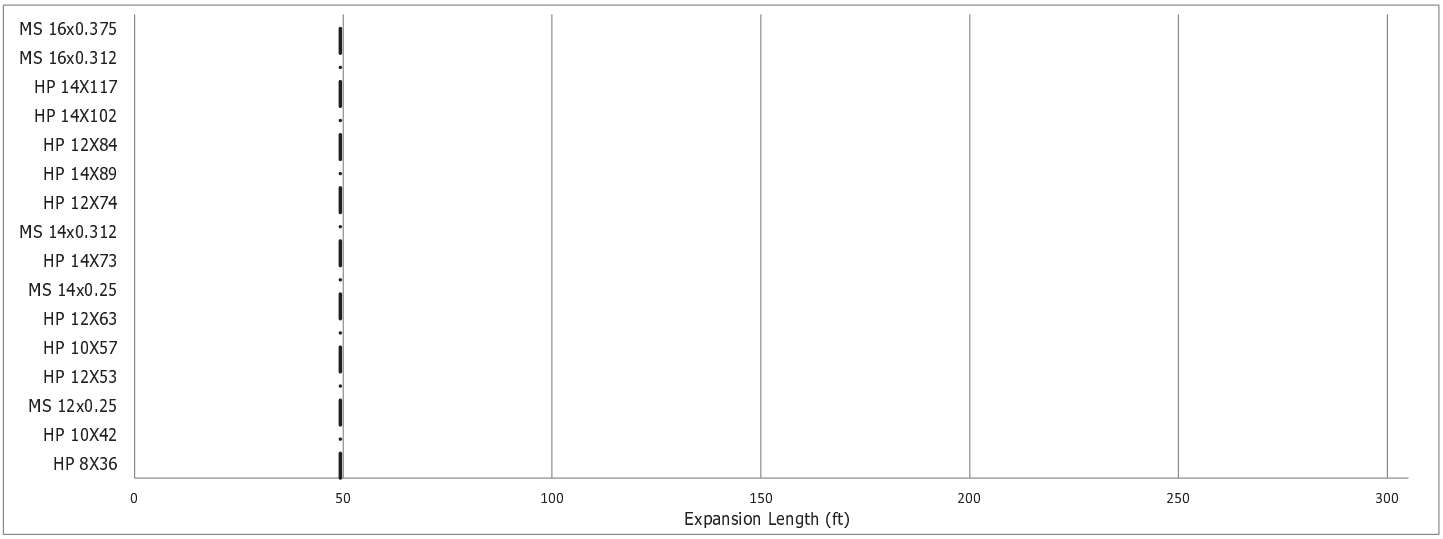
PILE STIFFNESS MODIFIER FOR ABUTMENT #2
= 1/(1.45-[0.3*3.08])========== 1.90

**WEIGHTED AVG. Qu > 3.0 TSF WITH TRIB. LENGTH > 20%, INTEGRAL ABUTMENT STRUCTURE NOT ALLOWED**

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.74*6*0+1.9*6*103]/[1.74*6+1.9*6]========== 53.73 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.9*6*0+1.74*6*103]/[1.9*6+1.74*6]========== ~~49.27~~ FT

## ABUT 2 (West) - EXPANSION LENGTH LIMIT CHART - 0 DEG. SKEW




*= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration (Note: The same size pile should be used at both abutments.)*

## Pile Design Table for Abutments using 2019 boring utilizing Boring #01 sta 967+18 16 Lt

| Nominal Required Bearing (Kips) | Factored Resistance Available (Kips) | Estimated Pile Length (Ft.) |
|---|---|---|
| **Steel HP 8 X 36** | | |
| 233 | 128 | 26 |
| **Steel HP 10 X 42** | | |
| 172 | 95 | 24 |
| 285 | 157 | 26 |
| 335 | 184 | 28 |
| **Steel HP 10 X 57** | | |
| 180 | 99 | 24 |
| 320 | 176 | 26 |
| 454 | 250 | 28 |
| **Steel HP 12 X 53** | | |
| 207 | 114 | 24 |
| 346 | 190 | 26 |
| 418 | 230 | 28 |
| **Steel HP 12 X 63** | | |
| 214 | 118 | 24 |
| 371 | 204 | 26 |
| 497 | 273 | 28 |
| **Steel HP 12 X 74** | | |
| 220 | 121 | 24 |
| 399 | 219 | 26 |
| 589 | 324 | 28 |
| **Steel HP 12 X 84** | | |
| 225 | 124 | 24 |
| 422 | 232 | 26 |
| 664 | 365 | 28 |
| **Steel HP 14 X 73** | | |
| 253 | 139 | 24 |
| 437 | 240 | 26 |
| 578 | 318 | 28 |
| **Steel HP 14 X 89** | | |
| 262 | 144 | 24 |
| 476 | 262 | 26 |
| 705 | 388 | 28 |
| **Steel HP 14 X 102** | | |
| 268 | 148 | 24 |
| 507 | 279 | 26 |
| 810 | 445 | 28 |
| **Steel HP 14 X 117** | | |
| 237 | 130 | 21 |
| 277 | 152 | 24 |
| 544 | 299 | 26 |
| 929 | 511 | 28 |

