



NDIC Brine Pond Study

Phase II: Site Assessments

Submitted to:

North Dakota Department of Mineral Resources - Oil and Gas Division

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1.0 INTRODUCTION

The work described herein is being performed for the North Dakota Industrial Commission (NDIC) Oil and Gas Division in support of the House Bill 1347 Brine Pond Assessment Program (Brine Pond Study). The Brine Pond Study includes a remote sensing and visual assessment of historical oil and gas produced water evaporation ponds (brine ponds) believed to be active in the State of North Dakota between 1951 and 1984.

Brine ponds were used to manage water extracted from oil bearing formations during oil and gas exploration and production (E&P) during periods of early oil and gas development in North Dakota. The typically high salinity brine was managed through retention and evaporation in brine ponds as early as 1951. In 1972, brine ponds were outlawed in North Dakota due to increasing research indicating brine was infiltrating into the soil profile rather than just evaporating¹. Between 1972 and 1984, brine ponds were drained and backfilled as a closure technique. Removal of salt-affected soils during brine pond closure was not common, and impacts from historical brine disposal remains a potential environmental threat.

Golder Associates Inc. (Golder) was retained under the current Environmental Services Consultant Contract to identify former brine ponds in North Dakota in two phases, as follows:

- Phase I includes a desktop investigation of publicly available historical aerial imagery and other historical records to identify former brine ponds in north-central North Dakota.
- Phase II includes conducting a visual environmental assessment in conformance with American Society for Testing and Materials (ASTM) standard E1527-13 Section 9 for each brine pond identified during Phase I.

This Summary Report (Report) is for Phase II of the project, which Golder performed starting May 1st, 2018. As specified in the authorized scope of work (SOW) provided by the NDIC and upon further discussions with NDIC, Phase II of the project targeted sites in Bottineau, Renville, and Ward Counties, North Dakota (the Counties). The authorized SOW is provided as Appendix A.

The NDIC authorized the work described herein on December 20th, 2017.

1.1 Phase II Objectives

The primary objective of Phase II of the Brine Pond Study is to conduct site reconnaissance of the historical brine ponds previously identified in Phase I. Due to budgetary constraints, it was agreed with NDIC that only brine ponds identified in the Counties in Phase I of the Study were to be visited and documented. Documentation included a summary of conditions observed at each site, including photographic documentation and approximate measurement of impacts.

2.0 SITE ASSESSMENT METHODOLOGY

Golder performed Phase II of the Brine Pond Study by visiting the identified brine ponds from Phase I in the Counties. An inspection report was created for each individual site visited. Visual assessments were conducted in accordance with ASTM standard E1527-13 Section 9, and included the following information:

- Brine pond site access and adjoining roads;
- Current land use and adjacent land use;

¹ Doll et al. *Characterization of Detrimental Effects of Salts and Other Chemical Constituents Carried in Surface and Subsurface Waters from Brine and Drilling Fluid Disposal Pits Buried During Oil Development*. North Dakota State University, 1985.

- Any evidence of buildings, structures, equipment, or oil and gas equipment on-site or in the vicinity of the site;
- Visual impacts such as barren areas, stressed vegetation, salt crusting, or evidence of erosion;
- Potential receptors in the vicinity such as wetlands, intermittent creeks, or residences;
- General topography and drainage in the vicinity;
- Evidence of utilities on-site or in the vicinity of the site;
- Photographs of the site and the surrounding areas; and
- Interviews conducted, if any.

3.0 RESULTS

Golder completed a site assessment at each of the 216 historical brine ponds identified in the Counties during Phase I of the brine pond study. Bottineau County brine pond locations and site assessment reports are provided in Table 1 and Appendix B, respectively. Renville County brine pond locations and site assessment reports are provided in Table 2 and Appendix C, respectively. Ward County brine pond locations and site assessment reports are provided in Table 3 and Appendix D, respectively. During the initial inspection, 12 sites in Bottineau County and 10 sites in Renville County had been recently plowed at the time of the site visit, and no impacts could be observed due to the ground disturbance. These sites were revisited in August 2018 to assess for visual impacts.

4.0 CLOSING

Using publicly available historical aerial imagery, a total of 216 historical brine ponds were identified in the Counties during Golder's remote sensing survey of north-central North Dakota under Phase I of the Brine Pond Study. Brine ponds were typically observed to be angular, in close proximity to oil and gas facilities, and exhibiting visual signs of salt impact.

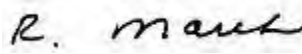
Locations of the brine ponds identified in the Counties were mapped and associated data were tabulated. Brine ponds in Burke, Divide, Mountrail, and Williams Counties were mapped and a Google Earth KMZ file indicating their locations is being provided to NDIC in-lieu of tabulated data. The data were used to conduct Phase II of the Brine Pond Study, which involved completing a site assessment of each brine pond identified in the Counties in accordance with ASTM standard E1527-13 Section 9. Conditions observed at each brine pond identified in the Counties are documented in Appendices B, C, and D of this report.

Signature Page

Golder Associates Inc.



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APPENDIX A

Scope of Work

Assessment of Brine ponds active between 1951&1984 Project

Intent

Per HB 1347 section 2 1a. this project is to determine how many brine ponds there are in the north central portion of the state that require remediation of salt and any other contamination from the surrounding soil. These ponds were active between 1951 and 1984.

Directions

Phase 1: Desktop Investigation

A desktop investigation will be performed to identify locations of former brine evaporation ponds. This investigation will be performed using publicly available data as follows:

- 1) Current and historical aerial imagery.
- 2) List and map of potential locations of former brine evaporation ponds compiled by the North Dakota Geological Survey.
- 3) Locatable historical records from the 1984 NDSU study of former brine evaporation ponds.
- 4) Will include north-central portions of North Dakota that have undergone oil and gas development. Portions will begin with Renville and Bottineau counties and may expand to surrounding counties if necessary. Expansion past Renville and Bottineau counties will be approved prior to investigation.

