

Final Comprehensive Field Reconnaissance Report

Demicks Lake Pipeline Right-of-Way
McKenzie County, North Dakota

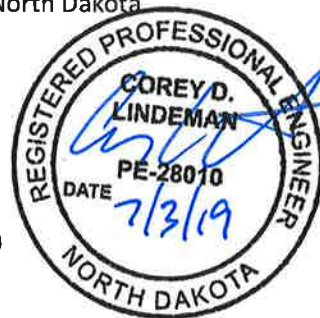
Prepared for

ONEOK, Inc.

Professional Certification:

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota

Corey D. Lindeman, PE
Staff Engineer
Registration Number: PE-28010
July 3, 2019



Project B1904193 (Activity 1.5)

Braun Intertec Corporation

July 3, 2019

Project B1904193 (Activity 1.5)

Mr. Blake Holland, Project Manager
ONEOK, Inc.
100 West 5th Street
Tulsa, OK 74103

Re: Comprehensive Field Reconnaissance Report
Demicks Lake Pipeline Right-of-Way
McKenzie County, North Dakota

Dear Mr. Holland:

We are pleased to present this Final Comprehensive Field Reconnaissance Report as a follow-up to our original Geotechnical Evaluation for the Demicks Lake Pipeline HDD Crossings in McKenzie County, North Dakota. As requested by Mr. Holland, Braun Intertec performed site reconnaissance at designated locations along the proposed Demicks Lake Pipeline right-of-way.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Corey Lindeman at 701.241.5029 or clindeman@braunintertec.com.

Sincerely,

BRAUN INTERTEC CORPORATION



Corey D. Lindeman, PE
Project Engineer



Charles D. Hubbard, PE
Principal Engineer/Geologist

C: Calvin Krall, PE (JTAM Engineering)
Christopher Rust (JTAM Engineering)

Table of Contents

Description	Page
A. Introduction.....	1
A.1. Project Description.....	1
A.2. Background.....	1
A.3. Document Review	1
A.4. Purpose.....	2
A.5. Scope of Services.....	3
B. Results	3
B.1. Desktop Study	3
B.2. Reconnaissance Results.....	4
B.2.a. MP29.3	4
B.2.b. MP30.4	4
B.2.c. MP38.1 and MP47.2	5
B.2.d. MP52.1	5
B.2.e. MP53.3	6
B.2.f. MP56.4	7
B.2.g. MP59.6	7
B.2.h. MP60.0	8
B.2.i. MP60.3	9
B.2.j. MP61.1 and ALT61.1	9
B.2.k. MP62.2 and ALT62.2	10
C. Construction Plan Review and Recommendations	11
C.1. Design Considerations.....	11
C.2. Open Cut Construction Recommendations.....	11
C.2.a. MP29.3	11
C.2.b. MP30.4	11
C.2.c. MP52.2	12
C.2.d. MP53.3	12
C.2.e. MP60.0	12
C.2.f. MP61.1	12
C.2.g. MP62.2	13
C.3. HDD Construction Recommendations	14
C.3.a. MP38.1 and MP47.2.....	14
C.3.b. MP56.4	14
C.3.c. MP59.6	14
C.3.d. MP60.3	14
D. Qualifications.....	15
D.1. Continuity of Professional Responsibility.....	15
D.1.a. Plan Review	15
D.1.b. Construction Observations and Testing	15
D.2. Use of Report.....	15
D.3. Standard of Care.....	15

Table of Contents (continued)

Appendix

Attachment 1 – Cross Section/Construction Plans for MP29.3

Attachment 2 – Cross Section/Construction Plans for MP30.4

Attachment 3 – Cross Section/Construction Plans for MP52.1

Attachment 4 – Cross Section/Construction Plans for MP53.3

Attachment 5 – Cross Section/Construction Plans for MP56.4

Attachment 6 – Cross Section/Construction Plans for MP59.6

Attachment 7 – Cross Section/Construction Plans for MP60.0

Attachment 8 – Cross Section/Construction Plans for MP60.3

Attachment 9 – Cross Section/Construction Plans for MP61.1

Attachment 10 – Cross Section/Construction Plans for MP62.2

Attachment 11 – Field Reconnaissance Report MP38.1 and MP47.2 HDD Sites

A. Introduction

A.1. Project Description

The Demicks Lake Pipeline (DLP) project, coordinated by ONEOK, Inc., includes the installation of approximately 75 miles of 20-inch-diameter pipe to transport Natural Gas Liquids (NGL) from the Demicks Lake Plant near Keene, North Dakota, to a tie-in location near the North Dakota/Montana border, east of Savage, Montana.

A.2. Background

This Comprehensive Field Reconnaissance Report builds on a May 30, 2019, Geotechnical Evaluation Report for ONEOK, Inc., prepared under this same project number, to help evaluate horizontal directional drilling (HDD) requirements for pipeline installation.

Subsequent to issuing our Geotechnical Evaluation Report, we were requested to perform a desktop study for, and site reconnaissance of, designated locations along the pipeline route that were identified by North Dakota Geological Survey (NDGS) as having the potential for future slope instability.

On June 18, 2019, we issued a report titled Field Reconnaissance Report MP38.1 and MP47.2 HDD Sites for two of the locations of interest – MP38.1 and MP47.2 – having an accelerated construction timeline. Our June 18, 2019, report is included in this report's Appendix.

A.3. Document Review

As part of our desktop study, and prior to performing our site reconnaissance, we reviewed the following documents to obtain information regarding historic and current conditions at the locations of interest:

- Aerial photographs of the site from Google Earth™ dated December 30, 1994 to July 3, 2017.
- North Dakota Geological Survey Landslide Maps, 24k Map Quadrangles: Tepee Buttes, Stocke Butte, Arnegard, Bear Butte, Moline School, Sather Lake, and Sheep Creek.
- Demicks Lake Pipeline Potential Geologically Unstable Areas Workbook received from JTAM Engineering on May 16, 2019.

- Horizontal Directional Drill (MP38.1) Cherry Creek, Two PEM Wetlands & Ephemeral Stream M.P. 37.88 Demicks Lake Pipeline Index #10597 construction plans/diagram dated and provided by JTAM Engineering on June 14, 2019.
- Horizontal Directional Drill (MP47.2) Two PEM Wetlands W-18042D-005 and W-18042D-004 M.P. 47.21 Demicks Lake Pipeline Index #10597 construction plans/diagram dated and provided by JTAM Engineering on June 14, 2019.
- Horizontal Directional Drill Branch of Bennie Peer Creek M.P. 60.38 Demicks Lake Pipeline Index #10597 (document OPL008JTAM-MP-20-028 dated June 28, 2019) provided by JTAM Engineering on July 2, 2019.
- Open cut construction plan/diagram for MP29.3 (document OPL008JTAM-MP-88-017 dated June 14, 2019) provided by JTAM Engineering on June 21, 2019.
- Open cut construction plan/diagram for MP30.4 (document OPL008JTAM-MP-88-018 dated June 14, 2019) provided by JTAM Engineering on June 21, 2019.
- Open cut construction plan/diagram for MP52.1 (document OPL008JTAM-MP-88-019 dated June 14, 2019) provided by JTAM Engineering on June 21, 2019.
- Open cut construction plan/diagram for MP53.3 (document OPL008JTAM-MP-88-020 dated June 14, 2019) provided by JTAM Engineering on June 21, 2019.
- Open cut construction plan/diagram for MP60.0 (document OPL008JTAM-MP-88-021 dated June 14, 2019) provided by JTAM Engineering on June 21, 2019.
- Open cut construction plan/diagram for MP61.1 (document OPL008JTAM-MP-88-022 dated June 14, 2019) provided by JTAM Engineering on June 21, 2019.
- Open cut construction plan/diagram for MP62.2 (document OPL008JTAM-MP-88-023 dated June 14, 2019) provided by JTAM Engineering on June 21, 2019.
- Conversations with ONEOK's Blake Holland and JTAM Engineering's Christopher Rust and Calvin Krall, PE.

A.4. Purpose

The purpose of our Comprehensive Field Reconnaissance Report was two-fold: (1) to qualify the identified locations of interest relative to their potential exposure to geologic hazards, and (2) to determine what modifications (if any) to alignment orientation are needed to limit that exposure.

A.5. Scope of Services

We performed our scope of services for the project in accordance with our Change Order, provided to ONEOK on May 20, 2019, and authorized via email on May 29, 2019, to our original Proposal QTB098648, dated April 25, 2019.

Our desktop study included a review of the documents cited above, and the preliminary qualification of each location based on the presence of geologic hazards, potential difficulties with installation, and the need for further evaluation with exploratory borings, laboratory testing, and engineering analyses.

Our reconnaissance included visual observation, and written and photographic documentation of each installation location plus varying pipeline alignment lengths extending in either direction from the assigned locations. We documented topographic and visually apparent geologic conditions, and evidence of instability.

Finally, we reviewed construction plans and other construction documents displaying planned installation depths, topographic data, and/or cross-sections as prepared by JTAM Engineering. The results of this review, submitted under a second Change Order on June 7, 2019, and authorized on June 11, 2019, were used to develop recommendations or opinions regarding the impact on construction of confirmed or suspected geologic hazards.

B. Results

B.1. Desktop Study

Based on available aerial photography and USGS Landslide Hazard maps, we noted the potential for unstable conditions impacting the sites at MP38.1, MP56.4, MP59.6, and MP60.3 along the Demicks Lake Pipeline. The information gathered indicated either visible failures or various levels of land scarring within or nearby the pipeline right-of-way. The remaining locations appeared not to be impacted by unfavorable geologic conditions but all were scheduled for reconnaissance.

B.2. Reconnaissance Results

The following sections summarize the findings from our reconnaissance of the locations of interest. While our findings did not warrant further exploration and analysis of these locations, recommendations for alignment adjustments were developed.

B.2.a. MP29.3

The alignment at this location traverses a plateau overlooking an eroded bluff to the south and southwest. The bluff appeared to be stable and showed minimal signs of instability, which indicates little risk of issues related to construction of the pipeline. This section of the pipeline is planned to be installed with open cut methods.

Photograph 4: MP29.3

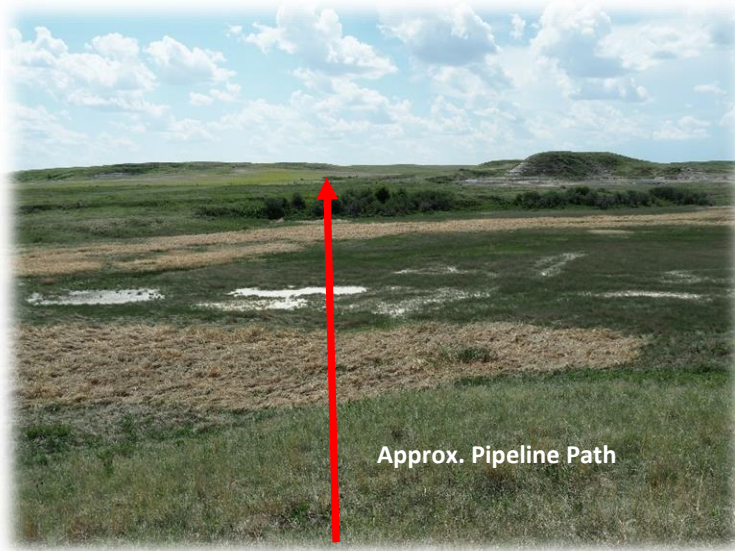


View facing northwest along alignment on high ground area.

B.2.b. MP30.4

This section of the pipeline is currently planned to be installed using open cut methods. Both banks appear to be stable, however the south bank contains patches of trees which made it difficult to observe the contours of the bank and determine if any unstable near-surface materials were present. Based on other sites, the presence of trees and dense shrubs as shown in Photograph 5 below generally indicates some deeper-seated failure (more than surface erosion which would be lessened by the tree and shrub roots) has occurred.

Photograph 5: MP30.4



View facing southwest along alignment on northern high ground area.

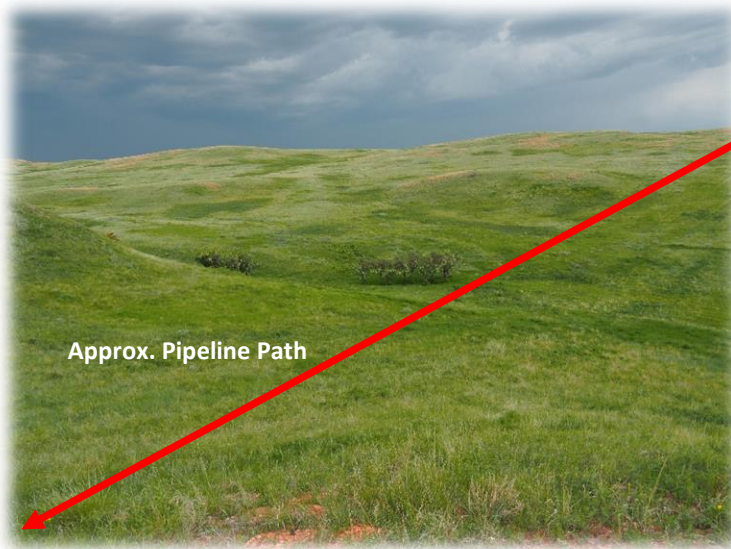
B.2.c. MP38.1 and MP47.2

Details for the sites at MP38.1 and MP47.2 were provided in our June 18, 2019, Field Reconnaissance Report MP38.1 and MP47.2 HDD Sites, which can be found in Attachment 11 of this report.

B.2.d. MP52.1

This site contains a relatively steep, grass-covered slope with a wetland area located west of the proposed alignment. This section of pipeline is planned to be installed with open cut techniques. As a precautionary measure, fencing may be installed to block highly sloping areas from being impacted during construction. The surrounding slopes showed no signs of past failure or instability near the pipeline alignment.

Photograph 8: MP52.1



View facing northwest across the ravine adjacent to the planned open cut alignment.

B.2.e. MP53.3

The pipeline section at this site is planned to be installed using open cut techniques between the roadway and existing slope. The slope contained no visible failures or instability.

Photograph 9: MP53.3

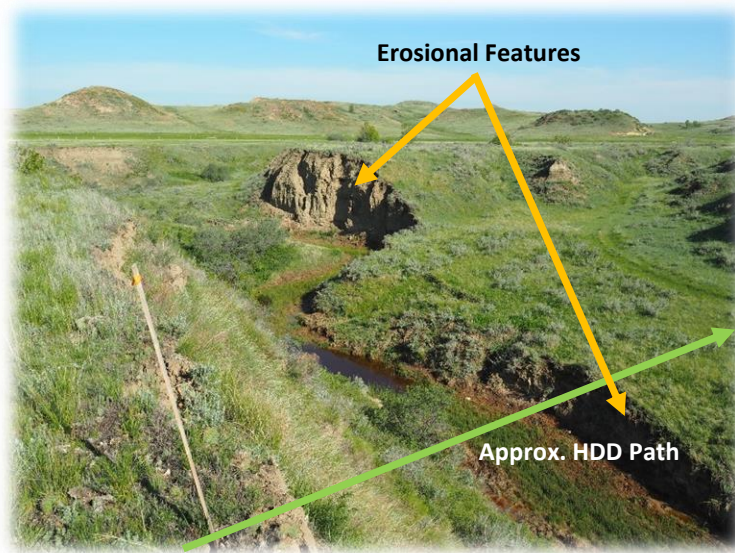


View facing north towards slope perpendicular to the planned open cut alignment.

