COAL ASH IMPOUNDMENT SITE ASSESSMENT FINAL REPORT

Coyote Station
Otter Tail Power Company, Montana-Dakota Utilities, Co., Northern Municipal Power Agency, and NorthWestern Energy

Prepared by:

KLEINFELDER
Bright People. Right Solutions.

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KLEINFELDER PROJECT NUMBER 118953-3

February 28, 2013

I acknowledge that the management units referenced herein:

- Nelsen Pond
- Sluice Pond
- Ash Pond

Were assessed on May 19, 2011

Signature: [signature] Date: 2/28/13

Charles E. Larson, P.E.
Lead Civil Engineer

EXECUTIVE SUMMARY

Background information taken from the U. S. Environmental Protection Agency's (EPA's) website:

> "Following the December 22, 2008 dike failure at the TVA/Kingston, Tennessee coal combustion waste (CCW) ash pond dredging cell that resulted in a spill of over 1 billion gallons of coal ash slurry, covered more than 300 acres and impacted residences and infrastructure, the EPA is embarking on an initiative to prevent the catastrophic failure from occurring at other such facilities located at electric utilities in an effort to protect lives and property from the consequences of a impoundment or impoundment failure of the improper release of impounded slurry."

As part of the EPA's effort to protect lives and the environment from a disaster similar to that experienced in 2008, Kleinfelder was contracted to perform a site assessment at the Coyote Station that is owned and operated by Otter Tail Power Company (OTPC), Montana-Dakota Utilities Co., Northern Municipal Power Agency, and NorthWestern Energy. This report summarizes the observations and findings of the site assessment that occurred on May 19, 2011.

The coal combustion waste impoundments observed during the site assessment included:

- Nelsen Pond – Commissioned in 1992
- Sluice Pond – Commissioned in 1981
- Ash Pond – Commissioned in 1981

Preliminary observations made during the site assessment are documented on the Site Assessment Checklists presented in Appendix A. A copy of this checklist was transmitted to the EPA following the field walk-through. A more detailed discussion of the observations is presented in Section 4, "Site Observations".

All three impoundments are regulated as one permitted site (permit number SP-170) by the North Dakota Department of Health – Waste Management Division. That agency has not established a hazard rating.

Overall, the ponds are reasonably well maintained and engineered, and operated with a few areas of concern as discussed in Section 6, "Recommendations". Of particular importance is the absence of critical stability and seismic loading studies necessary to identify potential impoundment safety deficiencies.

On the date of this site assessment, there appeared to be no immediate threat to the safety of the impoundment embankments. No assurance can be made regarding the impoundments' condition after this date. Subsequent adverse weather and other factors may affect the condition.

A brief summary of the Priority 1 and 2 Recommendations is given below. A more detailed discussion is provided in Section 6, "Recommendations".

Priority 1 Recommendations

1. Perform a stability analysis on the Nelsen Pond embankment by August 31, 2013.
2. Perform a hydraulics and hydrology study for Nelsen Pond by August 31, 2013.
3. Perform a seismic loading analysis on the Nelsen Pond embankment by August 31, 2013.
4. Prepare an Emergency Action Plan (EAP) for the facility by August 31, 2013.
5. Control animal burrowing on the downstream slopes of Nelsen Pond. Develop and implement an animal control program by August 31, 2013.

Priority 2 Recommendations

1. Perform video assessments of Nelsen Pond outlet piping by August 31, 2013.
2. Maintain a log of maintenance and other activities at the impoundments and supporting facilities by August 31, 2013.

3. Update the Operation and Maintenance (O&M) Manual for the impoundments and the facility by August 31, 2013.

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SECTION 1 – INTRODUCTION

1.1 GENERAL

This report has been prepared for the United States Environmental Protection Agency (EPA) to document findings and observations from a site assessment at Coyote Station on May 19, 2011.

The following sections present a summary of data collection activities, site information, performance history of the facility's impoundment ponds, a summary of site observations, and recommendations resulting from the site investigation.

1.2 PROJECT LOCATION

Coyote Station is located approximately three miles south of Beulah, ND, as shown in Plate 1. The power plant is located in Mercer County at approximately 47^{o}13'10''N and 101^{o}48'46''W. The nearby town of Beulah is a rural agricultural community with the town population of about 3,100.

1.3 SITE DOCUMENTATION

OTPC provided the following documents during the time of this assessment to aid in the review of the impoundments:

- Bechtel, Coyote Station Unit 1 – Soils Design and Geology Report, December 1976.
- Bechtel, Coyote Station Unit 1 Construction Drawings (Site Plan (1 sht.), Plot Plan (1 sht.), Site Grading Plan (2 shts.), original issue 1976.
- Bechtel, Coyote Station Unit 1 Construction Drawing - Ash Haul Road Plan & Profile (1 sht.), original issue July 1977.
- Ulteig Engineers, Inc., As-Built Drawings (Pond Layout (1 sht.), Discharge Piping (1 sht.), Cross Sections (3 shts.) for Ash Dewatering Site (Nelsen Pond) – Coyote Station, May 1992.
- Otter Tail Power Co., Coyote Station Property Boundary Map, undated.
- Otter Tail Power Co., Coyote Station 1998 Water Balance in GPD, 2007.

SECTION 2 – SITE ASSESSMENT

2.1 ATTENDEES

The site assessment was performed on May 19, 2011 by Charles Larson, P.E. and Brad Piede, E.I.T. of Kleinfelder. Other persons present during the site assessment included:

- Terry Graumann – OTPC
- Brad Zimmerman – OTPC
- T. J. Newkirk – OTPC
- Paul Vukonich – OTPC
- Kalle Godel – Montana-Dakota Utilities Co.
- Brandon Hoggarth – OTPC
- Brad Klipfel – OTPC
- Gerry Schatz – OTPC

2.2 IMPOUNDMENTS ASSESSED

Impoundments and associated structures that were observed during the site assessment included:

- Nelsen Pond – Commissioned in 1992
- Sluice Pond – Commissioned in 1981
- Ash Pond – Commissioned in 1981

Observations from the site assessment are documented on the Site Assessment Evaluation Checklists presented in Appendix A. A summary of observations from the site assessment is presented in Section 4.

2.3 WEATHER DURING ASSESSMENT

During the assessment of the OTPC Coyote Station impoundments, the weather was sunny and breezy. Temperatures ranged from about 65^{o} to 70^{o} F, and wind speeds ranged from about 5 to 15 miles per hour (mph).

SECTION 3 – SITE INFORMATION AND HISTORY

3.1 SITE INFORMATION AND HISTORY

Coyote Station is a coal-fired facility that has been in operation since 1981. The facility currently sluices primarily boiler slag residuals with small amounts of economizer ash which are both by-products of coal fired energy generation, into the Sluice Pond impoundment. The Sluice Pond is a small incised pond that allows the boiler slag to settle out and be continually removed by a loader and trucks as it decants off to the adjacent Ash Pond. The flue gas desulphurization (FGD) and fly ash are both dry processes and thus do not use ash ponds for settling or storage. The boiler slag is stockpiled at the southwest end of the Sluice Pond, where it is hauled away by trucks to be sold for commercial uses such as shingle grit and abrasives. During the decanting process from the Sluice Pond to the Ash Pond, some finer boiler slag and economizer ash flows into the Ash Pond. According to OTPC, it typically takes about two years to deposit sufficient boiler slag and economizer ash in the Ash Pond such that cleaning of that facility is required. At that time, boiler slag and economizer ash is hydraulically dredged from the Ash Pond to Nelsen Pond just northwest of the Sluice Pond. Nelsen Pond is designed to accommodate the volume of dredged slurry from the Ash Pond to allow dewatering and disposal of the liquid back into the Sluice Pond. The remaining boiler slag and economizer ash in Nelsen Pond dries out and is eventually loaded onto trucks for disposal at a nearby onsite landfill (North Dakota Solid Waste Permit No. SP-182 (Coyote Station – Blue Pit)). The process of dredging the Ash Pond and filling Nelsen Pond occurs over about three months. As such, Nelsen Pond holds wet ash/slag slurry on average less than 15 percent of the time. An aerial image of these impoundments can be seen on Plate 2.

There are no releases of decanted water to any water body. The water in the Ash Pond is reused as plant process water. Nelsen Pond is a combination incised and diked facility. The Ash Pond is primarily incised with a low height berm around half of its perimeter and a higher road embankment that is well above the water level around the remainder. A sluice pipe transports primarily boiler slag from power generating operations to an outlet near the north corner of the Sluice Pond. The Ash Pond and Sluice Pond were constructed with the original plant, and Nelsen Pond was constructed 11 years later in 1992. All three ponds were constructed in regraded or native earth, and thus no parts of the impoundments are built over wet ash, slag, or other unsuitable material.