The following results of the desktop investigation will be provided to the North Dakota Department of Mineral Resources Oil and Gas Division:

- 1) Monthly progress report with time and materials billing for the month the work was performed.
- 2) A final report to include the following:
 - a. Tabular list of all identified brine ponds including geographical coordinates.
 - b. Map of all identified brine ponds.
 - c. Copies or references for all publicly available data utilized.

Phase 2: Assessment

Phase 2 will include a Phase I Environmental Site Assessment (ESA) site reconnaissance per ASTM E1527-13 Section 9 or E2247-16 Section 9 for each brine pond identified in Phase 1 for total impacts observed. Full Phase I ESAs will not be provided.

The following results of the assessment will be provided to the North Dakota Department of Mineral Resources Oil and Gas Division:

- 1) A report briefly summarizing conditions observed at each site.
 - a. Documentation of any records review performed
 - b. Photo documentation of the inspection
 - c. Documentation of any interviews conducted.
 - d. Documentation of any measurement (size) of impacts. (No sampling is required for this project)

This effort will be billed on a time and materials basis per the rates in the Environmental Services Contract. Costs cannot exceed \$100,000.

APPENDIX B

Bottineau County Site Assessment Reports

B1-1



Photograph facing north off of an oilfield lease road showing no visual impacts in agricultural field.



Photograph facing northeast off of an oilfield lease road showing no visual impacts in agricultural field.

Site Inspection Observations

B1-1 was inspected on May 15th, 2018, and is located approximately 500 feet north of an oilfield lease road. The site could not be accessed at the time of the site visit. The site is currently used as agricultural land, and is surrounded by agricultural fields. Visual impacts were not observed from a distance at the time of the site visit. A wetland was observed to the south of the site. The site topography is generally flat, and a drainage direction could not be assessed due to access limitations.

B1-2



Photograph facing north off of an oilfield lease road showing no visual impacts in agricultural field. Wetlands were observed northwest of the site.



Photograph facing northeast off of an oilfield lease road showing no visual impacts in agricultural field. Aboveground powerlines were observed north of the site.

Site Inspection Observations

B1-2 was inspected on May 15th, 2018, and is located approximately 200 feet north of oilfield lease road. The site could not be accessed at the time of the site visit. The site is currently an agricultural field that was recently plowed, and is surrounded by agricultural fields. Visual impacts were not observed from a distance at the time of the site visit. A wetland was observed to the north of the site. The site topography is generally flat and slopes to the northwest. Aboveground powerlines were observed approximately 100 feet north of the site.

B1-3



Photograph facing north off of an oilfield lease road showing a visually impacted area. Barren ground and stressed vegetation is visible in an approximately 100 feet by 100 feet area. A pump jack pad is located 75 feet to the northeast.



Photograph facing northeast off of an oilfield lease road showing visually impacted area and wetland located approximately 75 feet southeast.

Site Inspection Observations

B1-3 was inspected on May 15th, 2018, and is located approximately 200 feet east of 32nd Ave NW and 50 feet north of an oilfield lease road. The site is currently native grassland, and is surrounded by grasslands. An oil & gas facility consisting of one pump jack was observed to the northeast of the site. Visual impacts were observed, including an area of barren ground with stressed vegetation; the area of visual impacts measured approximately 100 feet by 100 feet. The impacted area appeared to have been migrating from the pump jack to the northeast. A wetland was observed to the southeast of the site. The site topography is generally flat and slopes to the southwest. Aboveground powerlines were observed to the west of the site.

B1-4



Photograph facing east off of an oilfield lease road showing visual impacts. Two areas were observed with barren ground, a lack of vegetation, and salt crusts.



Photograph facing southeast off of an oilfield lease road showing one of the two visually impacted areas and a wetland to the south.

Site Inspection Observations

B1-4 was inspected on May 15th, 2018, and is located approximately 50 feet east of an oilfield lease road. The site is currently native grassland, and is surrounded by grasslands. An oil & gas facility consisting of one pump jack was observed to the northwest of the site. Visual impacts were observed, including two areas of barren ground with little to no vegetation and salt crusting. The areas measured approximately 50 feet by 40 feet and approximately 40 feet by 40 feet. A wetland was observed to the south of the site. The site topography is generally flat and slopes to the southwest. Aboveground powerlines were observed to the west of the site.

B1-5



Photograph facing northwest off of an oilfield lease road showing agricultural fields. The site is located 1,000 feet further northwest and could not be accessed.



Photograph facing north off of an oilfield lease road showing an agricultural field. The site could not be accessed due to access limitations.

Site Inspection Observations

B1-5 was inspected on May 16th, 2018, and is located approximately 1,000 feet northwest of an oilfield lease road. The site could not be accessed at the time of the site visit. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. No visual impacts could be observed at the time of site visit due to access limitations. The site topography is generally flat but a drainage direction could not be assessed due to access limitations.

B1-6



Photograph facing west from 30th Ave NW showing a visually impacted area. Depression and stressed vegetation are visible from the road approximately 500 feet west.



Photograph facing northwest off of 30th Ave NW showing a residential area approximately 1,000 feet northwest of the site.

Site Inspection Observations

B1-6 was inspected on May 16th, 2018, and is located approximately 500 feet west of 30th Ave NW. The site could not be accessed at the time of the site visit. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. From the road, a slight depression with stressed vegetation could be observed. However, the area could not be measured because of access limitations. The site topography is generally flat and seems to drain towards the north to northwest.

B1-7



Photograph facing east off of an oilfield lease road showing a visually impacted area. Extensive dead zones with salt crusts were visible in an area approximately 80 feet by 30 feet. Aboveground powerlines were observed to the east.



Photograph facing southwest off of an oilfield lease road showing a visually impacted area. Cracks and salt crusts were observed.

