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June 2016

ONEOK Bakken Pipeline Project
Topsoil Inspection Report
PU-15-801




Prepared for:

North Dakota Public Service Commission

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Topsoil 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 ONEOK Bakken Pipeline (Project) in Dunn and McKenzie Counties, North Dakota (ND), constructed by ONEOK Bakken Pipeline, LLC. (ONEOK). 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 21 April 2016. Wenck reviewed Project documents to become familiar with the Project and PSC Orders for the Project. Wenck visually inspected the Project area on 21 April, 12 May, and 3 June 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 was a minor noteworthy observation, which was that the pipeline goes through steep terrain, which could be a problem area for erosion.

2.0 Background and Scope

2.1 INTRODUCTION

The ONEOK Bakken Pipeline, L.L.C. (ONEOK) a wholly owned subsidiary of ONEOK Partners, L.P., owns and operates natural gas liquids (NGL) assets in North Dakota. The Bear Creek NGL pipeline Project (Project) originates at the ONEOK Rockies Midstream, L.L.C. Bear Creek Gas Plant in Dunn County, North Dakota and terminates at an interconnection with the Targa NGL Pipeline in McKenzie County, North Dakota (**Appendix A, Figure 1**). The Project is a 8-inch diameter underground NGL pipeline with a total length of approximately 38 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-15-801 on 23 March 2016, granting a Certificate of Corridor Compatibility No. 184 and Route Permit No. 196 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 21 April 2016, 12 May 2016, and 3 June 2016. Representatives from ONEOK Partners accompanied Wenck staff during the topsoil inspection site visits. Wenck staff was accompanied by Norman Mueller on 21 April, Todd Kelvington and Curt Kamman on 12 May, and Bradley Case on 3 June, 2016.

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 south end of the pipeline near the Bear Creek Gas Plant. 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 21 April 2016. At the time of inspection, topsoil work had started, which consisted of three spreads throughout the project area, each with a different contractor. The contractor for spread one was Jomax Construction, spread two was Sterling Construction and spread three was Site Energy Construction. On the first day of construction only spread one and two had begun, spread three did not start until the next day.

Equipment operators started by scraping a small area or a line in the topsoil with the edge of the dozer near the edge of the right of way (ROW) to identify where the topsoil pile should be placed (**Appendix B, Photos 1, 2**); or there would be a spotter for the dozer operator to make sure the topsoil pile was staying within the ROW. In one area, it was observed that, due to the potential wet conditions from the previous days rain, the contractors used an excavator to scrape the ROW so the dozer could get in the area and twist and turn to scrape the topsoil without taking too much topsoil or rutting up the area. Next, dozers were used to strip the topsoil to the appropriate depth, averaging a range of approximately 4-10 inch depths (**Appendix B, Photos 2, 4, 9, 10, and 22**). After the dozer had taken the appropriate amount of topsoil, 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 9**). 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 reach 12-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.

White areas or zones were observed on a few small areas of cropland on the pipeline ROW, likely indicating a calcareous area; the area did not appear saline (**Appendix B, Photo 6**). The white color was observed on the stripped ROW area, and small amounts in the topsoil pile. This is likely natural or could be enhanced from fertilizer and would have a higher pH.

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. Two-toning areas appeared to be in good condition for topsoil segregation (**Appendix B, Photo 5, 8**); however, trench spoil (subsoil) piles in the two-toning areas were not observed by Wenck during the site visits.

Portions of the project cross steep terrain (Observation Point 441, **Appendix B, Photo 19**). Areas of steep terrain often have shallow topsoil depths. These areas often require additional grading to a gentler slope to obtain a safe, flat, work terrace to accommodate pipeline work. In steep terrain, best management practices (BMPs) are needed to prevent movement of disturbed soil off the ROW, temporary sediment barriers could include silt fences and slope breakers. Silt fences, straw wattles and slope breakers were observed on site. Following construction, BMPs are also needed, such as, seed, mulch with certified weed-free hay/straw, or cover with erosion-control fabric. These are a few options to maintain the ROW until permanent vegetation is established.

The pipeline utilized a 100-ft construction ROW; additional temporary workspace was often used for bore locations. ROWs were often extended to 125-ft at bore locations or if there was a bore pull back area, it would have an additional 50-ft ROW (**Appendix B, Photos 3, 17**). The company appeared to manage newly acquired access roads like their ROW; they would strip the topsoil on the new access roads and place the topsoil pile alongside the road (**Appendix B, Photo 7**). If they acquired farmers two-track roads (previously used road area) they would manage as needed.