This sheet is superseded by revised calculations.
See memo dated 8/31/2020 for more information

Illinois Department of Transportation

# IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Abutments using 2019 boring
REFERENCE BORING ========== 01 sta 967+18 16 Lt
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 613.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 611.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== None ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== None ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1920 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 38.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 395.57 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 148.34 KIPS

***MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses***

| Maximum Nominal Req'd Bearing of Pile | Maximum Nominal Req.d Bearing of Boring | Maximum Factored Resistance Available in Boring | Maximum Pile Driveable Length in Boring |
|---|---|---|---|
| 335 KIPS | 335 KIPS | 184 KIPS | 28 FT. |

This sheet is superseded by revised calculations.
See memo dated 8/31/2020 for more information

PILE TYPE AND SIZE ========== Steel HP 10 X 42
Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area======== 0.086 SQFT.

| BOT. OF LAYER ELEV. (FT.) | LAYER THICK. (FT.) | UNCONF. COMPR. STRENGTH (TSF.) | S.P.T. N VALUE (BLOWS) | GRANULAR OR ROCK LAYER DESCRIPTION | NOMINAL PLUGGED SIDE RESIST. (KIPS) | NOMINAL PLUGGED END BRG. RESIST. (KIPS) | NOMINAL PLUGGED TOTAL RESIST. (KIPS) | NOMINAL UNPLUG'D SIDE RESIST. (KIPS) | NOMINAL UNPLUG'D END BRG. RESIST. (KIPS) | NOMINAL UNPLUG'D TOTAL RESIST. (KIPS) | NOMINAL REQ'D BEARING (KIPS) | FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS) | FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS) | FACTORED RESISTANCE AVAILABLE (KIPS) | ESTIMATED PILE LENGTH (FT.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 608.70 | 2.30 | 1.50 | 3 | | 7.3 | | 26.4 | 10.7 | | ***13.2*** | 13 | 0 | 0 | 7 | 4 |
| 606.20 | 2.50 | 2.00 | 7 | | 9.6 | 19.1 | 36.0 | 14.1 | 2.4 | ***27.3*** | 27 | 0 | 0 | 15 | 7 |
| 604.20 | 2.00 | 2.00 | 3 | | 7.7 | 19.1 | 74.2 | 11.3 | 2.4 | ***42.5*** | 42 | 0 | 0 | 23 | 9 |
| 601.70 | 2.50 | 5.20 | 12 | | 17.1 | 49.6 | 87.5 | 25.2 | 6.3 | ***67.2*** | 67 | 0 | 0 | 37 | 11 |
| 599.20 | 2.50 | 4.80 | 13 | | 17.1 | 45.8 | 106.6 | 25.2 | 5.8 | ***92.7*** | 93 | 0 | 0 | 51 | 14 |
| 596.70 | 2.50 | 5.00 | 14 | | 17.1 | 47.7 | 139.9 | 25.2 | 6.0 | ***120.0*** | 120 | 0 | 0 | 66 | 16 |
| 594.20 | 2.50 | 6.70 | 20 | | 17.1 | 63.9 | ***136.4*** | 25.2 | 8.1 | 142.7 | 136 | 0 | 0 | 75 | 19 |
| 591.70 | 2.50 | | 34 | Hard Till | 3.1 | 43.2 | 178.9 | 4.5 | 5.5 | ***152.2*** | 152 | 0 | 0 | 84 | 21 |
| 589.20 | 2.50 | | 65 | Hard Till | 8.1 | 82.6 | 251.8 | 11.9 | 10.5 | ***172.3*** | 172 | 0 | 0 | 95 | 24 |
| 586.70 | 2.50 | | 116 | Hard Till | 23.6 | 147.5 | 890.8 | 34.8 | 18.7 | ***285.0*** | 285 | 0 | 0 | 157 | 26 |
| 585.20 | 1.50 | | 600 | Hard Till | 374.1 | 762.8 | ***671.6*** | 550.8 | 96.5 | 760.7 | ~~672~~ | ~~0~~ | ~~0~~ | ~~369~~ | ~~28~~ |
| 584.20 | 1.00 | | | Limestone | 82.2 | 169.5 | ***753.9*** | 121.0 | 21.5 | 881.8 | ~~754~~ | ~~0~~ | ~~0~~ | ~~415~~ | ~~28.8~~ |
| 583.20 | 1.00 | | | Limestone | 82.2 | 169.5 | ***836.1*** | 121.0 | 21.5 | 1002.8 | ~~836~~ | ~~0~~ | ~~0~~ | ~~460~~ | ~~29.8~~ |
| 582.20 | 1.00 | | | Limestone | 82.2 | 169.5 | ***918.3*** | 121.0 | 21.5 | 1123.8 | ~~918~~ | ~~0~~ | ~~0~~ | ~~505~~ | ~~30.8~~ |
| 581.20 | 1.00 | | | Limestone | 82.2 | 169.5 | ***1000.5*** | 121.0 | 21.5 | 1244.9 | ~~1001~~ | ~~0~~ | ~~0~~ | ~~550~~ | ~~31.8~~ |
| 580.20 | 1.00 | | | Limestone | 82.2 | 169.5 | ***1082.7*** | 121.0 | 21.5 | 1365.9 | ~~1083~~ | ~~0~~ | ~~0~~ | ~~596~~ | ~~32.8~~ |
| 579.20 | 1.00 | | | Limestone | 82.2 | 169.5 | ***1164.9*** | 121.0 | 21.5 | 1487.0 | ~~1165~~ | ~~0~~ | ~~0~~ | ~~641~~ | ~~33.8~~ |
| 578.20 | 1.00 | | | Limestone | 82.2 | 169.5 | ***1247.2*** | 121.0 | 21.5 | 1608.0 | ~~1247~~ | ~~0~~ | ~~0~~ | ~~686~~ | ~~34.8~~ |
| 577.20 | 1.00 | | | Limestone | 82.2 | 169.5 | ***1329.4*** | 121.0 | 21.5 | 1729.0 | ~~1329~~ | ~~0~~ | ~~0~~ | ~~731~~ | ~~35.8~~ |
| 576.20 | 1.00 | | | Limestone | 82.2 | 169.5 | ***1411.6*** | 121.0 | 21.5 | 1850.1 | ~~1412~~ | ~~0~~ | ~~0~~ | ~~776~~ | ~~36.8~~ |
| 575.20 | 1.00 | | | Limestone | 82.2 | 169.5 | ***1493.8*** | 121.0 | 21.5 | 1971.1 | ~~1494~~ | ~~0~~ | ~~0~~ | ~~822~~ | ~~37.8~~ |
| 574.20 | 1.00 | | | Limestone | | 169.5 | | | 21.5 | | | | | | |