Site Inspection Observations

B1-7 was inspected on May 15th, 2018, and is located approximately 150 feet south of 104th St NW and 50 feet east of an oilfield lease road. The site is currently native grassland. Native grasslands lie to the east and south, and agricultural fields lie to the north. An oil & gas facility consisting of 11 aboveground storage tanks, one pump jack, and three heater-treaters was observed to the west of the site. Visual impacts were observed, including an area of barren ground with stressed vegetation and salt crusting; the area of visual impacts measured approximately 80 feet by 30 feet. The site topography is generally flat and slopes to the southeast. Aboveground powerlines were observed to the east of the site, and underground oil & gas pipelines were observed to the north, just south of 104th St NW.

B1-8



Photograph facing north off of 104th St NW showing a visually impacted area. Extensive dead zones and salt crusts were observed.



Photograph facing northwest off of 104th St NW showing visually impacted area with salt crusts in an agricultural field.

Site Inspection Observations

B1-8 was inspected on May 15th, 2018, and is located approximately 100 feet north of 104th St NW and 200 feet west of an oilfield lease road. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. Visual impacts were observed, including an area of barren ground with stressed vegetation and salt crusting; the area of visual impacts measured approximately 125 feet by 100 feet. The site topography slopes steeply to the south. Aboveground powerlines were observed to the south of the site.

B1-9



Photograph facing west off of an oilfield lease road showing a visually impacted area. Extensive dead zones, salt crusts, and soil cracks are visible in a 200 feet by 100 feet area. The impacted area is adjacent to pad containing oilfield equipment.



Photograph facing southwest off of oilfield lease road showing wetland adjacent to the south of the site.

Site Inspection Observations

B1-9 was inspected on May 15th, 2018, and is located approximately 500 feet east of 31st Ave NW and 700 feet south of 104th St NW. The site is currently native grassland. Native grasslands lie to the north and south, and agricultural fields lie to the east. An oil & gas facility lies to the east, consisting of a field office, a pump jack, a pipeline riser, and miscellaneous field equipment. Visual impacts were observed, including an area of barren ground with little to no vegetation; the area of visual impacts measured approximately 200 feet by 100 feet. A wetland was observed to the north. The site topography is generally flat, and slopes to the south. A pipeline riser was observed to the west, indicating the likelihood of underground pipeline utilities in the vicinity of the site.

B1-10



Photograph facing southeast off of an oilfield lease road showing no visual impacts. A pump jack is located approximately 1,000 feet east of site.



Photograph facing southwest off of oilfield lease road showing no visual impacts. A wetland is located approximately 100 feet south of the site.

Site Inspection Observations

B1-10 was inspected on May 15th, 2018, and is located approximately 200 feet south of an oilfield lease road. The site is currently native grassland, and is surrounded by grasslands to the west, south, and east. Agricultural fields lie to the north. No visual impacts were observed at the time of the site visit. A wetland was observed to the south. The site topography is generally flat, and slopes to the north.

B1-11



Photograph facing east off of 31st Ave NW showing native grasslands with no visual impacts. The site is located approximately 500 feet further southeast in a fenced off field.



Photograph facing south off of 31st Ave NW. The site is located approximately 500 feet southeast in a fenced off field. Aboveground powerlines are located approximately 500 west of site.

Site Inspection Observations

B1-11 was inspected on May 15th, 2018, and is located approximately 500 feet south of 31st Ave NW. The site could not be accessed at the time of the site visit. The site is currently native grassland, and is surrounded by grasslands. Visual impacts were not observed from a distance at the time of the site visit. A wetland was observed to the south of the site. The site topography is generally flat and slopes to the north.

B1-12



Photograph facing south off of 31st Ave NW showing native grassland. The site is approximately 1,000 feet further south in the fenced-off field. Aboveground powerlines are located approximately 500 feet west of site.



Photograph facing southwest from 31st Ave NW. Site could not be accessed due to fence.

Site Inspection Observations

B1-12 was inspected on May 16th, 2018, and is located approximately 1,000 feet south of 31st Ave NW. The site could not be accessed at the time of the site visit. The site is currently native grassland, and is surrounded by grasslands. Visual impacts could not be observed at the time of site visit due to access limitations. A wetland was observed to the south of the site. The site topography is generally flat but a drainage direction could not be assessed due to access limitations.

B1-13



Photograph facing southwest off of 31st Ave NW. Site is in fenced off pasture land approximately 1,500 feet further southwest.



Photograph facing southwest off of 31st Ave. NW. The site is in fenced-off pasture land. Aboveground powerlines are located approximately 500 feet east of the site.

Site Inspection Observations

B1-13 was inspected on May 15th, 2018, and is located approximately 1,500 feet south of 31st Ave NW. The site could not be accessed at the time of the site visit. The site is currently native grassland, and is surrounded by grasslands. Visual impacts were not observed from a distance at the time of the site visit. The site topography appears to drain to the north.

B1-14



Photograph facing northeast off of an oilfield lease road showing a visually impacted area including barren areas with no vegetation. The impacted area is approximately 200 feet by 175 feet. Oil pipeline risers are located southwest of site.



Photograph facing northeast off of oilfield lease road showing salt crusts and soil cracks on site. The site is adjacent to a wetland measuring approximately 300 feet by 100 feet.

Site Inspection Observations

B1-14 was inspected on May 15th, 2018, and is located approximately 50 feet east of an oilfield lease road. The site is currently native grassland, and is surrounded by grasslands to the east, south, and west. Oil & gas facilities lie to the northwest (consisting of one pump jack), and to the east (consisting of one pump jack). Visual impacts were observed, including an area of barren ground with little to no vegetation and salt crusting; the area of visual impacts measured approximately 200 feet by 175 feet. A wetland was observed to the north. The site topography is generally flat and slopes to the northeast. Aboveground pipeline risers were observed to the west of the site, indicating the likelihood of underground pipelines in the vicinity of the site.

