



Line 5 Wisconsin Segment Relocation Project

Ashland, Bayfield, Douglas, and Iron Counties Wisconsin

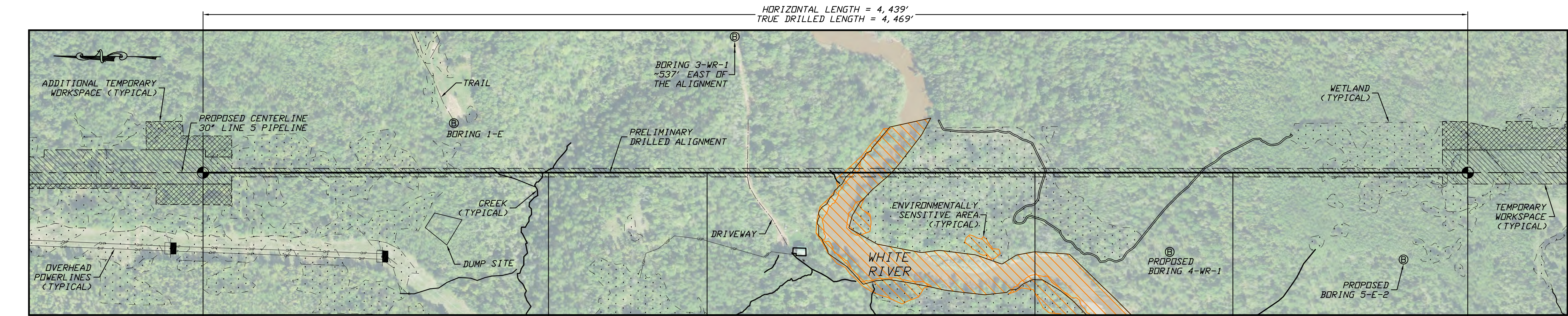
Water Resources Application for Project Permits

Environmental Impact Report

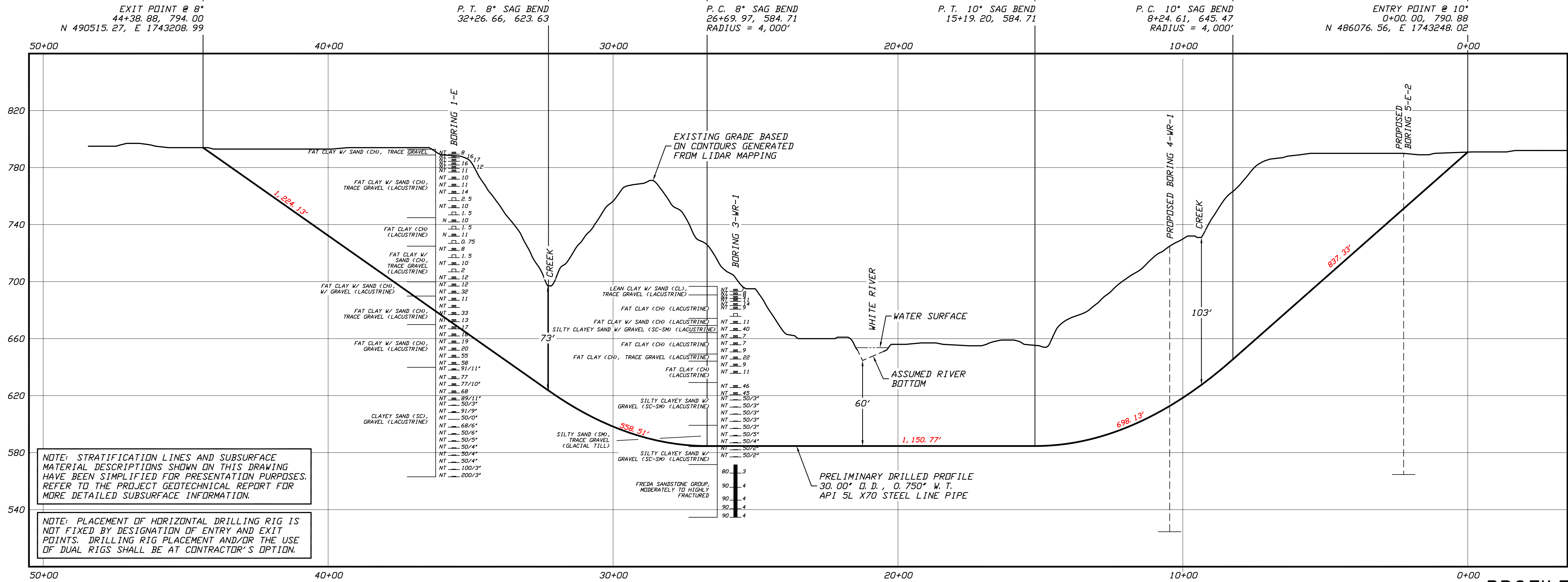
Revised August 2020

EIR Attachment M

HDD and Direct Pipe Site-Specific Drawings



PLAN
SCALE: 1"=200'



PROFILE
SCALE: 1"=200' HORIZONTAL
1"= 40' VERTICAL

GENERAL LEGEND

- DRILLED PATH ENTRY/EXIT POINT

GEOLOGICAL LEGEND

- ⑥ BORING LOCATION
- SPLIT SPOON SAMPLE
- 53.1.23 — PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
- CORE BARREL SAMPLE
- UCS 6,250 — UNCONFINED COMPRESSIVE STRENGTH (PSI)
- 53.6 — MOHS HARDNESS
- ROCK QUALITY DESIGNATION (PERCENT)

GEOLOGICAL NOTES

- GEOLOGICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE PRELIMINARY BORING LOGS DATED MAY AND JULY 2020 FOR MORE DETAILED SUBSURFACE INFORMATION.
- THE LETTER "N" TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS "NT" INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
- THE GEOLOGICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.

TOPOGRAPHIC SURVEY NOTES

- TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
- NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
- ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.

DRILLED PATH NOTES

- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
- DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

PILOT HOLE TOLERANCES

THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.

