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December 2015

Bridger Crude Oil Loop Pipeline Project
Topsoil Inspection Report
PU-15-097




Prepared for:

North Dakota Public Service Commission

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Construction inspection report
Wenck Associates, Inc.
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APPENDICES

1.0 Executive Summary

The North Dakota Public Service Commission (PSC) retained Wenck Associates, Inc. (Wenck) to complete topsoil inspections during construction of the Bridger Crude Oil Loop Pipeline (Project) in Billings and Stark Counties, North Dakota (ND), constructed by Bridger Pipeline, LLC. (Bridger). The purpose of the inspections was to ensure the project was constructed in compliance with the siting laws and rules and the applicable PSC Orders for the Project, which includes a requirement that topsoil must be segregated from subsoil during installation of the pipeline.

Construction for the Project began 2 November 2015. Wenck reviewed Project documents to become familiar with the Project and PSC Orders for the Project. Wenck visually inspected the Project area on 2 November, 3 November, 10 November, and 8 December 2015 and observed topsoil and subsoil removal and segregation done by the contractors. Overall soil removal and storage processes appeared to be done properly and the work was satisfactory. There were minor noteworthy issues which included 1) a bell hole location where topsoil and subsoil piles were too close together, and 2) the pipeline goes through an area that has alkaline soils, which will likely be a problem area to revegetate.

2.0 Background and Scope

2.1 INTRODUCTION

The Bridger Crude Oil Loop Pipeline (Project), also known as the "Heart River Pipeline," connects the Bridger's Skunk Hills Station to Bridger's Fryburg Station in Billings and Stark Counties, North Dakota (**Appendix A, Figure 1**). The Project will be constructed and operated by Bridger Pipeline, LLC (Bridger). The Project includes a 16-inch diameter underground pipeline with a total length of approximately 15 miles. The Project is under the jurisdiction of the North Dakota Public Service Commission (PSC), which issued its Findings of Fact, Conclusions of Law, and Order in Case No. PU-15-097 on 30 September 2015, granting a Certificate of Corridor Compatibility No. 172 and Route Permit No. 184 for the Project.

2.2 REGULATORY PURPOSE AND SCOPE OF WORK

The North Dakota Energy Conversion and Transmission Facility Act (North Dakota Century Code Chapter 49-22) authorizes the Public Service Commission to determine that the location, construction, and operation of jurisdictional energy conversion and transmission facilities will produce minimal adverse effects on the environment and the welfare of citizens of North Dakota. Construction inspections ensure that such projects are constructed in compliance with the siting laws (North Dakota Century Code Chapter 49-22) and rules (North Dakota Administrative Code Article 69-06) and the applicable Commission Orders.

The North Dakota PSC retained Wenck Associates, Inc. (Wenck) to complete a construction inspection, and specifically a topsoil inspection, of the Project. The inspection process included a review of the Application for Corridor Compatibility and Route Permit, Order, and other applicable documents. PSC Order #11 for the Project states: "Company understands and agrees that all topsoil, up to 12 inches, or topsoil to the depth of cultivation, whichever is greater, over and along trench areas where cuts will be made, must be stripped and segregated from the subsoil. Any area on which excavated subsoil will be placed must also be stripped of topsoil. After backfilling is completed, any excess subsoil must be placed over the excavation area, blending the grade into existing topography. Topsoil must be replaced over areas from which it was stripped only after the subsoil is replaced."

Wenck's scope of work was to perform and document on-site inspections during the topsoil removal phase of the Project to verify that topsoil was properly removed and kept segregated from subsoil until replacement occurred. The number of on-site inspections was to be based on Wenck's determination that equipment operators demonstrated proficiency concerning topsoil and subsoil removal and segregation in compliance with the Commission's Order. This report includes, but is not limited to, documentation of site visit observations and a summary of findings and issues that should be addressed for the Project to be considered complete and in full compliance.