Illinois Department of Transportation

# IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Abutments using 2019 boring
REFERENCE BORING ========== 01 sta 967+18 16 Lt
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 613.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 611.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== None ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== None ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1920 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 38.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 395.57 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 148.34 KIPS

***MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses***

| Maximum Nominal Req'd Bearing of Pile | Maximum Nominal Req.d Bearing of Boring | Maximum Factored Resistance Available in Boring | Maximum Pile Driveable Length in Boring |
|---|---|---|---|
| 418 KIPS | 418 KIPS | 230 KIPS | 28 FT. |

This sheet is superseded by revised calculations.
See memo dated 8/31/2020 for more information

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area======== 0.108 SQFT.

| BOT. OF LAYER ELEV. (FT.) | LAYER THICK. (FT.) | UNCONF. COMPR. STRENGTH (TSF.) | S.P.T. N VALUE (BLOWS) | GRANULAR OR ROCK LAYER DESCRIPTION | NOMINAL PLUGGED SIDE RESIST. (KIPS) | NOMINAL PLUGGED END BRG. RESIST. (KIPS) | NOMINAL PLUGGED TOTAL RESIST. (KIPS) | NOMINAL UNPLUG'D SIDE RESIST. (KIPS) | NOMINAL UNPLUG'D END BRG. RESIST. (KIPS) | NOMINAL UNPLUG'D TOTAL RESIST. (KIPS) | NOMINAL REQ'D BEARING (KIPS) | FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS) | FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS) | FACTORED RESISTANCE AVAILABLE (KIPS) | ESTIMATED PILE LENGTH (FT.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 608.70 | 2.30 | 1.50 | 3 | | 8.8 | | 36.3 | 12.8 | | ***15.8*** | 16 | 0 | 0 | 9 | 4 |
| 606.20 | 2.50 | 2.00 | 7 | | 11.5 | 27.6 | 47.9 | 16.9 | 3.0 | ***32.7*** | 33 | 0 | 0 | 18 | 7 |
| 604.20 | 2.00 | 2.00 | 3 | | 9.2 | 27.6 | 101.2 | 13.5 | 3.0 | ***51.1*** | 51 | 0 | 0 | 28 | 9 |
| 601.70 | 2.50 | 5.20 | 12 | | 20.6 | 71.7 | 116.3 | 30.1 | 7.8 | ***80.6*** | 81 | 0 | 0 | 44 | 11 |
| 599.20 | 2.50 | 4.80 | 13 | | 20.6 | 66.1 | 139.7 | 30.1 | 7.2 | ***111.0*** | 111 | 0 | 0 | 61 | 14 |
| 596.70 | 2.50 | 5.00 | 14 | | 20.6 | 68.9 | 183.7 | 30.1 | 7.5 | ***143.7*** | 144 | 0 | 0 | 79 | 16 |
| 594.20 | 2.50 | 6.70 | 20 | | 20.6 | 92.3 | 174.5 | 30.1 | 10.1 | ***170.6*** | 171 | 0 | 0 | 94 | 19 |
| 591.70 | 2.50 | | 34 | Hard Till | 3.7 | 62.5 | 235.1 | 5.4 | 6.8 | ***182.3*** | 182 | 0 | 0 | 100 | 21 |
| 589.20 | 2.50 | | 65 | Hard Till | 9.7 | 119.4 | 338.6 | 14.2 | 13.1 | ***206.7*** | 207 | 0 | 0 | 114 | 24 |
| 586.70 | 2.50 | | 116 | Hard Till | 28.4 | 213.1 | 1256.3 | 41.5 | 23.3 | ***345.6*** | 346 | 0 | 0 | 190 | 26 |