- ENTRY POINT: AS STAKED BY COMPANY
- EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
- ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
- ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
- CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

PROTECTION OF EXISTING FACILITIES

- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 - POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 4- PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF THE WHITE RIVER
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: ASHLAND COUNTY, WISCONSIN	CHECKED: KWW	APPROVED: JSP	DRAWING LABEL: WHITE RIVER	REVISION: P1
DRAWN: DMP	DATE: 01/15/20	SCALE: SHOWN FOR D-SIZED PLOT		

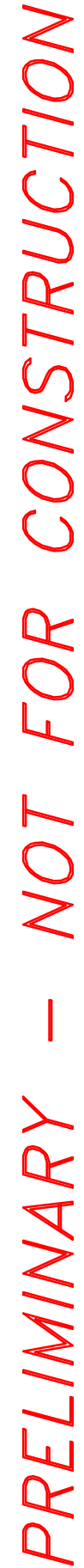
J.D. Hair & Associates, Inc.
Consulting Engineers

PROJECT NO.
Enbridge\1938

SHEET NUMBER

1

2424 East 21st Street
Tulsa, Oklahoma 74114



LINE 5 PIPELINE PROJECT

**MP 6 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF DEER CREEK
BY HORIZONTAL DIRECTIONAL DRILLING**

LOCATION: ASHLAND COUNTY, WISCONSIN

LOCATION: ASHLAND COUNTY, WISCONSIN					REVISION
DRAWN	DATE	CHECKED	APPROVED	SCALE	DRAWING LABEL
KWW	06/17/20	DLB	JSP	SHOWN FOR D-SIZED PLOT	DEER CREEK
					P1

J.D. Hair & Associates, Inc.
Consulting Engineers

2424 East 21st Street
Suite 510
Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

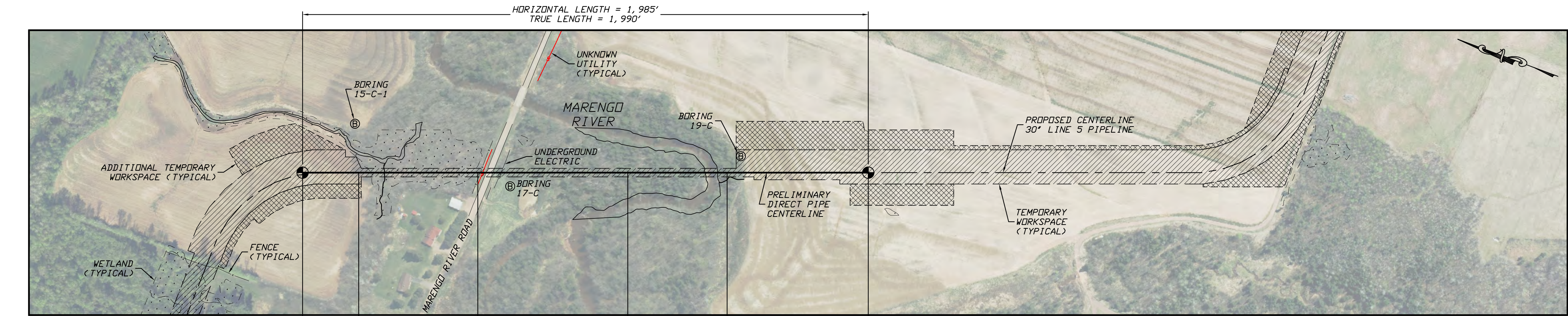
SHEET NUMBER

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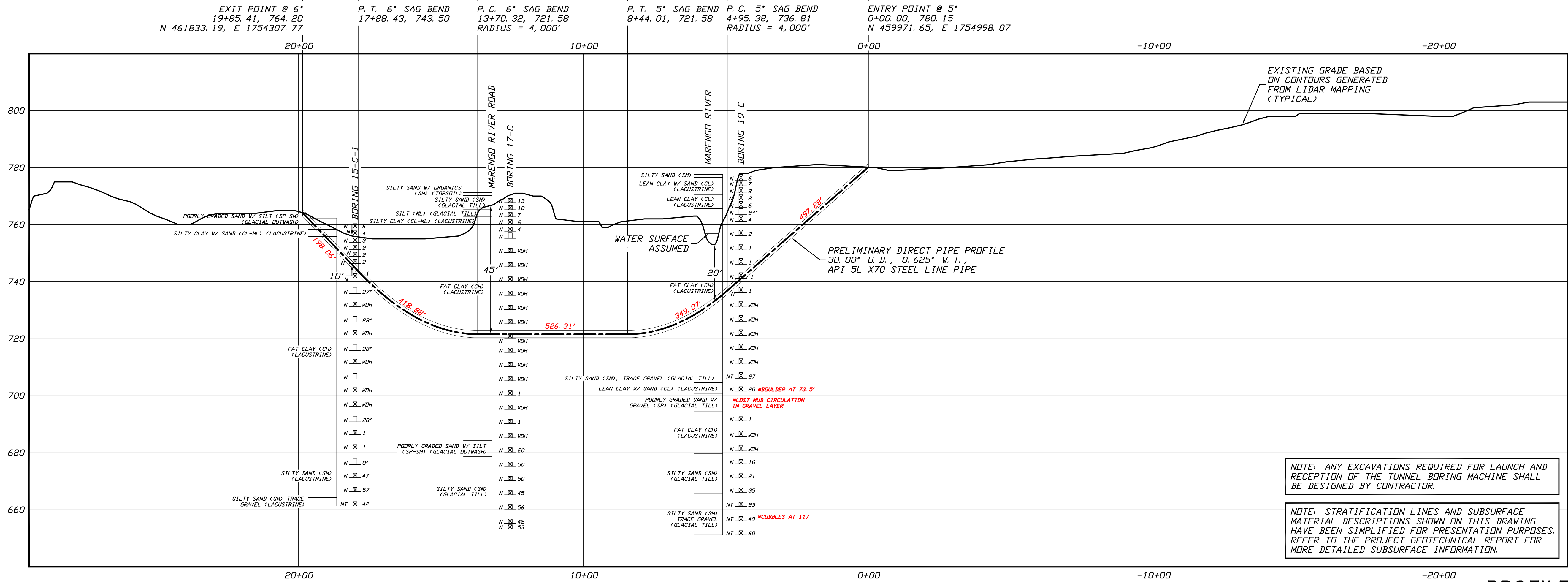
2424 East 21st Street
Suite 510
Tulsa, Oklahoma 74114

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BER



PLAN
SCALE: 1"=200'



GENERAL LEGEND

● DIRECT PIPE ENTRY/EXIT POINT

GEOTECHNICAL LEGEND

⊙ BORING LOCATION THIN WALL SAMPLE
SPLIT SPOON SAMPLE 15" RECOVERY AMOUNT
53.23 PENETRATION RESISTANCE IN BLOWS PER FOOT
FOR A 140 POUND HAMMER FALLING 30 INCHES
PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES
CONTAINING GRAVEL
CORE BARREL SAMPLE
UCS 6,250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
53.6 MOHS HARDNESS
ROCK QUALITY DESIGNATION (PERCENT)

GEOTECHNICAL NOTES

- GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE DRAFT BORING LOGS DATED MAY 2020 FOR MORE DETAILED SUBSURFACE INFORMATION.
- THE LETTER 'N' TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS 'NT' INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
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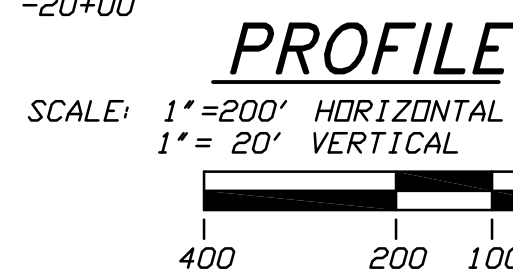
COORDINATE GEOMETRY NOTES

- STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DIRECT PIPE SEGMENT.
- COORDINATES REFER TO DIRECT PIPE CENTERLINE AS OPPOSED TO TOP OF INSTALLED PIPE.