The Sluice Pond and Ash Pond are directly connected by a pipe for decanting. Nelsen Pond and the Sluice Pond are also connected by two pipes that allow dewatering of Nelsen Pond into the Sluice Pond. There is also a small overflow spillway inlet and vertical overflow pipe that connects to one of the dewatering pipes in the event Nelsen Pond fills up above its maximum design elevation. All three ponds have managed inflow that is continuously monitored and thus do not have emergency spillways in the embankments. Nelsen Pond does not have any tributary drainage area outside of its footprint. The Sluice Pond has a very small tributary drainage area (estimated at less than one acre), and the Ash Pond has about 8 to 10 acres of area that drain into it via a storm sewer system. According to OTPC, the storm sewer is designed to handle the 10-year 24-hour rainfall event.

In reviewing the response letter to the EPA's section 104(e) request for information, shown in Appendix B, it is noted that there has never been a release of impounded water at Coyote Station.

3.2 Pertinent Data

A. GENERAL

1. Name....................Coyote Station
2. State....................North Dakota
3. County....................Mercer
4. Latitude.................... 47^{o} 13' 10'' North
5. Longitude.................... 101^{o} 48' 46'' West
6. River used for operations.................... N/A
7. Year Constructed.................... 1981
8. Modifications.................... Nelsen Pond added in 1992
9. Current Hazard Classification....................None assigned
10. Proposed Hazard Classification....................Low (Nelsen Pond only)
11. Size....................See below

B. IMPOUNDMENTS

NELSEN POND

1. Type....................Earthen – Incised and Diked
2. Crest Elevation....................±1943[1]
3. Crest Length....................~ 1,950 ft[2]
4. Crest Width....................10 ft

5. Impoundment Height .... ~ 11 ft (max)
6. Upstream Slope .... 3H:1V[1]
7. Downstream Slope .... 3H:1V[1]
8. Volume of Stored Ash .... ~15 acre-feet

SLUICE POND

1. Type .... Incised
2. Crest Elevation .... ~1910 (lowest point)
3. Crest Length .... ~ 1,650 ft[2]
4. Crest Width .... 10 ft
5. Impoundment Height .... N/A – Incised pond
6. Upstream Slope .... Incised sections near vertical
7. Downstream Slope .... N/A – Incised Pond
8. Volume of Stored Ash .... ~1 acre-feet

ASH POND

1. Type .... Incised with embankment above waterline
2. Crest Elevation .... ~1910 (lowest point)[1]
3. Crest Length .... ~ 2,700 ft[2]
4. Crest Width .... 8 ft to 20 ft
5. Impoundment Height .... ~ 3 ft to 32 ft[1]
6. Upstream Slope .... 3H:1V[3]
7. Downstream Slope .... 3H:1V[3]
8. Volume of Stored Ash .... ~10 acre-feet

C. DRAINAGE BASIN

1. Area of Contributing Drainage Basin .... Primarily the impoundment area
2. Downstream Description: .... Drainage sloughs to the Knife River

D. RESERVOIR INLET

NELSEN POND

1. Reservoir Inlet .... Temporary sluice pipe from Ash Pond[4]

SLUICE POND

1. Reservoir Inlet .... 12" steel sluice pipe, 8" optimizer sluice pipe, and double 12" pipes from Nelsen Pond

ASH POND

1. Reservoir Inlet .... 24" RCP and submerged plant drain inlet[5]

E. RESERVOIR

NELSEN POND

1. Reservoir Capacity .... Maximum storage is approximately 31 acre-feet[1]

SLUICE POND

1. Reservoir Capacity .... Maximum storage is approximately 3 acre-feet

ASH POND

1. Reservoir Capacity .... Maximum storage is approximately 40 acre-feet[1]

F. PRIMARY SPILLWAY

NELSEN POND

1. Description ....12” ductile iron pipe and overflow inlet structure with trashrack

SLUICE POND

1. Description ....N/A – No Spillway Present

ASH POND

1. Description ....N/A – No Spillway Present

G. OUTLET WORKS

NELSEN POND

1. Description ....Perforated PVC collector pipe with filter connected to a steel outlet pipe[5]
2. Location.. Buried under waterside toe of southeast embankment[5]
3. Intake Structure... 12” perforated PVC pipe with filter[5]
   a. Intake Invert Elevation ....1925-1926 ft
4. Discharge Conduit .... Steel pipe
   a. Length... 170 ft
   b. Diameter .... 12 inches[1]
5. Outlet Structure................................Projecting 12” steel outlet pipe through landside embankment
   a. Outlet Invert Elevation ....1920 ft [1]
   b. Energy Dissipation..None
6. Discharge Channel..None
7. Discharge Capacity with Water Surface at Top of Impoundment.......................................Unknown

SLUICE POND

1. Description .... Concrete 3’ x 4‘ drop inlet w/ 24-inch dia. concrete pipe to Ash Pond
2. Location...Southeast embankment
3. Intake Structure.. Concrete 3’ x 4’ drop box inlet
   a. Intake Invert Elevation ....~1923[1]
4. Discharge Conduit .... Concrete pipe
   a. Length.. ~120 ft
   b. Diameter ....24 inches
5. Outlet Structure.. 24” RCP
   a. Outlet Invert Elevation .... ~1920 ft
   b. Energy Dissipation.. Concrete mat
6. Discharge Channel..None
7. Discharge Capacity with Water Surface at Top of Impoundment.......................................Unknown

ASH POND

1. Description ....Pump station for plant reuse
2. Location...South embankment
3. Intake Structure..48-inch pipe[1,5]
   a. Intake Invert Elevation .... 1897 ft[1,5]
4. Discharge Conduit ....48-inch pipe[5]
   a. Length.. Unknown
   b. Diameter .... 48 inches[5]
5. Outlet Structure...Unknown – Terminates at plant
   a. Outlet Invert Elevation ....Unknown
   b. Energy Dissipation..N/A – Pumped to plant

6. Discharge Channel..None
7. Discharge Capacity with Water Surface at Top of Impoundment......................................Unknown

H. MANAGEMENT

1. Owner...Otter Tail Power Company, Montana-Dakota Utilities Co., Northern Municipal Power Agency, and NorthWestern Energy
2. Purpose...Coal Fired Energy Generation

Notes:

1. Data provided by plant staff or obtained from Bechtel or Ulteig Engineering reports
2. Pond shares common embankment with adjacent pond
3. Slope includes adjacent embankment constructed above maximum water surface elevation
4. Feature was not in use and not observed during assessment.
5. Feature was submerged and unable to be visually inspected

3.3 REGIONAL GEOLOGY AND SEISMICITY

Based on our review of the United States Geological Survey (USGS), information from the United States Department of Agriculture's Web Soil Survey, and Bechtel's Geological Map of the plant site, the subsurface conditions at the plant site are expected to primarily consist of glacial sediment composed of silty clays, with sand and gravel up to 100 feet thick. The glacial sediment overlays the Butte Formation formed during the Tertiary Period, which consists of sandy silt, sandstone, and lignite up to 600 feet thick.

The plant site is situated in a Seismic Zone 0 area with the largest historic earthquake in North Dakota registering magnitude 5.5 in May, 1909. The plant area is considered to have relatively low seismic risk.

3.4 HYDROLOGY AND HYDRAULICS

Nelsen Pond and the Sluice Pond were designed and situated in such a manner that there is little to no watershed drainage outside of the pond footprint contributing to the stored volume of the ponds. Normal pond operations are limited to pumping of boiler slag and economizer ash slurry and any precipitation that falls within the impoundments themselves. The Ash Pond has a storm sewer entering the pond that drains an estimated 8 to 10 acres of the plant area.

During the assessment, the design report and drawings prepared by Bechtel and the Nelsen Pond design drawings prepared by Ulteig Engineers were reviewed. Those documents covered details such as pond geometry and freeboard, operations, and pipe interconnects. The reports did not contain any discussion of site hydrology, impoundment break analyses, or overtopping analysis, nor were any subsequent documents located that covered those topics. According to plant personnel, the Sluice Pond and Nelsen Pond have managed inflow and pool levels that are regularly monitored by plant personnel, and both contain small volumes of ash. Furthermore, the Ash Pond is primarily incised and only accepts decant from the Sluice Pond and storm runoff from a relatively small area of the plant, and the water level is maintained below natural grade and managed with sufficient freeboard to provide adequate storage during significant hydrologic events.