| 585.20 | 1.50 | | 600 | Hard Till | 449.7 | 1102.5 | ***848.6*** | 657.6 | 120.6 | 909.4 | ~~849~~ | ~~0~~ | ~~0~~ | ~~467~~ | ~~28~~ |
| 584.20 | 1.00 | | | Limestone | 98.8 | 245.0 | ***947.4*** | 144.5 | 26.8 | 1053.9 | ~~947~~ | ~~0~~ | ~~0~~ | ~~521~~ | ~~28.8~~ |
| 583.20 | 1.00 | | | Limestone | 98.8 | 245.0 | ***1046.2*** | 144.5 | 26.8 | 1198.4 | ~~1046~~ | ~~0~~ | ~~0~~ | ~~575~~ | ~~29.8~~ |
| 582.20 | 1.00 | | | Limestone | 98.8 | 245.0 | ***1145.1*** | 144.5 | 26.8 | 1342.9 | ~~1145~~ | ~~0~~ | ~~0~~ | ~~630~~ | ~~30.8~~ |
| 581.20 | 1.00 | | | Limestone | 98.8 | 245.0 | ***1243.9*** | 144.5 | 26.8 | 1487.4 | ~~1244~~ | ~~0~~ | ~~0~~ | ~~684~~ | ~~31.8~~ |
| 580.20 | 1.00 | | | Limestone | 98.8 | 245.0 | ***1342.7*** | 144.5 | 26.8 | 1631.9 | ~~1343~~ | ~~0~~ | ~~0~~ | ~~738~~ | ~~32.8~~ |
| 579.20 | 1.00 | | | Limestone | 98.8 | 245.0 | ***1441.5*** | 144.5 | 26.8 | 1776.4 | ~~1442~~ | ~~0~~ | ~~0~~ | ~~793~~ | ~~33.8~~ |
| 578.20 | 1.00 | | | Limestone | 98.8 | 245.0 | ***1540.4*** | 144.5 | 26.8 | 1920.9 | ~~1540~~ | ~~0~~ | ~~0~~ | ~~847~~ | ~~34.8~~ |
| 577.20 | 1.00 | | | Limestone | 98.8 | 245.0 | ***1639.2*** | 144.5 | 26.8 | 2065.4 | ~~1639~~ | ~~0~~ | ~~0~~ | ~~902~~ | ~~35.8~~ |
| 576.20 | 1.00 | | | Limestone | 98.8 | 245.0 | ***1738.0*** | 144.5 | 26.8 | 2209.9 | ~~1738~~ | ~~0~~ | ~~0~~ | ~~956~~ | ~~36.8~~ |
| 575.20 | 1.00 | | | Limestone | 98.8 | 245.0 | ***1836.8*** | 144.5 | 26.8 | 2354.4 | ~~1837~~ | ~~0~~ | ~~0~~ | ~~1010~~ | ~~37.8~~ |
| 574.20 | 1.00 | | | Limestone | | 245.0 | | | 26.8 | | | | | | |

Illinois Department of Transportation

# IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Abutments using 2019 boring
REFERENCE BORING ========== 01 sta 967+18 16 Lt
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 613.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 611.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== None ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== None ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1920 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 38.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 395.57 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 148.34 KIPS

***MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses***

| Maximum Nominal Req'd Bearing of Pile | Maximum Nominal Req.d Bearing of Boring | Maximum Factored Resistance Available in Boring | Maximum Pile Driveable Length in Boring |
|---|---|---|---|
| 497 KIPS | 497 KIPS | 273 KIPS | 28 FT. |

This sheet is superseded by revised calculations.
See memo dated 8/31/2020 for more information

PILE TYPE AND SIZE ========== Steel HP 12 X 63
Plugged Pile Perimeter========== 4.000 FT. Unplugged Pile Perimeter========== 5.883 FT.
Plugged Pile End Bearing Area========== 1.000 SQFT. Unplugged Pile End Bearing Area======== 0.128 SQFT.