DIRECTIONAL TOLERANCES

THE CENTERLINE OF THE DIRECT PIPE INSTALLATION SHALL CONFORM TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.

- ELEVATION: UP TO 2 FEET ABOVE AND 5 FEET BELOW THE DESIGNED PROFILE
- ALIGNMENT: UP TO 10 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
- CURVE RADIUS: NO LESS THAN 2,000 FEET



PROTECTION OF EXISTING FACILITIES

CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DIRECT PIPE OPERATIONS.

- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
- POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DIRECT PIPE CENTERLINE SHALL BE EXPOSED.
- MODIFY DIRECT PIPE OPERATIONS AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY – NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

**MP 11 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF THE MARENGO RIVER
BY THE DIRECT PIPE METHOD**

LOCATION: ASHLAND COUNTY, WISCONSIN	CHECKED	APPROVED	SCALE	SHOWN FOR	DRAWING LABEL	REVISION
DRAWN	DATE	03/12/20	JSP	LKB	MARENGO DP	P2
DLB						

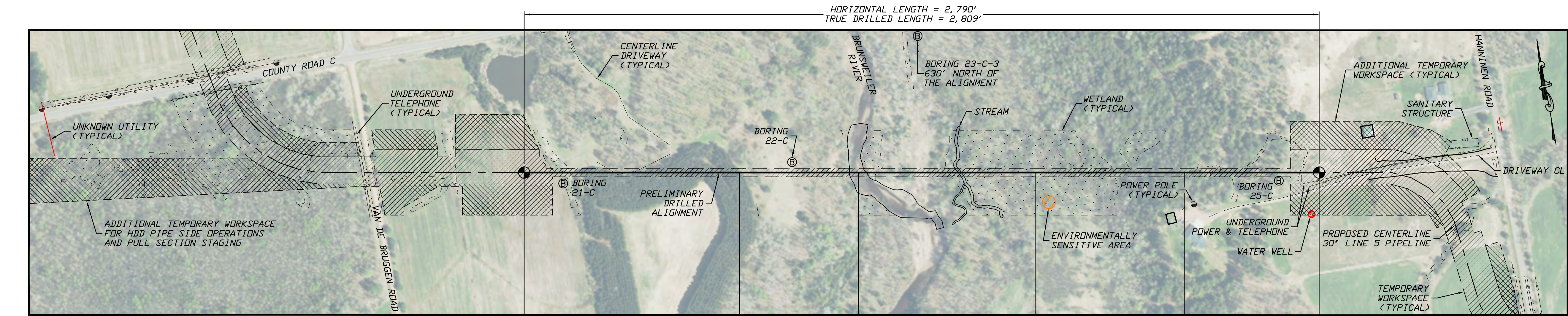
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Consulting Engineers

2424 East 21st Street
Tulsa, Oklahoma 74114

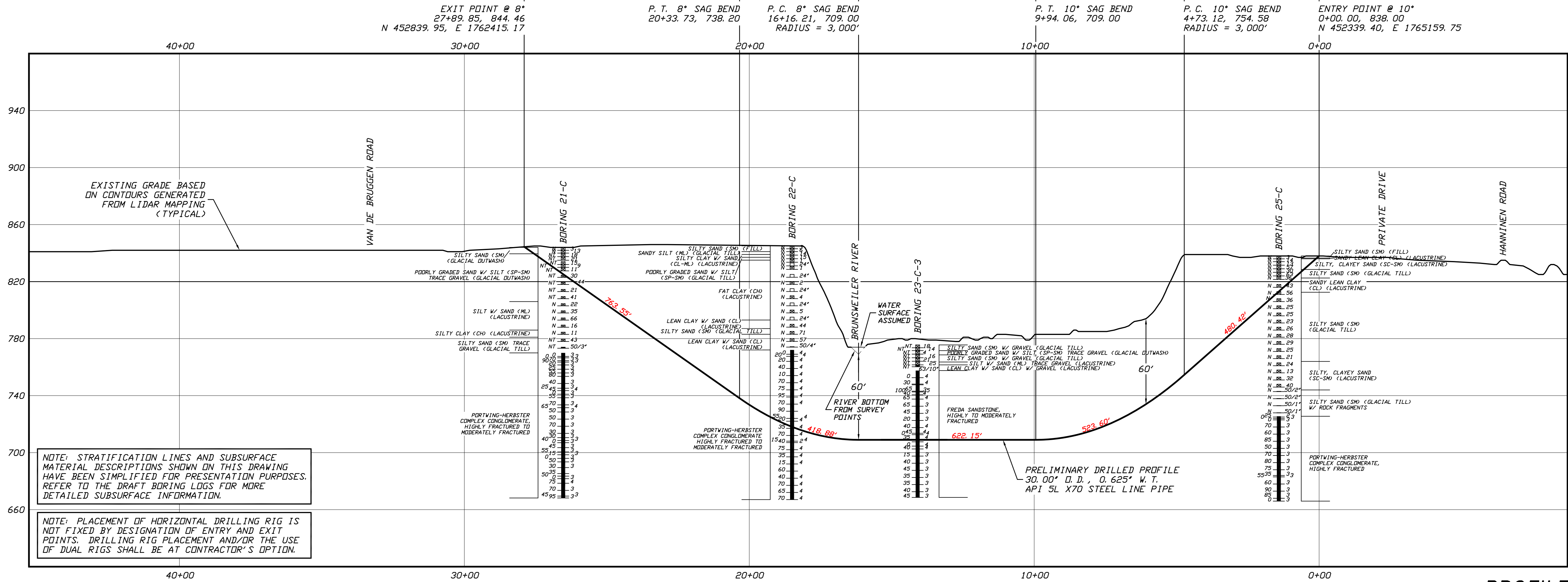
PROJECT NO.
Enbridge\1938

SHEET NUMBER

1



PLAN
SCALE: 1"=200'



NOTE: STRATIFICATION LINES AND SUBSURFACE MATERIAL DESCRIPTIONS SHOWN ON THIS DRAWING HAVE BEEN SIMPLIFIED FOR PRESENTATION PURPOSES. REFER TO THE DRAFT BORING LOGS FOR MORE DETAILED SUBSURFACE INFORMATION.

