

Location Restrictions

Nelsen Pond

Otter Tail Power Company- Coyote Station

Introduction

This report presents documentation and certification for the location standards for the Nelsen Pond at Coyote Station in Beulah, North Dakota. Nelsen Pond is an “existing” (i.e. received coal combustion residuals both before and after October 14, 2015) coal combustion residual (CCR) surface impoundment.

Nelsen Pond is used to periodically store and dewater CCR that has been hydraulically dredged from the Slag Pond. Once dewatered the CCR is hauled to the Blue Pit, an on-site CCR landfill, for disposal. Nelsen Pond contains CCR or slurry for a period of 2 to 3 months every 3 years.

This document addresses the requirements of 40 CFR Sections 257.60 through 257.64 (Rules), i.e. location standard requirements, for CCR surface impoundments and demonstrates Nelsen Pond’s compliance with the requirements.

Location Restrictions

The sections below provide substantiation of compliance for each of the location restrictions.

Compliance with §257.60, Placement above the uppermost aquifer

To comply with §257.60, the owner or operator must demonstrate that:

- (a) *New CCR Landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in the groundwater elevations.*

Hydrogeologic conditions beneath Nelsen Pond have been documented in the *Groundwater Monitoring System Report – Slag Pond Area (Barr, 2016)*. Groundwater flow occurs within the Coleharbor Formation, which consists of late Pleistocene age glacial till and is comprised predominantly of clay with a few laterally discontinuous lenses of silt, sand, and gravel. The Coleharbor till is separated into two hydrostratigraphic units: the Upper Coleharbor and the Lower Coleharbor. The uppermost groundwater beneath Nelsen Pond is encountered within the Upper Coleharbor, and movement of groundwater occurs mainly within the lenses of more permeable material. Although some of the permeable lenses may behave individually as confined aquifers, for the purposes of demonstrating separation from the uppermost aquifer the entirety of the Upper

Coleharbor formation is treated as an unconfined aquifer, and therefore the top of the aquifer corresponds to the potentiometric surface defined by the groundwater elevations measured within then unit (i.e. the groundwater table). This is a more conservative approach, as the elevation of the groundwater table is often higher than the top of the uppermost saturated sand lens. Groundwater flow within the Upper Coleharbor is generally from northwest to southeast.

Based on groundwater elevation measurements reported in the *Groundwater Monitoring System Report – Slag Pond Area (Barr, 2016)*, the minimum separation from the base of Nelsen Pond to the groundwater table during August 2016 was 7.5 feet. This occurred in the northern end of Nelsen Pond.

The highest recorded groundwater measurement from May 19, 2008 to date occurred on June 28, 2011. During this event, the groundwater elevation of monitoring well N3 (closest to Nelsen Pond) was 2.2 feet higher than the August 2016 measurement. This equates to a groundwater separation between Nelsen Pond base liner and the groundwater of 5.3 feet for the documented high water table.

Figure 1 shows the base liner contours of Nelsen Pond, and Figure 2 shows the groundwater contours from August 2016.

Compliance with §257.61, Wetlands

To comply with §257.61, the owner or operator must demonstrate that:

(b) New CCR Landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter.

There are no wetlands mapped within the Nelsen Pond footprint according to the U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) database.

Historical land use shown in aerial photography from the year 1967 (i.e. prior to construction of Coyote Station) does not indicate the presence of wetlands within the footprint of Nelsen Pond.

Figure 3 shows the National Wetland Inventory map.

Compliance with §257.62, Fault Areas

To comply with §257.62, the owner or operator must demonstrate that:

(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time.

Based on a review of the United States Geologic Survey (USGS) Faults and Folds Database map, Nelsen Pond is not located within 200 feet of a fault zone which has had displacement in Holocene time. Figure 4 shows the site location on a USGS Quaternary Faults and Folds Database map.

The site-wide *Soil Design & Geology Report (Bechtel, 1976)* conducted prior to construction of Coyote Station confirms the absence of fault activity in recent geological history.

Compliance with §257.63, Seismic Impact Zones

To comply with §257.63, the owner or operator must demonstrate that:

(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones.