3.5 GEOTECHNICAL CONSIDERATIONS

Regarding stability of the Ash Pond embankment slopes, we have reviewed the Soil Design and Geology Report for Coyote Station dated December, 1976 by Bechtel Engineering. That report included stability analyses for the most critical embankment section and used the maximum pool elevation. Three cases of slope stability were analyzed including end-of-construction, long-term, and long-term with rapid drawdown. Further, conservative soil parameters were used based on test data. Minimum factors of safety met or exceeded 1.5 for all cases. Results of the analysis are presented below and excerpts from that report are presented in Appendix C.

Summary of Ash Pond Stability Analysis (Bechtel, 1976)

Description	Static Factor of Safety	Dynamic Factor of Safety
End of Construction	1.5	NA
Long Term	2.7	NA
Rapid Drawdown	2.5	NA
Minimum Accepted Factor of Safety According to USACE	**1.5**	**1.0**

Seepage analysis was also performed on the Ash Pond for both clay lined and unlined cases. The maximum pool elevation and the average ground water elevation were used. The unlined pond analysis calculated seepage losses at 3.9 x 10^{-6} ft/yr or 0.12 cfs. Due to uncertainties, a 3-foot thick clay liner was recommended which was calculated to reduce seepage losses to 1.8 x 10^{-6} ft/y, or 0.06 cfs. A safety factor of 4 was applied to yield a design rate of 0.24 cfs.

No stability or seepage assessments were available for the Nelsen Pond or Sluice Pond and stability evaluations for the Nelsen Pond embankment should be completed. No seepage or stability instrumentation is installed at the site, and instrumentation installation should be contingent upon the results of the stability analysis.

No stability evaluation of the Sluice Pond is necessary because that pond is very small and is incised.

The ponds are located in Seismic Zone 0, and should have a low risk for seismic activity. No seismic loading evaluations were available and should be completed for Nelsen Pond only.

3.6 STRUCTURAL CONSIDERATIONS

Structures associated with the three ash ponds include a culvert intake and outlet, an overflow intake, a trussed sluice-pipe catwalk, and a pump house. The culvert allows decanted water to flow from the Sluice Pond to the Ash Pond. An overflow structure and trashrack are in place at the southeast end of Nelsen Pond which flows to the Sluice Pond. The catwalk is a wooden truss structure approximately 10 feet tall that supports the sluice pipe inlet to the Sluice Pond. The pump house is a metal structure located at the southern end of the Ash Pond.

The structures were not inspected in detail, but appeared visually to be in Satisfactory condition with no evidence of movement, concrete spalling, excessive rust or corrosion of metal parts, or any structural distress. All structures appeared to be functioning as intended during the assessment.

3.7 PERFORMANCE EVALUATIONS

There have been no previous federal or state assessments of the Coyote Station ash ponds to our knowledge. Likewise, there have not been any outside independent consultant assessments for the ponds to our knowledge. Based on discussions with OTPC, there have been no significant incidents involving any of the three ash pond units.

3.8 HAZARD CLASSIFICATION

The Coyote Station's three impoundments are regulated by the North Dakota Department of Health – Waste Management Division, but do not currently have a designated hazard rating assigned by that agency. The Ash Pond is primarily incised and would have little chance of releasing its contents because the water level is maintained below natural ground, and thus would not justify a hazard rating. Likewise, the Sluice Pond is incised and contains a very small volume of liquid and ash, and thus would also not justify a hazard rating. Nelsen Pond is only in service for about three months during a typical 24 month period, and also contains a relatively small volume at its maximum storage (about 15 acre-feet), and is continuously dewatering as the pond is being filled with dredged boiler slag from the Ash Pond. Ongoing dewatering would make the ash material much less fluid and thus less likely to flow significant distances in the event of a loss of containment. Furthermore, any release of the small volume would be completely contained on OTPC property or on the adjacent lignite mine property, and there is no probable potential for loss of human life. Considering that Nelsen Pond is continuously monitored by plant personnel as part of normal ash sluicing operations, a Low Hazard rating would be justified for the Nelsen Pond only; however, a formal hazard classification should still be performed on the Nelsen Pond. No private homes, recreational facilities, businesses, paved roads or other structures outside of the plant area would be impacted.

3.9 SITE ACCESS

We were required to seek permission from OTPC to gain access to the plant site. After arriving at the site and meeting with representatives of OTPC, we were escorted by facility personnel to assess the impoundments. The impoundments can be accessed by standard passenger vehicle during normal weather conditions via gravel-surfaced roadways on the Coyote Station property.

SECTION 4 – SITE OBSERVATIONS

The Nelsen Pond impoundment embankment on the southeast, upstream and downstream toes, and all three ponds' outlet works components (portions not inundated at the time of assessment) were observed during the May 19, 2011 site assessment. General observations of these features are presented below; more specific observations of the site and facilities are documented in the Site Assessment Evaluation Checklist provided in Appendix A. Captioned site photographs are presented at the end of this section.

4.1 NELSEN POND

4.1.1 Upstream Slope

Overall, the upstream slope of the impoundment was in Satisfactory condition. Photos 1, 3, 7, 15, 21, and 22 show the conditions of the upstream slope. Specific observations include:

- The upstream slope is in satisfactory condition, appears stable, and is in general accordance with the 1992 design drawings prepared by Ulteig Engineers.
- The upstream slopes and pond bottom have a two-foot-thick clay lining, according to the drawings. The pond is generally free of grasses and any woody brush over the entire inside perimeter of the impoundment.
- There is no riprap placed on the upstream slope.

4.1.2 Crest

Overall, the crest of the impoundment was in Satisfactory condition. Photos 1, 2, 7, 15, 19, 21, and 22 show the condition of the crest. Specific observations include:

- No major depressions, erosion, or rutting were noted on the impoundment crest.
- The crest was generally well vegetated with native grasses.

* Numerous small animal burrows were present on the crest.

4.1.3 Downstream Slope

Overall, the downstream slope was in Satisfactory condition. Photos 5, 8, 19, 22, 23, and 25 show the condition of the downstream slope. Specific observations include:

* The slopes were well vegetated and appeared stable.
* No slope scarps or depressions were noted.
* A few small animal burrows were noted.

4.1.4 Downstream Toe Areas

The toe areas of the embankment were in Satisfactory condition. See Photos 5, 8, 19, 23, 24, and 25 for the condition of these areas. Key features and observations of these areas include:

* The pond was dry and thus no seepage at the downstream toe was evident.
* The embankment toe was well vegetated and clear of any woody bushes and small trees.

4.1.5 Outlet Works

The outlet works of Nelsen Pond consists of a 12-inch diameter ductile iron pipe (DIP) through the embankment that outlets into the Sluice Pond. That DIP is connected to a buried 12-inch diameter perforated PVC pipe in a trench at the downstream end of Nelsen Pond. The buried PVC pipe collects dewatering liquid from the dredged ash material placed in the pond, and conveys that to the 12-inch DIP for disposal into the Sluice Pond. The 12-inch diameter DIP can be closed by a valve between Nelsen Pond and the Sluice Pond. There is also a grated concrete intake spillway structure at the maximum deposition level of Nelsen Pond with a vertical 12-inch DIP outlet pipe that connects to a second and parallel 12-inch diameter DIP that outlets into the Sluice Pond. See Photos 15, 16, 17, and 29 for the visible portions of the outlet works and overflow spillway piping. Key observations include:

- The outlet piping was buried and thus unable to be observed at the time of the assessment.
- The intake structure grate was clean and appeared that it would function effectively if needed.
- No video monitoring of the pipe was available at the time of assessment.
- Overall, the outlet works and overflow system piping system appeared to be functioning as intended at the time of assessment, and as confirmed by plant staff during the assessment.

4.1.6 Impoundment Inlet

Inflow into Nelsen Pond is by a temporary pipe that is placed when the pond is needed to accept ash dredge material from the Ash Pond. At the time of the assessment, Nelsen Pond was not in service, and thus there was no inlet piping in place from the Ash Pond.

4.2 SLUICE POND

4.2.1 Upstream Slope

The Sluice Pond is incised and was not assigned a Hazard Classification; therefore, the upstream slopes were not given a condition rating, however they appeared to function properly. Photos 28 through 34 show the condition of the upstream slope within the pond. The eastern side of the pond is also an access road for mining trucks, and because the pond is constructed on sloping land, the east side is primarily incised with roadway embankment. Specific observations include:

- The upstream slope was in fair condition, appeared stable, but was oversteepened over much of its perimeter.
- There were no design drawings of the Sluice Pond available for review.
- The pond lining type, if any, is unknown.
- There was riprap placed on portions of the upstream north slope where a separate economizer ash settling channel has been constructed.