4.0 Issues to Resolve and Recommendations

4.1 STEEP TERRAIN

When the topsoil inspection of the project was conducted, there were portions of the project that went through steep slopes (Observation Point 441 and 439, **Appendix A, Figure 1 and Appendix C**). Areas of steep terrain often have shallow topsoil depths. These steep areas require additional grading down to a gentler slope to accommodate pipeline work. In steep terrain, best management practices (BMPs) are needed such as silt fences, slope breakers, certified weed-free mulch, seed, and erosion-control fabric; these are a few options to maintain the ROW until permanent vegetation is established. Silt fences, straw wattles and slope breakers were observed on site. Contractors/equipment operators need to take special care in this area to prevent movement of disturbed soil off the ROW. Wenck recommends monitoring and documentation of this area to ensure 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.

6.0 References

North Dakota Public Service Commission (ND PSC). 2016. Online Case Search. Available from: http://www.psc.nd.gov/database/company_case_list.php. Accessed April 2016-June 2016.

Mueller, Norman. 2016. ONEOK Partners. Personal Communication: discussion during site visit on 21 April 2016.

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Sedivec, K., C. Piper, J. Printz, A. Wick, A. Daigh, R. Limb. 2014. Successful reclamation of lands disturbed by oil and gas development and infrastructure construction. North Dakota State University Extension Service Pub. R1728.

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.

_____ _____

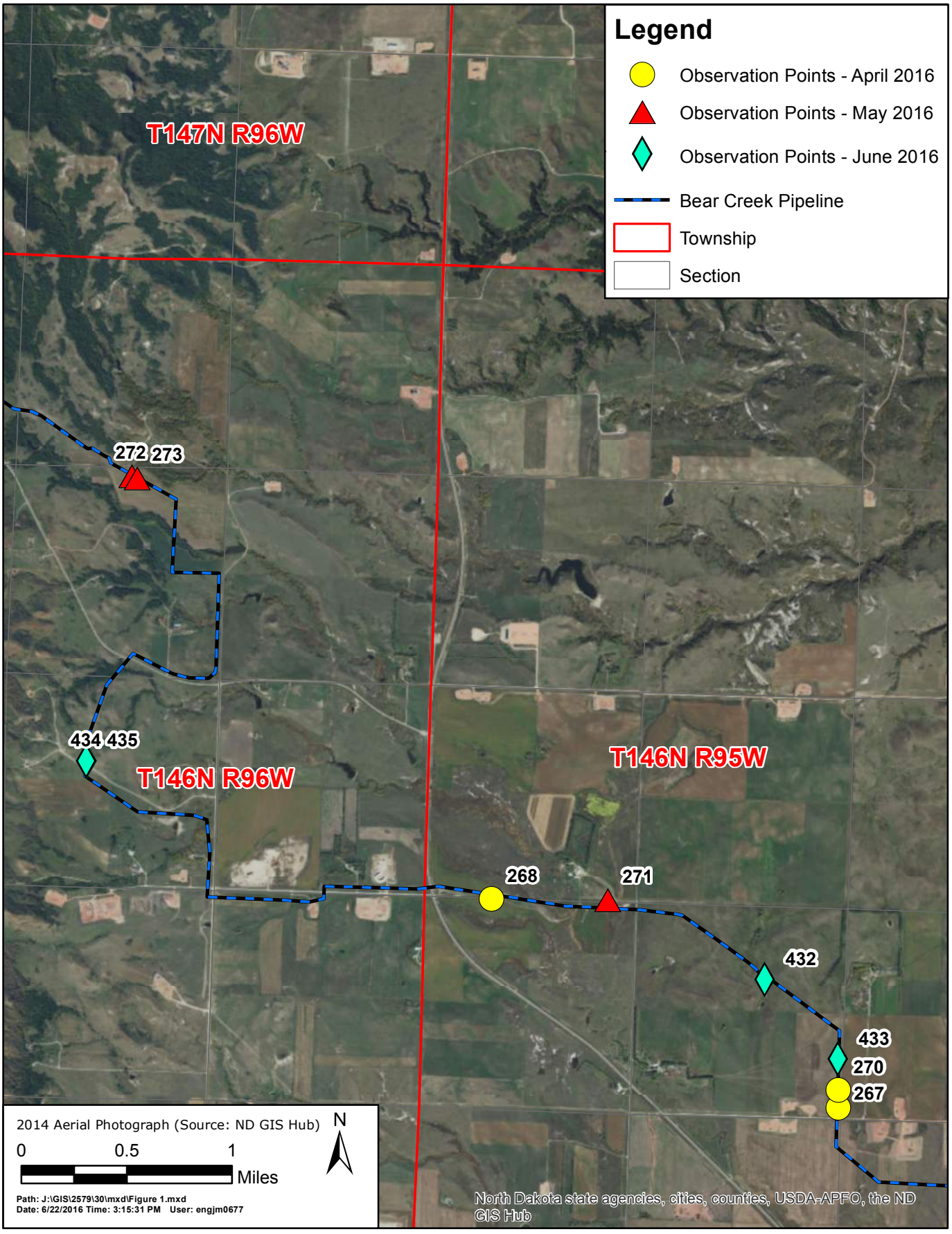
Kevin J. Magstadt, P.E., Principal/Regional Manager Date