B2-1 (May 2018)



Photograph facing east of an oilfield lease road. No visual impacts were observed at the time of the May 16, 2018 site visit. The site is surrounded by agricultural fields with an oil & gas facility located to the west.

Site Inspection Observations

B2-1 was inspected on May 16th, 2018 and is located approximately 350 feet north of 104th St NW and 50 feet east of an oilfield lease road. The site is currently used for agricultural purposes and is surrounded by agricultural fields. An oil & gas facility consisting of two aboveground storage tanks, one heater-treater, and one pump jack was observed to the west of the site. No visual impacts were observed at the time of the site visit. A wetland was observed to the southeast of the site. The site topography is generally flat and slopes to the west and northwest. Aboveground powerlines were observed to the south of the site.

B2-1 (August 2018)



Photograph facing northeast off of an oilfield lease road showing the northern portion of the visually impacted area. Barren ground and stressed vegetation were observed in an area measuring approximately 100 feet by 20 feet.



Photograph facing southeast off of an oilfield lease road showing the southern portion of the visually impacted area.

Site Inspection Observations

B2-1 was revisited on August 20th, 2018. During the initial inspection, the site had recently been plowed, and no impacts could be observed. This follow-up investigation identified visual impacts consisting of barren ground and stressed vegetation in an area measuring approximately 100 feet by 20 feet.



Photograph facing north of 29th Ave NW. The site is located approximately 500 feet further north from the location of the picture and could not be accessed during the time of the inspection.



Photograph facing northwest of the wetland located to the southwest of the site. No visual impacts could be observed at the time of the visit due to access limitations.

Site Inspection Observations

B2-2 was inspected on May 16th, 2018, and is located approximately 500 feet northeast of 29th Ave NW. The site could not be accessed at the time of the site visit. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. No visual impacts could be observed from a distance at the time of the site visit. A wetland was observed to the southwest of the site. The site topography is generally flat and slopes to the southwest.

B2-3



Photograph facing northwest showing site conditions. A 50 feet by 50 feet area of visual impacts can be seen in the foreground.



Photograph facing west showing site conditions. Minimal visual impacts were observed. The wetland observed southwest of the site can be seen in the left side of the photograph.

Site Inspection Observations

B2-3 was inspected on May 16th, 2018, and is located approximately 450 feet west of 28th Ave NW. The site is currently used for agricultural purposes, and is surrounded by agricultural fields to the north, west, and south. An oil & gas facility consisting of four aboveground storage tanks, one heater-treater, one wellhead, and one flare pit was observed to the east of the site. Minimal visual impacts were observed, including an area of lighter colored soils and stressed vegetation; the area of visual impacts measured approximately 50 feet by 50 feet. A wetland was observed to the southwest of the site. The site topography is generally flat and slopes to the east.

B3-1



Photograph facing southwest from the northeast corner of the site, showing visual impacts, including salt residues, barren soils and stressed vegetation, within the oil & gas pad.



Photograph facing west from the east side of the site, showing site conditions.

Site Inspection Observations

B3-1 was inspected on May 16th, 2018, and is located at the center of an active oil & gas facility. The site is currently used as an oil & gas facility. The facility consists of 16 aboveground storage tanks, four heater-treaters, four shacks, and one horizontal separator. Visual impacts were observed, including an area of barren soils with little to no vegetation and salt residues; the area of visual impacts measured approximately 50 feet by 50 feet. The site topography is generally flat and slopes to the northeast. An aboveground powerline was observed on the oil pad facility, running east-west.

B3-2 (May 2018)



Photograph facing east off of 19th Ave NW. No visual impacts were observed at the time of the May 16, 2018 site visit.

Site Inspection Observations

B3-2 was inspected on May 16th, 2018 and is located approximately 500 feet east of 19th Ave NW and 50 feet north of an oilfield lease road. The site is currently used for agricultural purposes and is surrounded by agricultural fields. An oil & gas facility consisting of one wellhead was observed to the east of the site. No visual impacts were observed at the time of the site visit. The site topography is generally flat and slopes to the east.

B3-2 (August 2018)



Photograph facing east off of an oilfield lease road showing a visually impacted area. Barren ground and stressed vegetation were observed in numerous areas.



Photograph facing north off of an oilfield lease road showing a visually impacted area. Stressed vegetation was observed in numerous areas.

Site Inspection Observations

B3-2 was revisited on August 20th, 2018. During the initial inspection, the site had recently been plowed, and no impacts could be observed. This follow-up investigation identified visual impacts consisting of barren ground and stressed vegetation in four distinct areas. One area measuring approximately 20 feet by 15 feet is located in the eastern portion of the site, while 3 additional areas measuring 20 feet by 10 feet, 20 feet by 20 feet, and 30 feet by 15 feet are located to the north of the lease road.

B3-3 (May 2018)



Photograph facing east off of 19th Ave NW. No visual impacts were observed at the time of the May 16, 2018 site visit.



Photograph facing southwest looking onto the oil & gas facility. Soils shown in the foreground were part of the oil & gas pad, and not part of the site.

Site Inspection Observations

B3-3 was inspected on May 16th, 2018 and is located approximately 450 feet east of 19th Ave NW and just north of an oilfield lease road. The site is currently used for agricultural purposes and is surrounded by agricultural fields. An oil & gas facility was observed to the south of the site, consisting of two aboveground storage tanks, one wellhead, one pump jack, and one shack. Two grain bins were also located on the site, just north of the oil & gas facility. No visual impacts were observed at the time of the site visit. The site topography is generally flat and slopes to the northwest.

B3-3 (August 2018)



Photograph facing northeast off of an oilfield lease road showing stressed vegetation in an agricultural field. The area measured approximately 20 feet by 15 feet.



Photograph facing north off of an oil lease road showing two grain bins located at site and lighter colored grasses, which could potentially indicate stressed vegetation.