| BOT. OF LAYER ELEV. (FT.) | LAYER THICK. (FT.) | UNCONF. COMPR. STRENGTH (TSF.) | S.P.T. N VALUE (BLOWS) | GRANULAR OR ROCK LAYER DESCRIPTION | NOMINAL PLUGGED SIDE RESIST. (KIPS) | NOMINAL PLUGGED END BRG. RESIST. (KIPS) | NOMINAL PLUGGED TOTAL RESIST. (KIPS) | NOMINAL UNPLUG'D SIDE RESIST. (KIPS) | NOMINAL UNPLUG'D END BRG. RESIST. (KIPS) | NOMINAL UNPLUG'D TOTAL RESIST. (KIPS) | NOMINAL REQ'D BEARING (KIPS) | FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS) | FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS) | FACTORED RESISTANCE AVAILABLE (KIPS) | ESTIMATED PILE LENGTH (FT.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 608.70 | 2.30 | 1.50 | 3 | | 8.8 | | 36.9 | 13.0 | | ***16.6*** | 17 | 0 | 0 | 9 | 4 |
| 606.20 | 2.50 | 2.00 | 7 | | 11.6 | 28.0 | 48.5 | 17.1 | 3.6 | ***33.7*** | 34 | 0 | 0 | 19 | 7 |
| 604.20 | 2.00 | 2.00 | 3 | | 9.3 | 28.0 | 102.7 | 13.7 | 3.6 | ***53.1*** | 53 | 0 | 0 | 29 | 9 |
| 601.70 | 2.50 | 5.20 | 12 | | 20.8 | 72.9 | 117.9 | 30.6 | 9.3 | ***83.0*** | 83 | 0 | 0 | 46 | 11 |
| 599.20 | 2.50 | 4.80 | 13 | | 20.8 | 67.3 | 141.4 | 30.6 | 8.6 | ***113.9*** | 114 | 0 | 0 | 63 | 14 |
| 596.70 | 2.50 | 5.00 | 14 | | 20.8 | 70.1 | 186.1 | 30.6 | 9.0 | ***147.6*** | 148 | 0 | 0 | 81 | 16 |
| 594.20 | 2.50 | 6.70 | 20 | | 20.8 | 93.9 | 176.5 | 30.6 | 12.0 | ***174.3*** | 174 | 0 | 0 | 96 | 19 |
| 591.70 | 2.50 | | 34 | Hard Till | 3.7 | 63.5 | 238.1 | 5.5 | 8.1 | ***187.2*** | 187 | 0 | 0 | 103 | 21 |
| 589.20 | 2.50 | | 65 | Hard Till | 9.8 | 121.4 | 343.2 | 14.4 | 15.5 | ***213.8*** | 214 | 0 | 0 | 118 | 24 |
| 586.70 | 2.50 | | 116 | Hard Till | 28.7 | 216.7 | 1276.2 | 42.1 | 27.7 | ***371.5*** | 371 | 0 | 0 | 204 | 26 |
| 585.20 | 1.50 | | 600 | Hard Till | 453.5 | 1121.1 | ***857.8*** | 667.0 | 143.3 | 927.1 | ~~858~~ | *0* | *0* | ~~472~~ | ~~28~~ |
| 584.20 | 1.00 | | | Limestone | 99.7 | 249.1 | ***957.4*** | 146.6 | 31.8 | 1073.6 | ~~957~~ | *0* | *0* | ~~527~~ | ~~28.8~~ |
| 583.20 | 1.00 | | | Limestone | 99.7 | 249.1 | ***1057.1*** | 146.6 | 31.8 | 1220.2 | ~~1057~~ | *0* | *0* | ~~581~~ | ~~29.8~~ |
| 582.20 | 1.00 | | | Limestone | 99.7 | 249.1 | ***1156.8*** | 146.6 | 31.8 | 1366.8 | ~~1157~~ | *0* | *0* | ~~636~~ | ~~30.8~~ |
| 581.20 | 1.00 | | | Limestone | 99.7 | 249.1 | ***1256.4*** | 146.6 | 31.8 | 1513.4 | ~~1256~~ | *0* | *0* | ~~691~~ | ~~31.8~~ |
| 580.20 | 1.00 | | | Limestone | 99.7 | 249.1 | ***1356.1*** | 146.6 | 31.8 | 1660.0 | ~~1356~~ | *0* | *0* | ~~746~~ | ~~32.8~~ |
| 579.20 | 1.00 | | | Limestone | 99.7 | 249.1 | ***1455.7*** | 146.6 | 31.8 | 1806.5 | ~~1456~~ | *0* | *0* | ~~801~~ | ~~33.8~~ |
| 578.20 | 1.00 | | | Limestone | 99.7 | 249.1 | ***1555.4*** | 146.6 | 31.8 | 1953.1 | ~~1555~~ | *0* | *0* | ~~855~~ | ~~34.8~~ |
| 577.20 | 1.00 | | | Limestone | 99.7 | 249.1 | ***1655.0*** | 146.6 | 31.8 | 2099.7 | ~~1655~~ | *0* | *0* | ~~910~~ | ~~35.8~~ |
| 576.20 | 1.00 | | | Limestone | 99.7 | 249.1 | ***1754.7*** | 146.6 | 31.8 | 2246.3 | ~~1755~~ | *0* | *0* | ~~965~~ | ~~36.8~~ |
| 575.20 | 1.00 | | | Limestone | 99.7 | 249.1 | ***1854.4*** | 146.6 | 31.8 | 2392.9 | ~~1854~~ | *0* | *0* | ~~1020~~ | ~~37.8~~ |
| 574.20 | 1.00 | | | Limestone | | 249.1 | | | 31.8 | | | | | | |