2.3 BACKGROUND

During pipeline installation and excavation work in general, it is very important to separate topsoil and subsoil. Topsoil has biological, physical and chemical properties that are critical to recovery of a site. Topsoil, also known as the A horizon, should be stripped to the correct depth according to natural variations in the depth of this top layer of soil. Distinguishing the

horizon boundaries can be difficult as they vary in distinctiveness and topography. Most boundaries are zones of transition rather than sharp lines of division. Boundary distinctiveness is the vertical distance over which one horizon transitions into another which can be abrupt, clear, gradual or diffuse. The boundary topography is the cross-sectional shape of the contact between the horizons which can be smooth, wavy, irregular or broken (Soil Survey, 1993).

Mixing subsoil in with the topsoil is usually detrimental to the reclamation and re-vegetation of a site. Subsoil material has lower organic matter content than topsoil, making it typically lighter in color. It may also have a different texture than the topsoil (Sedivec et al., 2014). The most visible impact of pipeline constructions on agricultural land is the mixing of organic and nutrient rich topsoil with less fertile, mineral subsoil, which can bring up toxic elements such as sodium that restrict plant growth (Folga, 2007).

3.0 Findings of Site Inspection

3.1 METHODS

Samantha Swanberg, Wenck Environmental Scientist, visited the Project site on 2 November 2015, 3 November 2015, 10 November 2015, and 8 December 2015. A representative from Avery Pipeline Services, Bridger Inspector, Mike Ray, accompanied Wenck staff during the topsoil inspection site visits, and a representative from Avery Pipeline Services, Bridger Inspector, Scot Morrison, accompanied Wenck staff during the trenching/subsoil inspection on 8 December 2015.

The site was inspected visually by driving to access points and walking or driving within the Project right-of-way (ROW). The survey began at the north end of the pipeline near Skunk Hill Station. Contractors/equipment operators were observed during the topsoil removal phase of the project to check that topsoil has been properly removed, piled, and kept segregated from subsoil. Digital photographs (Canon Power Shot SD1300 IS, 12 megapixels) were taken showing typical Project infrastructure and documenting problem areas (**Appendix B**). Geographic coordinates were recorded at observation points or potential problem areas using a handheld Global Positioning System (GPS) (Garmin GPSMAP 60CSx; <10m accuracy; NAD83 datum) (**Appendix C**).

3.2 ON-SITE INSPECTION OBSERVATIONS AND FINDINGS

Construction for the Project began 2 November 2015. At the time of inspection, topsoil work had started, which consisted of three main steps (**Appendix B, Photos 1, 2**). Equipment operators started by stripping the topsoil using a grader, which went to a depth of approximately 4 inches through the pipeline ROW. Then they came along with dozers and stripped the topsoil further to the appropriate depth, averaging around an 8 inch depth (**Appendix B, Photos 2, 3, 6**). Finally they came through with a grader to finish or smooth out the area in the ROW for the trenching machine and other equipment (**Appendix B, Photo 7**). Contractors often employ a combination of graders and dozers depending on the equipment available, depth of topsoil, land use and procedure used to remove the topsoil.

The contractors/equipment operators seemed competent at topsoil stripping. Contractors removed topsoil according to color change in the soil rather than to a fixed 12-inch depth throughout the pipeline ROW. This was appropriate for site conditions, since topsoil did not reach12-inch depth along most of the route. Working with heavy equipment can be difficult to accurately strip topsoil; some areas had a little topsoil left on the stripped ROW, while other areas had a little subsoil scraped up with the topsoil. Overall it was a minor volume of mixing.

Along parts of the pipeline ROW near where it paralleled another pipeline, Wenck observed lighter topsoil where the grader went through at a depth of approximately 4 inches. This could potentially be from subsoil and topsoil mixing from the previous pipeline's ROW activities (**Appendix B, Photos 3, 4**).

Equipment operators noticed a coal vein running through the ROW; this was found within the top approximate 4 inches of the soil profile (**Appendix A, Photo 9**). Operators took less topsoil from this area, so as not to mix coal with topsoil.

White crusts were observed on some areas of the pipeline ROW, likely indicating an alkaline/saline area (**Appendix B, Photos 13, 14**). The white color was observed on the stripped ROW area, on the topsoil pile and on the surface of the background (undisturbed) area. These areas may have problems with re-vegetation establishment due to the natural alkalinity of the soils.