Site Inspection Observations

B3-3 was revisited on August 21st, 2018. During the initial inspection, the site had recently been plowed, and no impacts could be observed. This follow-up investigation identified visual impacts consisting of stressed vegetation in an area measuring approximately 20 feet by 15 feet. An area of lighter colored grasses was also observed, measuring approximately 15 feet by 10 feet, which could indicate stressed vegetation.

B3-4



Photograph facing east off of an oilfield lease road. No visual impacts were observed at the time of the site visit.

Site Inspection Observations

B3-4 was inspected on May 16th, 2018, and is located approximately 800 feet north of 107th St NW and 100 feet east of an oilfield lease road. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. An oil & gas facility consisting of one wellhead and one pump jack was observed to the west/southwest of the site. No visual impacts were observed at the time of the site visit. The site topography is generally flat and slopes to the southeast.



Photograph facing east of site conditions off of 19th Ave NW. Visual impacts including barren soils with little to no vegetative growth and salt crusting were observed.



Photograph facing west from the eastern portion of the site. The oil & gas facility can be seen in the background of the photograph.

Site Inspection Observations

B3-5 was inspected on May 16th, 2018, and is located approximately 600 feet east of 19th Ave NW and 100 feet east of an oilfield lease road. The site is currently native grassland, and is surrounded by agricultural fields. An oil & gas facility consisting of one pump jack was observed to the west of the site. Visual impacts were observed, including an area of barren soils with little to no vegetative growth and salt crusting; the area of visual impacts measured approximately 125 feet by 75 feet. The site topography is generally flat and slopes to the northwest.



Photograph facing northwest off of an oilfield lease road. An area of stressed vegetation, measuring approximately 100 feet by 100 feet can be seen in the center of the photograph.



Photograph facing southeast, taken northwest of the wetland. The wetland lies northwest of the area of stressed vegetation. The site topography is generally flat and slopes to the west.

Site Inspection Observations

B3-6 was inspected on May 16th, 2018, and is located approximately 600 feet west of 24th Ave NW and 150 feet north of an oilfield lease road. The site is currently native grassland, and is surrounded by grasslands. An oil & gas facility consisting of one pump jack was observed to the southeast of the site. A wetland was observed to the northwest of the site. Visual impacts were observed, including an area of stressed vegetation; the area of visual impacts measured approximately 100 feet by 100 feet. The site topography is generally flat and slopes to the west.

B4-1



Photograph facing northwest off of an oilfield lease road. Barren soils with no vegetation and salt crusting was observed in an area approximately 75 feet by 15 feet.



Photograph facing west/northwest off of an oilfield lease road. Visual impacts were observed within the road ditch.

Site Inspection Observations

B4-1 was inspected on May 16th, 2018, and is located approximately 50 feet west of an oilfield lease road. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. An oil & gas facility consisting of one pump jack was observed to the north of the site. Visual impacts were observed, including an area of barren soils with little to no vegetation and salt crusting; the area of visual impacts measured approximately 75 feet by 15 feet. The impacts appear to be confined to a roadside ditch along the lease road, just south of the pump jack. The site topography is generally flat and slopes to the roadside ditch along the lease road. An aboveground power line was observed to the south of the site.

B4-2



Photograph facing east off of US Highway 83. The site is located approximately 1,500 feet farther east, on private property. No visual impacts could be observed due to access limitations.

Site Inspection Observations

B4-2 was inspected on May 16th, 2018, and is located approximately 1,500 feet east of US Highway 83. The site could not be accessed at the time of the site visit. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. No visual impacts could be observed at the time of site visit due to access limitations. The site topography is generally flat but a drainage direction could not be assessed due to access limitations.



Photograph facing northwest off of an oilfield lease road. Visual impacts were observed, including barren soils and salt residues.

Site Inspection Observations

B4-3 was inspected on May 16th, 2018, and is located approximately 2,500 feet north of 108th St NW and 125 feet northwest of an oilfield lease road. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. An oil & gas facility consisting of seven aboveground storage tanks, two heater-treaters, and one shack was observed to the south of the site. Visual impacts were observed, including an area of barren soils with little to no vegetation and salt residues; the area of visual impacts measured approximately 150 feet by 100 feet. The site topography is generally flat and slopes to the southwest.



Photograph facing southwest off of 108th St NW. Barren soils with little to no vegetation and salt residues were observed.



Photograph facing south off of 108th St NW, showing the eastern extent of the area of visual impacts.

Site Inspection Observations

B4-4 was inspected on May 17th, 2018, and is located approximately 50 feet south of 108th St NW. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. Grasslands lie to the north, across 108th St NW. Visual impacts were observed, including an area of barren soils with little to no vegetation and salt residues; the area of visual impacts measured approximately 200 feet by 100 feet. The site topography is generally flat and slopes to the north. An electrical transformer and a power pole were observed to the east of the site.



Photograph facing east off of an oilfield lease road, showing an area of stressed vegetation and salt residues.



Photograph showing a closer view of the area of stressed vegetation and salt residues.

Site Inspection Observations

B4-5 was inspected on May 17th, 2018, and is located approximately 600 feet south of 108th St NW and just east of an oilfield lease road. The site is currently used for agricultural purposes. Agricultural land lies to the north and grasslands lie to the east and south. An oil & gas facility was observed to the west, consisting of five aboveground storage tanks, one heater treater, one flare pit, and one shack. Visual impacts were observed, including an area of stressed vegetation and salt residues; the area of visual impacts measured approximately 50 feet by 50 feet. The site topography is generally flat and slopes to the east/southeast.



Photograph facing northwest off of an oil & gas facility showing the visually impacted area. Visual impacts follow the edge of the oil & gas facility.



Photograph facing northeast off of the oil & gas facility showing the visually impacted area between the facility and an agricultural field. The Souris River can be seen in the background.



Photograph facing southeast off of the oil & gas facility showing the visually impacted area between the facility and an agricultural field. The Souris River can be seen in the background.