NOTE: PLACEMENT OF HORIZONTAL DRILLING RIG IS NOT FIXED BY DESIGNATION OF ENTRY AND EXIT POINTS. DRILLING RIG PLACEMENT AND/OR THE USE OF DUAL RIGS SHALL BE AT CONTRACTOR'S OPTION.

GENERAL LEGEND

- DRILLED PATH ENTRY/EXIT POINT

GEOTECHNICAL LEGEND

- ⊙ BORING LOCATION THIN WALL SAMPLE
- SPLIT SPOON SAMPLE 15" — RECOVERY AMOUNT
- 53.1.23 — PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES
- PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
- CORE BARREL SAMPLE
- UCS 6,250 — UNCONFINED COMPRESSIVE STRENGTH (PSI)
- 53.6 — MOHS HARDNESS
- ROCK QUALITY DESIGNATION (PERCENT)

GEOTECHNICAL NOTES

- GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE DRAFT BORING LOGS DATED MAY & JUNE 2020 FOR MORE DETAILED SUBSURFACE INFORMATION.
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- ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.

DRILLED PATH NOTES

- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
- DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

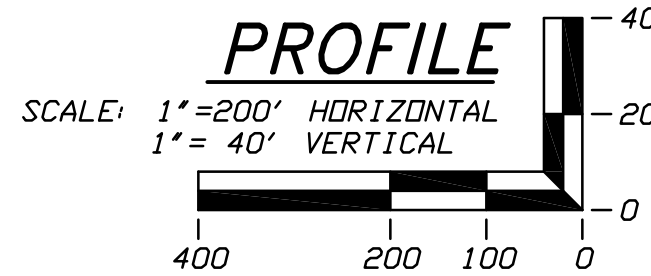
PILOT HOLE TOLERANCES

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PROTECTION OF EXISTING FACILITIES

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 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.



PRELIMINARY – NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

**MP 14 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF THE BRUNSWELLER RIVER
BY HORIZONTAL DIRECTIONAL DRILLING**

LOCATION: ASHLAND COUNTY, WISCONSIN	CHECKED: KWW	APPROVED: JSP	DRAWING LABEL: BRUNSWELLER	REVISION: P2
DRAWN: DMP	DATE: 12/17/19	SCALE: SHOWN FOR D-SIZED PLOT		

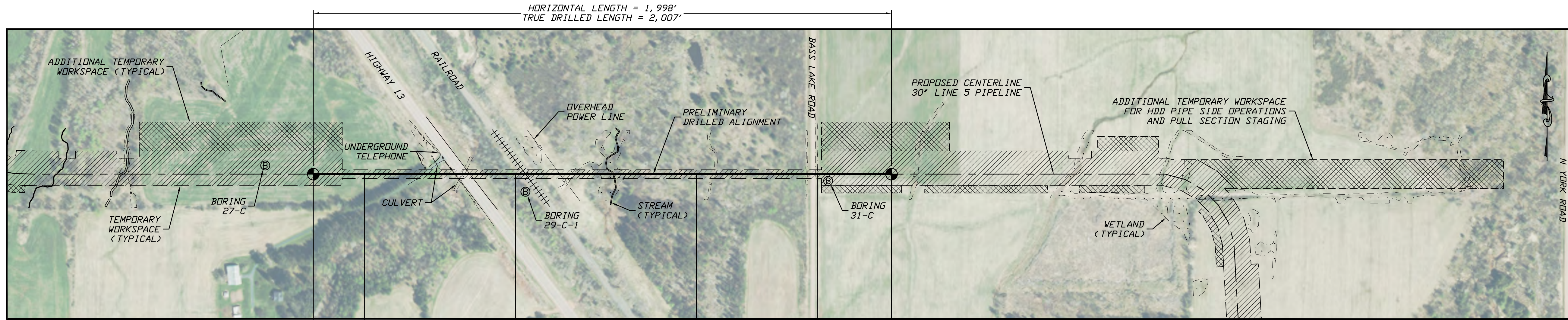
J.D.Hair & Associates, Inc.
Consulting Engineers

PROJECT NO.
Enbridge\1938

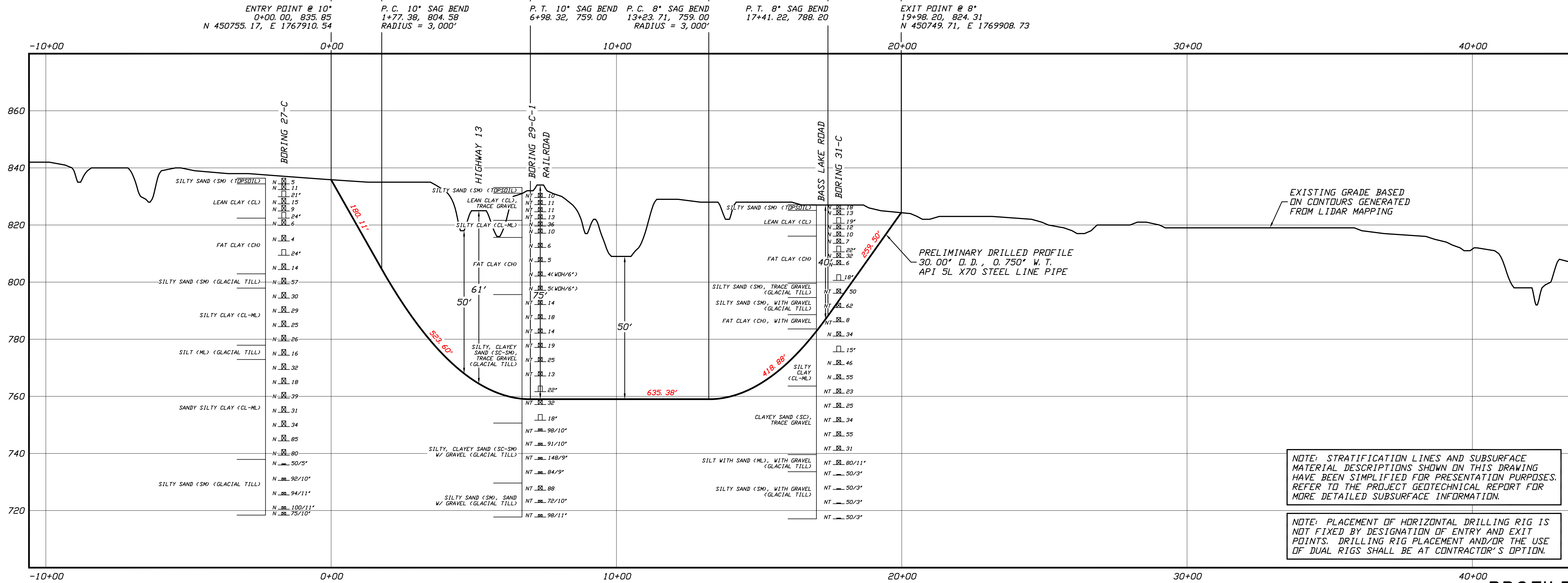
SHEET NUMBER

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2424 East 21st Street
Tulsa, Oklahoma 74114