Additionally, the Preamble to 40 CFR 257 states that *"a seismic impact zone means an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g) will exceed 0.10 g in 50 years.*

Based on the USGS 2014 two-percent probability of exceedance in 50 years map, Nelsen Pond is located in an area of peak acceleration ranging from 0.02 g to 0.04 g, which is less than the 0.10 g threshold constituting a seismic impact zone. A map showing Coyote Station relative to peak acceleration zones is provided as Figure 5.

Compliance with §257.64, Unstable Areas

To comply with §257.64, the owner or operator must demonstrate that:

(a) An existing or new CCR landfill, existing or new CCR surface impoundments, and all lateral expansions of CCR units must not be located in an unstable area.

(b) The owner or operator must consider all of the following factors, at minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;

(2) On-site or local geologic or geomorphologic features;

(3) On-site or local human-made features or events (both surface and subsurface).

The *Soils Design & Geology Report (Bechtel, 1976)* and *Groundwater Monitoring System Report (Barr, 2016)* referenced above describe the soils and geology beneath Nelsen Pond. Nelsen Pond is located within the Great Plains region of the Missouri Plateau. This region is characterized by sedimentary rock (Sentinel Butte Formation) overlain by glacial till (Coleharbor Formation). The Sentinel Butte Formation consists of mainly silt, clay, sand, sandstone, and lignite. No lignite has been found underlying Nelsen Pond. The Coleharbor Formation consists of silty clays and sandy clays of medium plasticity, with lenses of silty sand. These soils are stable and are well-suited to support the pond foundation. Standard penetration test results vary from 12 to 70 blows per foot in the clay, and from

14 to over 100 blows per foot in the sandy soils. No soft soils, areas susceptible to mass movements, or karts terrains were reported in the investigation area.

The land surrounding Nelsen Pond is gently rolling and slopes gradually (two to three percent slope) south.

The arrangement of soils and topography provide a stable base not prone to differential settling or mass movements. Additionally, pond construction practices such as removal of all topsoil and vegetation and soil compaction of the base and embankments ensure the underlying soils are capable of supporting the pond.

Nelsen Pond located is near other Coyote Station infrastructure with aboveground and underground utilities located adjacent to the pond. There are no utilities that would cause unstable conditions beneath the pond.

Conclusion

Nelsen Pond meets all of the location restrictions listed under 40 CFR §257.60 to §257.64 and there are no apparent conditions that would cause underlying soils to move or impact the structure of the unit and cause risk to human health or the environment through structural failures.

Certification

I hereby certify under penalty of law that this report was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment.