4.2.2 Crest

The Sluice Pond is incised and was not assigned a Hazard Classification; therefore, the crest was not given a condition rating, but appeared to function properly. Photos 28 through 34 also show the condition of the perimeter crest. Specific observations include:

- Much of the perimeter crest also serves as an access road.
- No major depressions, erosion, or rutting were noted on the pond crest.
- A trestle structure supports the sluice pipe entering the west side of the pond, as shown in Photos 28 and 32.

4.2.3 Downstream Slope

Overall, there is no downstream slope because the pond is primarily incised. The east side of the Sluice Pond adjacent to the Ash Pond appears both partially incised and consisting of embankment, as shown in Photos 36 and 37. Specific observations include:

- The slope was well vegetated and appeared stable.
- The east slope between the Sluice Pond and the Ash Pond had a small scarp feature, as shown on Photos 39 and 42. While that condition did not appear to present an imminent threat to the slope stability, the embankment should be repaired with vegetation re-established.

4.2.4 Downstream Toe Areas

The Sluice Pond is incised and was not assigned a Hazard Classification; therefore, the downstream toe areas were not given a condition rating, but appeared to function properly. The pond side toes were submerged and could not be observed. The downstream toe on the east slope between the Sluice Pond and the Ash Pond appeared stable, as shown on Photos 37 and 42. Key features and observations of these areas include:

- There was a small discharge at the downstream toe of the Sluice Pond between the Sluice Pond and the Ash Pond. According to plant staff that water was discharging from a buried pipe that collected drainage from inside the plant production area. See Photos 37 and 41.
- The outlet pipe from the Sluice Pond penetrates the slope and enters the Ash Pond, as shown on Photo 37.
- The downstream toe was well vegetated and clear of any woody bushes and small trees.

4.2.5 Outlet Works

The outlet works of the Sluice Pond consists of a concrete drop inlet that connects to a 24-inch diameter RCP that outfalls into the Ash Pond. See Photos 35, 37, and 38 for the Sluice Pond outlet works. Key observations include:

- The intake portion of the outlet pipe was not able to be observed because it was inundated at the time of the assessment.
- The concrete drop inlet is approximately 3 feet by 4 feet, is uncontrolled and does not have a trashrack.
- The discharge location of the outlet pipe into the Ash Pond appeared to be functioning normally, as shown on Photo 38.
- No video monitoring of the pipe was available at the time of assessment.
- Overall, the outlet works system appeared to be functioning as intended during the site assessment.
- The drop inlet has no trashrack and exposed rebar, and presents a possible fall hazard.

4.2.6 Impoundment Inlet

Inflow into the Sluice Pond is via a 12-inch diameter steel pipe supported on a wooden trestle structure. There is a diverter valve near the end of the pipe that can allow economizer ash to be discharged into a separate area of the Sluice

Pond, as shown on Photo 32. The inlet pipe was operating during the site assessment and appeared to be in functional condition.

4.3 Ash Pond

4.3.1 Upstream Slope

The Ash Pond is incised and was not assigned a Hazard Classification; therefore, the upstream slope was not given a condition rating, but appeared to function properly. Photos 39, 40, and 42 through 46 show the conditions of the upstream slope. Specific observations include:

- The upstream slope appeared generally stable, and was in general accordance with the 1976 Bechtel design report and drawings.
- According to the design drawings, the ponds slopes and pond bottom have a 3-foot-thick clay liner.
- There was no riprap placed on the upstream slope. As a result, there was some minor beaching that had occurred due to wind generated wave action.

4.3.2 Crest

There is no crest, per se, because the pond is essentially incised. There appeared to be a small two to three foot high berm of wasted material placed along the eastern length of the pond and well above the normal water level. See photos 45 and 46 showing the incised configuration of the Ash Pond.

4.3.3 Downstream Slope

There is no downstream slope because the pond is incised. See photos 45 and 46 showing the incised configuration of the Ash Pond.

4.3.4 Downstream Toe Areas

There are no downstream toe areas because the pond is incised. See photos 45 and 46 showing the incised configuration of the Ash Pond.

4.3.5 Outlet Works

The outlet works of the Ash Pond consists of a 48-inch diameter pipe that serves as an intake to a pump station that recirculates the water back to the plant for reuse. There is a 24-inch diameter RCP drainage culvert under the FGD haul road shown on the Bechtel drawings that was never installed. Otherwise, there is no secondary outlet for the pond contents other than the water level getting sufficiently high and spilling out of the east side of the pond along the natural grade. Key observations include:

- The intake portion of the outlet pipe that connects to the pump station was not able to be observed because it was inundated at the time of the assessment.
- No video monitoring of the pipe was available at the time of assessment.
- Plant personnel reported that the outlet works system has been functioning properly.

4.3.6 Impoundment Inlet

Inflow into the Ash Pond is by the 24-inch diameter RCP from the Sluice Pond. The Sluice Pond decants off to the Ash Pond, and then is recirculated back into the plant for reuse. See Photos 37 and 38 for the inlet into the Ash Pond.

4.3.7 Other

We inquired if OTPC had developed an Emergency Action Plan (EAP) related to a potential failure of the impoundments. We understand that an EAP has not been developed for the site, and nor is one needed for the Sluice Pond or Ash Pond since those facilities are incised ponds. OTPC does not intend to prepare one at this time for Nelsen Pond because there is no potential for loss of life, the volume of stored ash is very small, the pond only contains ash slurry less than 15 percent of the time, any ash slurry material released during a failure would be contained on the plant or adjacent lignite mine property, and any impacts would be limited to OTPC or adjacent mine facilities.

We also inquired if OTPC had developed an Operation and Maintenance (O&M) Manual for the Coyote Station Ash Ponds. According to plant staff, no such written document was located for review. No monitoring equipment was observed during the site assessment.

1-Nelsen Pond Northeast Waterside Embankment (looking SE)

2-Nelsen Pond Northeast Landside Embankment and Sluice Pipe (looking SE)

3-Nelsen Pond Dredging Activity (looking SW)

4-Nelsen Pond Animal Burrows

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Otter Tail Power Company
Beulah, North Dakota

5-Nelsen Pond Northeast Landside Embankment and Sluice Pipe (looking SE)

6-Sluice Pond Sluice Pipe

7-Nelsen Pond Northeast Waterside Embankment (looking NW)

8-Nelsen Pond East Corner Landside Embankment with Sluice Pipe (looking W)

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9-Nelsen Pond East Landside Embankment and Sluice Pipe (looking NW)

10-Down Gradient Area Adjacent to Max Height of Nelsen Pond (looking E)

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11-Continued Down Gradient Area Adjacent to Max Height of Nelsen Pond (looking S)

12-Continued Down Gradient Railroad Adjacent to the Nelsen Pond (looking S)

13-Continued Down Gradient Railroad Adjacent to the Nelsen Pond (looking SE)

14-Continued Down Gradient Railroad Adjacent to the Nelsen Pond (looking NE)

15-Nelsen Pond South Waterside Embankment with Overflow Inlet Structure (looking SW)

16-Nelsen Pond Overflow Structure and Trashrack

17-Nelsen Pond Overflow Inlet Structure

18-Valve Operator between Nelsen and Sluice Pond (looking SE)

19-Nelsen Pond Southeast Landside Embankment (looking SW)

20-Nelsen Pond Animal Burrow

21-Nelsen Pond Southeast Waterside Embankment (looking NE)

22-Nelsen Pond Southwest Embankment Crest (looking NW)

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23-Nelsen Pond Southwest Landside Embankment (looking NW)

24-Nelsen Pond Steepening of Southern Landside Embankment Corner (looking E)

25-Nelsen Pond West Landside Embankment Toe (looking N)

26-Nelsen Pond West Embankment Animal Burrow

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27-Nelsen Pond North Embankment and Dredging Ramp Entrance (looking W)

28-Sluice Pond Inlet and Northwest Waterside Embankment (looking NE)

29-Outlet Pipes from Nelsen Pond (Steel Drain Pipe and Overflow Pipe)

30-Sluice Pond Dredging (looking E)

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31-Sluice Pond Economizer Inlet Channel (looking SE)

32-Sluice Pond Slag Inlet (red pipe) and Economizer Inlet (green pipe)

33-Sluice Pond and Original Outlet Intake (looking SW)

34-Sluice Pond 3'x4' Outlet Intake to Ash Pond without Trashrack (looking NE)