B.2.f. MP56.4

This site is dominated by a deeply incised, meandering stream channel which shows evidence of large-scale slumping along its length. HDD installation techniques are already planned for this site due to the terrain.

Photograph 10: MP56.4



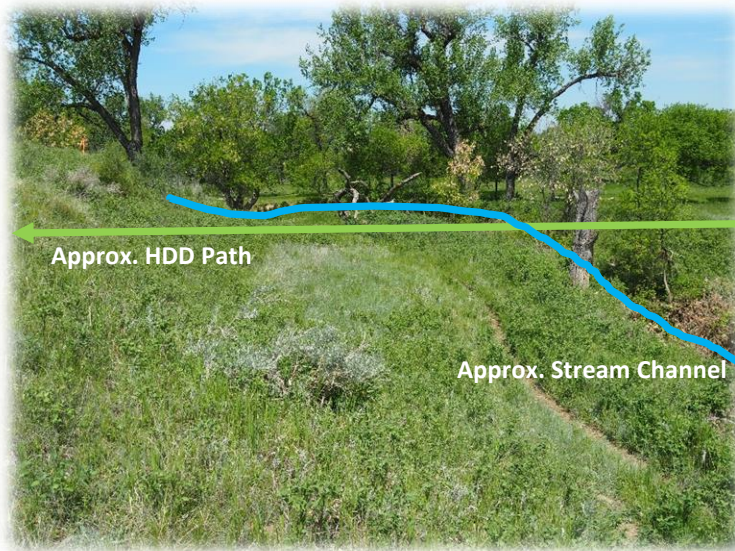
High ground area facing west/southwest oblique to HDD alignment.

B.2.g. MP59.6

The pipeline in this area crosses a steep-banked stream channel which, similar to MP56.4, appears to only flow during heavy rain events or spring melt. The remaining terrain includes various slope benches and what appear to be flood plain areas. This site is planned to be crossed with HDD installation.

The steep banks of the stream channel show signs of erosional damage, however, no deeper-seated evidence of instability was observed along the main slope located west/southwest of the stream channel. Photograph 11 below illustrates the approximate stream channel and proposed pipeline path.

Photograph 11: MP59.6



View facing northwest perpendicular to the planned HDD alignment and parallel with the slope.

B.2.h. MP60.0

This site traverses a relatively steep banked ravine approximately 150 feet wide (Photograph 12 below). The ravine hosts a dry stream bed which we suspect is subject only to seasonal flow or event flooding. Open cut installation perpendicular to the ravine banks is planned to minimize impacts to the existing slopes, and trench breakers will be employed during pipeline installation to further minimize erosion risk. There were no visible signs of failure or instability at this site.

Photograph 12: MP60.0

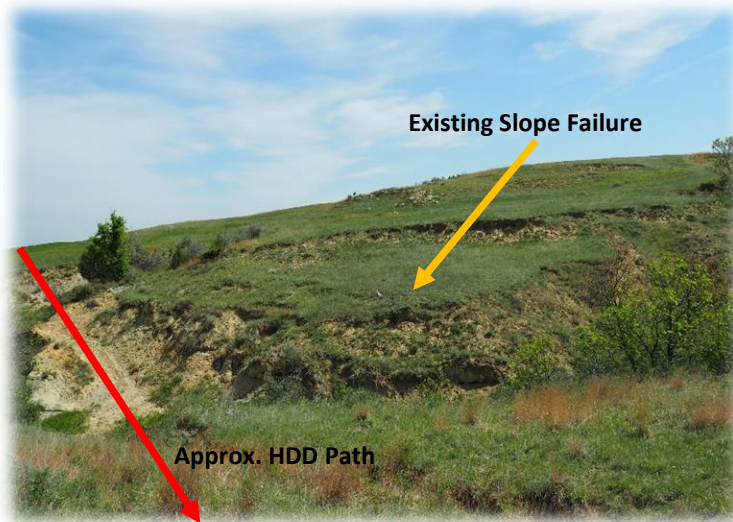


From the east high ground with view facing west across planned alignment.

B.2.i. MP60.3

This site is directly impacted by an active landslide. The proposed alignment for this section of pipeline traverses the landslide obliquely to contours, as illustrated in Photograph 13 below. The exposed soils at this site consist of silt/siltstone which is highly erodible. Based on aerial imagery obtained from Google Earth™, the failure seemingly occurred prior to approximately July 1995.

Photograph 13: MP60.3



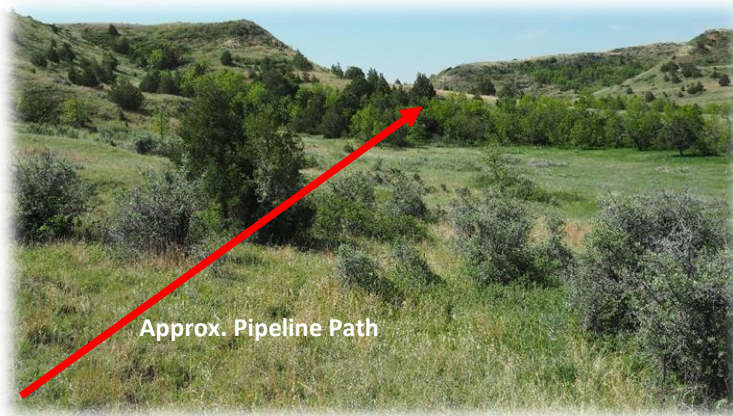
View facing east across the ravine parallel with the planned section alignment. Image also illustrates the existing failure observed at the site.

Based on the existing slope geometry, the failure surface appears to rise from the toe of the ravine bank (versus descending beneath the ravine/channel bottom) along an undetermined profile. This ravine, although dry at the time of our fieldwork, may experience flow during discrete rain events or spring melt. To avoid the landslide, HDD installation techniques are planned for this site.

B.2.j. MP61.1 and ALT61.1

The alignment for this section of the pipeline is elevated and trends along contours above a northeast to southwest oriented valley. Photograph 14 below illustrates the approximate path of the alignment as it proceeds toward the southwest. An alternate route is available that would offset the pipeline from the valley's east side (shown in the photo) to its west side. Both routes plan for open cut installation techniques. The valley slopes did not reveal unstable conditions.

Photograph 14: MP61.1

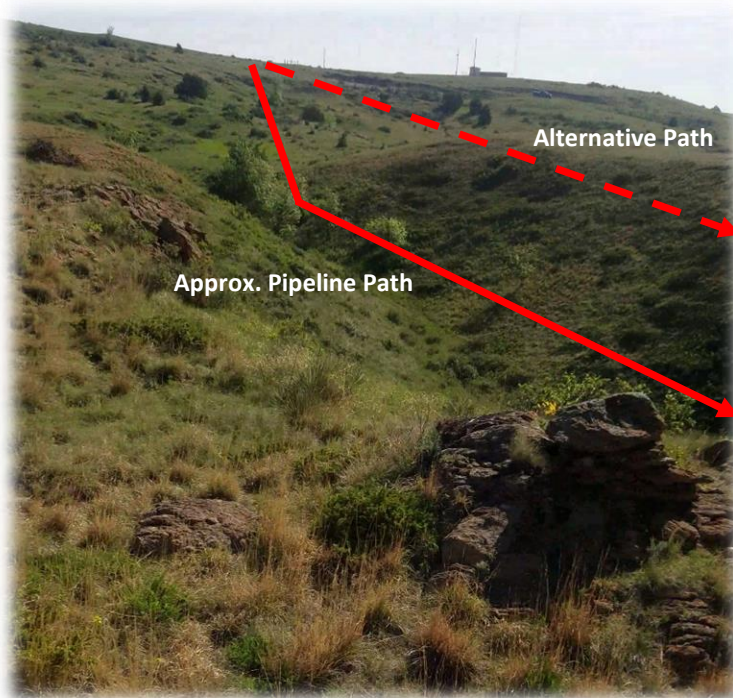


View facing south/southwest parallel with the valley and the planned open cut alignment.

B.2.k. MP62.2 and ALT62.2

This site area is traversed by alternating steep valleys and ridges. Photograph 15 below illustrates the approximate planned alignment for the open cut installation for this site. The alternative route is similar, but would be further up the hill to the east while still remaining in the PSC corridor. There were no signs of slope instability within the alignment in this area.

Photograph 15: MP62.2/ALT62.2



Elevated view facing north/northeast across the ravine adjacent to the planned open cut alignment.

C. Construction Plan Review and Recommendations

C.1. Design Considerations

Table 1 below indicates the planned installation technique for each location of interest (and alternate where applicable), and provides details regarding maximum/minimum elevations in the area, minimum pipe cover thickness for open cut, and minimum depth below the lowest elevation for HDD installation.

Table 1: Proposed Pipeline Installation Details

Site Location	Planned Installation Technique	Highest Nearby Elevation, ft*	Lowest Nearby Elevation, ft*	Open Cut Min. Pipe Cover Thickness, ft	HDD Min. Depth Below Low Points, ft
MP29.3	Open Cut	2,224	2,203	4	--
MP30.4	Open Cut	2,199	2,179	4	--
MP38.1	HDD	2,370	2,237	--	25
MP47.2	HDD	2,394	2,326	--	20
MP52.2	Open Cut	2,510	2,403	4	--
MP53.3	Open Cut	2,436	2,378	4	--
MP56.4	HDD	2,310	2,208	--	25
MP59.6	HDD	2,190	2,098	--	20
MP60.0	Open Cut	2,186	2,120	4	--
MP60.3	HDD	2,182	2,142	--	28
MP61.1	Open Cut	2,391	2,240	4	--
MP62.2	Open Cut	2,441	2,334	4	--

*Elevations obtained from construction information/diagrams/Lidar data and were rounded to the nearest foot.

C.2. Open Cut Construction Recommendations

C.2.a. MP29.3

Based on our field observations, and the construction information provided, there is little concern regarding slope instability for open cut installation of this segment of pipeline.

C.2.b. MP30.4

This area illustrated little evidence of slope instability, so open cut installation techniques may, in our opinion, proceed based on the planned soil cover of 4 feet.

C.2.c. MP52.2

Based on our field observations and construction information provided, there is little concern regarding slope instability due to open cut construction installation techniques at this site location.

C.2.d. MP53.3

Based on our field observations and construction information provided, there is little concern regarding slope instability at this site. However, care should be taken to not excavate too steeply into the existing slope, which could cause an unstable situation. Although the native slope of the hill is approximately 2:1 (H:V), we recommend cut slopes, which are perpendicular to the hill slope, be maintained at 3:1 (H:V) or flatter during and after construction to minimize risk of destabilizing slopes during construction. As an option, benching may be performed instead of sloping during construction. We recommend establishing benches no taller than 4 feet.

C.2.e. MP60.0

Based on our field observations of the existing valley slopes and provided construction plan/diagram, there is little risk of inducing slope instability due to open cut installation techniques. As the exposed earth materials consisted largely of silt/siltstone, however, we recommend establishing cut slopes at 3:1 (H:V) or flatter.

C.2.f. MP61.1

Based on our field observations and construction information provided, there is little concern regarding slope instability at this site. However, similar to MP53.3, care should be taken to not excavate too steeply into the slope and create an unstable situation. Although the native slope of the valley is as steep as 1:1 (H:V) in some locations, we recommend benching the cut slopes to minimize risk of slope instability during construction. Each bench should be less than 4 feet in height. Figure 1 depicts the slope benching technique as described above. The local earth materials are again also highly erodible, warranting long-term slope protection.

Figure 1: MP61.1 Example Slope Construction

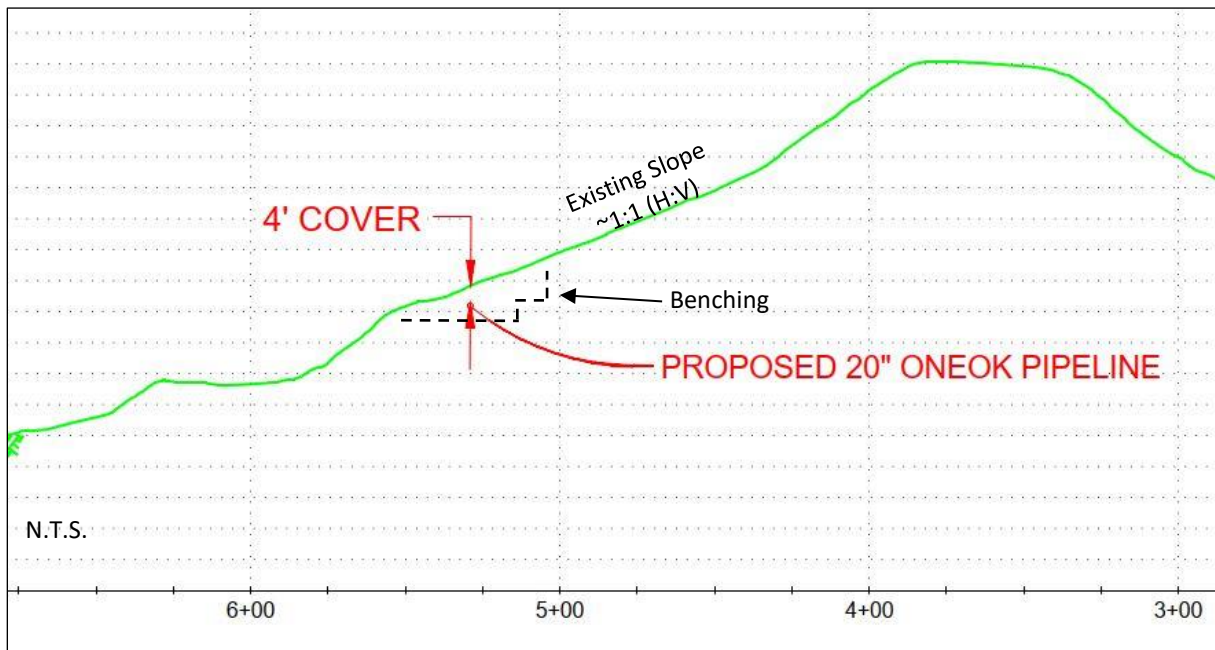


Figure obtained from JTAM Engineering Drawing No. OPL008JTAM-MP-88-022 dated June 14, 2019.

The alternative route for this area would be to install the alignment 50 to 100 feet uphill to the east. Since there were no visible signs of slope instability, and the slope is fairly steeper as one proceeds east, we recommend constructing the pipeline in its originally proposed location for ease of construction.

C.2.g. MP62.2

During our field reconnaissance, no signs of slope instability were observed along either slope of the valley. The existing west slope is approximately 2:1 (H:V) and spans from elevations 2,364 to 2,428, so benching or sloping would be needed during construction to minimize the risk of creating slope instability. As similar to MP61.1, benches should be no more than 4 feet in height and extend adequately into the slope as needed for construction of the pipeline. Finished slopes at this site should remain at 3:1 (H:V) or flatter.

We understand the alternative would be to shift the alignment east up to 50 feet to the flatter area at the bottom of the valley. Based the existing topography, it may be more suitable to move the pipeline east approximately 30 feet, near Station 4+46, to take advantage of the flatter terrain so benching/sloping would not be required, saving on construction effort and/or costs.

C.3. HDD Construction Recommendations

C.3.a. MP38.1 and MP47.2

Construction discussion and recommendations for sites at MP38.1 and MP47.2 were previously provided in the Field Reconnaissance Report MP38.1 and MP47.2 HDD Sites. Please refer to the Appendix for our findings.