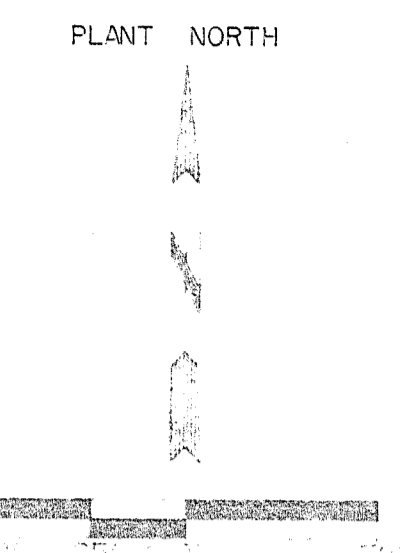
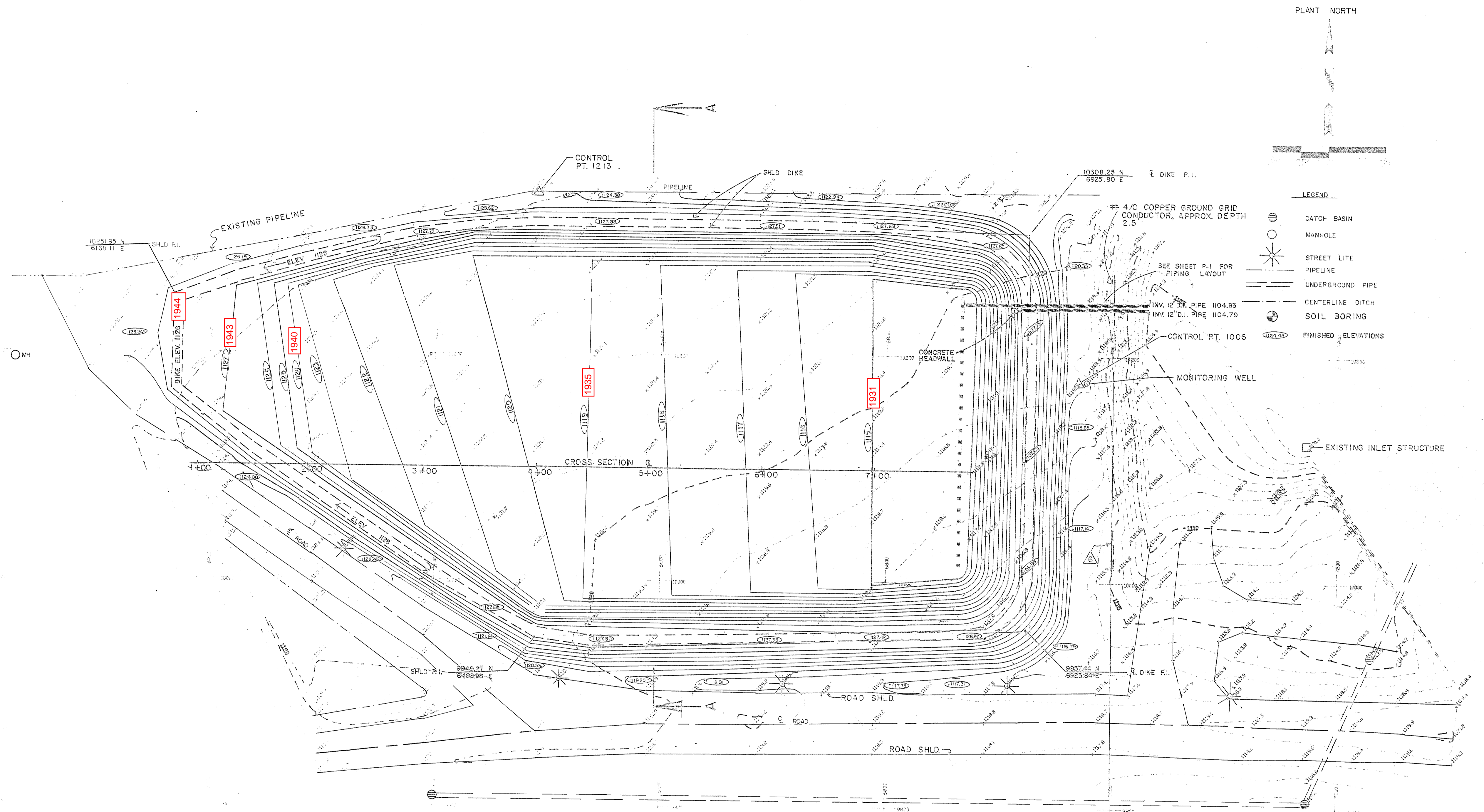
Daniel J. Riggs, PE
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October 17, 2018