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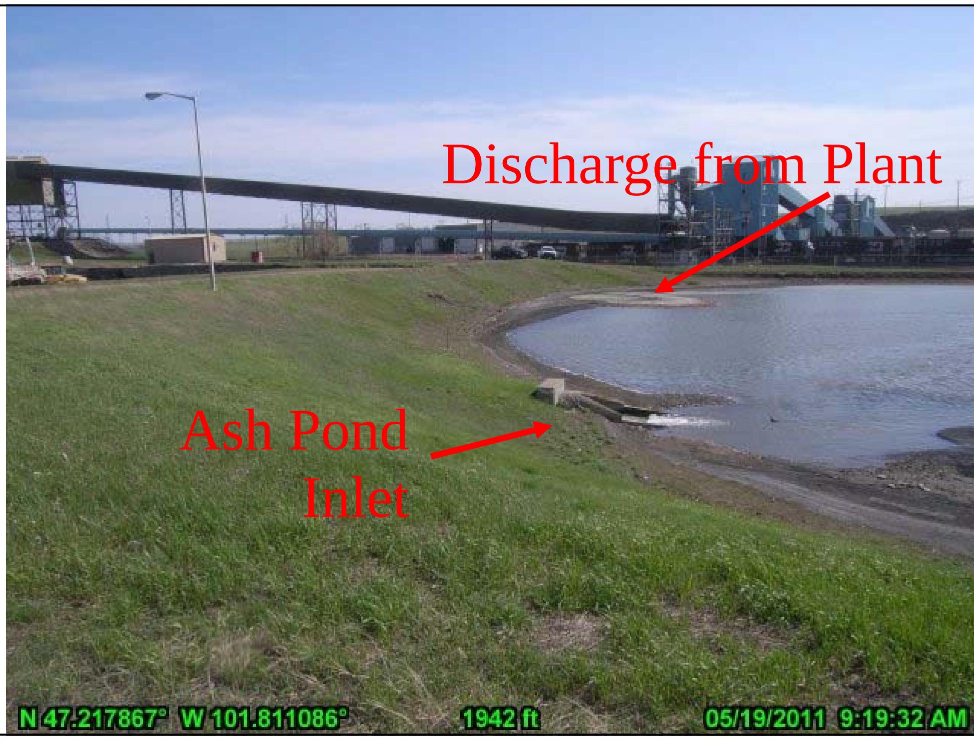
35-Sluice Pond 3'x4' Concrete Outlet Intake Structure to the Ash Pond without Trashrack

36-Sluice Pond from Southern Corner with Slag Pile (left) and Monitoring Wells (right)



37-Ash Pond Northwest Waterside Embankment and Inlet Structure (looking NE)

38-Ash Pond Inlet from the Sluice Pond

39-Ash Pond Northwest Waterside Embankment Scarping (looking NE)

40-Ash Pond East Incised Embankment (looking S)

41-Ash Pond Inlet (underwater) from Plant Drains (looking SE)

42-Ash Pond Northwest Waterside Embankment Scarping (looking SW)

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43-Ash Pond South Waterside Embankment and Pump Station (looking E)

44-Ash Pond West Waterside Incised Embankment (looking N)

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45-Ash Pond East Waterside Incised Embankment (looking N)

46-Ash Pond West Waterside Incised Embankment (looking NW)

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Coyote Station
Otter Tail Power Company
Beulah, North Dakota

SECTION 5 – OVERALL CONDITION OF THE FACILITY IMPOUNDMENTS

5.1 Analysis and Conclusions

Our analysis is summarized in two general considerations that are presented as follows:

Structural Stability of the Impoundments

Kleinfelder reviewed the slope stability analysis performed by Bechtel as part of the Soils Design and Geology Report (see Appendix C). We conclude the analysis calculated a reasonable factor of safety against embankment failure of the Nelsen Pond. Results of the analysis are discussed in Section 3.5.

Safety of the Impoundments Including Maintenance and Methods of Operation

We understand that the impoundments have a history of safe performance. However, the future performance of these impoundments will depend on a variety of factors that may change over time, including changes in groundwater levels, maintenance and monitoring procedures, changes in embankment integrity, etc. Nelsen Pond constitutes a more significant hazard because it has an embankment at its southeast (outlet) end. Both the Sluice Pond and Ash Pond are incised and thus pose little threat of an unintended pond release. In light of this situation, we have noted several items as follows that present some concern in this regard:

- No stability analyses for the Nelsen Pond embankment section have been located, and plant staff could not confirm that those analyses have been completed. While the Nelsen Pond embankment appeared stable and functioning properly, the absence of a stability analysis automatically justifies a POOR condition rating in accordance with EPA condition rating guidelines.
- No seismic loading analyses have been located for review for Nelsen Pond. While the Nelsen Pond embankment appeared stable and functioning properly, the absence of a seismic loading analysis automatically justifies a POOR condition rating for Nelsen Pond in accordance with EPA condition rating guidelines.
- Numerous animal burrows were observed on the embankment portion of

Nelsen Pond. All of the burrows were small – typically less than a 2-inch diameter opening. Most of the burrow openings were located on the crest or higher up on the land side embankment. This condition should be remedied with a more aggressive animal control program, as about two-thirds of Nelsen Pond is constructed of an earth and clay embankment, with no plastic liner on the inside of the pool to provide a secondary barrier.

- The outlet culvert from Nelsen Pond into the Sluice Pond could not be inspected. There is currently no evidence of distress within the outlet pipe, but it should be internally inspected while the pond is not in active use.
- The Sluice Pond outlet drop structure was not observed to have a trash rack. The current outlet configuration appeared to function as intended; however, it is an open hydraulic structure with exposed rebar that presents a fall hazard. A trashrack should better ensure employee safety and inhibit debris blockage.
- An EAP is not currently in place at the site to mitigate damage in the event of an emergency related to breach failure of the Nelsen Pond embankment adjacent to the Sluice Pond. While a failure of the embankment should not present a probable loss of life situation, a short, simple document should be prepared to formally outline the procedures to undertake in the event of such a failure. We do not envision that any type of detailed dambreak analyses would be necessary. The EAP should be added to the O&M Manual, and should also serve as a stand-alone document.
- An O&M Manual for pond operations was not provided for review. If that document exists, the EAP should be added. If an O&M Manual cannot be located, one should be prepared that includes pond operations, the EAP, and discussion of a more robust animal control program.

Adequacy of Program for Monitoring Performance of the Impoundments

The present monitoring program primarily involves visual inspections by plant personnel and by OTPC technical staff on occasion. These visual inspections seem to be adequate to address issues such as surface erosion and general condition of the impoundments. However, a more detailed monitoring program is recommended to be established to quantify various important factors associated with embankment stability and integrity and outlet pipe functionality for Nelsen Pond. Those factors include, but are not limited to monitoring for seepage, monitoring condition of any minor scarps observed, noting effectiveness of animal control measures, documenting any fluctuations of groundwater levels, and noting pipe discharge capacity when the Nelsen Pond is in operation.

5.2 Summary Statement

I acknowledge that the management unit(s) referenced herein was personally inspected by me and found to be in the following condition:

POOR (Nelsen Pond only)

Signature: ________________ Date: 2/28/13

Charles E. Larson, P.E.
Lead Civil Engineer

EPA's Response: Subsequent to the Round 9 Coal Combustion Residuals (CCR) Assessments, EPA has strengthened its position regarding the structural stability of assessed CCR impoundments by taking a more conservative approach regarding the rating of CCR surface impoundments. Effective 02/07/2012, EPA's policy has been to provide a condition rating of Poor for any CCR surface impoundment which lacks sufficient technical reports/data to allow for independent verification of the impoundment's Factor of Safety (FOS). These automatic ratings of Poor are independent of the ratings of similar impoundments from previous rounds of assessments (rounds completed prior to 02/07/2012) and of the observed condition and history of safe performance of the impoundment.

SECTION 6 – RECOMMENDATIONS

6.1 PRIORITY 1 RECOMMENDATIONS

1. **Perform a stability analysis on the Nelsen Pond embankment by August 31, 2013.** The stability analysis should evaluate a conservative loading condition such as the pond full to the crest with wet CCW dredge material, and demonstrate that a factor of safety equal to or greater than 1.5 exists. The analysis should include an instrumentation plan recommendation, or lack thereof, based on the results of the analysis.

2. **Perform a Hydraulics and Hydrology study for Nelsen Pond by August 31, 2013.** An analysis should be performed that compares the impoundment freeboard with the Probable Maximum Precipitation (PMP) to determine potential for overtopping.