C.3.b. MP56.4

Slopes overlooking the alignment at this location are particularly steep to the east and extend 40 or so feet above the streambed. The nearly east to west running portion of the planned HDD has a total planned length of approximately 1,504 feet. The minimum HDD installation depth below the streambed is planned to be approximately 25 feet. As with other HDD locations, we did not observe evidence of slope stability and see little risk to the HDD installation from geologic hazards.

C.3.c. MP59.6

The pipeline near MP59.6 is planned to extend horizontally from northeast to southwest for approximately 1,116 feet. The HDD is planned to cross Bennie Peer Creek. Based on the provided plans, the planned HDD installation depth below the potential geologically unstable area is approximately 29 feet, and a minimum depth of 20 feet is planned below the bottom of the channel. The depth of installation at this location is planned to be about 65 feet. Based on the minimum proposed depth and our field observations, there is little risk of slope instability due to the planned HDD pipeline installation.

C.3.d. MP60.3

The pipeline near MP60.3 is planned to extend from northeast to southwest directly north of the existing failure area. The horizontal distance of this section will be 947 feet will have a minimum depth of 28 1/2 feet below the bottom of the streambed. Since the existing failure appears to terminate at the bottom of the streambed and the entrance and exit locations of the HDD installation are more than 400 feet away from the failure zone, in our opinion, there is low risk of destabilizing the slope further due to HDD installation and a minimum depth of 28 1/2 feet below the lowest point is suitable.

D. Qualifications

D.1. Continuity of Professional Responsibility

D.1.a. Plan Review

We based this report on a limited amount of information, and a number of assumptions were made to help us develop these recommendations. Braun Intertec should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether the design was anticipated correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

D.1.b. Construction Observations and Testing

Braun Intertec recommends being retained to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

D.2. Use of Report

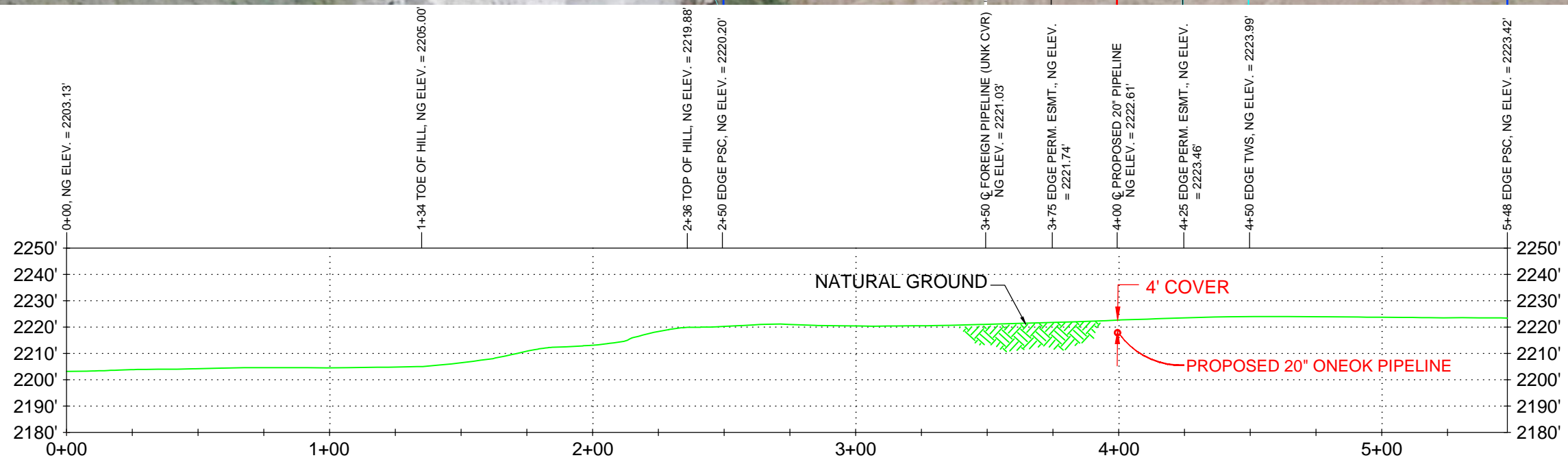
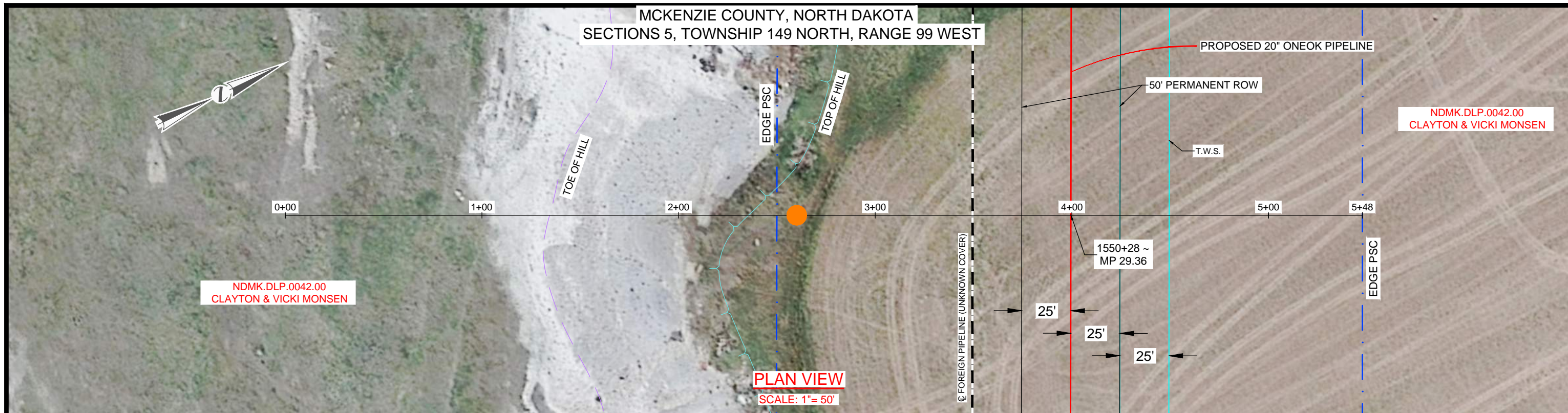
This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

D.3. Standard of Care

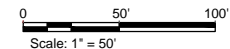
In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix

MCKENZIE COUNTY, NORTH DAKOTA
SECTIONS 5, TOWNSHIP 149 NORTH, RANGE 99 WEST

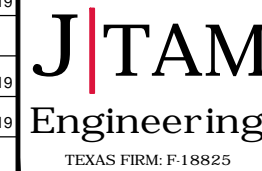


PROFILE VIEW
SCALE: 1"= 50' HORIZONTAL & VERTICAL
PROFILE CROSSING ROUTE @ MILE POST 29.36



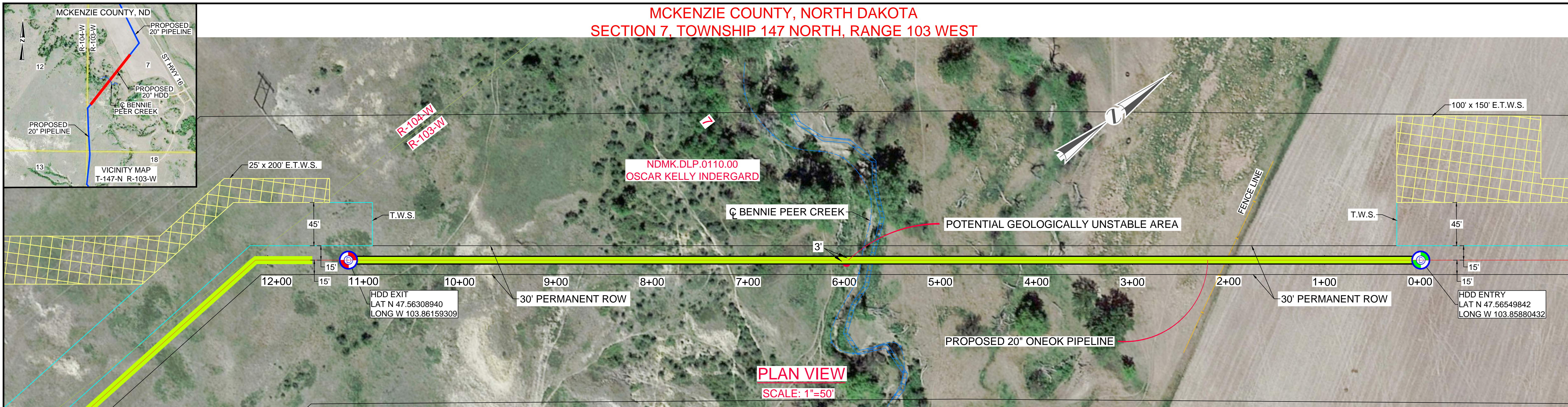
REFERENCE DRAWINGS		REVISIONS			
NUMBER	TITLE	NO.	DESCRIPTION	BY	DATE
0		0	ISSUED FOR GEOTECHNICAL EVALUATION	EP	6/14/19

DRAWN BY		DATE
EP		06/14/19
CHECKED BY		DATE
CK		06/14/19
ENGR. APPD.		DATE
CR		06/14/19
PROJ. MGR. APPD.		DATE
CLIENT APPD.		DATE

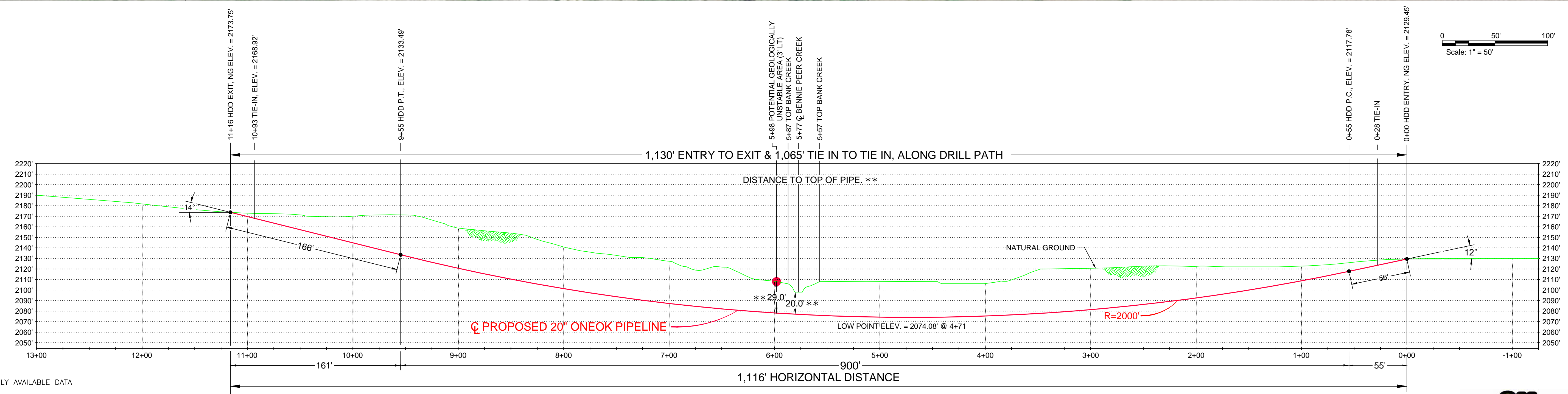


20" DEMICKS LAKE PIPELINE			
NATURAL GROUND PROFILE CROSSING ROUTE @ MILE POST 29.36 MCKENZIE COUNTY, NORTH DAKOTA			
SCALE 1"=50'	PROJECT NO. OPL-008	DRAWING NUMBER OPL008JTAM-MP-88-017	REV. 0

MCKENZIE COUNTY, NORTH DAKOTA
SECTION 7, TOWNSHIP 147 NORTH, RANGE 103 WEST



PLAN VIEW
SCALE: 1"=50'



PROFILE VIEW
SCALE: 1"=50' HORIZONTAL & VERTICAL
BENNIE PEER CREEK (EPHERMAL STREAM s-18042d-013)

- CONSTRUCTION NOTES:**
- The types, locations, sizes, and/or depths of existing underground utilities as shown on the improvement plans were obtained from sources of varying reliability. The contractor is cautioned that only actual excavation will reveal the types, extent, sizes, locations, and depths of such underground utilities. (A reasonable effort has been made to locate and delineate all known underground utilities.) The engineer, however, can assume no responsibility for the completeness or accuracy of the delineation of such underground utilities that might be encountered but which are not shown on these drawings.
 - The contractor shall ascertain and verify the true location and elevation of underground utility pipes and/or structures prior to the start of construction and locate and protect utility lines and structures whether shown or not. Also, the contractor shall notify the owners of utilities and/or structures concerned before starting work. Any underground facilities damaged by the contractor or contractor's agent during the course of work shall be replaced at contractor's own expense.
 - Minor adjustments required in the field at proposed pipeline locations due to conflicts with existing utilities shall be done with the approval of the client and the engineer without additional expenses to the client or the engineer.

NOTE:
IMAGE DATA DERIVED FROM PUBLICLY AVAILABLE DATA SOURCES.
ELEVATIONS ARE BASED ON THE SURVEY DATA FROM LWS & LIDAR DATA FROM GEODIGITAL.

PRODUCT:
NATURAL GAS LIQUID

CONSTRUCTION METHOD:
HORIZONTAL DIRECTIONAL DRILL (HDD)

PIPE SPECIFICATIONS:
20.000" OD X 0.375" WT, "API-5L" PSL-2, ERW, X-65, 14-16 MILS FBE & 30 MILS ARO QRL

MAOP:
1,480 PSIG

MAX ALLOWABLE PULL FORCE:
1,277,389 LBS = 639 TONS

2 HR PRE-TEST REQUIRED

ISSUED FOR CONSTRUCTION

DESIGN SPECIFICATIONS COMPLY WITH U.S. DOT TITLE 49 CFR 195: TRANSPORTATION OF HAZARDOUS LIQUIDS BY PIPELINE AND ASME B31.4

COORDINATE SYSTEMS NOTE:
ALL BEARINGS, DISTANCES AND COORDINATES ARE REFERENCED TO THE "UNIVERSAL TRANSVERSE MERCATOR COORDINATE SYSTEM" ZONE 13, NORTH AMERICAN DATUM OF 1983; U.S. SURVEY FEET.

MK	DATE	REVISIONS	BY	AP.	MK	DATE	REVISIONS	BY	AP.
A	06/21/19	ISSUED FOR INFORMATION	EP	CR					

NOTICE
This drawing has not been published and is the sole property of ONEOK BAKKEN PIPELINE, A SUBSIDIARY OF ONEOK, Tulsa Ok., and is loaned to the borrower for his confidential use only; and in consideration of the loan of this drawing the borrower promises and agrees that it shall not be reproduced, copied, loaned, or otherwise disposed of directly or indirectly, nor used for any purpose other than for which it is specifically furnished.