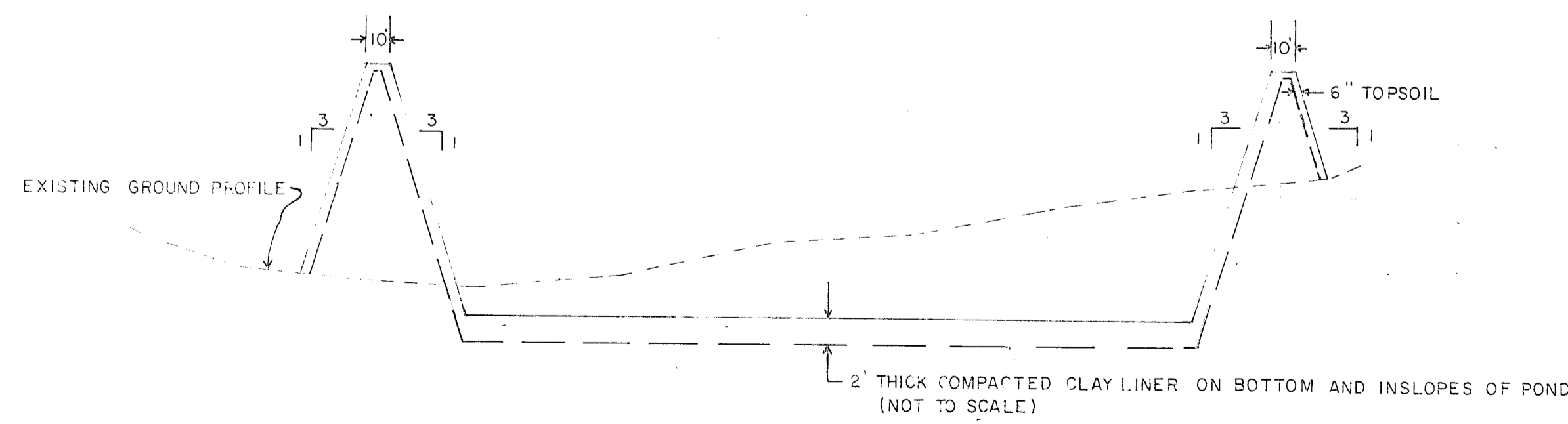
Date

References

- Bechtel, 1976.** Coyote Station Unit 1 Soils Design & Geology Report, Power Plant Area. Prepared for, Minnesota Power and Light Company, Minnkota Power Cooperative, Inc., Montana-Dakota Utilities CO., Northwestern Public Service Company, and Otter Tail Power Company. December 1976
- Barr, 2016.** Groundwater Monitoring System Report Slag Pond Area, Coyote Station. Prepared for Otter Tail Power, November 2016



- LEGEND
- CATCH BASIN
 - MANHOLE
 - STREET LITE
 - PIPELINE
 - UNDERGROUND PIPE
 - CENTERLINE DITCH
 - SOIL BORING
 - FINISHED ELEVATIONS



SECTION A-A
 HORIZ. SCALE 1" = 50'
 VERT. SCALE 1" = 5'

CONSTRUCTION NOTES

- 1. OUTSIDE TOE OF DIKES TO BE A MINIMUM OF 5' FROM THE PIPELINE AND STREET LITES
- 2. DO NOT DISTURB MONITORING WELL
- 3. STRIP SITE TOPSOIL TO A MINIMUM DEPTH OF 6"
- 4. ALL STRIPPED MATERIAL TO BE PLACED ON OUTSIDE SLOPES OF DIKES
- 5. COPPER GROUND GRID CONDUCTOR TO BE ABANDONED ON EAST-WEST RUN, COORDINATE WITH OWNER
- 6. DO NOT CUT COPPER GROUND GRID CONDUCTOR WHEN INSTALLING 16" D.I. PIPE
- 7. CONTRACTOR MUST COORDINATE STOCKPILE LOCATIONS WITH OWNER

SURVEY CONTROL POINTS

NO.	NORTH	EAST	ELEV.	DESCRIPTION
1001	9932.92	6537.72	1119.91	5/8" REBAR
1006	10,176.49	6970.66	1119.33	5/8" REBAR
1213	10,342.78	6490.22	1125.44	5/8" REBAR