Illinois Department of Transportation

# IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Abutments using 2019 boring
REFERENCE BORING ========== 01 sta 967+18 16 Lt
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 613.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 611.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== None ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== None ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1920 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 38.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 395.57 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 148.34 KIPS

***MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses***

| Maximum Nominal Req'd Bearing of Pile | Maximum Nominal Req.d Bearing of Boring | Maximum Factored Resistance Available in Boring | Maximum Pile Driveable Length in Boring |
|---|---|---|---|
| 578 KIPS | 578 KIPS | 318 KIPS | 28 FT. |

This sheet is superseded by revised calculations.
See memo dated 8/31/2020 for more information

PILE TYPE AND SIZE ========== Steel HP 14 X 73
Plugged Pile Perimeter========== 4.700 FT. Unplugged Pile Perimeter========== 6.975 FT.
Plugged Pile End Bearing Area========== 1.379 SQFT. Unplugged Pile End Bearing Area======== 0.149 SQFT.

| BOT. OF LAYER ELEV. (FT.) | LAYER THICK. (FT.) | UNCONF. COMPR. STRENGTH (TSF.) | S.P.T. N VALUE (BLOWS) | GRANULAR OR ROCK LAYER DESCRIPTION | NOMINAL PLUGGED SIDE RESIST. (KIPS) | NOMINAL PLUGGED END BRG. RESIST. (KIPS) | NOMINAL PLUGGED TOTAL RESIST. (KIPS) | NOMINAL UNPLUG'D SIDE RESIST. (KIPS) | NOMINAL UNPLUG'D END BRG. RESIST. (KIPS) | NOMINAL UNPLUG'D TOTAL RESIST. (KIPS) | NOMINAL REQ'D BEARING (KIPS) | FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS) | FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS) | FACTORED RESISTANCE AVAILABLE (KIPS) | ESTIMATED PILE LENGTH (FT.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 608.70 | 2.30 | 1.50 | 3 | | 10.4 | | 49.0 | 15.4 | | ***19.6*** | 20 | 0 | 0 | 11 | 4 |
| 606.20 | 2.50 | 2.00 | 7 | | 13.7 | 38.6 | 62.7 | 20.3 | 4.2 | ***39.9*** | 40 | 0 | 0 | 22 | 7 |
| 604.20 | 2.00 | 2.00 | 3 | | 10.9 | 38.6 | 135.5 | 16.2 | 4.2 | ***62.8*** | 63 | 0 | 0 | 35 | 9 |
| 601.70 | 2.50 | 5.20 | 12 | | 24.4 | 100.5 | 152.2 | 36.2 | 10.8 | ***98.2*** | 98 | 0 | 0 | 54 | 11 |
| 599.20 | 2.50 | 4.80 | 13 | | 24.4 | 92.8 | 180.5 | 36.2 | 10.0 | ***134.9*** | 135 | 0 | 0 | 74 | 14 |
| 596.70 | 2.50 | 5.00 | 14 | | 24.4 | 96.6 | 237.8 | 36.2 | 10.4 | ***174.7*** | 175 | 0 | 0 | 96 | 16 |
| 594.20 | 2.50 | 6.70 | 20 | | 24.4 | 129.5 | 220.3 | 36.2 | 14.0 | ***206.4*** | 206 | 0 | 0 | 114 | 19 |
| 591.70 | 2.50 | | 34 | Hard Till | 4.4 | 87.6 | 304.6 | 6.5 | 9.4 | ***221.5*** | 222 | 0 | 0 | 122 | 21 |
| 589.20 | 2.50 | | 65 | Hard Till | 11.5 | 167.5 | 447.5 | 17.1 | 18.0 | ***252.8*** | 253 | 0 | 0 | 139 | 24 |