For the majority of the project, the subsoil pile was placed on the opposite side from the topsoil pile, except where two-toning/side sloping and bell holes were located. Two-toning or side sloping refers to a construction technique where the uphill side of the construction ROW is cut during grading. The material removed from the cut is used to fill the downhill side of the construction ROW to provide a safe and level surface from which heavy equipment can operate. It usually requires extra workspace to accommodate the additional volumes of material generated by using this technique (Folga, 2007). A bell hole is a widening of the trench over a given distance, to provide space for installing a tie-in, valve, etc.; in this area more subsoil is removed creating a bell-shaped trench. At one location the subsoil pile was observed touching the topsoil pile at a bell hole (**Appendix B, Photos 23, 24**). Most of the topsoil was piled on the opposite side, but when they extended the ROW a small portion of the topsoil was pushed to the opposite side, near where the trench spoil (subsoil) pile would be. Two-toning areas appeared to be in good condition for topsoil segregation; however, trench spoil (subsoil) piles in the two-toning areas were not observed by Wenck during the site visits.

4.0 Issues to Resolve and Recommendations

4.1 TOPSOIL SEGREGATION AT BELL HOLE

When the topsoil inspection of the project was conducted, there was one location where the subsoil pile was observed touching the topsoil pile at a bell hole location (Observation Point 217, **Appendix A, Figure 1 and Appendix C**). Contractors/equipment operators need to take special care in this area not to mix the topsoil and subsoil. Wenck recommends monitoring and documentation of this area to ensure vegetation becomes established after reclamation.

4.2 NATURALLY-ALKALINE AREAS

White crusts on the soil were observed on some areas (Observation Point 210, **Appendix A, Figure 1 and Appendix C**) of the pipeline. During reclamation and revegetation of these areas, a seed mix using species of the undisturbed surrounding alkaline areas should be considered or perhaps a saline-alkaline seed mix. Along with soil amendments and irrigation management, such as fredquent irrigation that provides drainage to avoid build up of salinity. Wenck recommends monitoring and documentation of this area to ensure the vegetation becomes established after reclamation.

5.0 Conclusions

Overall, the Project appeared to have been constructed as designed, with minimal impacts to the surrounding natural or human environment. The Project site was well-maintained and in satisfactory condition. There were a few minor issues that included: a bell hole area where the subsoil pile was touching the topsoil pile, and the pipeline went through an alkaline soil area which could have re-vegetation establishment problems in the future. Wenck recommends monitoring of these areas after reclamation.

6.0 References

North Dakota Public Service Commission (ND PSC). 2015. Online Case Search. Available from: http://www.psc.nd.gov/database/company_case_list.php. Accessed November 2015-December 2015.

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Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook.

7.0 Signatures

The services performed by Wenck staff for this project have been conducted in a manner consistent with the degree of care and technical skill appropriately exercised by professionals currently practicing in this area under similar time and budget constraints. Recommendations and findings contained in this report represent our professional judgment and are based upon available information and technically accepted practices at the present time and location. Other than this, no warranty is implied or expressed.

Lead Project Manager, Kevin Magstadt, and Environmental Scientist, Samantha Swanberg, prepared the report.