COORDINATE VALUES AND ELEVATIONS ARE BASED ON PLANT DATUM

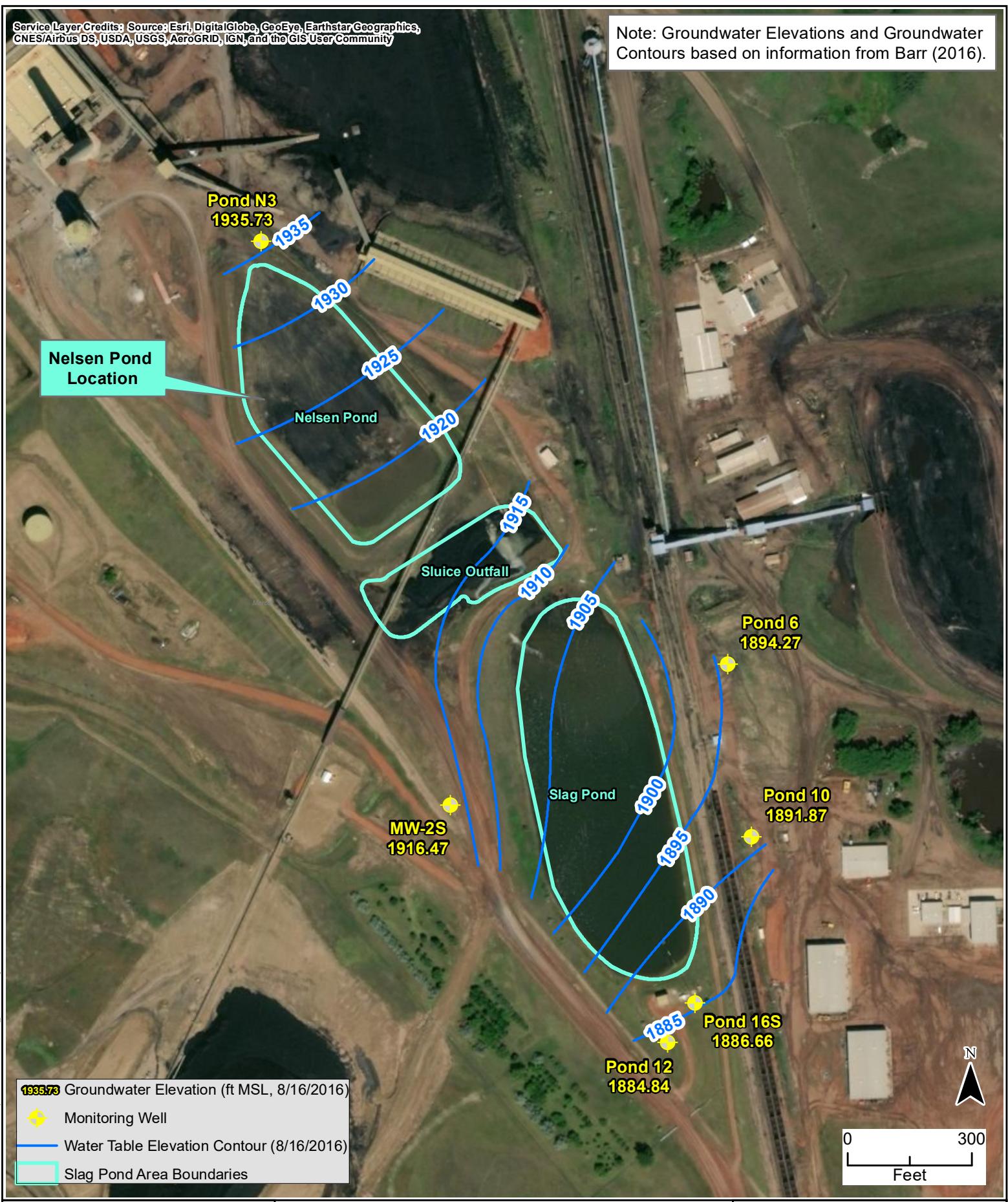
NOTE: Add 816 feet to provided contours to convert elevations
 1935 Elevation adjusted to current datum

CCR LOCATION DOCUMENTATION REPORT
 NELSEN POND
 FIGURE 1
 BASE LINER CONTOURS



5-6-92	AS-BUILTS	TF
ASH DEWATERING SITE MDU COYOTE STATION BEULAH, NORTH DAKOTA		
POND LAYOUT AND FINAL CONTOURS		
ULTEIG ENGINEERS, INC. ENGINEERS		
DESIGNED BY: [Signature]	DATE: 5/11/92	SCALE: AS SHOWN
CHECKED BY: [Signature]	DATE: 5/11/92	SCALE: AS SHOWN
APPROVED BY: [Signature]	DATE: 5/11/92	SCALE: AS SHOWN

Note: Groundwater Elevations and Groundwater Contours based on information from Barr (2016).