_____ _____

Samantha Swanberg, Environmental Scientist Date

Appendix A

Map of Project and Observation Points



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Field Observation Map (Page 1 of 5)

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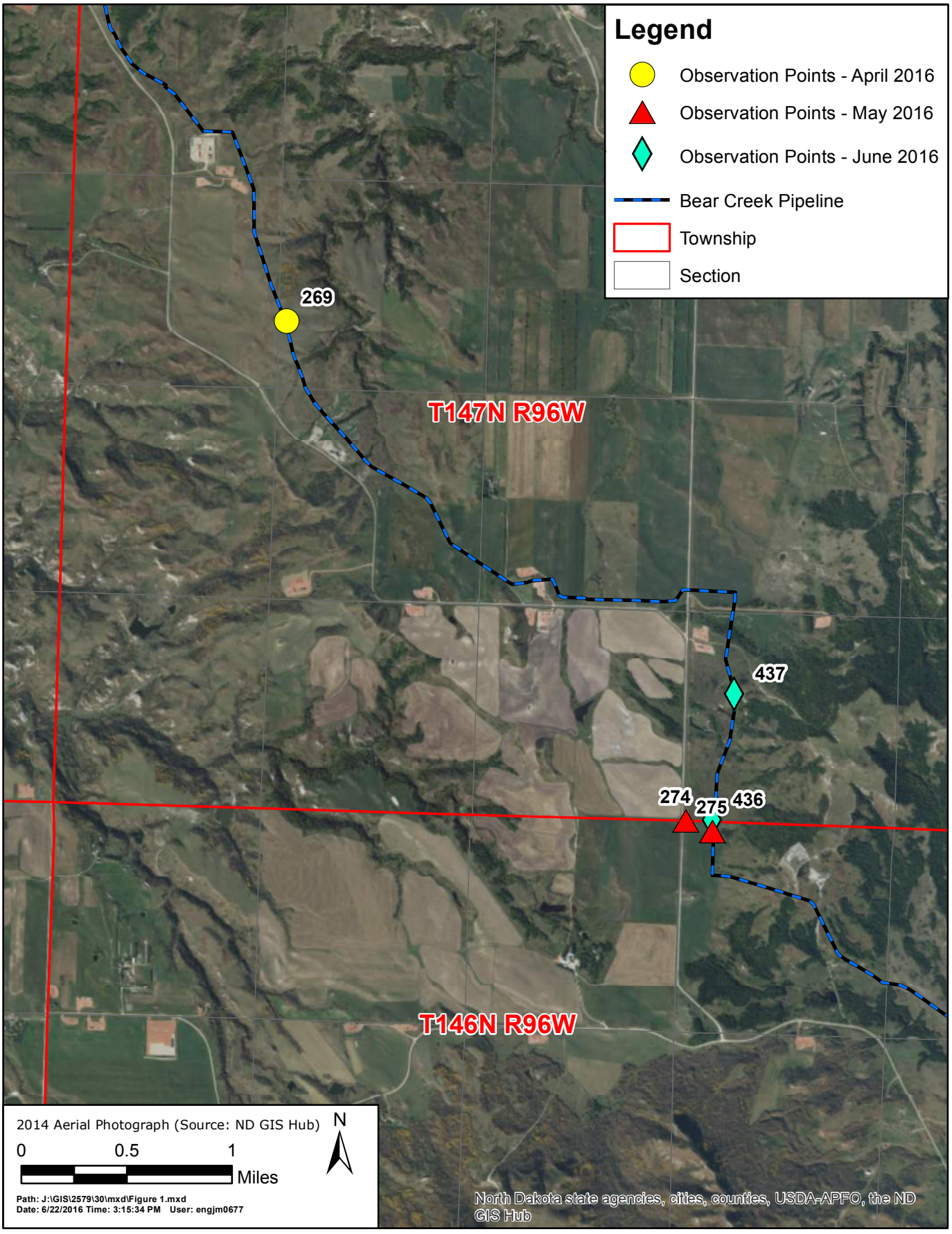
Figure 1