| 586.70 | 2.50 | | 116 | Hard Till | 33.7 | 298.9 | 1728.2 | 50.0 | 32.2 | ***437.1*** | 437 | 0 | 0 | 240 | 26 |
| 585.20 | 1.50 | | 600 | Hard Till | 532.9 | 1545.9 | ***1058.7*** | 790.8 | 166.6 | 1098.4 | ~~1059~~ | ~~0~~ | ~~0~~ | ~~582~~ | ~~28~~ |
| 584.20 | 1.00 | | | Limestone | 117.1 | 343.5 | ***1175.8*** | 173.8 | 37.0 | 1272.1 | ~~1176~~ | ~~0~~ | ~~0~~ | ~~647~~ | ~~28.8~~ |
| 583.20 | 1.00 | | | Limestone | 117.1 | 343.5 | ***1292.9*** | 173.8 | 37.0 | 1445.9 | ~~1293~~ | ~~0~~ | ~~0~~ | ~~711~~ | ~~29.8~~ |
| 582.20 | 1.00 | | | Limestone | 117.1 | 343.5 | ***1410.0*** | 173.8 | 37.0 | 1619.7 | ~~1410~~ | ~~0~~ | ~~0~~ | ~~775~~ | ~~30.8~~ |
| 581.20 | 1.00 | | | Limestone | 117.1 | 343.5 | ***1527.1*** | 173.8 | 37.0 | 1793.5 | ~~1527~~ | ~~0~~ | ~~0~~ | ~~840~~ | ~~31.8~~ |
| 580.20 | 1.00 | | | Limestone | 117.1 | 343.5 | ***1644.2*** | 173.8 | 37.0 | 1967.2 | ~~1644~~ | ~~0~~ | ~~0~~ | ~~904~~ | ~~32.8~~ |
| 579.20 | 1.00 | | | Limestone | 117.1 | 343.5 | ***1761.3*** | 173.8 | 37.0 | 2141.0 | ~~1761~~ | ~~0~~ | ~~0~~ | ~~969~~ | ~~33.8~~ |
| 578.20 | 1.00 | | | Limestone | 117.1 | 343.5 | ***1878.4*** | 173.8 | 37.0 | 2314.8 | ~~1878~~ | ~~0~~ | ~~0~~ | ~~1033~~ | ~~34.8~~ |
| 577.20 | 1.00 | | | Limestone | 117.1 | 343.5 | ***1995.5*** | 173.8 | 37.0 | 2488.6 | ~~1995~~ | ~~0~~ | ~~0~~ | ~~1098~~ | ~~35.8~~ |
| 576.20 | 1.00 | | | Limestone | 117.1 | 343.5 | ***2112.6*** | 173.8 | 37.0 | 2662.4 | ~~2113~~ | ~~0~~ | ~~0~~ | ~~1162~~ | ~~36.8~~ |
| 575.20 | 1.00 | | | Limestone | 117.1 | 343.5 | ***2229.7*** | 173.8 | 37.0 | 2836.1 | ~~2230~~ | ~~0~~ | ~~0~~ | ~~1226~~ | ~~37.8~~ |
| 574.20 | 1.00 | | | Limestone | | 343.5 | | | 37.0 | | | | | | |

Illinois Department of Transportation

# IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Abutments using 2019 boring
REFERENCE BORING ========== 01 sta 967+18 16 Lt
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 613.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 611.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== None ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== None ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1920 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 38.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 395.57 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 148.34 KIPS

***MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses***

| Maximum Nominal Req'd Bearing of Pile | Maximum Nominal Req.d Bearing of Boring | Maximum Factored Resistance Available in Boring | Maximum Pile Driveable Length in Boring |
|---|---|---|---|
| 705 KIPS | 705 KIPS | 388 KIPS | 28 FT. |

This sheet is superseded by revised calculations.
See memo dated 8/31/2020 for more information

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area======== 0.181 SQFT.