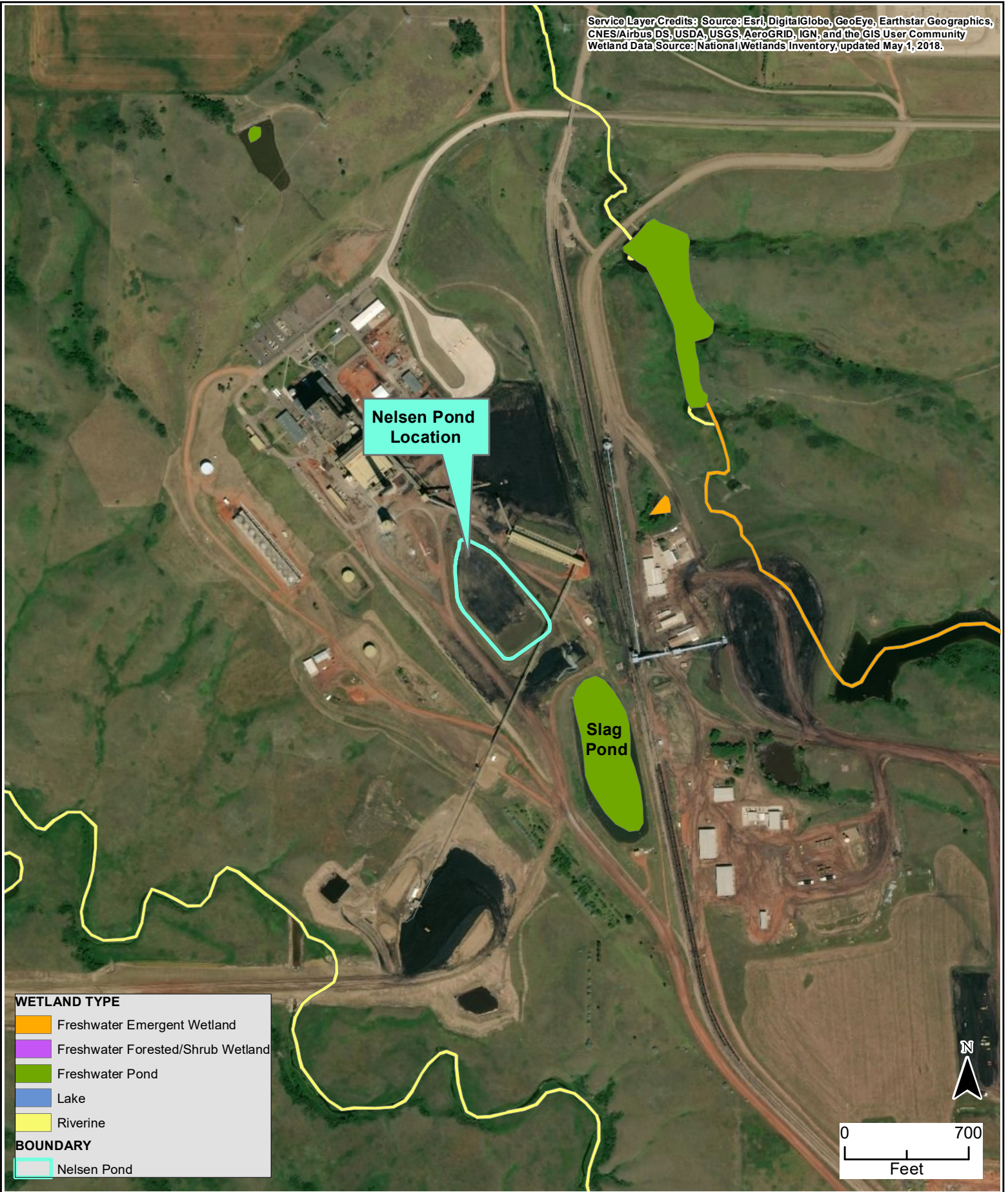
1935.73 Groundwater Elevation (ft MSL, 8/16/2016)

Monitoring Well

Water Table Elevation Contour (8/16/2016)