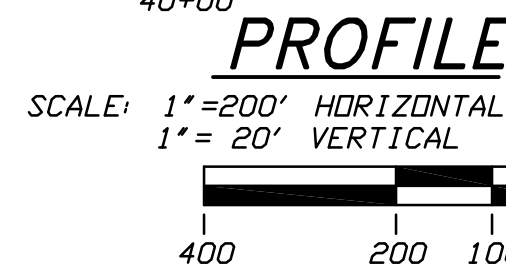


PLAN
SCALE: 1"=200'



NOTE: STRATIFICATION LINES AND SUBSURFACE MATERIAL DESCRIPTIONS SHOWN ON THIS DRAWING HAVE BEEN SIMPLIFIED FOR PRESENTATION PURPOSES. REFER TO THE PROJECT GEOTECHNICAL REPORT FOR MORE DETAILED SUBSURFACE INFORMATION.

NOTE: PLACEMENT OF HORIZONTAL DRILLING RIG IS NOT FIXED BY DESIGNATION OF ENTRY AND EXIT POINTS. DRILLING RIG PLACEMENT AND/OR THE USE OF DUAL RIGS SHALL BE AT CONTRACTOR'S OPTION.



GENERAL LEGEND

● DRILLED PATH ENTRY/EXIT POINT

GEOTECHNICAL LEGEND

⊙ BORING LOCATION THIN WALL SAMPLE
15' RECOVERY AMOUNT
SPLIT SPOON SAMPLE
53.23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES
PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL

CORE BARREL SAMPLE

UCS 6,250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
53.6 MOHS HARDNESS
ROCK QUALITY DESIGNATION (PERCENT)

GEOTECHNICAL NOTES

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- ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.

DRILLED PATH NOTES

- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
- DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

PILOT HOLE TOLERANCES

THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.

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PROTECTION OF EXISTING FACILITIES

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PRELIMINARY – NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

**MP 15 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF HIGHWAY 13
BY HORIZONTAL DIRECTIONAL DRILLING**

LOCATION: ASHLAND COUNTY, WISCONSIN	CHECKED: JSP	APPROVED: KWW	SCALE: SHOWN FOR D-SIZED PLOT	DRAWING LABEL: HIGHWAY 13	REVISION: P4
DRAWN: DMP	DATE: 12/18/19				

P4	07/23/20	UPDATE BASE DATA	JSP	KWW	JSP
P3	06/03/20	MINOR UPDATES, ISSUE FOR PERMIT	JSP	JSP	JSP
P2	05/20/20	ADD LABELS; ADD SECOND SHEET	JSP	JSP	JSP
P1	05/07/20	ENTER GEOTECH DATA & UPDATE THE DESIGN	JSP	JSP	JSP
NO.	DATE	REVISION DESCRIPTION	BY	CHKD	APP.

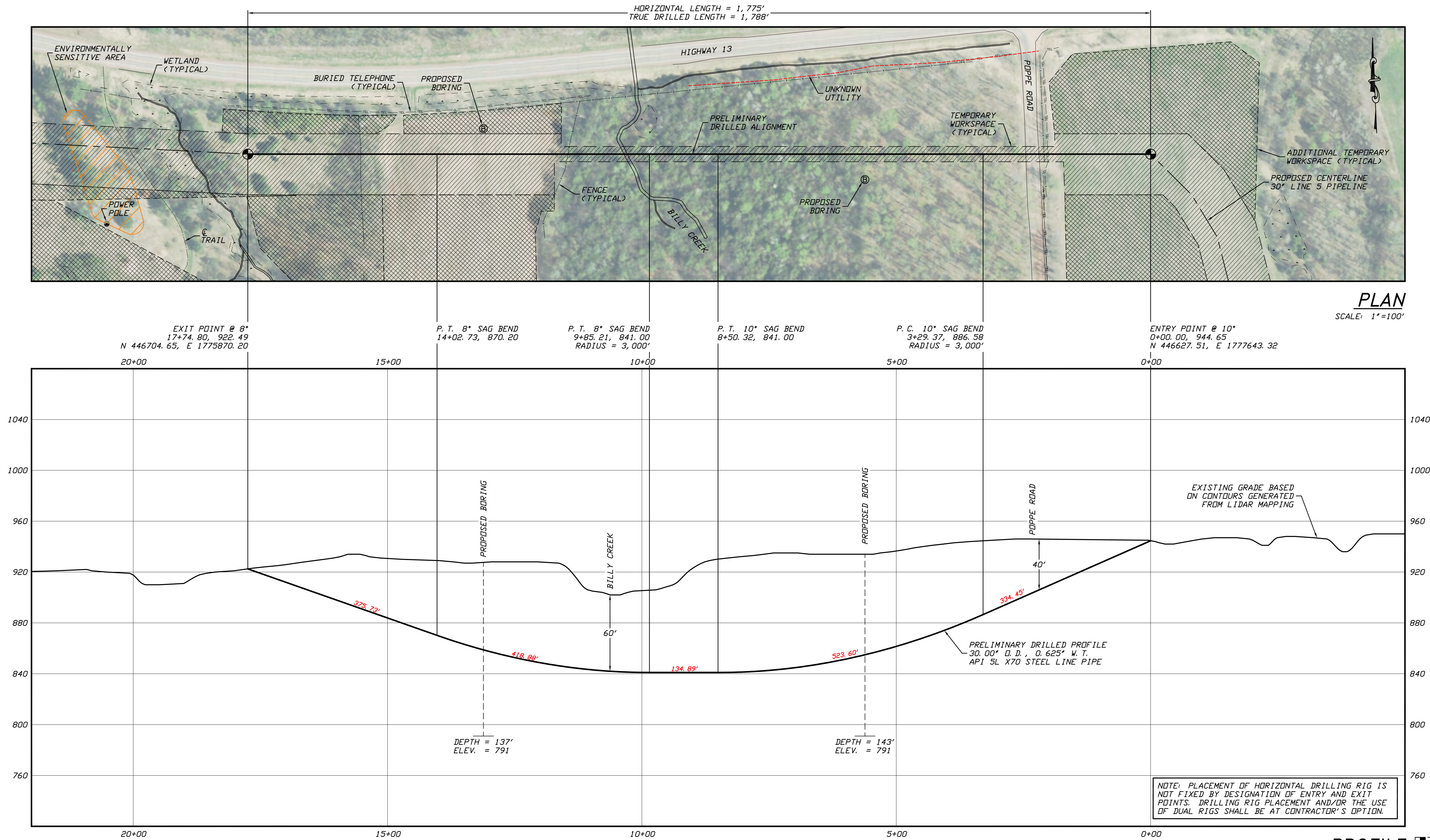
J.D.Hair & Associates, Inc.
Consulting Engineers