Site Inspection Observations

B4-6 was inspected on May 17th, 2018, and is located approximately 250 feet south of 108th St NW and just east of an oilfield lease road. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. An oil & gas facility was observed to the west, consisting of one shack. Visual impacts were observed along the eastern edge of the oil & gas facility, including an area of stressed vegetation and salt residues; the area of visual impacts measured approximately 200 feet by 20 feet. The site topography is generally flat and slopes to the southeast.

B5-1



Photograph facing south off of 109th St NW showing the site. No visual impacts were observed at the time of the site visit.

Site Inspection Observations

B5-1 was inspected on May 17th, 2018, and is located approximately 400 feet south of 109th St NW. The site could not be accessed at the time of the site visit. The site is currently native grassland, and is surrounded by grasslands. Two small wetlands were observed at the site. Visual impacts were not observed from a distance at the time of the site visit. The site topography is generally flat and slopes to the northeast. An underground natural gas pipeline was observed to the north, running south of 109th St NW.

B5-2



Photograph facing southwest off of an oil & gas facility showing the visually impacted area lacking vegetation.



Photograph facing southwest off of an oil & gas facility showing the visually impacted area lacking vegetation. The visually impacted area is north of a wetland visible in the background.

Site Inspection Observations

B5-2 was inspected on May 17th, 2018, and is located approximately 200 feet south of an oilfield lease road. The site is currently used for agricultural purposes. A wetland lies to the west/southwest, and agricultural fields lie to the east/southeast. An oil & facility was observed to the north, consisting of three aboveground storage tanks, one heater-treater, one flare pit, one pump jack, and one shack. Visual impacts were observed, including an area of barren soils with little to no vegetation growth; the area of visual impacts measured approximately 100 feet by 50 feet. The site topography is generally flat and slopes to the northwest.

B5-3



Photograph facing southeast off of an oil & gas facility. A visually impacted area lacking vegetative growth can be seen.



Photograph facing south off of an oil & gas facility showing the lack of vegetative growth in the visually impacted area.

Site Inspection Observations

B5-3 was inspected on May 17th, 2018 and is located approximately 600 feet east of County Road 27A and just east of an oilfield lease road. The site is currently used for agricultural purposes and is surrounded by agricultural fields. An oil & gas facility was observed to the west, consisting of four aboveground storage tanks, two heater-treaters, one flare pit, one pump jack, and one shack. Visual impacts were observed, including an area of barren soils with little to no vegetation growth; the area of visual impacts measured approximately 100 feet by 75 feet. The site topography is generally flat and slopes to the north.

B5-4



Photograph facing southeast off of an oilfield lease road showing the site. No visual impacts were observed at the time of the site visit.

Site Inspection Observations

B5-4 was inspected on May 17th, 2018 and is located approximately 400 feet west of 11th Ave NW and 50 feet south of an oilfield lease road. The site is currently native grassland and is surrounded by grasslands. An oil & facility was observed to the south, consisting of one pump jack. An abandoned well pad was also observed to the northwest. Visual impacts were not observed at the time of the site visit. The site topography is generally flat and slopes to the east.



Photograph facing west off of an oil & gas facility, looking into an area of the facility used as a laydown yard. A visually impacted area with cracking soils was observed.



Photograph facing west showing a closer view of the cracking soils at the visually impacted area located within the laydown yard of the oil & gas facility.

Site Inspection Observations

B5-5 was inspected on May 17th, 2018, and is located approximately 500 feet south of 104th St NW. The site is currently an oil & gas facility and is surrounded by agricultural fields. The oil & facility consisted of four aboveground storage tanks, one heater-treater, and two shacks. Visual impacts were observed on the well pad at the laydown yard, including an area of stressed vegetation and cracking soils; the area of visual impacts measured approximately 75 feet by 75 feet. The site topography is generally flat and slopes to the southeast.

B6-1



Photograph facing northwest off of an oilfield lease road showing the site. No visual impacts could be observed due to access limitations.

Site Inspection Observations

B6-1 was inspected on May 17th, 2018, and is located approximately 500 feet northwest of an oilfield lease road. The site could not be accessed at the time of the site visit. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. Visual impacts were not able to be observed at the time of site visit due to access limitations. The site topography is generally flat and slopes to the south. An aboveground powerline was observed to the south of the oilfield lease road and west of the site.



Photograph facing south off of an oilfield lease road showing the site. No visual impacts could be observed due to access limitations.

Site Inspection Observations

B6-2 was inspected on May 17th, 2018, and is located approximately 500 feet southwest of an oilfield lease road. The site could not be accessed at the time of the site visit. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. Visual impacts were not able to be observed at the time of site visit due to access limitations. The site topography is generally flat and slopes to the north.

B6-3 (May 2018)



Photograph facing south off of an oilfield lease road showing the site. No visual impacts could be determined at the time of the May 17, 2018 site visit due to recent disturbance in the field.

Site Inspection Observations

B6-3 was inspected on May 17th, 2018 and is located approximately 1,500 feet north of 106th St. NW and 200 feet south of an oilfield lease road. The site is currently an agricultural field that was freshly plowed and is surrounded by agricultural fields. Visual impacts were not observed due to the recent disturbance. The site topography is generally flat and slopes to the west/northwest.

B6-3 (August 2018)



Photograph facing southeast off of an oilfield lease road showing the eastern portion of the visually impacted area. Barren ground and stressed vegetation were observed in an approximately 150 feet by 20 feet area.



Photograph facing southwest off of an oilfield lease road showing western portion of visually impacted area.

Site Inspection Observations

B6-3 was revisited on August 21st, 2018. During the initial inspection, the site had recently been plowed, and no impacts could be observed. This follow-up investigation identified visual impacts consisting of barren ground and stressed vegetation in an area measuring approximately 150 feet by 20 feet.

B6-4 (May 2018)



Photograph facing south off of an oilfield lease road showing the site. No visual impacts were observed at the time of the May 17, 2018 site visit.