DWG. NO.	REFERENCE DRAWINGS

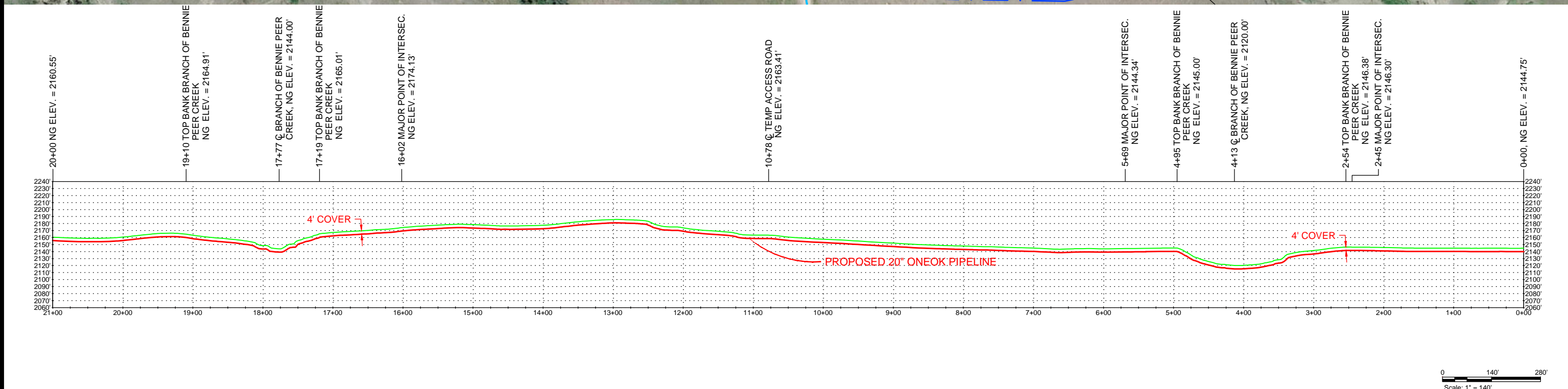
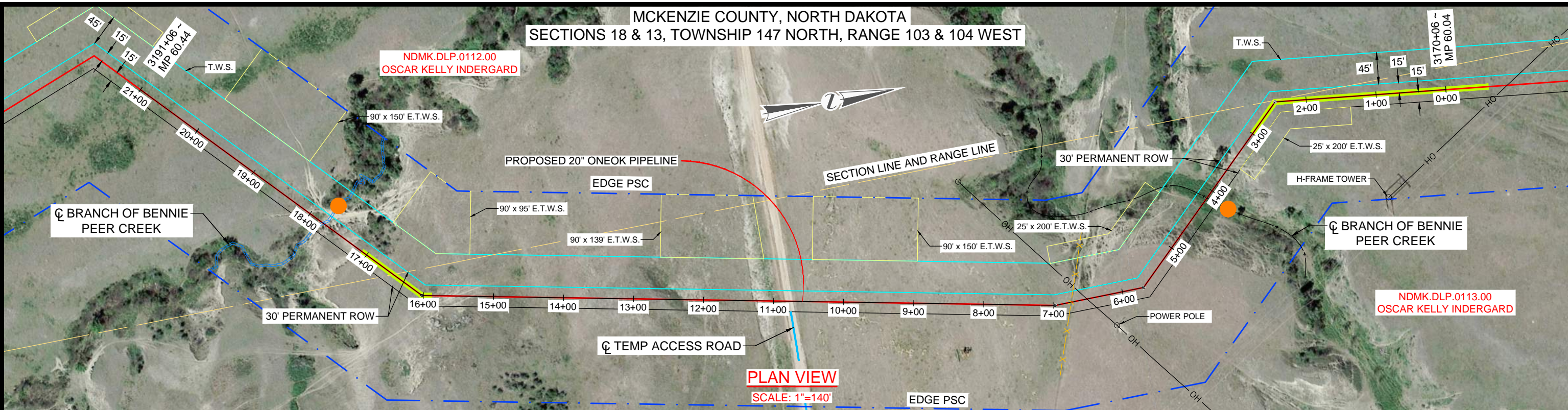


HORIZONTAL DIRECTIONAL DRILL BENNIE PEER CREEK M.P. 59.68 DEMICKS LAKE PIPELINE INDEX #10597			
DES.: EP	AFE#:	DATE: 06/21/19	
DR.: EP		DWG. NO.:	
CH.: CR	SCALE: NOTED		
AP.: CR	CAD#:		
EXHIBIT D			REV. A



Drawing name: C:\Projects\ONEOK\CP-008 Demicks Lake Pipeline\CA_Des\OB_Mapping\01_Const\01_Plan\TAM-MP-20-011 MP 59.68 Bennie Peer Creek Exh D.dwg Plotted on: Jun 21, 2019 - 8:27pm

MCKENZIE COUNTY, NORTH DAKOTA
 SECTIONS 18 & 13, TOWNSHIP 147 NORTH, RANGE 103 & 104 WEST

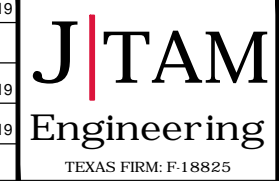


0 140' 280'
Scale: 1" = 140'



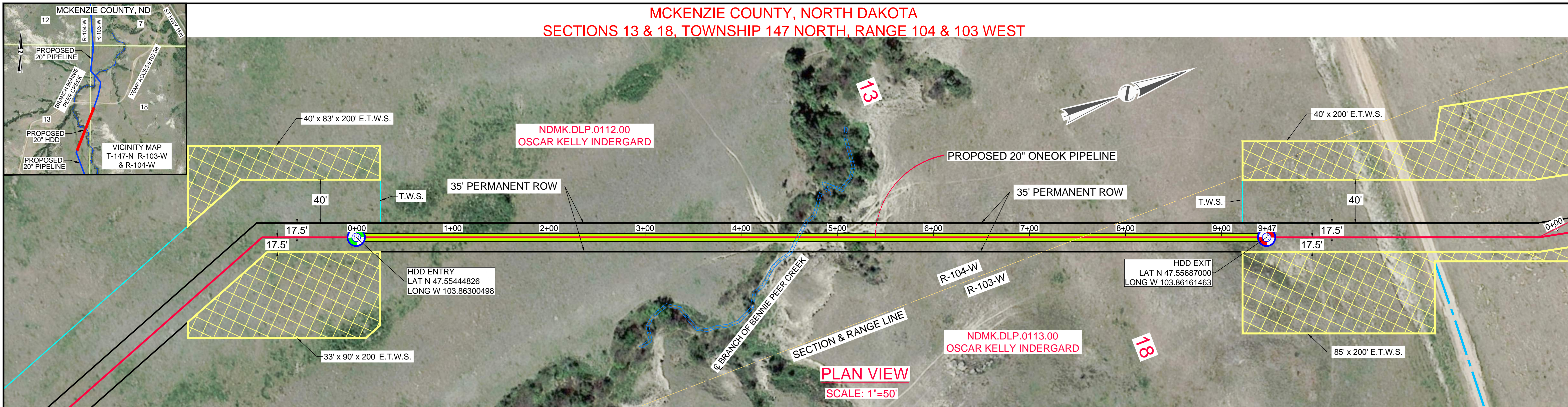
REFERENCE DRAWINGS		REVISIONS				
NUMBER	TITLE	NO.	DESCRIPTION	BY	CHKD.	DATE
0		0	ISSUED FOR GEOTECHNICAL EVALUATION	EP	CR	6/14/19

DRAWN BY		DATE
EP		06/14/19
CHECKED BY		DATE
CK		06/14/19
ENGR. APPD.		DATE
CR		06/14/19
PROJ. MGR. APPD.		DATE
CLIENT APPD.		DATE



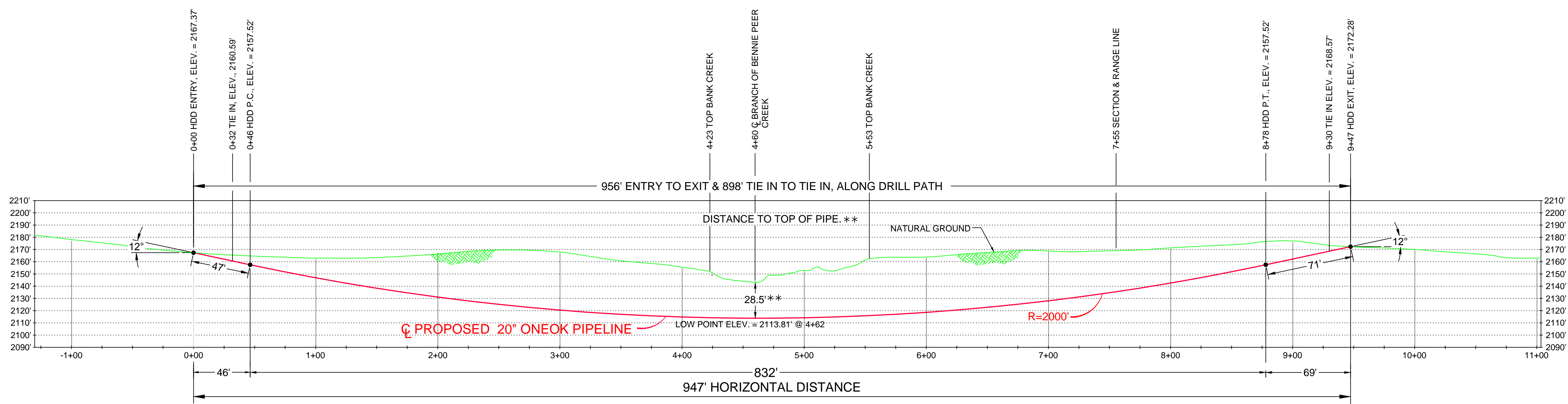
20" DEMICKS LAKE PIPELINE			
NATURAL GROUND PROFILE ALONG ROUTE @ MILE POST 60.2 MCKENZIE COUNTY, NORTH DAKOTA			
SCALE	PROJECT NO.	DRAWING NUMBER	REV.
1"=140'	OPL-008	OPL008JTAM-MP-88-021	0

MCKENZIE COUNTY, NORTH DAKOTA
SECTIONS 13 & 18, TOWNSHIP 147 NORTH, RANGE 104 & 103 WEST



CONSTRUCTION NOTES:

- The types, locations, sizes, and/or depths of existing underground utilities as shown on the improvement plans were obtained from sources of varying reliability. The contractor is cautioned that only actual excavation will reveal the types, extent, sizes, locations, and depths of such underground utilities. (A reasonable effort has been made to locate and delineate all known underground utilities.) The engineer, however, can assume no responsibility for the completeness or accuracy of the delineation of such underground utilities that might be encountered but which are not shown on these drawings.
- The contractor shall ascertain and verify the true location and elevation of underground utility pipes and/or structures prior to the start of construction and locate and protect utility lines and structures whether shown or not. Also, the contractor shall notify the owners of utilities and/or structures concerned before starting work. Any underground facilities damaged by the contractor or contractor's agent during the course of work shall be replaced at contractor's own expense.
- Minor adjustments required in the field at proposed pipeline locations due to conflicts with existing utilities shall be done with the approval of the client and the engineer without additional expenses to the client or the engineer.



PROFILE VIEW
SCALE: 1" = 50' HORIZONTAL & VERTICAL
BRANCH OF BENNIE PEER CREEK

NOTE:
IMAGE DATA DERIVED FROM PUBLICLY AVAILABLE DATA SOURCES.
ELEVATIONS ARE BASED ON THE SURVEY DATA FROM LWS & LIDAR DATA FROM GEODIGITAL.

PRODUCT:
NATURAL GAS LIQUID

CONSTRUCTION METHOD:
HORIZONTAL DIRECTIONAL DRILL (HDD)

PIPE SPECIFICATIONS:
20.000" OD X 0.375" WT, "API-5L" PSL-2, ERW, X-65, 14-16 MILS FBE & 30 MILS ARO QRL

MAOP:
1,480 PSIG

MAX ALLOWABLE PULL FORCE:
1,277,389 LBS = 639 TONS

DESIGN SPECIFICATIONS COMPLY WITH U.S. DOT
TITLE 49 CFR 195: TRANSPORTATION OF HAZARDOUS
LIQUIDS BY PIPELINE AND ASME B31.4

COORDINATE SYSTEMS NOTE:
ALL BEARINGS, DISTANCES AND COORDINATES ARE
REFERENCED TO THE "UNIVERSAL TRANSVERSE MERCATOR
COORDINATE SYSTEM" ZONE 13, NORTH AMERICAN DATUM
OF 1983; U.S. SURVEY FEET.

**ISSUED FOR
CONSTRUCTION**

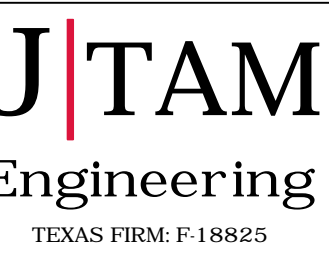
MK	DATE	REVISIONS	BY	AP.	MK	DATE	REVISIONS	BY	AP.
0	06/28/17	ISSUED FOR CONSTRUCTION	EP	CR					

NOTICE
This drawing has not been published and is the sole property of ONEOK BAKKEN PIPELINE, A SUBSIDIARY OF ONEOK, Tulsa Ok., and is loaned to the borrower for his confidential use only; and in consideration of the loan of this drawing the borrower promises and agrees that it shall not be reproduced, copied, loaned, or otherwise disposed of directly or indirectly, nor used for any purpose other than for which it is specifically furnished.

DWG. NO.	REFERENCE DRAWINGS

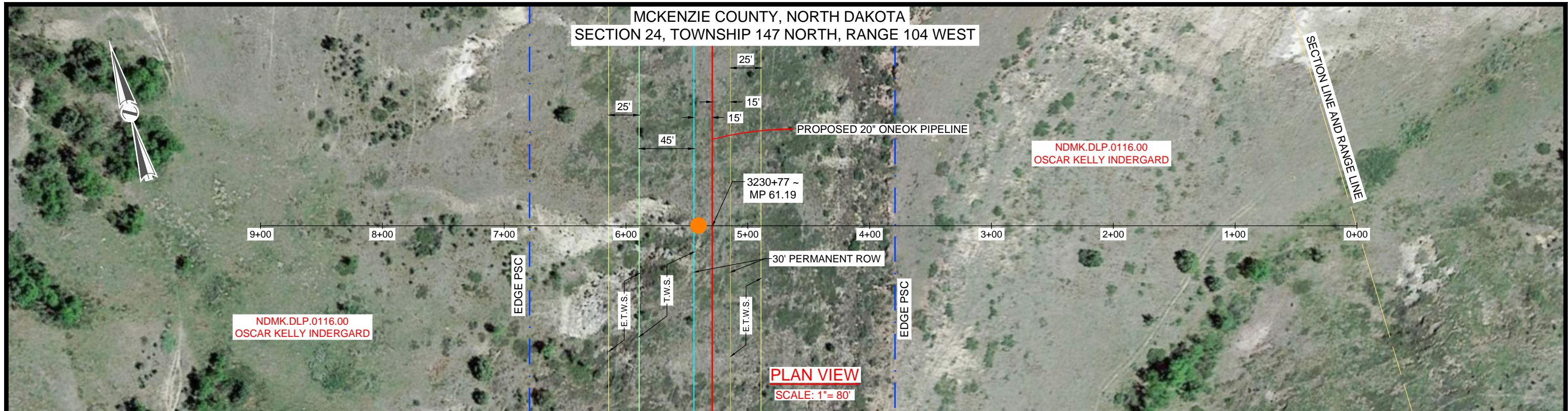


HORIZONTAL DIRECTIONAL DRILL BRANCH OF BENNIE PEER CREEK M.P. 60.38 DEMICKS LAKE PIPELINE INDEX #10597			
DES.: EP	AFE#:	DATE: 06/28/17	REV.
DR.: EP	DWG. NO.:		0
CH.: CR	SCALE: NOTED	OPL008JTAM-MP-20-028	
AP.: CR	CAD#:		