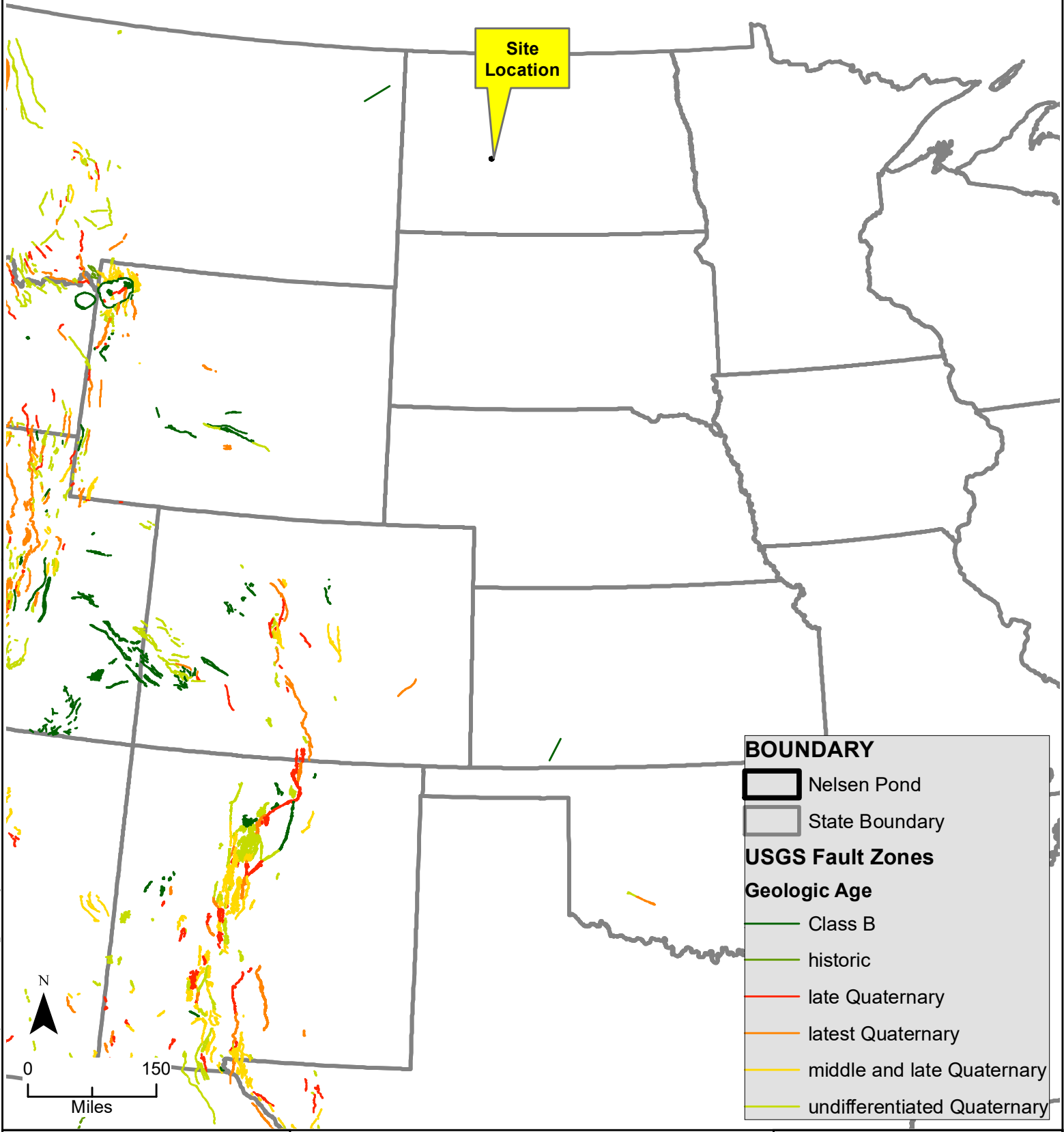
Slag Pond Area Boundaries

Document Path: P:\Projects\Otter Tail Power\6347 - Coyote Station\GIS\CCR_Location\Figure 2 - WTCContourMap.mxd