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Field Observation Map (Page 2 of 5)

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Figure 1

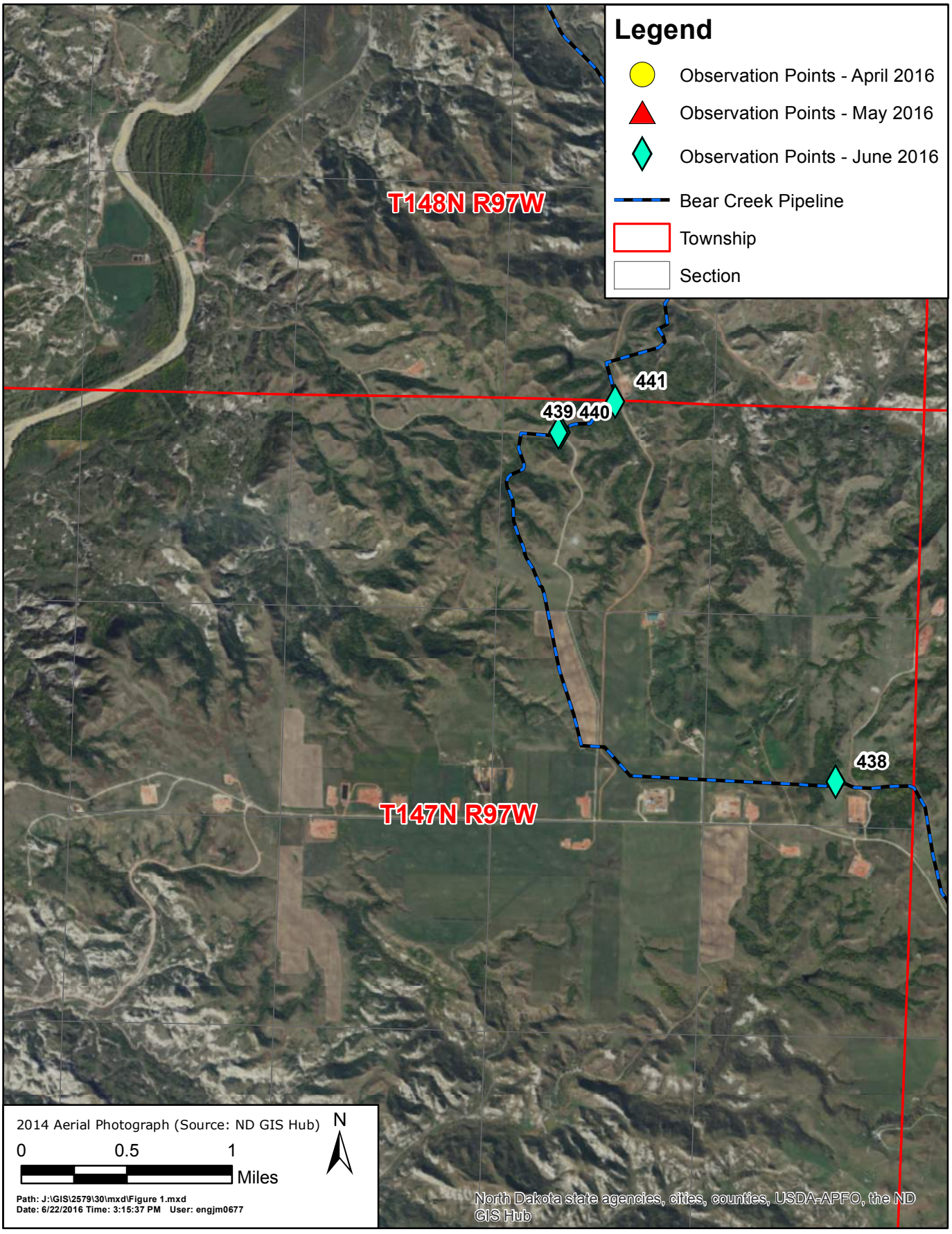

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Figure 1

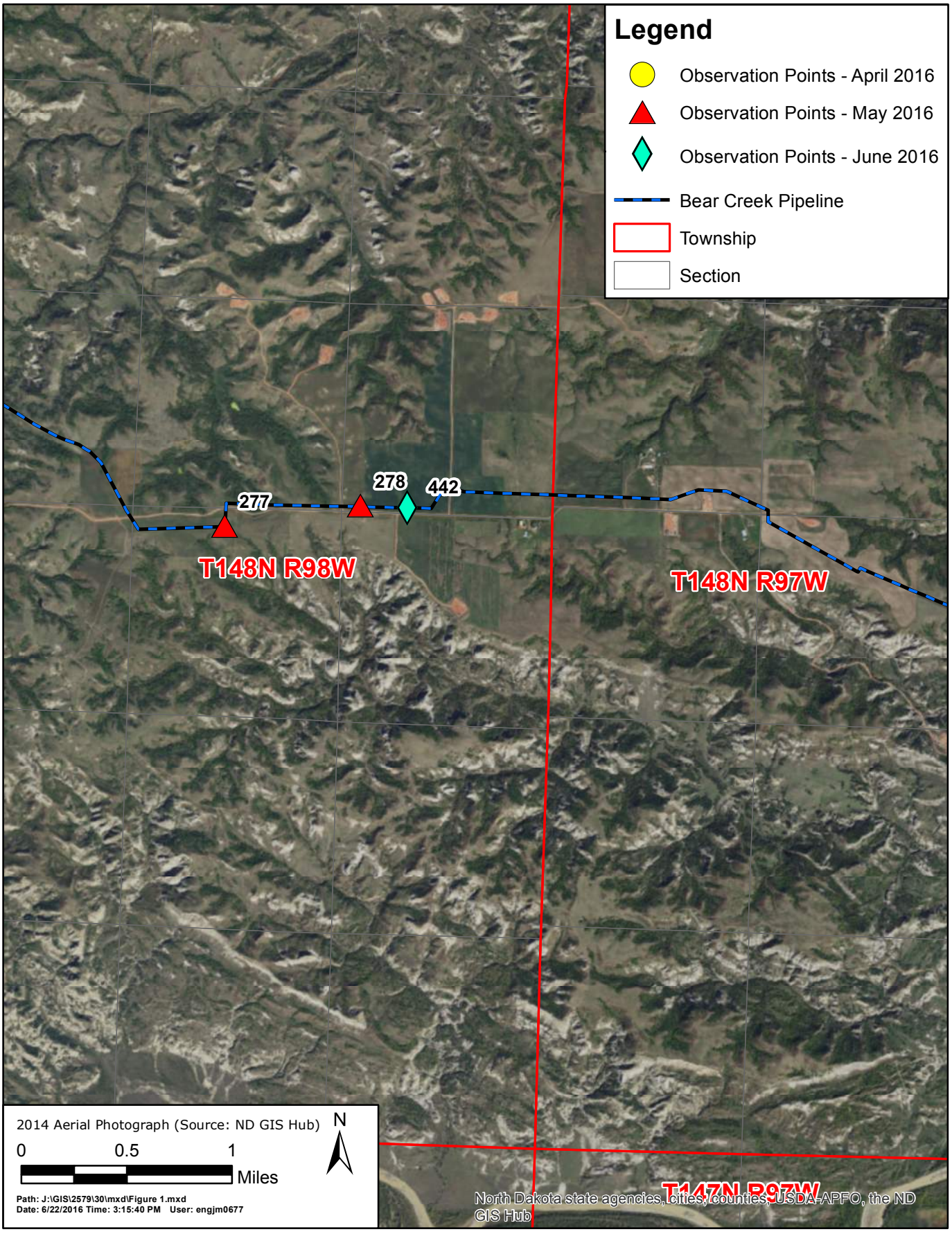

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Figure 1

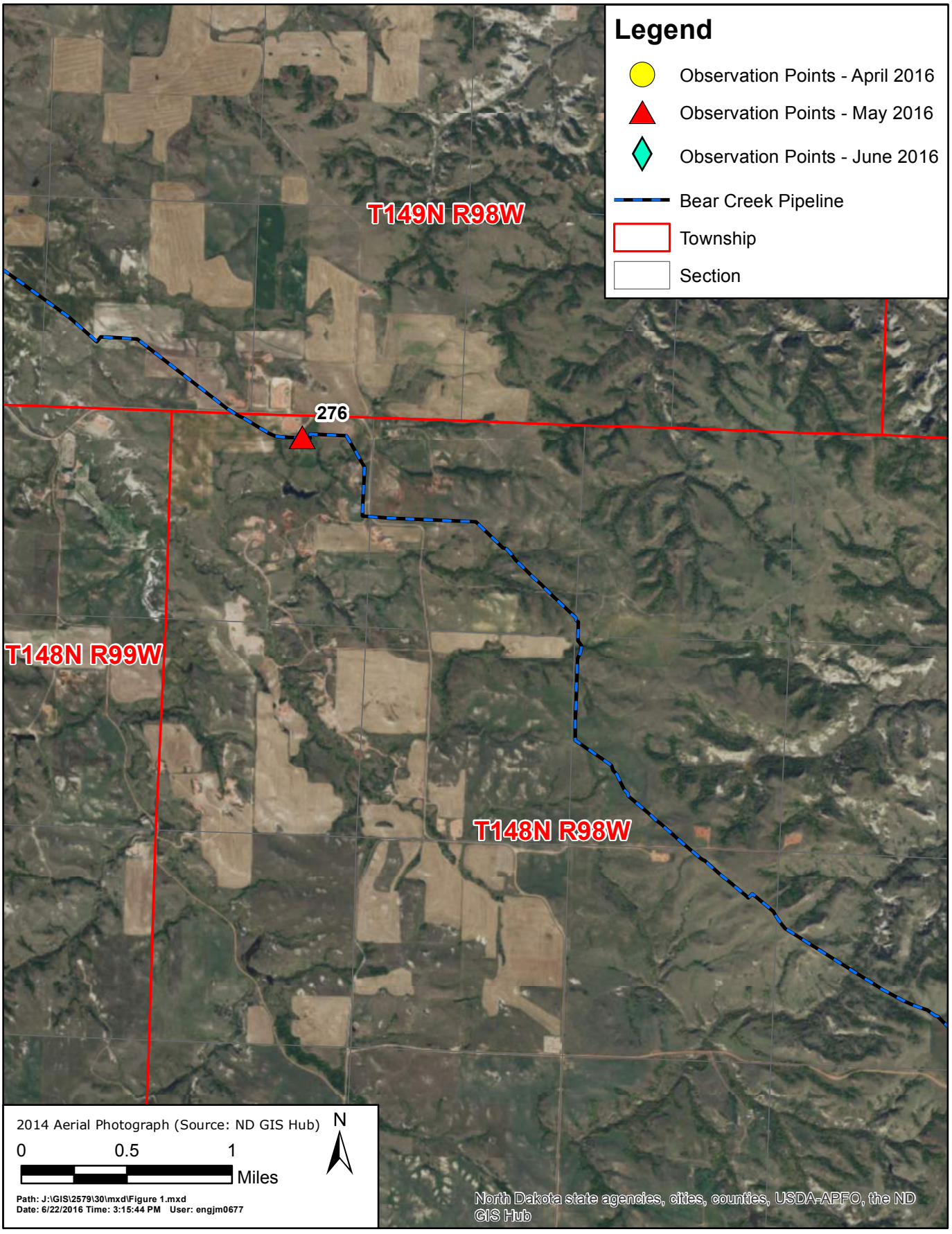

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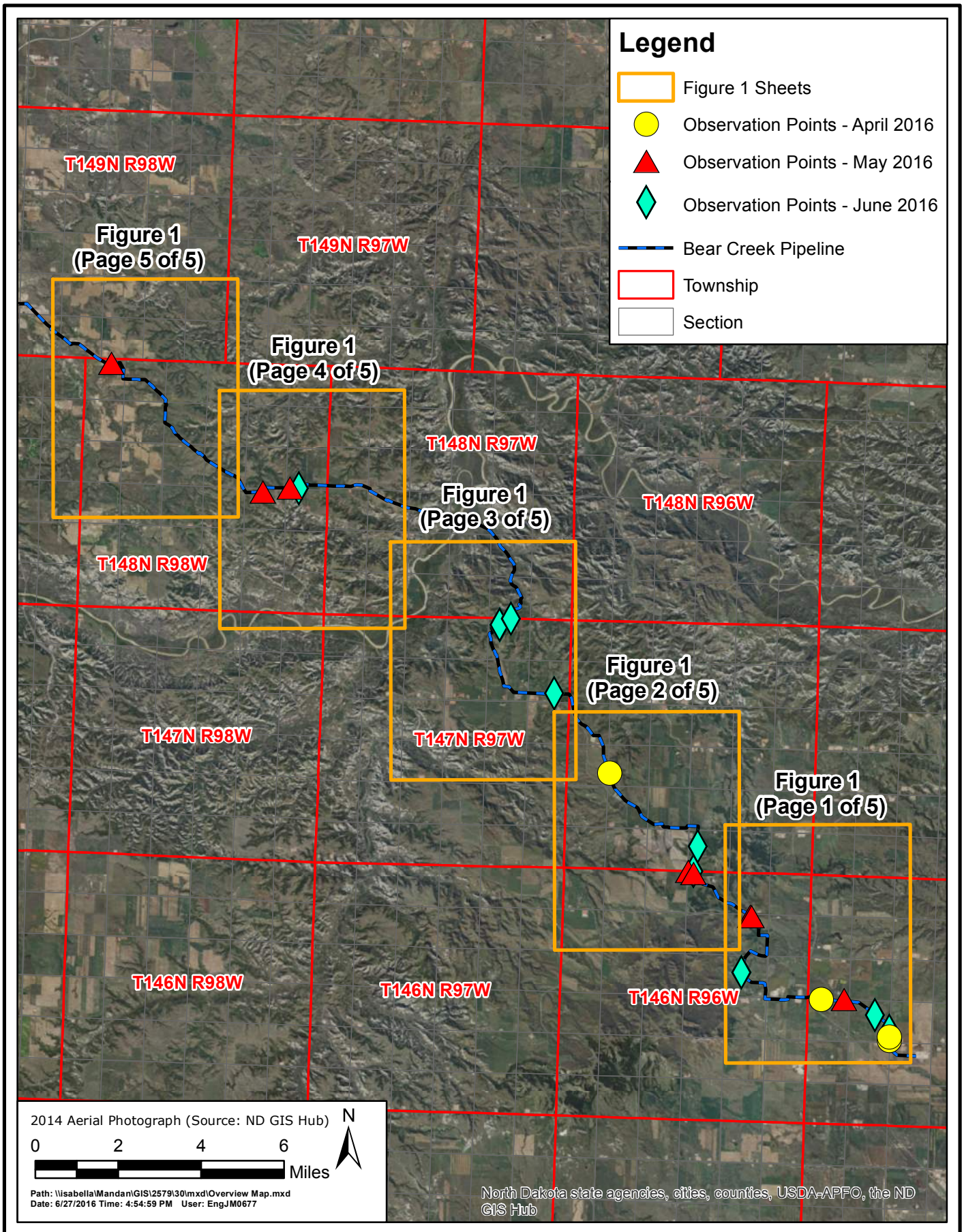