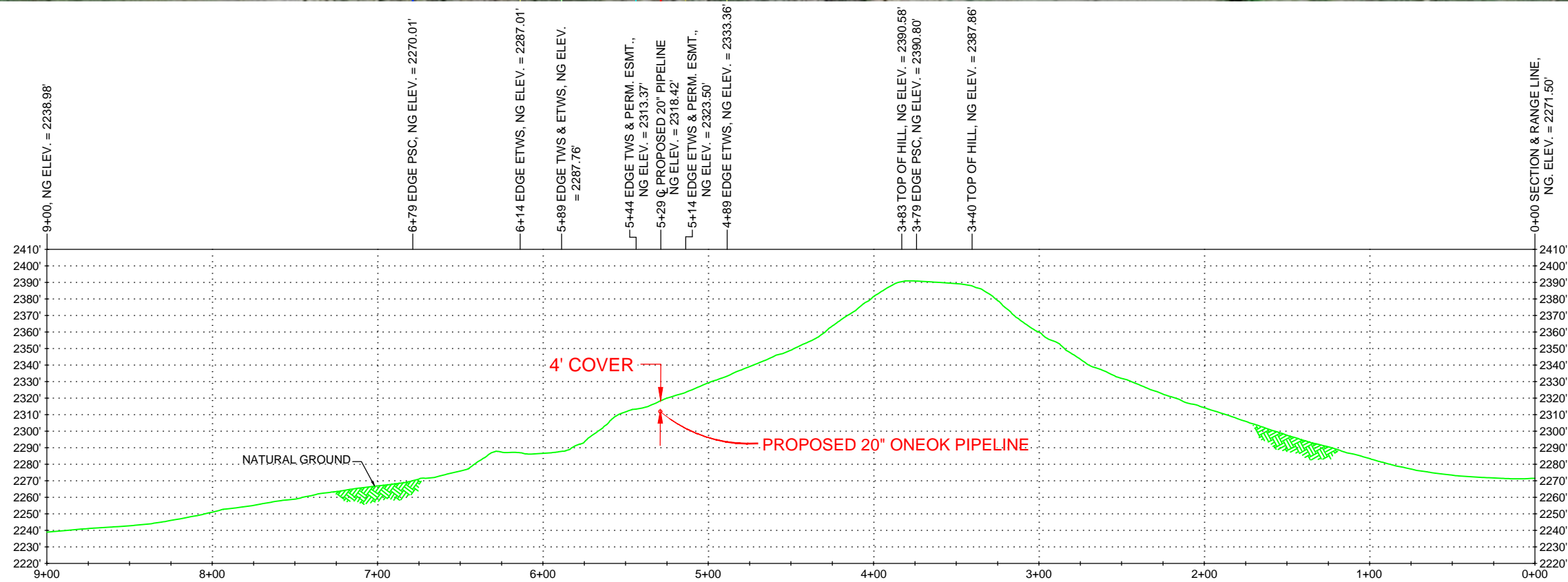


Drawing name: C:\Projects\ONEOK\CP-008 Demicks Lake Pipeline\04_Des\08_Mapping\01_Const\OPL008JTAM-MP-20-028 MP_60.38 Branch Bennie Peer Creek.dwg
Plotted on: Jun 27, 2019 - 8:23pm

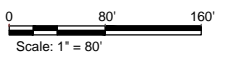
MCKENZIE COUNTY, NORTH DAKOTA
SECTION 24, TOWNSHIP 147 NORTH, RANGE 104 WEST



PLAN VIEW
SCALE: 1"= 80'



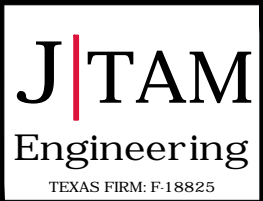
PROFILE VIEW
SCALE: 1"= 80' HORIZONTAL & VERTICAL
PROFILE CROSSING ROUTE @ MILE POST 61.19



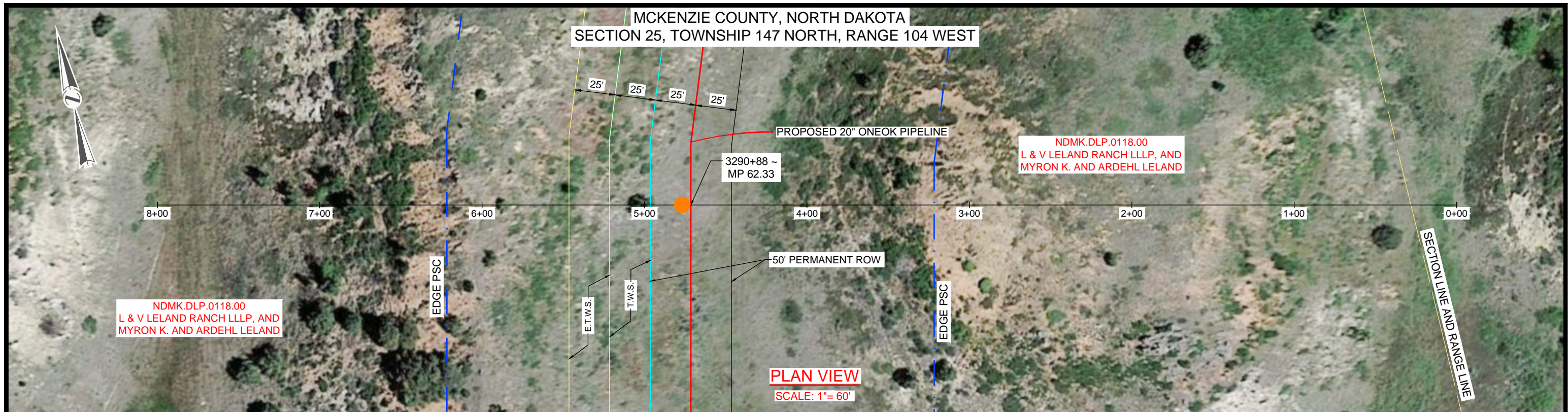
REFERENCE DRAWINGS	
NUMBER	TITLE

REVISIONS				
NO.	DESCRIPTION	BY	CHKD.	DATE
0	ISSUED FOR GEOTECHNICAL EVALUATION	EP	CR	6/14/19

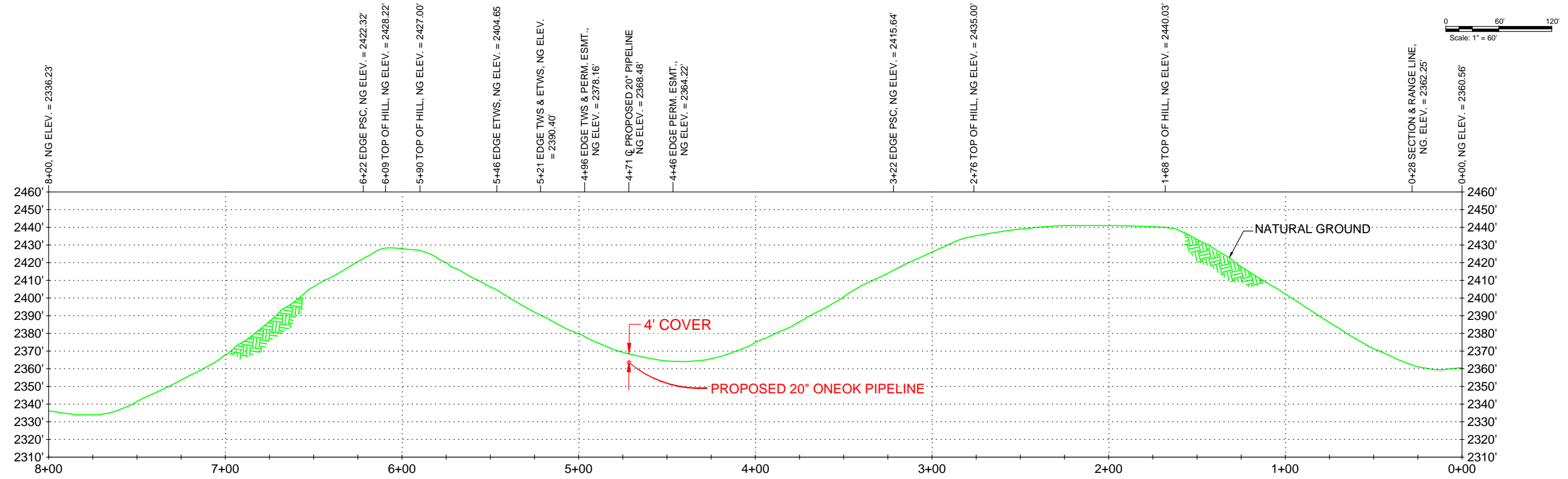
DRAWN BY	EP	DATE	06/14/19
CHECKED BY		DATE	
ENGR. APPD.	CK	DATE	06/14/19
PROJ. MGR. APPD.	CR	DATE	06/14/19
CLIENT APPD.		DATE	



20" DEMICKS LAKE PIPELINE			
NATURAL GROUND PROFILE CROSSING ROUTE @ MILE POST 61.19 MCKENZIE COUNTY, NORTH DAKOTA			
SCALE	PROJECT NO.	DRAWING NUMBER	REV.
1"=80'	OPL-008	OPL008JTAM-MP-88-022	0



PLAN VIEW
SCALE: 1"= 60'

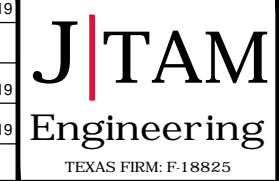


PROFILE VIEW
SCALE: 1"=60' HORIZONTAL & VERTICAL
PROFILE CROSSING ROUTE @ MILE POST 62.33



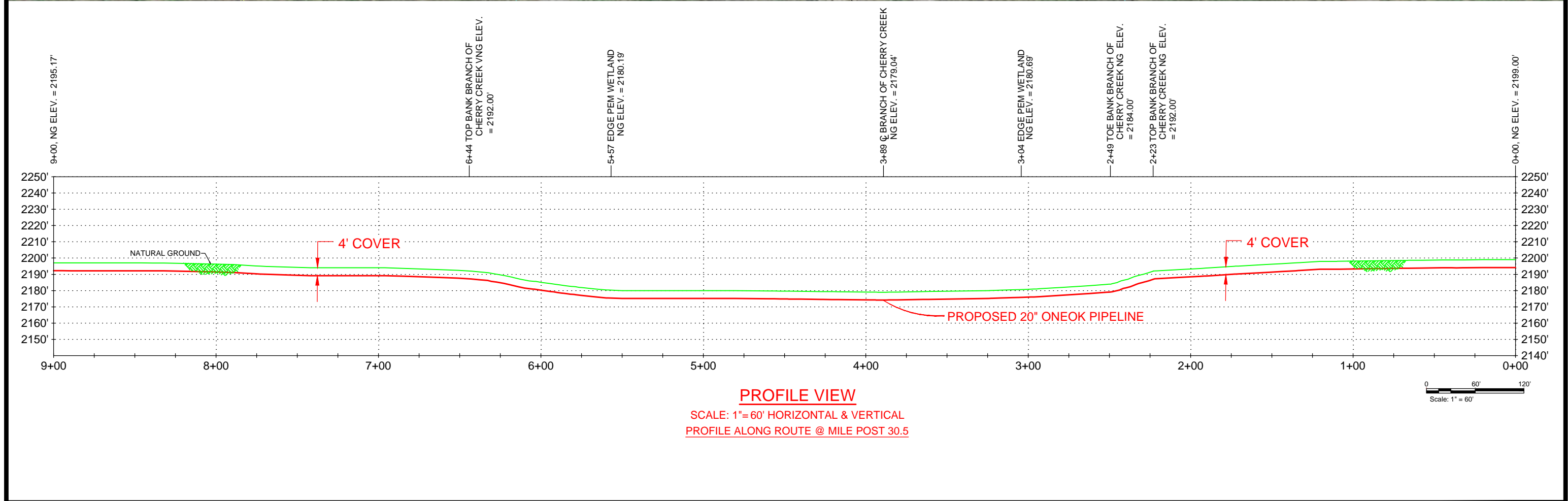
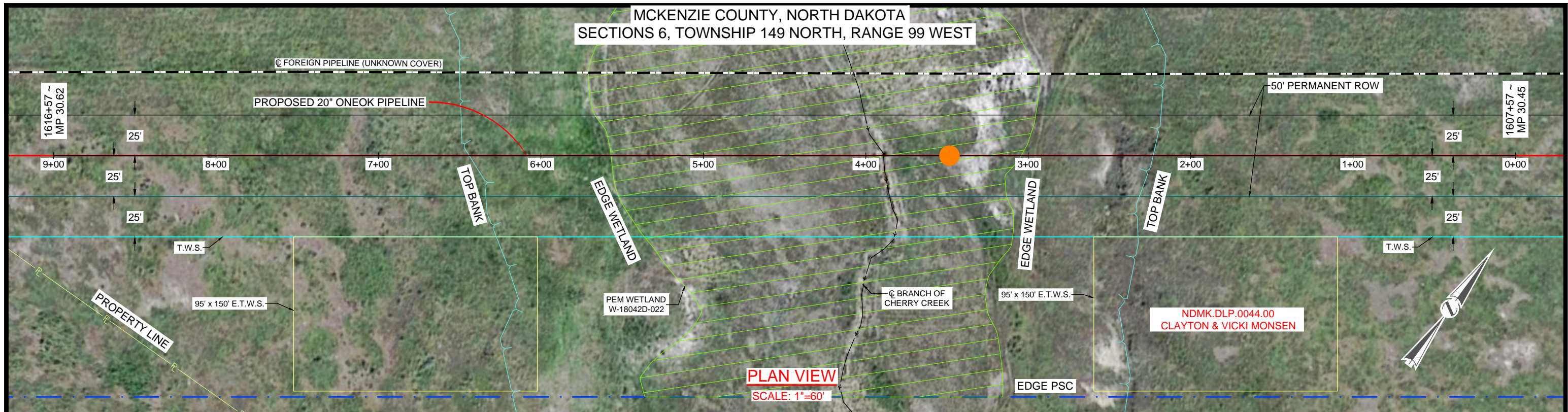
REFERENCE DRAWINGS		REVISIONS				
NUMBER	TITLE	NO.	DESCRIPTION	BY	CHKD.	DATE
0		0	ISSUED FOR GEOTECHNICAL EVALUATION	EP	CR	6/14/19

DRAWN BY	DATE
EP	06/14/19
CHECKED BY	DATE
CK	06/14/19
ENGR. APPD.	DATE
CR	06/14/19
PROJ. MGR. APPD.	DATE
CLIENT APPD.	DATE



20" DEMICKS LAKE PIPELINE			
NATURAL GROUND PROFILE CROSSING ROUTE @ MILE POST 62.33 MCKENZIE COUNTY, NORTH DAKOTA			
SCALE 1"=60'	PROJECT NO. OPL-008	DRAWING NUMBER OPL008JTAM-MP-88-023	REV. 0

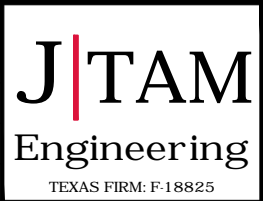
MCKENZIE COUNTY, NORTH DAKOTA
SECTIONS 6, TOWNSHIP 149 NORTH, RANGE 99 WEST