December 29, 2015

_____ _____

Kevin Magstadt, P.E., Principal/Regional Manager Date

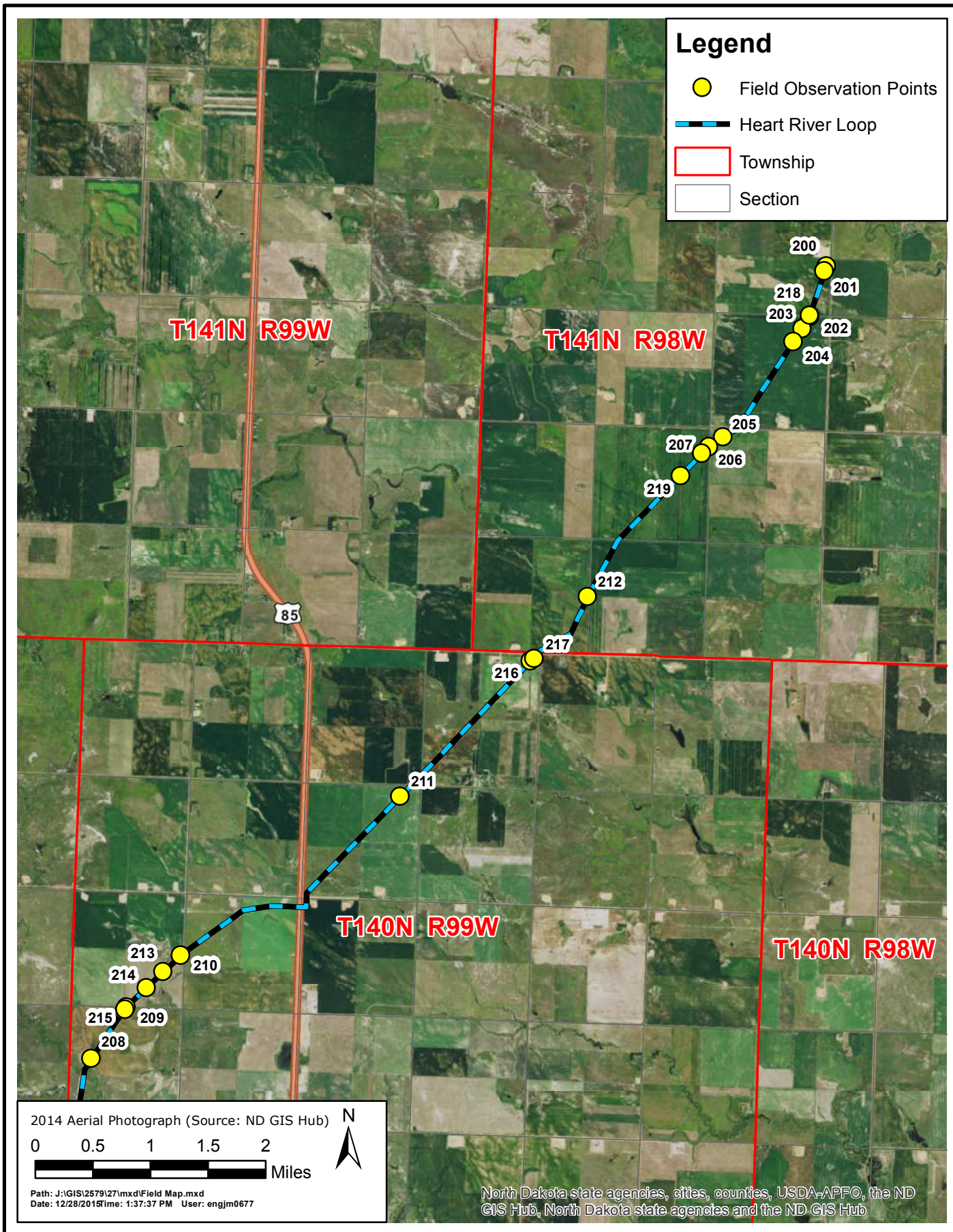
December 29, 2015

_____ _____

Samantha Swanberg, Environmental Scientist Date

Appendix A

Map of Project and Observation Points



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Field Observation Map

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Figure 1

Photographs

Above: Photo 1 (Point 201) – Direction looking south near Skunk Hill Station. Start of topsoil stripping.

Below: Photo 2 (Point 200) – Direction looking south by Skunk Hill Station. Start of topsoil stripping.

Above: Photo 3 (pt. 202) - Direction looking north toward Skunk Hill Station. Start of topsoil stripping. Parallel pipeline to the right on photo (yellow and orange flags). In some areas soil is lighter near parallel pipeline's ROW.
Below: Photo 4 (pt. 202) – Direction looking north toward Skunk Hill. Parallel pipeline to the right on photo (orange flags). In some areas soil is lighter near parallel pipeline.

Above: Photo 5 (pt. 202) – Direction looking north towards Skunk Hill. Topsoil stripped.

Below: Photo 6 (pt. 202) – Direction looking south. Topsoil being stripped.

Above: Photo 7 (pt. 204) – Direction looking south. Topsoil stripped, area being finished (leveled off, smoothed and flattened).