Site Inspection Observations

B6-4 was inspected on May 17th, 2018 and is located approximately 1,800 feet west of 5th Ave NW and 200 feet south of an oilfield lease road. The site is currently used for agricultural purposes and is surrounded by agricultural fields. An oil & gas facility was observed to the northwest, consisting of one aboveground storage tank, one heater-treater, and one pump jack. A wetland was observed to the south, and a residential property was observed approximately 1,500 feet to the east. Visual impacts were not observed at the time of the site visit. The site topography is generally flat and slopes to the south. An aboveground powerline was observed to the north.

B6-4 (August 2018)



Photograph facing south off of an oilfield lease road showing a visually impacted area. Barren ground and stressed vegetation were observed in an area measuring approximately 100 feet by 50 feet.



Photograph facing southeast off of an oilfield lease road showing a visually impacted area. Aboveground storage tanks are visible to the right of the picture, located north of the site.

Site Inspection Observations

B6-4 was revisited on August 21st, 2018. During the initial inspection, the site had recently been plowed, and no impacts could be observed. This follow-up investigation identified visual impacts consisting of barren ground and stressed vegetation in an area measuring approximately 100 feet by 50 feet.

B6-5



Photograph facing south off of an oilfield lease road showing the site. A wetland and aboveground powerlines can be seen in the background.



Photograph facing south off of an oilfield lease road showing the site. A small area of slightly stressed vegetation was observed at the time of the site visit.

Site Inspection Observations

B6-5 was inspected on May 17th, 2018 and is located approximately 300 feet north of 103rd St NW and 100 feet south of an oilfield lease road. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. Oil & gas facilities were observed to the west and north, consisting of two aboveground storage tanks, one heater-treater, and one pump jack. A barn and grain silo were observed to the southwest. A wetland was observed to the south. Minimal visual impacts were observed, including an area of slightly stressed vegetation; the area of visual impacts measured measuring approximately 25 feet by 25 feet. The site topography is generally flat and slopes to the south towards the aforementioned wetland. An aboveground powerline was observed to the south of the site.



Photograph facing southwest off of 103rd St NW showing the visually impacted area lacking vegetation with salt crusting.



Photograph facing southwest showing a closer view of the visually impacted area.

Site Inspection Observations

B6-6 was inspected on May 17th, 2018, and is located approximately 100 feet south of 103rd St. NW. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. A wetland was observed to the west. Visual impacts were observed, including an area of barren soils, stressed vegetation, and salt residues; the area of visual impacts measured approximately 120 feet by 120 feet. The site topography is generally flat and slopes slightly to the north.

B7-1



Photograph facing south off of 109th St NE showing the site. The site appears to have been recently reclaimed. No visual impacts were observed during the site visit.

Site Inspection Observations

B7-1 was inspected on May 16th, 2018, and is located approximately 300 feet south of 109th St NE. The site appears to be a recently reclaimed oil & gas pad. Agricultural fields lie to the south and west, and grasslands lie to the east. A wetland was observed to the east of the site. No visual impacts were observed at the time of the site visit. The site topography is generally flat and slopes to the northeast towards the wetland.

B7-2



Photograph facing west off of an oilfield lease road showing the site. No visual impacts were observed at the time of the site inspection.

Site Inspection Observations

B7-2 was inspected on May 16th, 2018 and is located approximately 50 feet west of an oilfield lease road. The site is currently used for agricultural purposes and is surrounded by agricultural fields. A wetland was observed to the north of the site. No visual impacts were observed at the time of the site visit. The site topography is generally flat and slopes to the west.

B7-3



Photograph facing northeast off of an oilfield lease road showing the visually impacted area.



Photograph showing a closer view of the visually impacted area. A lack of vegetative growth and salt crusting can be seen. A wetland can be seen in the background.

Site Inspection Observations

B7-3 was inspected on May 16th, 2018 and is located approximately 75 feet north of an oilfield lease road. The site is currently native grassland. Oil & gas facilities lie to the north, east, and south of the site. The facility to the north consists of three aboveground storage tanks and one pump jack. The facility to the east consists of two aboveground storage tanks. The facility to the south consists of five aboveground storage tanks and one heater treater. Wetlands were observed to the west, east, and south of the site. Visual impacts were observed, including a barren area with salt crusting; the area of visual impacts measured approximately 50 feet by 20 feet. The site is located in a low area, between the aforementioned wetlands. Aboveground powerlines were observed to the south of the site.

B7-4



Photograph facing west/northwest off of 3rd Ave NE showing the visually impacted area. Visual impacts were minimal and included slightly stressed vegetation.

Site Inspection Observations

B7-4 was inspected on May 16th, 2018, and is located approximately 2,000 feet south of 106th St NE and 200 feet west of 3rd Ave. NE. The site is currently used for agricultural purposes and is surrounded by agricultural fields. A wetland was observed to the south/southeast of the site. Minimal visual impacts were observed, including an area of stressed vegetation; the area of visual impacts measured approximately 20 feet by 20 feet. The site topography is generally flat and slopes to the south/southeast.



Photograph facing north off of an oilfield lease road showing the visually impacted area lacking vegetative growth.

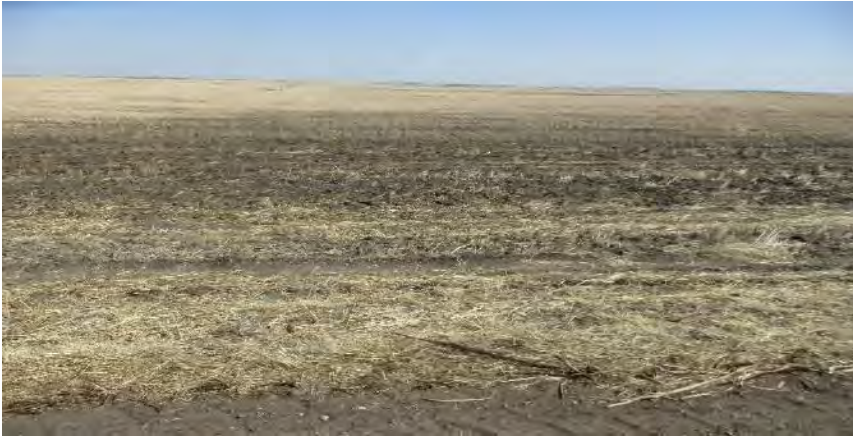


Photograph facing north off of an oilfield lease road showing the visually impacted area lacking vegetative growth.