Figure 1



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Field Observation Overview Map

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Figure 2

Photographs

Above: Photo 1 (Point 267) – Direction looking north. Start of topsoil stripping. Dozer and excavator/hoe were used in this area, because this was a potential wet area, the excavator was used to start the topsoil stripping so the dozer could get in there, and would not twist and turn and mess up the area or take an incorrect amount of topsoil.
Below: Photo 2 (Point 267) – Direction looking north. Start of topsoil stripping.

Above: Photo 3 (pt. 267) - Direction looking north. Extended ROW to 125-ft for additional work space for road bore.

Below: Photo 4 (pt. 269) – Cut along the ROW where two-toning is located; shows soil profile.

Above: Photo 5 (pt. 269) – Direction looking south. Topsoil stripped (far right) in two-toning area. There is space between topsoil and subsoil piles.

Below: Photo 6 (pt. 273) – Direction looking north. Topsoil stripped; small zone of light, white coloring on soil, appeared calcareous.

Above: Photo 7 (pt. 274) – Direction looking east. Topsoil stripped for access road.

Below: Photo 8 (pt. 275) – Direction looking south. View on top of two-tone area, pushed some subsoil downhill, angled down to level out area after 12-in topsoil was taken. Extended ROW for bore location, boring under other line. Dozer stripping topsoil.