2424 East 21st Street
Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

SHEET NUMBER

1



GENERAL LEGEND

- DRILLED PATH ENTRY/EXIT POINT

TOPOGRAPHIC SURVEY NOTES

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DRILLED PATH NOTES

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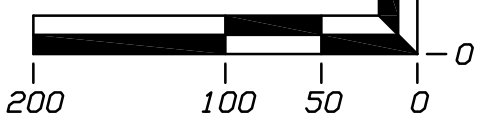
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PROFILE

SCALE: 1"=100' HORIZONTAL
1"= 40' VERTICAL

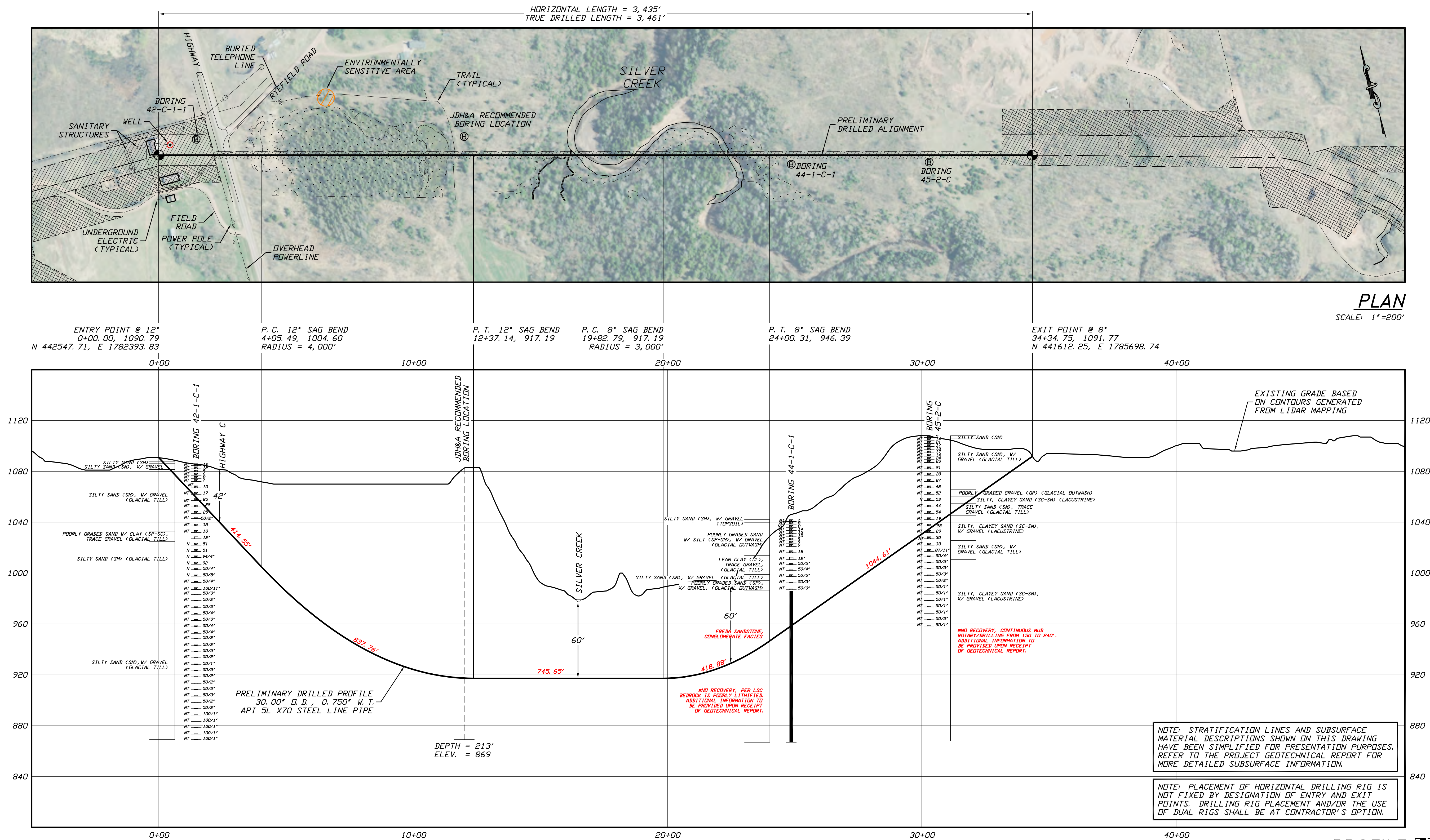


PRELIMINARY – NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 17 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF BILLY CREEK
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: ASHLAND COUNTY, WISCONSIN				
DRAWN	DATE	CHECKED	APPROVED	SCALE
DMP	1/10/20	KWW	---	SHOWN FOR D-SIZED PLOT
				DRAWING LABEL
				BILLY CREEK
				P2



GENERAL LEGEND

● DRILLED PATH ENTRY/EXIT POINT

GEOTECHNICAL LEGEND

⊗ BORING LOCATION THIN WALL SAMPLE
SPLIT SPOON SAMPLE
53.1.23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL

CORE BARREL SAMPLE

1. UCS 6,250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
53.1.6 MOHS HARDNESS
ROCK QUALITY DESIGNATION (PERCENT)

GEOTECHNICAL NOTES

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- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
- DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

PILOT HOLE TOLERANCES

THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.