Site Inspection Observations

B7-5 was inspected on May 16th, 2018 and is located approximately 50 feet north of an oilfield lease road. The site is currently native grassland and is surrounded by grasslands. A wetland was observed to the east/northeast of the site. Visual impacts were observed, including an area of barren soils with little to no vegetative growth, and salt crusting; the area of visual impacts measured approximately 30 feet by 10 feet. There is a slight rise to the east of the impacted area, and the site drains away from the hill. Aboveground powerlines were observed to the north of the site. A pipe was observed protruding from the ground west of the site, indicating there may potentially be underground utilities in the area.

B11-1



Photograph facing south off of 101st St. NW showing the site. The site could not be accessed at the time of the site visit and no visual impacts were visible from the roadway.

Site Inspection Observations

B11-1 was inspected on May 16th, 2018, and is located approximately 700 feet south of 101st St. NW. The site could not be accessed at the time of the site visit. The site is currently used for agricultural purposes and is surrounded by agricultural fields. A wetland was observed to the southwest of the site, and a pond was observed to the southeast of the site. No visual impacts were observed from a distance at the time of the site visit. The site topography is generally flat and slopes to the north.

B11-2



Photograph facing east off of an oilfield lease road showing the visually impacted area lacking vegetation. A wetland can be seen in the background.



Photograph facing west from the east edge of the visually impacted area. Salt crusting and a lack of vegetation can be seen. The oilfield lease road can be seen in the background.

Site Inspection Observations

B11-2 was inspected on May 16th, 2018 and is located approximately 800 feet south of 97th St NW and 50 feet east of an oilfield lease road. The site is currently native grassland, and is surrounded by agricultural fields. An oil & gas facility was observed to the west, consisting of one pump jack. A wetland was observed to the south of the site. Visual impacts were observed, including an area of barren soil, stressed vegetation, and salt crusting; the area of visual impacts measured approximately 70 feet by 50 feet. The site topography is generally flat and slopes to the southeast. An aboveground powerline was observed west of the site.

B11-3



Photograph facing northeast off of an oilfield lease road showing the visually impacted area and the lack of vegetative growth. The impacted area is directly east of the oilfield lease road.



Photograph facing southeast off of an oilfield lease road showing the visually impacted area. Lack of vegetative growth and salt crusting can be seen.



Photograph facing south showing a closer view of the visually impacted area and the salt crusting. Aboveground powerlines can be seen in the background.

Site Inspection Observations

B11-3 was inspected on May 16th, 2018 and is located approximately 150 feet north of 96th St NW and just east of an oilfield lease road. The site is currently used for agricultural purposes and is surrounded by agricultural fields. An oil & gas facility lies immediately to the west, consisting of one pump jack. A wetland was observed to the northeast of the site. Visual impacts were observed, including an area of barren soil and salt crusting; the area of visual impacts measured approximately 350 feet by 100 feet. The site topography is generally flat and slopes to the southwest. An aboveground powerline was observed west of the site running east-west, and an underground oil & gas pipeline was observed west of the site running north-south.

B11-4



Photograph facing southwest off of an oilfield lease road showing the visually impacted area lacking vegetative growth.



Photograph facing southwest showing a closer view of the visually impacted area located on agricultural land. Aboveground powerlines and an intermittent stream can be seen in the background.

Site Inspection Observations

B11-4 was inspected on May 16th, 2018, and is located approximately 250 feet north of 96th St NW and 50 feet south of an oilfield lease road. The site is currently used for agricultural purposes, and is surrounded by agricultural fields. An oil & gas facility lies to the east, consisting of eight aboveground storage tanks, one heater-treater, and one pump jack. A wetland was observed to the north of the site, and an intermittent stream was observed 200 feet south of the site. Visual impacts were observed, including an area of barren soil with stressed vegetation; the area of visual impacts measured approximately 40 feet by 15 feet. The site topography is generally flat and slopes to the west/southwest. An aboveground powerline was observed west of the site.

B12-1



Photograph facing west/southwest off of 25th Ave NW showing the visually impacted area north/northeast of aboveground storage tanks. A wetland bordering the site was observed northeast along the road.



Photograph facing southwest off of 25th Ave NW showing the visually impacted area and wetland bordering the site. Aboveground powerlines were observed south of the oilfield lease road.



Photograph facing west off of 25th Ave NW showing the wetland adjacent to road, and agricultural land to the north.

Site Inspection Observations

B12-1 was inspected on May 4th, 2018, and is located approximately 10 feet west of 25th Ave NW and 40 feet north of an oilfield lease road. The site is currently used for agricultural purposes. Agricultural fields are located to the north, east, and west. An oil & gas facility was observed to the south, consisting of seven aboveground storage tanks, two horizontal separators, a wellhead, and a pump jack. Visual impacts included an area with barren soil lacking vegetation with salt crusting; the area of visual impacts measured approximately 50 feet by 25 feet. A wetland was also observed to the northeast of the site. The site topography is generally flat, slightly undulating, and slopes slightly to the southeast. Aboveground powerlines were observed to the south of the lease road.

B13-1



Photograph facing east off of an oil & gas facility showing the visually impacted area lacking vegetation and exhibiting salt crusting.



Photograph facing west/southwest off of an oilfield lease road showing the visually impacted area.



Photograph facing south off of an oilfield lease road showing visually impacted area. Soil cracking and salt crusting can be seen. A wetland is located adjacent to the site as can be seen in the background.