REFERENCE DRAWINGS	
NUMBER	TITLE

REVISIONS				
NO.	DESCRIPTION	BY	CHKD.	DATE
0	ISSUED FOR GEOTECHNICAL EVALUATION	EP	CR	6/14/19

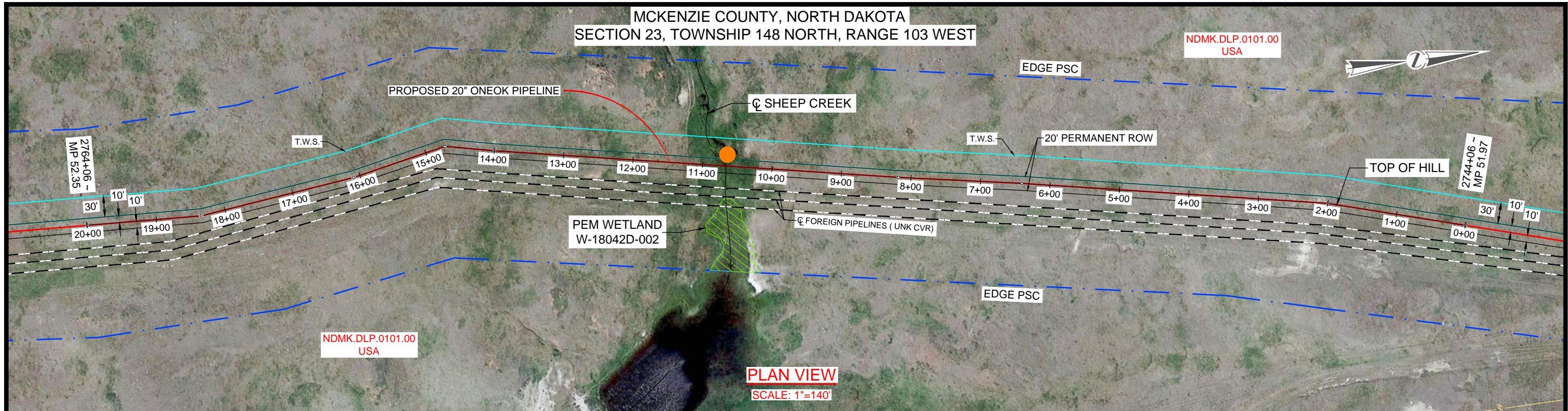
DRAWN BY	EP	DATE	06/14/19
CHECKED BY		DATE	
ENGR. APPD.	CK	DATE	06/14/19
PROJ. MGR. APPD.	CR	DATE	06/14/19
CLIENT APPD.		DATE	



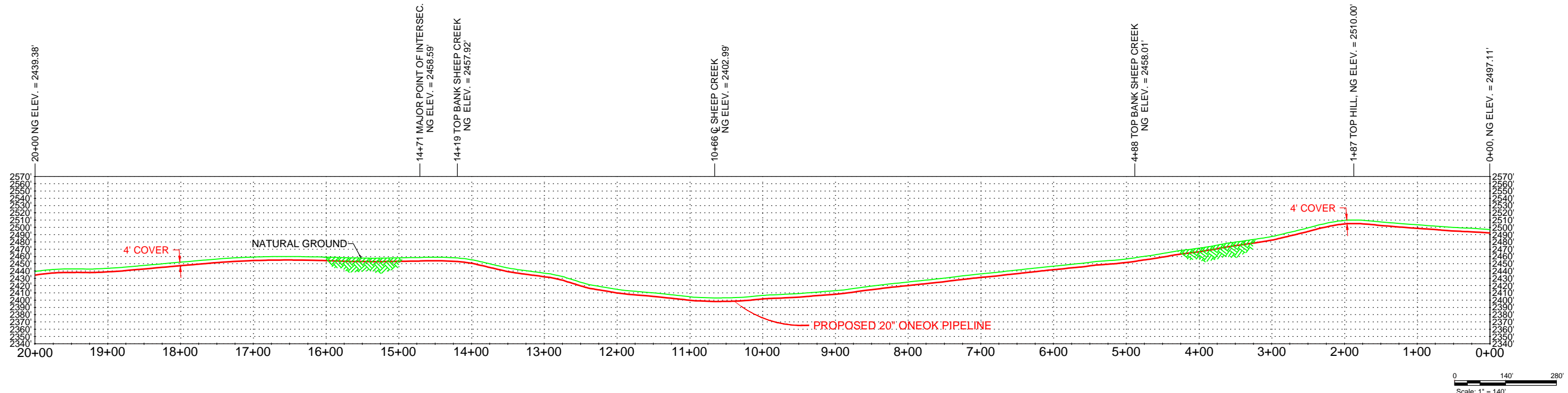
20" DEMICKS LAKE PIPELINE			
NATURAL GROUND PROFILE ALONG ROUTE @ MILE POST 30.5 MCKENZIE COUNTY, NORTH DAKOTA			
SCALE	PROJECT NO.	DRAWING NUMBER	REV.
1"=60'	OPL-008	OPL008JTAM-MP-88-018	0

MCKENZIE COUNTY, NORTH DAKOTA
SECTION 23, TOWNSHIP 148 NORTH, RANGE 103 WEST

NDMK.DLP.0101.00
USA



PLAN VIEW
SCALE: 1"=140'



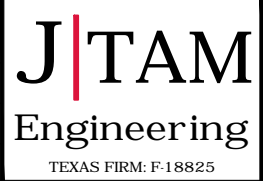
PROFILE VIEW
SCALE: 1"=140' HORIZONTAL & VERTICAL
PROFILE ALONG ROUTE @ MILE POST 52.2

Scale: 1" = 140'



REFERENCE DRAWINGS		REVISIONS			
NUMBER	TITLE	NO.	DESCRIPTION	BY	DATE
0		0	ISSUED FOR GEOTECHNICAL EVALUATION	EP	6/14/19

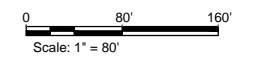
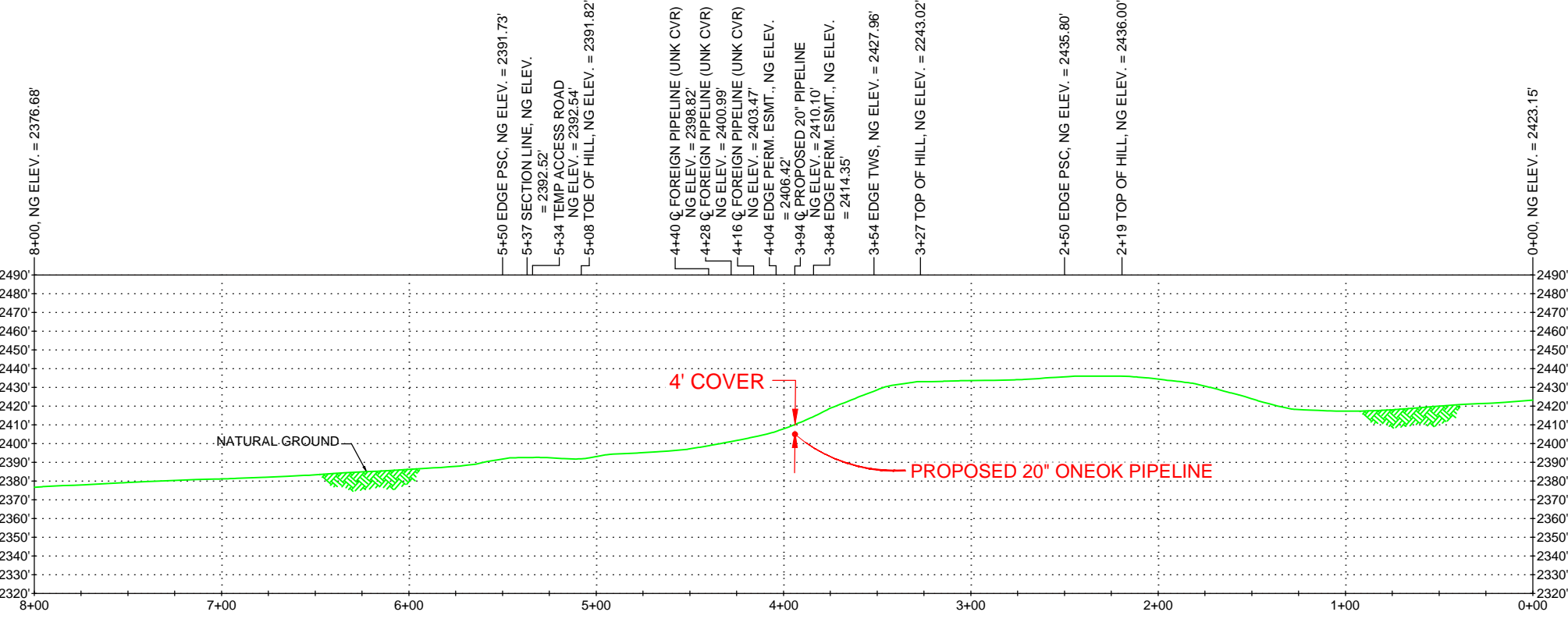
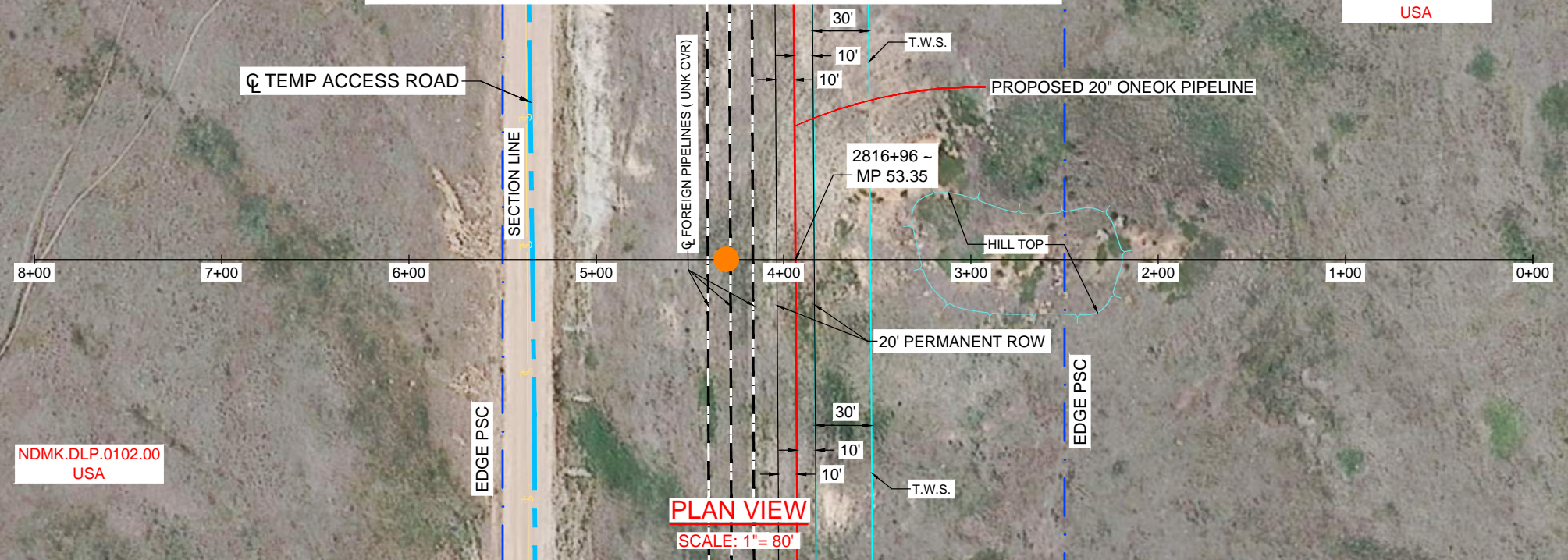
DRAWN BY	EP	DATE	06/14/19
CHECKED BY	CK	DATE	06/14/19
ENGR. APPD.	CR	DATE	06/14/19
PROJ. MGR. APPD.		DATE	
CLIENT APPD.		DATE	



20" DEMICKS LAKE PIPELINE			
NATURAL GROUND PROFILE ALONG ROUTE @ MILE POST 52.2 MCKENZIE COUNTY, NORTH DAKOTA			
SCALE	PROJECT NO.	DRAWING NUMBER	REV.
1"=140'	OPL-008	OPL008JTAM-MP-88-019	0

MCKENZIE COUNTY, NORTH DAKOTA
 SECTIONS 23 & 26, TOWNSHIP 148 NORTH, RANGE 103 WEST

NDMK.DLP.0101.00
 USA

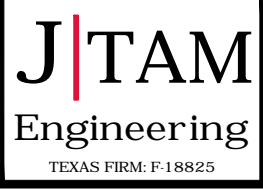


PROFILE VIEW
 SCALE: 1"=80' HORIZONTAL & VERTICAL
 PROFILE CROSSING ROUTE @ MILE POST 53.35



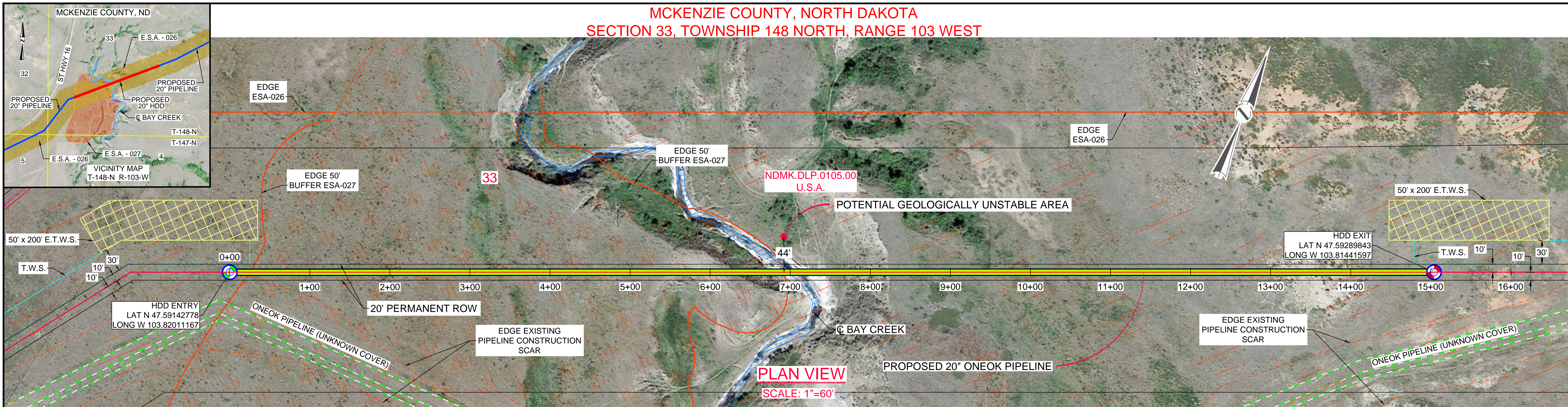
REFERENCE DRAWINGS		REVISIONS				
NUMBER	TITLE	NO.	DESCRIPTION	BY	CHKD.	DATE
0		0	ISSUED FOR GEOTECHNICAL EVALUATION	EP	CR	6/14/19

DRAWN BY	EP	DATE	06/14/19
CHECKED BY		DATE	
ENGR. APPD.	CK	DATE	06/14/19
PROJ. MGR. APPD.	CR	DATE	06/14/19
CLIENT APPD.		DATE	