3. **Perform a seismic loading analysis on the Nelsen Pond embankment by August 31, 2013.** The seismic analysis should evaluate a loading condition in accordance with the EPA 1995 RCRA Subtitle D seismic design guidelines, and demonstrate that a factor of safety equal to or greater than 1.0 exists.

4. **Prepare an Emergency Action Plan (EAP) for the facility by August 31, 2013.** An EAP should be prepared for Nelsen Pond. The EAP could be a very short and straightforward document basically confirming that a full pond release would be adequately contained on OTPC or the adjacent mine property, and outlines procedures to undertake in the event of an unplanned release, including phone calls to interested and potentially impacted parties.

5. **Control animal burrowing on the downstream slopes of Nelsen Pond. Develop and implement an animal control program by August 31, 2013.** Refer to FEMA publication 473, *Technical Manual for Dam Owners, Impacts of Animals on Earthen Dams*. That manual is available on the FEMA website.

6.2 PRIORITY 2 RECOMMENDATIONS

1. **Perform video assessments of Nelsen Pond outlet piping by August 31, 2013.** This would include only the outlet piping from Nelsen Pond. The video survey should determine the condition of both the 12-inch diameter ductile iron dewatering pipe (including the perforated PVC portion) and the 12-inch ductile iron spillway pipe.

2. **Maintain a log of maintenance and other activities at the impoundments and supporting facilities by August 31, 2013.** This would include weekly or monthly walk around inspection of the ponds, with an emphasis on Nelsen Pond when it is in active service. Other documentation may exist that catalogs routine maintenance and repair activities, and if so, those should be collected and bound in a notebook in a secure location if that practice is not being followed currently. We believe that this log will provide continuity during periods of staff change.

3. **Update the Operation and Maintenance (O&M) Manual for the impoundments and the facility by August 31, 2013.** The O&M manual should either be located and updated, or a new one prepared that includes O&M procedures, the EAP (discussed above), and a section on animal control.

6.3 DEFINITIONS

Priority 1 Recommendation: Priority 1 Recommendations involve the correction of more severe deficiencies where action is required to ensure the structural safety, operational integrity of a facility, and that may threaten the safety of the impoundment.

Priority 2 Recommendation: Priority 2 Recommendations where action is needed or required to prevent or reduce further damage or impair operation and/or improve or enhance the O&M of the facility, that do not appear to threaten the safety of the impoundment.

Based on observations during the site assessment, it is recommended that the following actions be taken at the Coyote Station facility.

SECTION 7 – GLOSSARY OF TERMS

For the EPA Ash Pond Assessment program, the following glossary of terms shall be used for classification unless otherwise noted.

Hazard Potential Rating

"Hazard potential" means the possible adverse incremental consequences that result from the release of water or stored contents due to the failure of the impoundment or reservoir or the misoperation of the impoundment, reservoir, or appurtenances. The hazard potential classification of a impoundment or reservoir shall not reflect in any way on the current condition of the impoundment or reservoir and its appurtenant works, including the impoundment's or reservoir's safety, structural integrity, or flood routing capacity. These classifications are as described below:

1. **Less than Low Hazard Potential**

   "Less than Low Hazard" means failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

2. **Low Hazard Potential**

   "Low Hazard" means an impoundment's or reservoir's failure will result in no probable loss of human life and low economic loss or environmental loss, or both. Economic losses are principally limited to the owner's property.

3. **Significant Hazard Potential**

   "Significant Hazard" means a impoundment's or reservoir's failure will result in no probable loss of human life but can cause major economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. Significant Hazard Potential classification impoundments or reservoirs are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

4. High Hazard Potential

"High Hazard" means a impoundment's or reservoir's failure will result in probable loss of human life.

North Dakota State Hazard Classification

According to the North Dakota Dam Design Handbook, dated June 1985, dams are categorized according to the potential hazard to property or loss of life if the dam should suddenly fall.

- Low - Dams located in rural or agricultural areas where there is little possibility of future development. Failure of low hazard dams may result in damage to agricultural land, township and county roads, and farm buildings other than residences. No loss of life is expected if the dam fails;
- Medium - Dams located in predominantly rural or agricultural areas where failure may damage isolated homes, main highways, railroads or cause interruption of minor public utilities. The potential for the loss of a few lives may be expected if the dam fails;
- High - Dams located upstream of developed and urban areas where failure may cause serious damage to homes, industrial and commercial buildings and major public utilities. There is a potential for the loss of more than a few lives if the dam fails.

After a dam has been classified according to failure hazard, it will also be classified for dam design criteria. Design criteria shall be based on the hazard classification and the height of the dam. ("Height of the dam" is defined as the distance in feet from the stream channel bottom at the centerline of the dam to the top of the settled embankment.)

The table below is based on dam height and hazard categories and outlines five classifications for dam design. Each classification will require varying degrees of intensity of investigation for hydrology, foundation and borrow explorations, soil testing, structural design, etc.

Dam Design Classifications

Dam Height (ft)	Hazard Categories		
	Low	Medium	High
Less than 10	I	II	IV
10 to 24	II	III	IV
25 to 39	III	III	IV
40 to 55	III	IV	V
Over 55	III	IV	V

Overall Classification of Impoundment

In a system similar to the New Jersey Department of Environmental Protection Impoundment Safety Guidelines for the Inspection of Existing Impoundments (January 2008), when the following terms are capitalized they denote and shall be used to describe the overall classification of the impoundment as follows:

SATISFACTORY - No existing or potential impoundment safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. Minor maintenance items may be required.

FAIR – Acceptable performance is expected* under all required loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.

POOR - A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, seismic) in accordance with the applicable impoundment safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential impoundment safety deficiencies.

UNSATISFACTORY – Considered unsafe. A impoundment safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

*the term expected is to be defined as likely

Recommendation Listing

Recommendations shall be written concisely and identify the specific actions to be taken. The first word in the recommendation should be an action word (i.e. “Prepare”, “Perform”, or ”Submit”). The recommendations shall be prioritized and numbered to provide easy reference. Impoundment Safety recommendations shall be grouped, listed or categorized similar to the U.S. Department of Interior, Reclamation Manual - Directives and Standards - Review/Examination Program for High- and Significant-Hazard Impoundments (July, 1998 FAC 01-07) as follows:

Priority 1 Recommendations: Priority 1 Recommendations involve the correction of severe deficiencies where action is required to ensure the structural safety, operational integrity of a facility, and that may threaten the safety of the impoundment.

Priority 2 Recommendations: Priority 2 Recommendations where action is needed or required to prevent or reduce further damage or impair operation and/or improve or enhance the O&M of the facility, that do not appear to threaten the safety of the impoundment.

SECTION 8 – LIMITATIONS

The scope of this work is for a preliminary screening for the EPA and plant owner/operator of the visible performance and apparent stability of the impoundment embankments based only on the observable surface features and information provided by the owner/operator. Other features below the ground surface may exist or may be obscured by vegetation, water, debris, or other features that could not be identified and reported. This site assessment and report were performed without the benefit of any soil drilling, sampling, or testing of the subsurface materials, calculations of capacities, quantities, or stability, or any other engineering analyses. The purpose of this assessment is to provide information to the EPA and the plant owner/operator about recommended actions and/or studies that need to be performed to document the stability and safety of the impoundments.

This work was performed by qualified personnel in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession, practicing in the same locality, under similar conditions, and at the date the services are provided. Kleinfelder's conclusions, opinions, and recommendations are based on a limited number of observations. It is possible that conditions could vary between or beyond the observations made. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided. Kleinfelder makes no warranty or guaranty of future embankment stability or safety.

This report may be used only by the client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance but in no event later than one (1) year from the date of the report.

The information, included on graphic representations in this report, has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, expressed or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. These documents are not intended for use as a land survey product nor are they designed or intended as a construction design document. The use or misuse of the information contained on these graphic representations is at the sole risk of the party using or misusing the information.

Recommendations contained in this report are based on preliminary field observations without the benefit of subsurface explorations, laboratory tests, or detailed knowledge of the existing construction. If the scope of the proposed recommendations changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed and the conclusions of this report are modified or approved in writing by Kleinfelder. Kleinfelder cannot be responsible for interpretation by others of this report or the conditions encountered in the field.