Below: Photo 8 (pt. 206) – Dozer stripping topsoil. Looking S-SW.

Above: Photo 9 (pt. 207) – Coal vein observed approximately 4 inches deep. Less topsoil was stripped in this small area, as to not mix coal with soil.

Below: Photo 10 (pt. 208) – Topsoil stripped; can see area that was side-sloped/two-toned in the distance. Topsoil was moved to opposite side; ROW area was leveled. Looking southwest.

Above: Photo 11 (pt. 208) – Side-sloping/two-toning area, used to level hill slope. Moved topsoil to opposite side. Looking southwest.

Below: Photo 12 (near pt. 209) – Pipeline ROW, topsoil to the left. There are two white areas that appear to from saline/alkaline deposits. Looking north-northeast.

Above: Photo 13 (pt. 210) – Topsoil pile has white crusts. Likely saline/alkaline area.

Below: Photo 14 (pt. 210) – Topsoil pile has white crusts. Note white area in background in undisturbed area.

Above: Photo 15 (near pt. 210) – ROW topsoil has been removed. Topsoil piles were moved away from low area of landscape, in case of drainage. Looking northwest.

Below: Photo 16 (pt. 212) – Pipe strung in ROW. Two-toning/side-sloping at the top of hill. Yellow pin flags cross through ROW, indicate other pipeline. Looking south-southwest.

Above: Photo 17 (pt. 212) – ROW topsoil has been removed, area in crop land.

Below: Photo 18 (pt. 213) – Pipe strung next to trench. Subsoil to the left and topsoil pile to the far right. Looking south-southwest.

Above: Photo 19 (pt. 213) – Trench. Subsoil pile to the left.

Below: Photo 20 (pt. 214) – Trenching machine removed subsoil. Subsoil pile to the right. Wet area, sediment plug towards the top of photo to help stop water. Looking northeast.

Above: Photo 21 (pt. 215) – Trenching machine removing subsoil. Subsoil pile to the left. Looking south.

Below: Photo 22 (pt. 215) – Trenching machine removing subsoil. Subsoil pile to the left. Looking south.

Above: Photo 23 (pt. 217) – Bell hole needed for tie-ins. Larger amount of subsoil needed to be removed for slope and work space. Looking north-northeast toward 30th St.

Below: Photo 24 (pt. 217) – Topsoil pile to left of pipe on far left of photo. Bell hole subsoil pile shown in middle of photo is touching small second topsoil pile on far right (darker color) from where they extended the ROW to 100ft. Looking north-northeast toward 30th St.

Above: Photo 25 (pt. 216) – Topsoil replaced. Lighter colored subsoil at very bottom of photo where topsoil has not been replaced yet. Looking southwest.

Below: Photo 26 (pt. 219) – Dozer replacing topsoil back over ROW ground. Looking southwest.

Field Observation Points

POINT	NAME	LATITUDE	LONGITUDE
200	Topsoil Stripping	47.0303	-103.0971
201	Topsoil Stripping	47.0296	-103.0975
202	Topsoil Stripping	47.0239	-103.0997
203	Topsoil Stripping	47.0223	-103.1012
204	Topsoil Stripping	47.0207	-103.1027
205	Topsoil Stripping	47.0083	-103.1150
206	Topsoil Stripping	47.0071	-103.1176
207	Topsoil Stripping	47.0063	-103.1188
208	Topsoil Stripping - Two Toning	46.9275	-103.2272
209	Topsoil Stripping	46.9342	-103.2209
210	Topsoil Stripping – Alkaline Area	46.9409	-103.2114
211	Topsoil Stripping	46.9618	-103.1721
212	Topsoil Stripping - Two Toning	46.9877	-103.1389
213	Trenching	46.9388	-103.2145
214	Trenching	46.9367	-103.2174
215	Trenching	46.9339	-103.2212
216	Topsoil Replaced	46.9795	-103.1490
217	Trenching - Bell Hole	46.9797	-103.1484
218	Topsoil Replaced	47.0240	-103.0999
219	Topsoil Replaced	47.0033	-103.1226

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