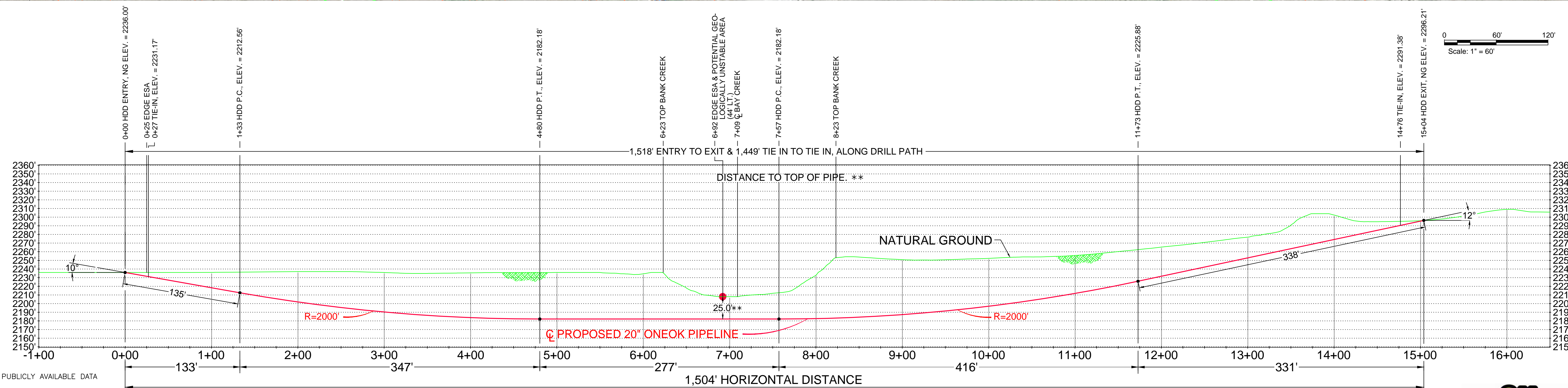


20" DEMICKS LAKE PIPELINE			
NATURAL GROUND PROFILE CROSSING ROUTE @ MILE POST 53.35 MCKENZIE COUNTY, NORTH DAKOTA			
SCALE	PROJECT NO.	DRAWING NUMBER	REV.
1"=80'	OPL-008	OPL008JTAM-MP-88-020	0

MCKENZIE COUNTY, NORTH DAKOTA
SECTION 33, TOWNSHIP 148 NORTH, RANGE 103 WEST



PLAN VIEW
SCALE: 1"=60'



PROFILE VIEW
SCALE: 1"=60' HORIZONTAL & VERTICAL
BAY CREEK (INTERMITTENT STREAM s-18024d-021) & ESA 026 AND ESA 027

- CONSTRUCTION NOTES:**
- The types, locations, sizes, and/or depths of existing underground utilities as shown on the improvement plans were obtained from sources of varying reliability. The contractor is cautioned that only actual excavation will reveal the types, extent, sizes, locations, and depths of such underground utilities. (A reasonable effort has been made to locate and delineate all known underground utilities.) The engineer, however, can assume no responsibility for the completeness or accuracy of the delineation of such underground utilities that might be encountered but which are not shown on these drawings.
 - The contractor shall ascertain and verify the true location and elevation of underground utility pipes and/or structures prior to the start of construction and locate and protect utility lines and structures whether shown or not. Also, the contractor shall notify the owners of utilities and/or structures concerned before starting work. Any underground facilities damaged by the contractor or contractor's agent during the course of work shall be replaced at contractor's own expense.
 - Minor adjustments required in the field at proposed pipeline locations due to conflicts with existing utilities shall be done with the approval of the client and the engineer without additional expenses to the client or the engineer.

2 HR PRE-TEST REQUIRED

ISSUED FOR CONSTRUCTION

NOTE:
IMAGE DATA DERIVED FROM PUBLICLY AVAILABLE DATA SOURCES.
ELEVATIONS ARE BASED ON THE SURVEY DATA FROM LWS & LIDAR DATA FROM GEODIGITAL.

PRODUCT:
NATURAL GAS LIQUID

CONSTRUCTION METHOD:
HORIZONTAL DIRECTIONAL DRILL (HDD)

PIPE SPECIFICATIONS:
20.000" OD X 0.375" WT, "API-5L" PSL-2, ERW, X-65, 14-16 MILS FBE & 30 MILS ARO QRL

MAOP:
1,480 PSIG

MAX ALLOWABLE PULL FORCE:
1,277,389 LBS = 639 TONS

DESIGN SPECIFICATIONS COMPLY WITH U.S. DOT TITLE 49 CFR 195: TRANSPORTATION OF HAZARDOUS LIQUIDS BY PIPELINE AND ASME B31.4

COORDINATE SYSTEMS NOTE:
ALL BEARINGS, DISTANCES AND COORDINATES ARE REFERENCED TO THE "UNIVERSAL TRANSVERSE MERCATOR COORDINATE SYSTEM" ZONE 13, NORTH AMERICAN DATUM OF 1983; U.S. SURVEY FEET.

NOTICE
This drawing has not been published and is the sole property of ONEOK BAKKEN PIPELINE, A SUBSIDIARY OF ONEOK, Tulsa Ok., and is loaned to the borrower for his confidential use only; and in consideration of the loan of this drawing the borrower promises and agrees that it shall not be reproduced, copied, loaned, or otherwise disposed of directly or indirectly, nor used for any purpose other than for which it is specifically furnished.

MK	DATE	REVISIONS	BY	AP.	MK	DATE	REVISIONS	BY	AP.
A	06/21/19	ISSUED FOR INFORMATION	EP	CR					

DWG. NO.	REFERENCE DRAWINGS

A SUBSIDIARY OF ONEOK

**HORIZONTAL DIRECTIONAL DRILL BAY CREEK
(I.S. S-18024D-021) & E.S.A.-026 & E.S.A.-027 M.P. 56.43
DEMICKS LAKE PIPELINE INDEX #10597**

DES.: EP	AFE#:	DATE: 06/21/19	REV.:
DR.: EP	DWG. NO.:		A
CH.: CR	SCALE: NOTED		
AP.: CR	CAD#:	EXHIBIT C	

Know what's below.
Call 811 before you dig.

TEXAS FIRM: F-18825

Drawing name: C:\Projects\ONEOK\CP-008 Demicks Lake Pipeline\CA_Des_OB_Mapping\01_Const\01_008\ITAM-MP-20-010 MP 56.43 Bay Creek Ech C.dwg
Printed on: Jun 21, 2019 - 5:40pm

June 18, 2019

Project B1904193 (Activity 1.5)

Mr. Blake Holland, Project Manager
ONEOK, Inc.
100 West 5th Street
Tulsa, OK 74103

Re: Field Reconnaissance Report MP 38.1 and MP47.2 HDD Sites
Demicks Lake Pipeline Right-of-Way
McKenzie County, North Dakota

Dear Mr. Holland:

As requested by Mr. Holland, Braun Intertec is presenting this Field Reconnaissance Report for horizontal directional drilling (HDD) locations MP38.1 and MP47.2. The content of this report will be included in our Final Comprehensive Field Reconnaissance Report.

A. Introduction

A.1. Project Description

The project consists of the installation of approximately 75 miles of new 20-inch-diameter pipeline to transport Natural Gas Liquids (NGL) from the Demicks Lake Plant near Keene, North Dakota to a tie-in location near the North Dakota/Montana border, east of Savage, Montana.

A.2. Purpose

As part of the original scope of work, we performed 6 exploratory soil borings at designated locations along the pipeline as instructed by JTAM Engineering. We then were requested to perform a desktop study and site reconnaissance of designated locations along the pipeline route that were identified by North Dakota Geological Survey (NDGS) as having the potential for future slope instability. We performed a reconnaissance of all such designated locations and will be providing a Comprehensive Field Reconnaissance Report containing information from our site reconnaissance, construction plans review, and recommendations. Two of the locations, MP38.1 and MP47.2, have an accelerated construction timeline, so this report contains our findings and recommendations for those specific locations.

A.3. Site Conditions and Desktop Review

We reviewed the following information in advance of our reconnaissance to obtain historical and current existing conditions at the sites:

- Aerial photographs of the site from Google Earth™ dated December 30, 1994 to June 14, 2017.
- North Dakota Geological Survey Landslide Maps, 24k Map Quadrangles: Bear Butte and Moline School.
- Demicks Lake Pipeline Potential Geologically Unstable Areas Workbook received from JTAM Engineering on May 16, 2019.
- Horizontal Directional Drill Cherry Creek, Two PEM Wetlands & Ephemeral Stream M.P. 37.88 Demicks Lake Pipeline Index #10597 construction plans/diagram dated and provided by JTAM Engineering on June 14, 2019.
- Horizontal Directional Drill Two PEM Wetlands W-18042D-005 and W-18042D-004 M.P. 47.21 Demicks Lake Pipeline Index #10597 construction plans/diagram dated and provided by JTAM Engineering on June 14, 2019.
- Conversations with ONEOK's Blake Holland and JTAM Engineering's Christopher Rust and Calvin Krall, PE.

A.4. Scope of Services

We performed our scope of services for the project in accordance with our Change Order, provided to ONEOK on May 20, 2019, and authorized via email on May 29, 2019, to our original Proposal QTB098648, dated April 25, 2019. The additional scope of services included performing a desktop study of the 15 site locations identified by NDGS as having the potential for future slope instability. The desktop work was performed prior to our site reconnaissance of each site.

In addition to our desktop study and site reconnaissance work, we were asked to review the construction plans, planned depths, topographic data, and/or cross-sections prepared by JTAM Engineering and make recommendations or comments regarding the impact on construction of confirmed or suspected geologic hazards. This work was submitted as a 2nd Change Order on June 7, 2019 and authorized on June 11, 2019.

B. Results

B.1. Desktop Study

Based on available aerial photography and USGS Landslide Hazard maps, we noted the potential for unstable conditions impacting only the site at MP38.1. The information gathered indicated either visible failures or various levels of land scarring within or nearby the pipeline right-of-way.

B.2. Reconnaissance Results

The following sections indicate the existing conditions and a brief discussion of our visit for the two accelerated sites which were labeled as being host to potential geologic hazards. Based on our site reconnaissance, additional soil borings or testing was not deemed warranted.

B.2.a. MP38.1

Horizontal directional drilling (HDD) installation techniques are planned for this section of the pipeline due to various deep valleys and generally rough terrain. Based on our nearby boring, the near surface geology consists mainly of a thin layer of topsoil underlain by Sentinel Butte Formation sandstone, siltstone, claystone, and lignite. As illustrated in Photograph 6 below, we observed some areas containing historic slump failures, generally on the north facing slopes in the valleys.

Photograph 6: MP38.1



View facing southwest slightly oblique to alignment illustrating existing slumping.

The slump failures appeared to be shallow in nature. Based on information provided by JTAM ENGINEERING, the HDD will be no less than 20 feet below the lowest point across this area. Due to the

planned HDD installation technique and depth, it is our opinion there is little risk of short- or long-term slope instability impacting the pipeline as it is proposed to be installed.

B.2.b. MP47.2

Due to an existing wetland area (yellow sign in Photograph 7 below), HDD installation is planned for this site as well. The elevated portion of the ground in the area is comprised of scoria, which was observed to be cascading down the slopes. The slopes in the area appeared to show no signs of failure, and since the site is planned for HDD installation of the pipeline, it is our opinion that there is little risk of instability at this site.

Photograph 7: MP47.2



View facing northeast oblique to alignment towards the outcropping bank.

C. Construction Plan Review and Recommendations

C.1. Design Considerations

As mentioned, the Demicks Lake Pipeline at the two noted locations will be constructed using HDD installation techniques. Table 1 below summarizes the maximum/minimum elevations in the area and planned depth below the lowest elevation for HDD installation.

Table 1: Proposed Pipeline Installation Details

Site Location	Highest Nearby Elevation, ft*	Lowest Nearby Elevation, ft*	HDD Min. Depth Below Low Points, ft
MP38.1	2,370	2,237	25
MP47.2	2,394	2,326	20

*Elevations obtained from construction information/diagrams and were rounded to the nearest foot.

C.2. HDD Construction Recommendations

C.2.a. MP38.1

This section of pipeline near MP38.1 extends horizontally from east to west for approximately 4,731 feet. Based on the construction plans, the minimum depth below low points (wetlands, valleys, etc.) is 25 feet. The pipeline in this area crosses two wetlands, Cherry Creek, and several eroded valleys. The geologically unstable area was identified between Stations 33+00 and 38+00. Based on our site reconnaissance in this area, there were several north/northeast facing slopes, particularly near Stations 16+00 (directly west of Cherry Creek) and 36+00 (within the 'unstable' area), which indicated slope instabilities. However, the slopes containing dense tree cover and indicate slump failures appeared to be shallow in nature and likely caused by historic erosion at the toe.

The planned depths below these areas' low points are about 28 feet (Station 16+00) and 81 feet (Station 36+00) below the existing ground surface. Based on the geologic conditions of these areas and the planned HDD depths, construction may proceed as planned. Geotechnically, the planned depth below wetland areas is sufficient.

C.2.b. MP47.2

The pipeline near MP47.2 is planned to extend horizontally from east to west for approximately 1,062 feet. Based on the provided plans, the minimum depth below the wetland and potentially geologically unstable area (lowest point) is approximately 20 feet. The area of concern was identified between Stations 4+00 and 5+00. Based on our site reconnaissance in this area, there were no signs of slope instability or distress other than varying degrees of erosion/degradation within the surface scoria stratum.

The planned depth below the lowest point in this area is about 20 feet (Station 4+78) below the existing ground surface. Since there were no signs of slope instabilities and the HDD depth is sufficient, construction may proceed as planned.

D. Qualifications

D.1. Continuity of Professional Responsibility

D.1.a. Plan Review

We based this report on a limited amount of information, and a number of assumptions were made to develop these recommendations. Braun Intertec should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether the design was

anticipated correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

D.1.b. Construction Observations and Testing

Braun Intertec recommends being retained to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

D.2. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

D.3. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

D.4. Remarks

This report should be attached to and considered a part of our Site Summary Report, which will be completed later.

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

If you have any questions about this report, please contact Corey Lindeman at 701.241.5029 or clindeman@braunintertec.com.

Sincerely,

BRAUN INTERTEC CORPORATION

Professional Certification:

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.