SECTION 9 – REFERENCES

Google Inc. (2011). Google Earth Pro (Version 6.0.2.2074) [Software]. Available from http://www.google.com/earth/index.html

North Dakota State Engineer, North Dakota Dam Design Handbook, Chapter IV – Classification of Dams, June 1985

US Department of Agriculture (USDA)/ Natural Resources Conservation Service (NRCS) Web Soil Survey – online

US Department of the Interior, Safety and Evaluation of Existing Impoundments (SEED), 1995

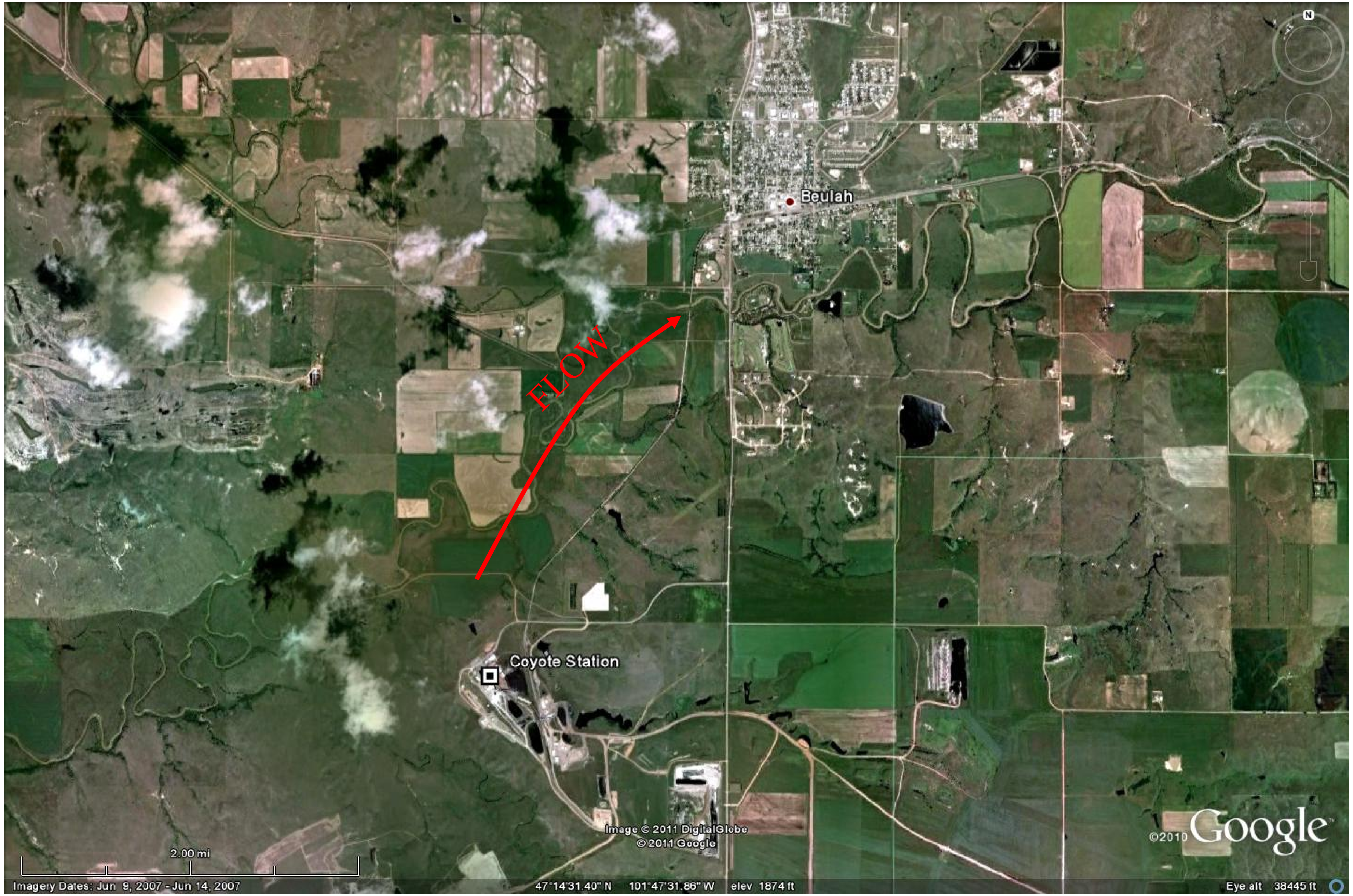
New Jersey Department of Environmental Protection, Impoundment Safety Guidelines for the Inspection of Existing Impoundments, January 2008

US Department of Interior, Reclamation Manual – Directives and Standards – Review/Examination Program for High and Significant Hazard Impoundments, July 1998

US Geologic Survey, North Dakota Geologic Map Data, March 18, 2011. http://tin.er.usgs.gov/geology/state/state.php?state=ND

Documents provided by Otter Tail Power Company are listed in Section 1.3.

Plates



Notes: 1) Flow represents general direction of drainage to the Knife River.

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PROJECT NO. 118953-3	COYOTE STATION CRITICAL INFRASTRUCTURE MAP		PLATE
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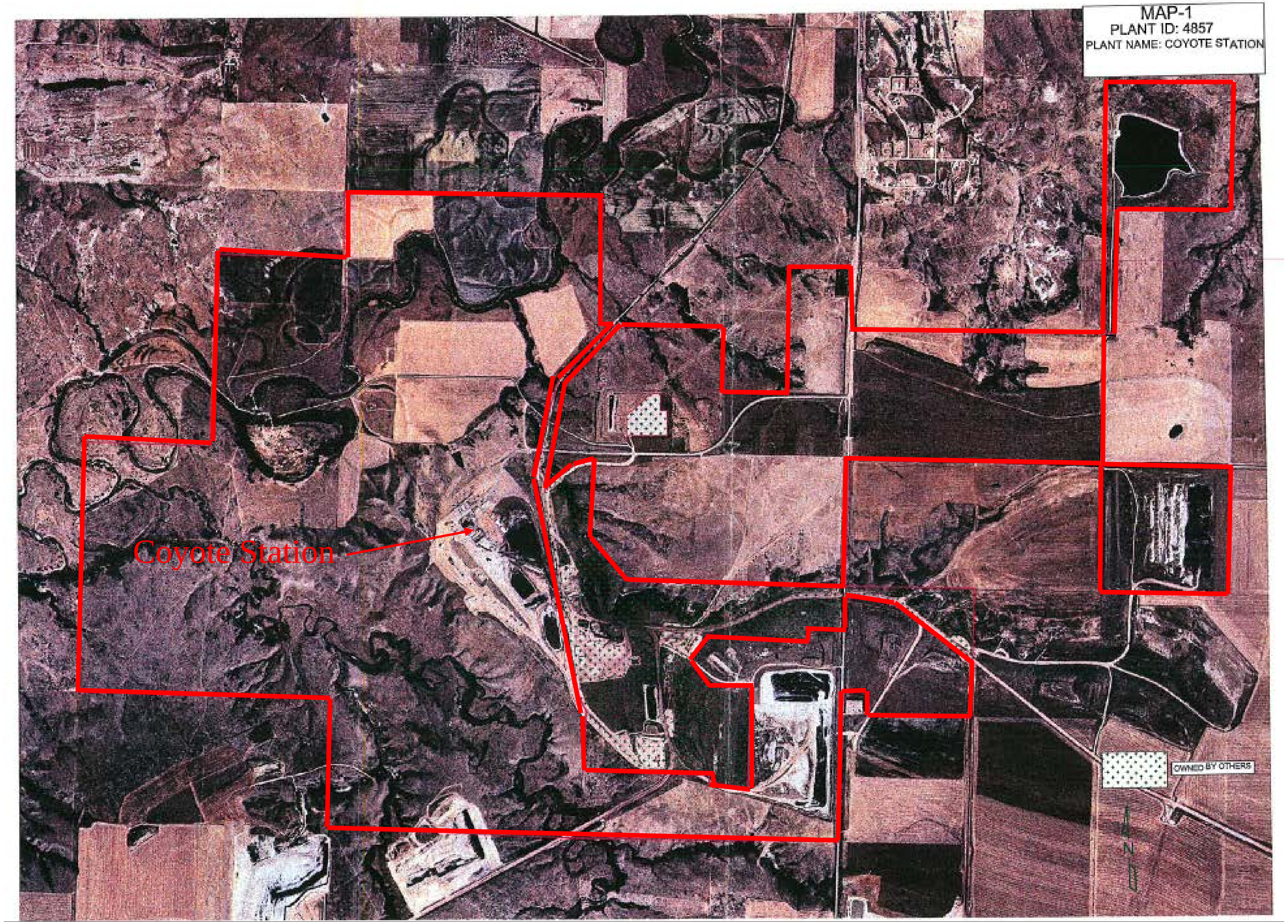
CHECKED BY: C. Larson	COYOTE STATON OTTER TAIL POWER COMPANY BEULAH, NORTH DAKOTA		
FILE NAME: Coyote Station Plates			