| BOT. OF LAYER ELEV. (FT.) | LAYER THICK. (FT.) | UNCONF. COMPR. STRENGTH (TSF.) | S.P.T. N VALUE (BLOWS) | GRANULAR OR ROCK LAYER DESCRIPTION | NOMINAL PLUGGED SIDE RESIST. (KIPS) | NOMINAL PLUGGED END BRG. RESIST. (KIPS) | NOMINAL PLUGGED TOTAL RESIST. (KIPS) | NOMINAL UNPLUG'D SIDE RESIST. (KIPS) | NOMINAL UNPLUG'D END BRG. RESIST. (KIPS) | NOMINAL UNPLUG'D TOTAL RESIST. (KIPS) | NOMINAL REQ'D BEARING (KIPS) | FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS) | FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS) | FACTORED RESISTANCE AVAILABLE (KIPS) | ESTIMATED PILE LENGTH (FT.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 608.70 | 2.30 | 1.50 | 3 | | 10.5 | | 50.0 | 15.6 | | ***20.6*** | 21 | 0 | 0 | 11 | 4 |
| 606.20 | 2.50 | 2.00 | 7 | | 13.8 | 39.5 | 63.8 | 20.5 | 5.1 | ***41.1*** | 41 | 0 | 0 | 23 | 7 |
| 604.20 | 2.00 | 2.00 | 3 | | 11.1 | 39.5 | 138.0 | 16.4 | 5.1 | ***65.6*** | 66 | 0 | 0 | 36 | 9 |
| 601.70 | 2.50 | 5.20 | 12 | | 24.7 | 102.7 | 154.8 | 36.6 | 13.2 | ***101.1*** | 101 | 0 | 0 | 56 | 11 |
| 599.20 | 2.50 | 4.80 | 13 | | 24.7 | 94.8 | 183.5 | 36.6 | 12.2 | ***138.2*** | 138 | 0 | 0 | 76 | 14 |
| 596.70 | 2.50 | 5.00 | 14 | | 24.7 | 98.7 | 241.7 | 36.6 | 12.7 | ***179.1*** | 179 | 0 | 0 | 98 | 16 |
| 594.20 | 2.50 | 6.70 | 20 | | 24.7 | 132.3 | 223.6 | 36.6 | 17.0 | ***210.1*** | 210 | 0 | 0 | 116 | 19 |
| 591.70 | 2.50 | | 34 | Hard Till | 4.4 | 89.5 | 309.7 | 6.6 | 11.5 | ***227.2*** | 227 | 0 | 0 | 125 | 21 |
| 589.20 | 2.50 | | 65 | Hard Till | 11.6 | 171.1 | 455.6 | 17.2 | 22.0 | ***261.7*** | 262 | 0 | 0 | 144 | 24 |
| 586.70 | 2.50 | | 116 | Hard Till | 34.0 | 305.4 | 1763.6 | 50.4 | 39.3 | ***476.1*** | 476 | 0 | 0 | 262 | 26 |
| 585.20 | 1.50 | | 600 | Hard Till | 538.5 | 1579.4 | ***1073.8*** | 797.4 | 203.3 | 1115.4 | ~~1074~~ | ~~0~~ | ~~0~~ | ~~591~~ | ~~28~~ |
| 584.20 | 1.00 | | | Limestone | 118.3 | 351.0 | ***1192.1*** | 175.2 | 45.2 | 1290.6 | ~~1192~~ | ~~0~~ | ~~0~~ | ~~656~~ | ~~28.8~~ |
| 583.20 | 1.00 | | | Limestone | 118.3 | 351.0 | ***1310.4*** | 175.2 | 45.2 | 1465.8 | ~~1310~~ | ~~0~~ | ~~0~~ | ~~721~~ | ~~29.8~~ |
| 582.20 | 1.00 | | | Limestone | 118.3 | 351.0 | ***1428.8*** | 175.2 | 45.2 | 1641.1 | ~~1429~~ | ~~0~~ | ~~0~~ | ~~786~~ | ~~30.8~~ |
| 581.20 | 1.00 | | | Limestone | 118.3 | 351.0 | ***1547.1*** | 175.2 | 45.2 | 1816.3 | ~~1547~~ | ~~0~~ | ~~0~~ | ~~851~~ | ~~31.8~~ |
| 580.20 | 1.00 | | | Limestone | 118.3 | 351.0 | ***1665.5*** | 175.2 | 45.2 | 1991.5 | ~~1665~~ | ~~0~~ | ~~0~~ | ~~916~~ | ~~32.8~~ |
| 579.20 | 1.00 | | | Limestone | 118.3 | 351.0 | ***1783.8*** | 175.2 | 45.2 | 2166.8 | ~~1784~~ | ~~0~~ | ~~0~~ | ~~981~~ | ~~33.8~~ |
| 578.20 | 1.00 | | | Limestone | 118.3 | 351.0 | ***1902.2*** | 175.2 | 45.2 | 2342.0 | ~~1902~~ | ~~0~~ | ~~0~~ | ~~1046~~ | ~~34.8~~ |
| 577.20 | 1.00 | | | Limestone | 118.3 | 351.0 | ***2020.5*** | 175.2 | 45.2 | 2517.2 | ~~2020~~ | ~~0~~ | ~~0~~ | ~~1111~~ | ~~35.8~~ |
| 576.20 | 1.00 | | | Limestone | 118.3 | 351.0 | ***2138.8*** | 175.2 | 45.2 | 2692.5 | ~~2139~~ | ~~0~~ | ~~0~~ | ~~1176~~ | ~~36.8~~ |
| 575.20 | 1.00 | | | Limestone | 118.3 | 351.0 | ***2257.2*** | 175.2 | 45.2 | 2867.7 | ~~2257~~ | ~~0~~ | ~~0~~ | ~~1241~~ | ~~37.8~~ |
| 574.20 | 1.00 | | | Limestone | | 351.0 | | | 45.2 | | | | | | |