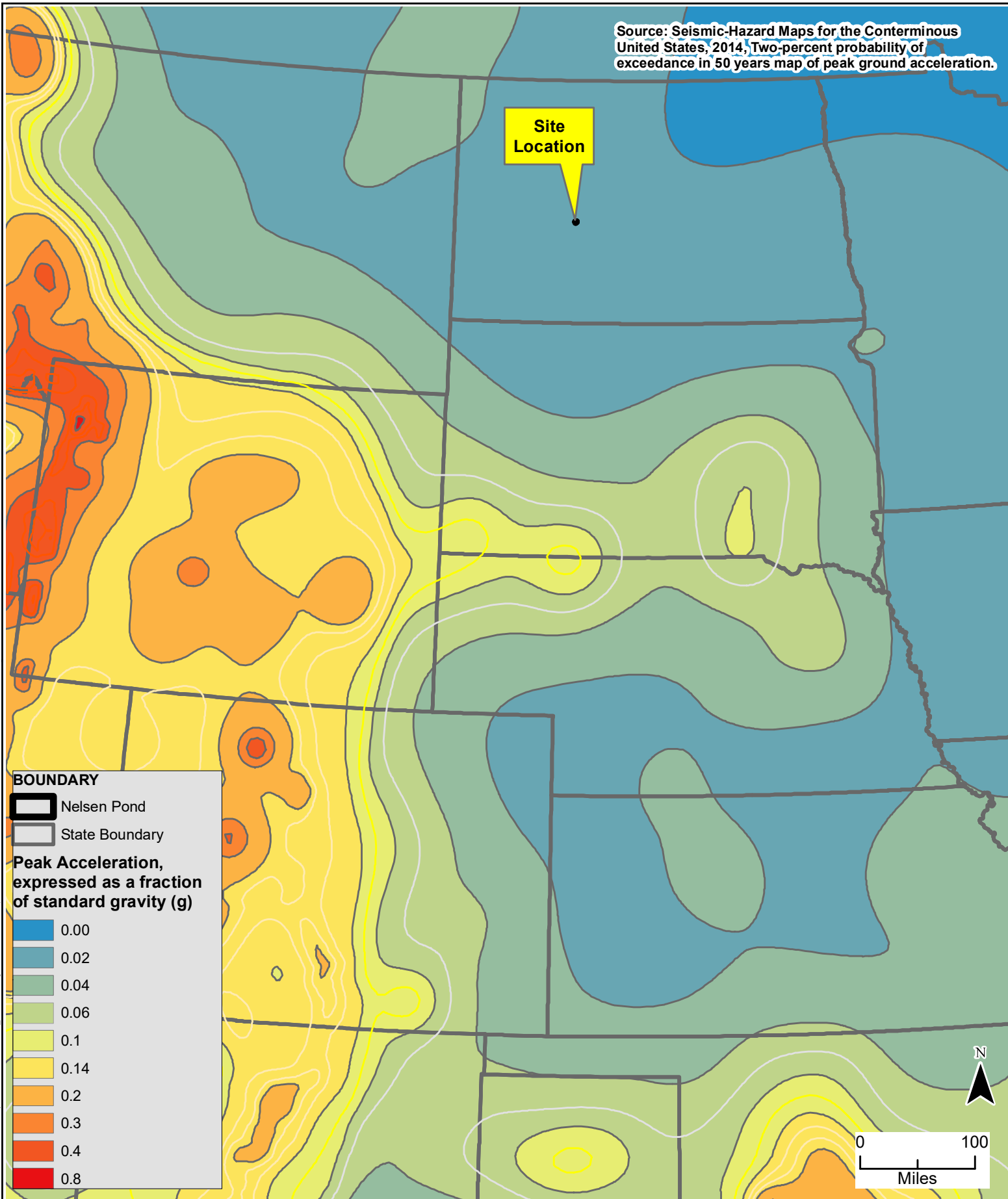
**CCR LOCATION
DOCUMENTATION REPORT
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Otter Tail Power Coyote Station
Beulah, North Dakota

**FIGURE 3
CFR §257.61
WETLANDS**



Document Path: P:\Projects\Otter Tail Power\6347 - Coyote Station\GIS\CCR_Location\Figure 3 - Fault Zones.mxd

Source: Seismic-Hazard Maps for the Conterminous United States, 2014, Two-percent probability of exceedance in 50 years map of peak ground acceleration.



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**FIGURE 5
CFR §257.63 SEISMIC
IMPACT ZONES**