- ENTRY POINT: AS STAKED BY COMPANY
- EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
- ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
- ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
- CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

PROTECTION OF EXISTING FACILITIES

- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 - POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY – NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 19 - PLAN AND PROFILE 30-INCH PIPELINE CROSSING OF SILVER CREEK BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: ASHLAND COUNTY, WISCONSIN	CHECKED	APPROVED	SCALE	DRAWING LABEL	REVISION
DRAWN	DATE	01/31/20	JSP	SHOWN FOR D-SIZED PLOT	P1
DLB	KWW			SILVER CREEK ALT	

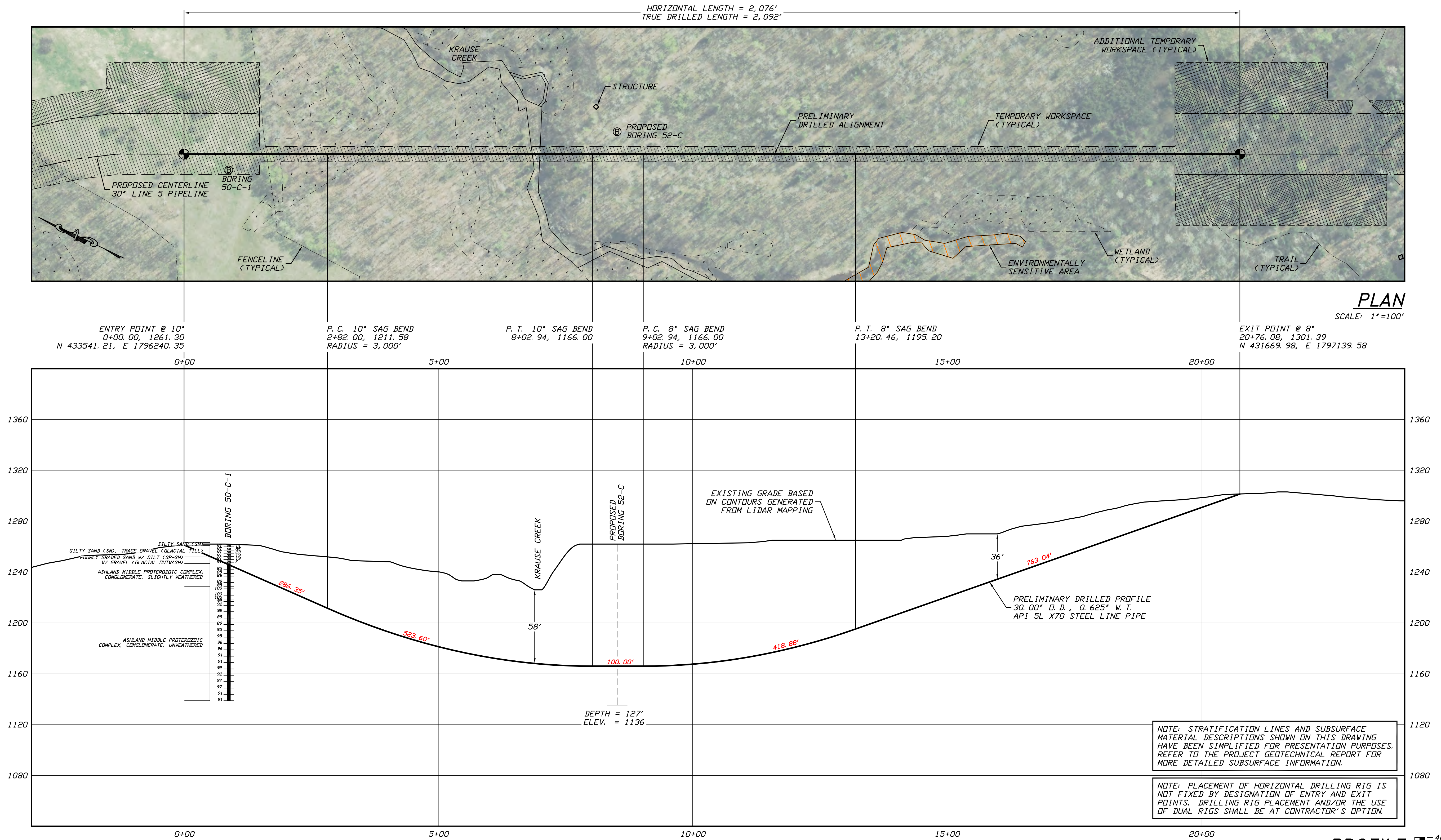
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Consulting Engineers

2424 East 21st Street
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Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

SHEET NUMBER

1



GENERAL LEGEND

● DRILLED PATH ENTRY/EXIT POINT

GEOTECHNICAL LEGEND

Ⓢ BORING LOCATION THIN WALL SAMPLE
15" RECOVERY AMOUNT
53.23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES
PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
CORE BARREL SAMPLE
UCS 6,250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
53.6 MOHS HARDNESS
ROCK QUALITY DESIGNATION (PERCENT)

GEOTECHNICAL NOTES

- GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MN. REFER TO THE DRAFT BORING LOG DATED 2/19/20 FOR MORE DETAILED SUBSURFACE INFORMATION.
- THE LETTER "N" TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS "NT" INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
- THE GEOTECHNICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.

TOPOGRAPHIC SURVEY NOTES

- TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
- NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
- ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.

DRILLED PATH NOTES

- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
- DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

PILOT HOLE TOLERANCES

THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.

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- ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
- ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
- CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

PROTECTION OF EXISTING FACILITIES

- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 - POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY – NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

**MP 22 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF KRAUSE CREEK
BY HORIZONTAL DIRECTIONAL DRILLING**

LOCATION: ASHLAND COUNTY, WISCONSIN		DRAWING LABEL	REVISION
DRAWN	CHECKED	SCALE	FOR D-SIZED PLOT
KWW	DMP	JSP	P1
DATE	01/10/20		