Above: Photo 9 (pt. 276) – Direction looking west. Neck down location; observe silt fences in front of trees and ravine area.

Below: Photo 10 (pt. 277) – Direction looking west. Topsoil stripped and area smoothed. The slurry from hydrovac truck was dumped and ran across edges of ROW. Clean water and mud/bentonite was used. Slurry was only dropped on ROW after topsoil stripped and if landowner approved.

Above: Photo 11 (pt. 278) – Direction looking east. Side-sloping/two-toning area, used to level hill slope. Topsoil pile on far left of photo.

Below: Photo 12 (near pt. 278) – Direction looking east. Side-sloping/two-toning area, used to level hill slope. Can see cut into hill on far right of photo.

Above: Photo 13 (pt. 435) – Slope breaker on ROW.

Below: Photo 14 (pt. 432) – Fence around trenched area, with stairs cut out along the sides. Subsoil pile to the left of photo.

Above: Photo 15 (near pt. 433) – Direction looking north. The excavator uses a shaker with ¾-inch screen, used for rocky areas. The area around the pipe is padded with this finer material/soil from the shaker, 4-12 inches around the pipe, to protect the pipeline.

Below: Photo 16 (pt. 434) – Direction looking north. Padding machine, used to get rocks out of subsoil stratum. The loose fill will compact down around the pipe.

Above: Photo 17 (pt. 437) – Direction looking north. Bore area. Topsoil has been removed on additional bore pull back area, 50-ft ROW. To the far left of the photo is the pipeline ROW.

Below: Photo 18 (pt. 438) – Direction Looking west. Wooded ravine has a smaller ROW, topsoil from woody ravine brought up and piled. Woody debris in topsoil pile.

Above: Photo 19 (pt. 441) – Steep slope, with little topsoil. Two-tone area. Topsoil to the far right of photo.

Below: Photo 20 (pt. 442) – Direction looking east. Trench just backfilled, equipment smoothing out area.

Above: Photo 21 (pt. 442) – Direction looking west. Subsoil pile from trench is flattened for work area.

Below: Photo 22 (pt. 275) – Direction looking south. Another line runs through here, this area will be bored under. Dozer stripping topsoil.

Field Observation Points

POINT	NAME	LATITUDE	LONGITUDE	DATE
267	Topsoil Stripping – Near bore location	47.4454	-102.8011	April 21, 2016
268	Topsoil Stripping	47.4590	-102.8369	April 21, 2016
269	Topsoil Stripped- two tone area	47.5357	-102.9493	April 21, 2016
270	Topsoil Stripped	47.4466	-102.8012	April 21, 2016
271	Prep for Bore – Trench clearing	47.4591	-102.8251	May 12, 2016
272	Topsoil stripped - Smoothed ROW	47.4872	-102.8746	May 12, 2016
273	Topsoil stripped - Small calcareous area	47.4871	-102.8741	May 12, 2016
274	Access road – Topsoil stripped	47.5023	-102.9072	May 12, 2016
275	Bore location near two - tone area	47.5016	-102.9045	May 12, 2016
276	Bore area - Neck down area	47.6729	-103.2135	May 12, 2016
277	Topsoil stripped - Hydrovac slurry along ROW	47.6298	-103.1329	May 12, 2016
278	Two-tone area	47.6316	-103.1192	May 12, 2016
432	Bell hole	47.4540	-102.8090	June 3, 2016
433	Shaker – placed subsoil around pipe	47.4487	-102.8014	June 3, 2016
434	Lower pipe in trench and Padding machine	47.4676	-102.8783	June 3, 2016
435	Topsoil Stripped- Steep terrain – Slope breaker	47.4676	-102.8784	June 3, 2016
436	Topsoil Stripped- top and subsoil pile separate	47.5024	-102.9046	June 3, 2016
437	Bore area - additional ROW	47.5111	-102.9028	June 3, 2016
438	Topsoil pile with woody debris	47.5629	-102.9792	June 3, 2016
439	Topsoil Stripped - Steep terrain	47.5863	-103.0083	June 3, 2016
440	Topsoil Stripped - Slope breaker	47.5862	-103.0085	June 3, 2016
441	Topsoil Stripped - Steep terrain	47.5885	-103.0028	June 3, 2016
442	Backfilling trench	47.6315	-103.1144	June 3, 2016

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