Charles Hubbard
Jun 18 2019 9:28 AM



Charles Hubbard
Jun 18 2019 9:28 AM

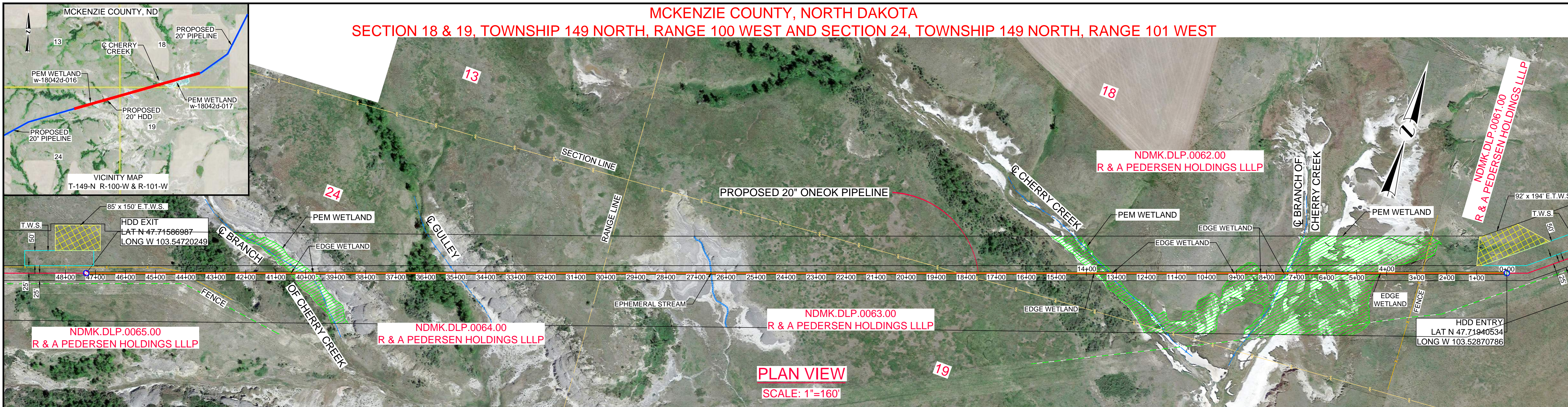
Charles D. Hubbard, PE
Principal Engineer/Geologist
Registration Number: PE-6168

Corey D. Lindeman, PE
Staff Engineer

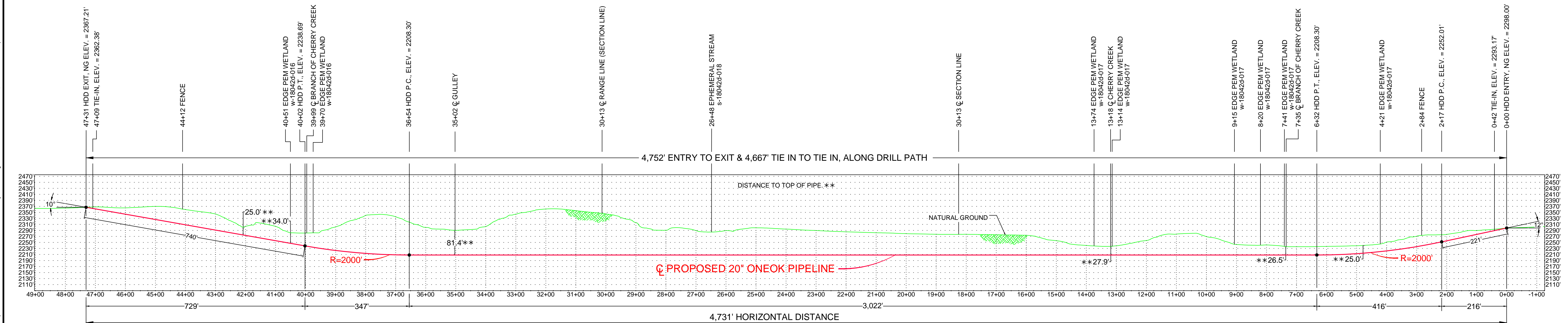
Attachments: Exhibit A – Cross Section/Construction Plans for MP38.1
Exhibit B – Cross Section/Construction Plans for MP47.2

C: Calvin Krall, PE (JTAM Engineering)
Christopher Rust (JTAM Engineering)

MCKENZIE COUNTY, NORTH DAKOTA
SECTION 18 & 19, TOWNSHIP 149 NORTH, RANGE 100 WEST AND SECTION 24, TOWNSHIP 149 NORTH, RANGE 101 WEST



PLAN VIEW
SCALE: 1"=160'



PROFILE VIEW

SCALE: 1"= 160' HORIZONTAL & VERTICAL

CHERRY CREEK
PEM WETLAND w-18042d-017
EPHEMERAL STREAM s-18042d-018
PEM WETLAND w-18042d-016

**2 HR PRE-TEST
REQUIRED**

**ISSUED FOR
CONSTRUCTION**

NOTE:
IMAGE DATA DERIVED FROM PUBLICLY AVAILABLE DATA SOURCES. ELEVATIONS ARE BASED ON THE SURVEY DATA FROM LWS & LIDAR DATA FROM GEODIGITAL.

PRODUCT:
NATURAL GAS LIQUID

CONSTRUCTION METHOD:
HORIZONTAL DIRECTIONAL DRILL (HDD)

PIPE SPECIFICATIONS:
20.000" OD X 0.375" WT, "API-5L" PSL-2, ERW, X-65, 14-16 MILS FBE & 30 MILS ARO QRL

MAOP:
1,480 PSIG

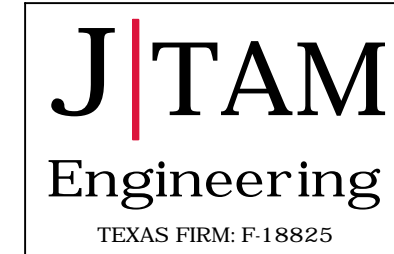
MAX ALLOWABLE PULL FORCE:
1,277,389 LBS = 639 TONS

DESIGN SPECIFICATIONS COMPLY WITH U.S. DOT TITLE 49 CFR 195: TRANSPORTATION OF HAZARDOUS LIQUIDS BY PIPELINE AND ASME B31.4

COORDINATE SYSTEMS NOTE:
ALL BEARINGS, DISTANCES AND COORDINATES ARE REFERENCED TO THE "UNIVERSAL TRANSVERSE MERCATOR COORDINATE SYSTEM" ZONE 13, NORTH AMERICAN DATUM OF 1983; U.S. SURVEY FEET.

- CONSTRUCTION NOTES:**
- The types, locations, sizes, and/or depths of existing underground utilities as shown on the improvement plans were obtained from sources of varying reliability. The contractor is cautioned that only actual excavation will reveal the types, extent, sizes, locations, and depths of such underground utilities. (A reasonable effort has been made to locate and delineate all known underground utilities.) The engineer, however, can assume no responsibility for the completeness or accuracy of the delineation of such underground utilities that might be encountered but which are not shown on these drawings.
 - The contractor shall ascertain and verify the true location and elevation of underground utility pipes and/or structures prior to the start of construction and locate and protect utility lines and structures whether shown or not. Also, the contractor shall notify the owners of utilities and/or structures concerned before starting work. Any underground facilities damaged by the contractor or contractor's agent during the course of work shall be replaced at contractor's own expense.
 - Minor adjustments required in the field at proposed pipeline locations due to conflicts with existing utilities shall be done with the approval of the client and the engineer without additional expenses to the client or the engineer.

Scale: 1" = 160'



MK	DATE	REVISIONS	BY	AP.	MK	DATE	REVISIONS	BY	AP.
1	04/19/19	ISSUED FOR CONSTRUCTION	EP	CR					
1	06/05/19	REVISED 4 HR TO 2 HR PRE-TEST	EP	CR					

MK	DATE	REVISIONS	BY	AP.

NOTICE
This drawing has not been published and is the sole property of ONEOK BAKKEN PIPELINE, A SUBSIDIARY OF ONEOK, Tulsa Ok., and is loaned to the borrower for his confidential use only; and in consideration of the loan of this drawing the borrower promises and agrees that it shall not be reproduced, copied, loaned, or otherwise disposed of directly or indirectly, nor used for any purpose other than for which it is specifically furnished.

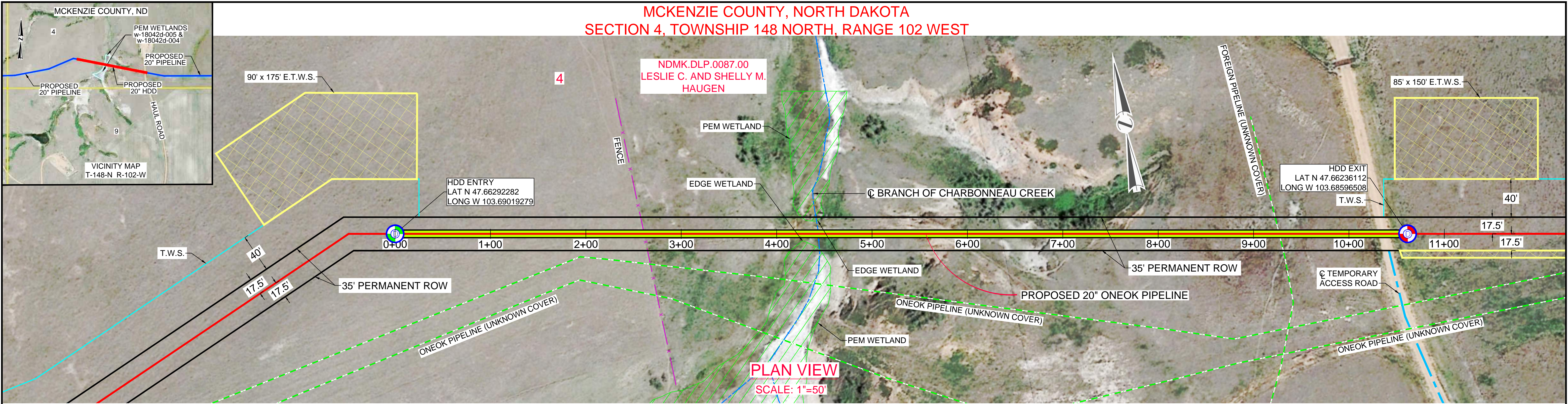
DWG. NO.	REFERENCE DRAWINGS



HORIZONTAL DIRECTIONAL DRILL CHERRY CREEK, TWO PEM WETLANDS & EPHEMERAL STREAM M.P. 37.88 DEMICKS LAKE PIPELINE INDEX #10597			
DES.: EP	AFE#:	DATE: 04/19/19	
DR.: EP		DWG. NO.:	
CH.: CR	SCALE: NOTED		
AP.: CR	CAD#:	OPL008JTAM-MP-20-006	REV. 1

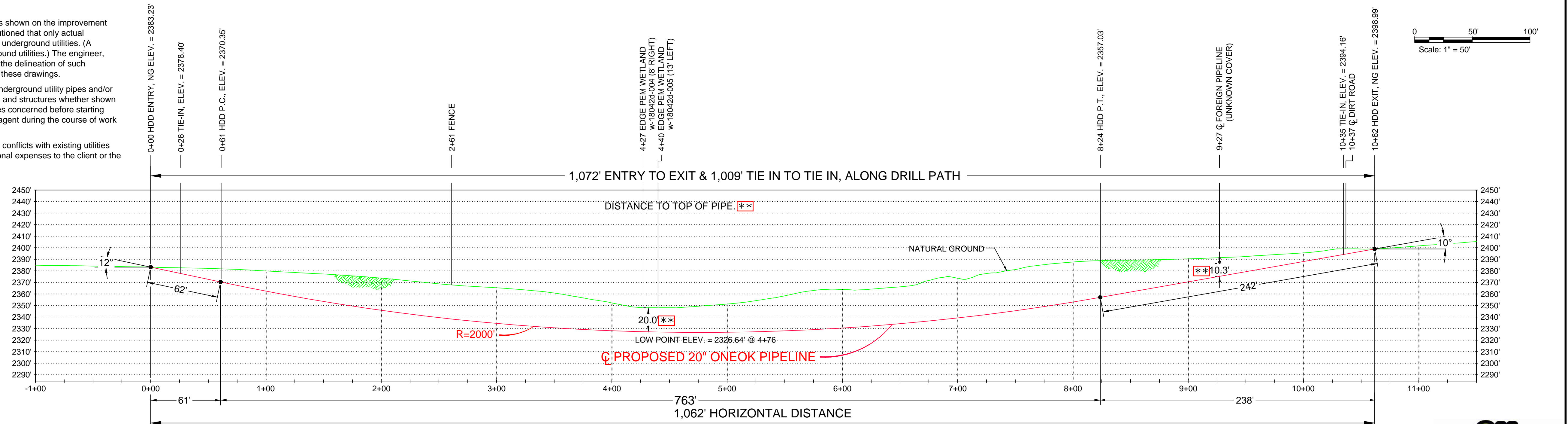
Drawing name: C:\Projects\ONEOK\CP-008 Demicks Lake Pipeline\CA_Des_OB_Mapping\OPL008JTAM-MP-20-006 MP 37.88 Cherry Creek.dwg Plotted on: Jun 05, 2019 9:58pm

MCKENZIE COUNTY, NORTH DAKOTA
SECTION 4, TOWNSHIP 148 NORTH, RANGE 102 WEST



CONSTRUCTION NOTES:

- The types, locations, sizes, and/or depths of existing underground utilities as shown on the improvement plans were obtained from sources of varying reliability. The contractor is cautioned that only actual excavation will reveal the types, extent, sizes, locations, and depths of such underground utilities. (A reasonable effort has been made to locate and delineate all known underground utilities.) The engineer, however, can assume no responsibility for the completeness or accuracy of the delineation of such underground utilities that might be encountered but which are not shown on these drawings.
- The contractor shall ascertain and verify the true location and elevation of underground utility pipes and/or structures prior to the start of construction and locate and protect utility lines and structures whether shown or not. Also, the contractor shall notify the owners of utilities and/or structures concerned before starting work. Any underground facilities damaged by the contractor or contractor's agent during the course of work shall be replaced at contractor's own expense.
- Minor adjustments required in the field at proposed pipeline locations due to conflicts with existing utilities shall be done with the approval of the client and the engineer without additional expenses to the client or the engineer.



PROFILE VIEW
SCALE: 1"=50' HORIZONTAL & VERTICAL
PEM WETLAND w-18042d-005
PEM WETLAND w-18042d-004

NOTE:
IMAGE DATA DERIVED FROM PUBLICLY AVAILABLE DATA SOURCES. ELEVATIONS ARE BASED ON THE SURVEY DATA FROM LWS & LIDAR DATA FROM GEODIGITAL.

PRODUCT:
NATURAL GAS LIQUID

CONSTRUCTION METHOD:
HORIZONTAL DIRECTIONAL DRILL (HDD)

PIPE SPECIFICATIONS:
20.000" OD X 0.375" WT, "API-5L" PSL-2, ERW, X-65, 14-16 MILS FBE & 30 MILS ARO QRL

MAOP:
1,480 PSIG

MAX ALLOWABLE PULL FORCE:
1,277,389 LBS = 639 TONS

2 HR PRE-TEST REQUIRED

DESIGN SPECIFICATIONS COMPLY WITH U.S. DOT TITLE 49 CFR 195: TRANSPORTATION OF HAZARDOUS LIQUIDS BY PIPELINE AND ASME B31.4

COORDINATE SYSTEMS NOTE:
ALL BEARINGS, DISTANCES AND COORDINATES ARE REFERENCED TO THE "UNIVERSAL TRANSVERSE MERCATOR COORDINATE SYSTEM" ZONE 13, NORTH AMERICAN DATUM OF 1983; U.S. SURVEY FEET.

ISSUED FOR CONSTRUCTION

MK	DATE	REVISIONS	BY	AP	MK	DATE	REVISIONS	BY	AP
0	04/19/19	ISSUED FOR CONSTRUCTION	EP	CR					

NOTICE
This drawing has not been published and is the sole property of ONEOK BAKKEN PIPELINE, A SUBSIDIARY OF ONEOK, Tulsa Ok., and is loaned to the borrower for his confidential use only; and in consideration of the loan of this drawing the borrower promises and agrees that it shall not be reproduced, copied, loaned, or otherwise disposed of directly or indirectly, nor used for any purpose other than for which it is specifically furnished.

DWG. NO.	REFERENCE DRAWINGS



HORIZONTAL DIRECTIONAL DRILL TWO PEM WETLANDS W-18042D-005 AND W-18042D-004 M.P. 47.21 DEMICKS LAKE PIPELINE INDEX #10597			
DES: EP	AFE#: []	DATE: 04/19/19	REV: []
DR: EP	DWG. NO.:		
CH: CR	SCALE: NOTED	OPL008JTAM-MP-20-008	0
AP: CR	CAD#:		



Drawing name: C:\Projects\ONEOK\CP-008 Demicks Lake Pipeline\CA_Des_DWG_Mapping\01_Constr\OPL008JTAM-MP-20-008 MP 47.21 Two PEM Wetlands.dwg
Plotted on: Apr 16, 2019 - 2:01pm