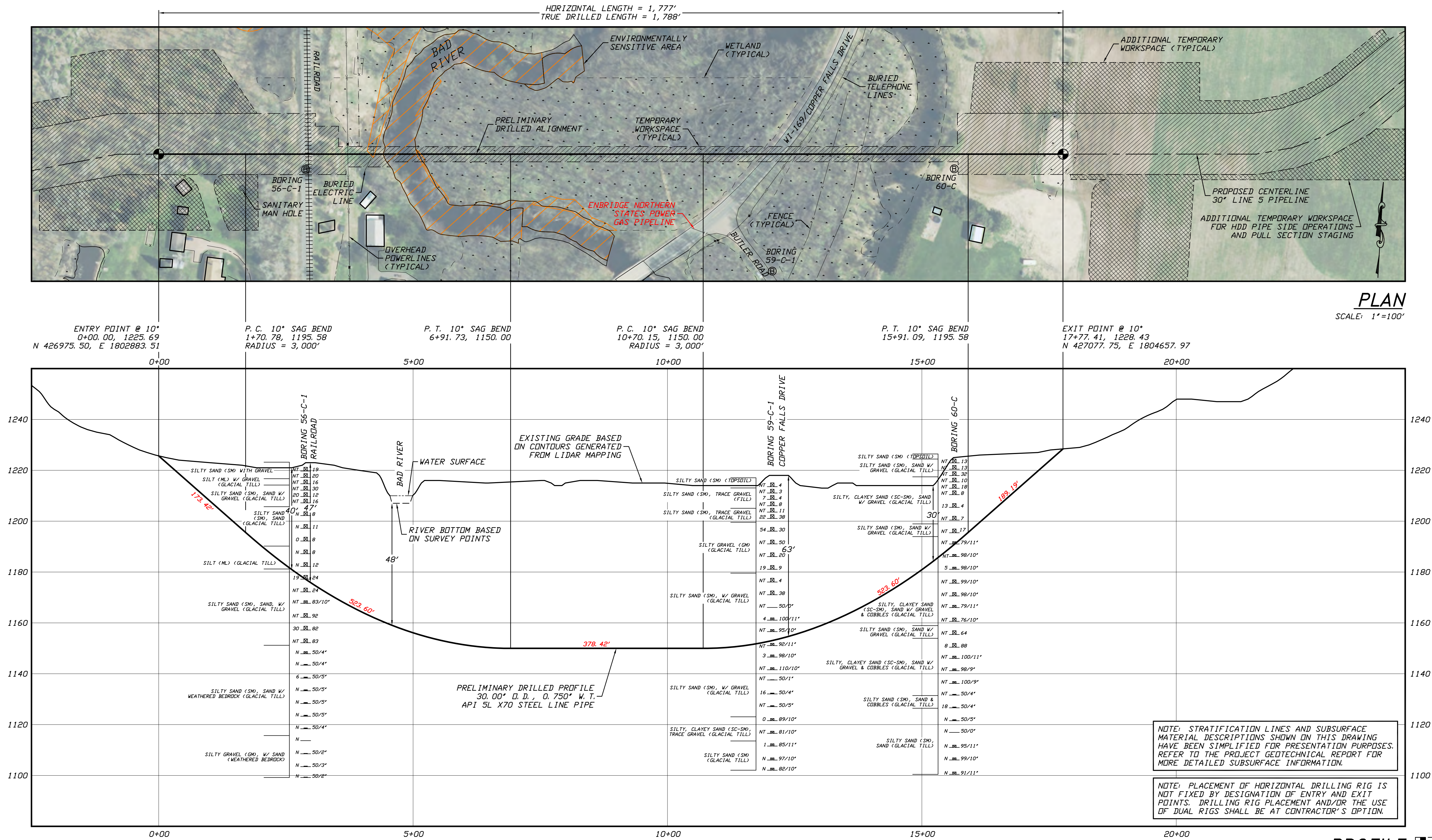
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GENERAL LEGEND

- DRILLED PATH ENTRY/EXIT POINT

GEOTECHNICAL LEGEND

- ⊙ BORING LOCATION

SPLIT SPOON SAMPLE

- 53.1 23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES
PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL

CORE BARREL SAMPLE

- 1 UCS 6,250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
53.1 6 MOHS HARDNESS
ROCK QUALITY DESIGNATION (PERCENT)

GEOTECHNICAL NOTES

- GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE SUBSURFACE INVESTIGATION REPORT DATED 5/27/20 FOR MORE DETAILED SUBSURFACE INFORMATION.
- THE LETTER "N" TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS "NT" INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
- THE GEOTECHNICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.

TOPOGRAPHIC SURVEY NOTES

- TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
- NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
- ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.

DRILLED PATH NOTES

- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
- DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

PILOT HOLE TOLERANCES

THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.

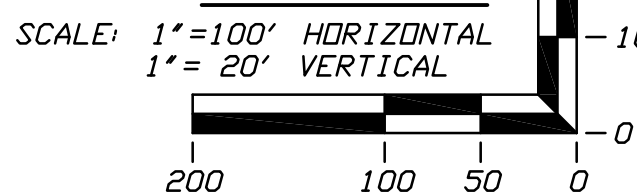
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PROTECTION OF EXISTING FACILITIES

CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.

- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
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- MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PROFILE



PRELIMINARY – NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 24 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF THE BAD RIVER
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: ASHLAND COUNTY, WISCONSIN		SCALE FOR D-SIZED PLOT		REVISION
DRAWN	DATE	CHECKED	APPROVED	DRAWING LABEL
DMP	01/10/20	CDS	JSP	BAD RIVER
				P4

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SHEET NUMBER

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Tulsa, Oklahoma 74114



LINE 5 PIPELINE PROJECT

**MP 38 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF THE POTATO RIVER
BY HORIZONTAL DIRECTIONAL DRILLING**

LOCATION: IRON COUNTY, WISCONSIN

DRAWN	DATE	CHECKED	APPROVED	SCALE	DRAWING LABEL	REVISION
KWW	01/14/20	DMP	JSP	SHOWN FOR D-SIZED PLOT	POTATO RIVER	P1

P1	07/24/20	ADD GEOTECH DATA & UPDATE BASE DATA	DMP	JSD
NO.	DATE	REVISION DESCRIPTION	BY	CHK'D APP.

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Consulting Engineers

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Suite 510
Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

SHEET NUMBER

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GENERAL LEGEND

- DRILLED PATH ENTRY/EXIT POINT

GEO TECHNICAL LEGEND

- ⑥ BORING LOCATION

SPLIT SPOON SAMPLE

- 53 23 ← PENETRATION RESISTANCE IN BLOWS PER FOOT
FOR A 140 POUND HAMMER FALLING 30 INCHES
↑ PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES
CONTAINING GRAVEL

CORE BARREL SAMPLE

- UCS 6,250 ← UNCONFINED COMPRESSIVE STRENGTH (PSI)
 53 — 6 ← MOHS HARDNESS
 ← ROCK QUALITY DESIGNATION (PERCENT)

GEO TECHNICAL NOTES

1. GEOTECHNICAL DATA PROVIDED BY BRAUN INTEREC, DULUTH, MINNESOTA, REFER TO THE PRELIMINARY BORING LOGS DATED APRIL & MAY 2020 FOR MORE DETAILED SUBSURFACE INFORMATION.
2. THE LETTER 'N' TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS 'NT' INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
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DRILLED PATH NOTES

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3. ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW
THE DESIGNED PROFILE
4. ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE
DESIGNED ALIGNMENT
5. CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON
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PROTECTION OF EXISTING FACILITIES

CONTRACTOR SHALL UNDERTAKE THE FOLLOWING
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