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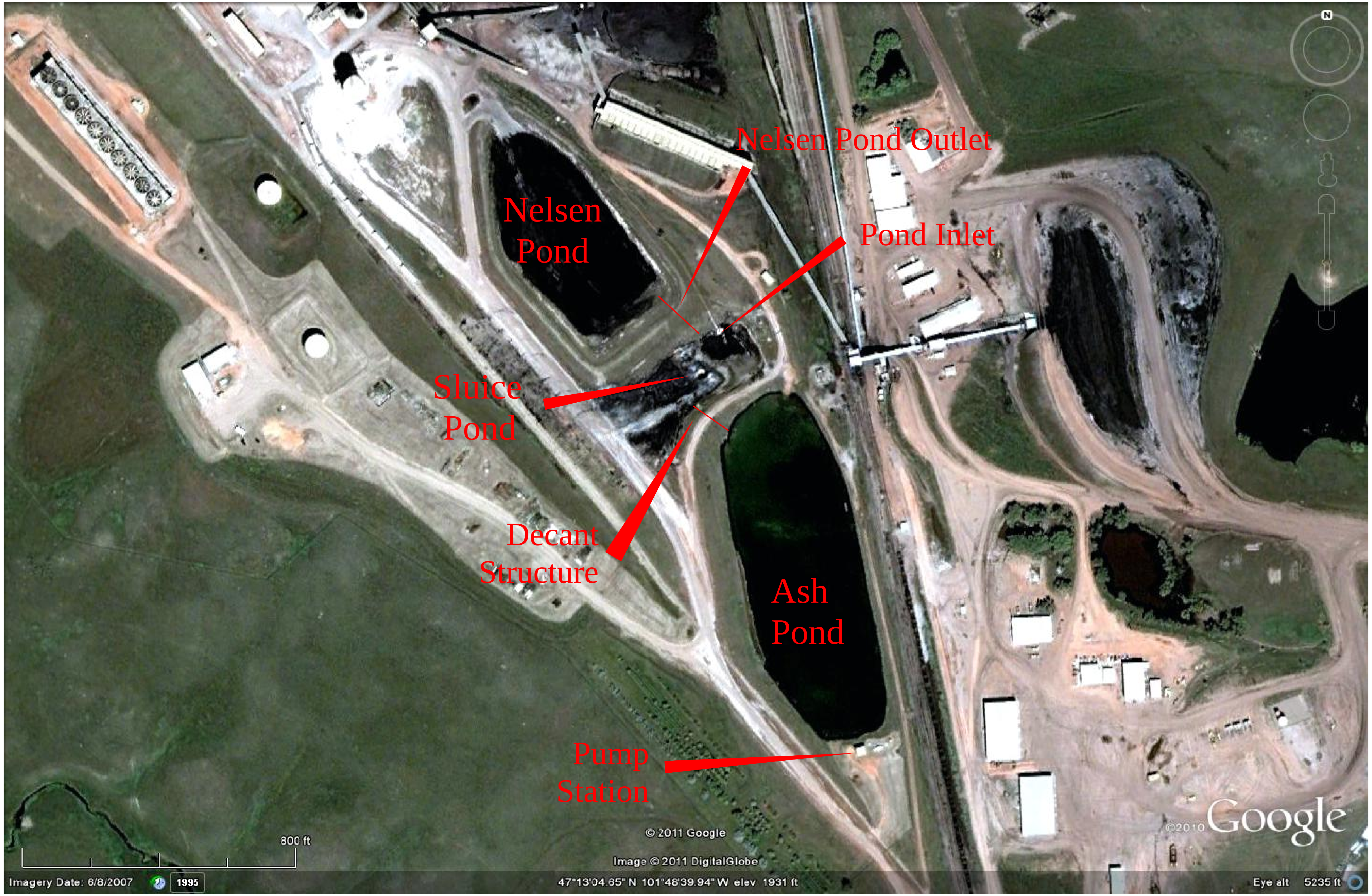
COYOTE STATION
AERIAL PROPERTY MAP

COYOTE STATON
OTTER TAIL POWER COMPANY
BEULAH, NORTH DAKOTA

PLATE
2



Notes: 1) Image is a general features map and does not reflect conditions on the date of inspection.

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PROJECT NO. 118953-3	ASH PONDS SITE FEATURES MAP	PLATE
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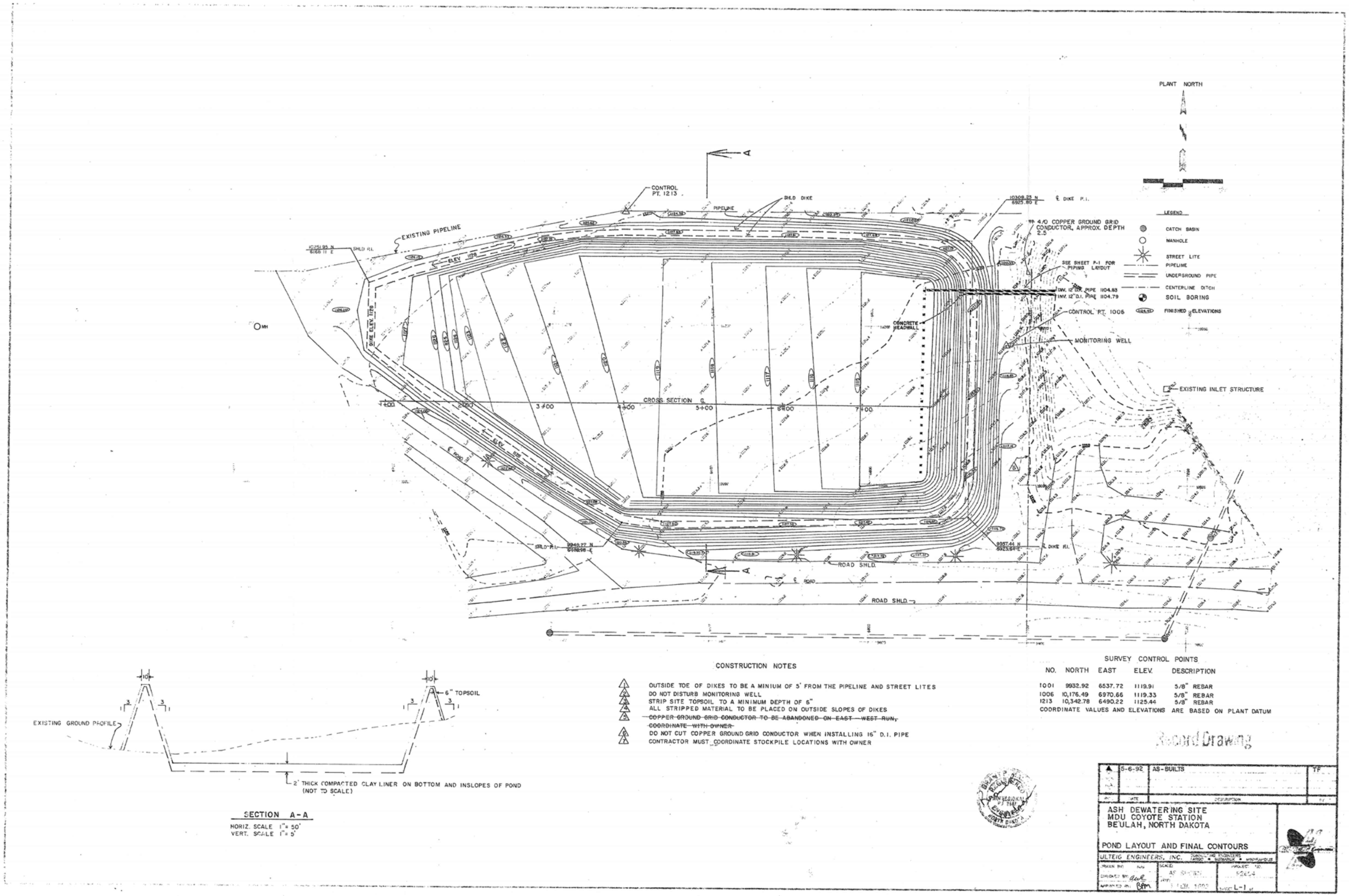
CHECKED BY: C. Larson	COYOTE STATON OTTER TAIL POWER COMPANY BEULAH, NORTH DAKOTA	
FILE NAME: Coyote Station Plates		



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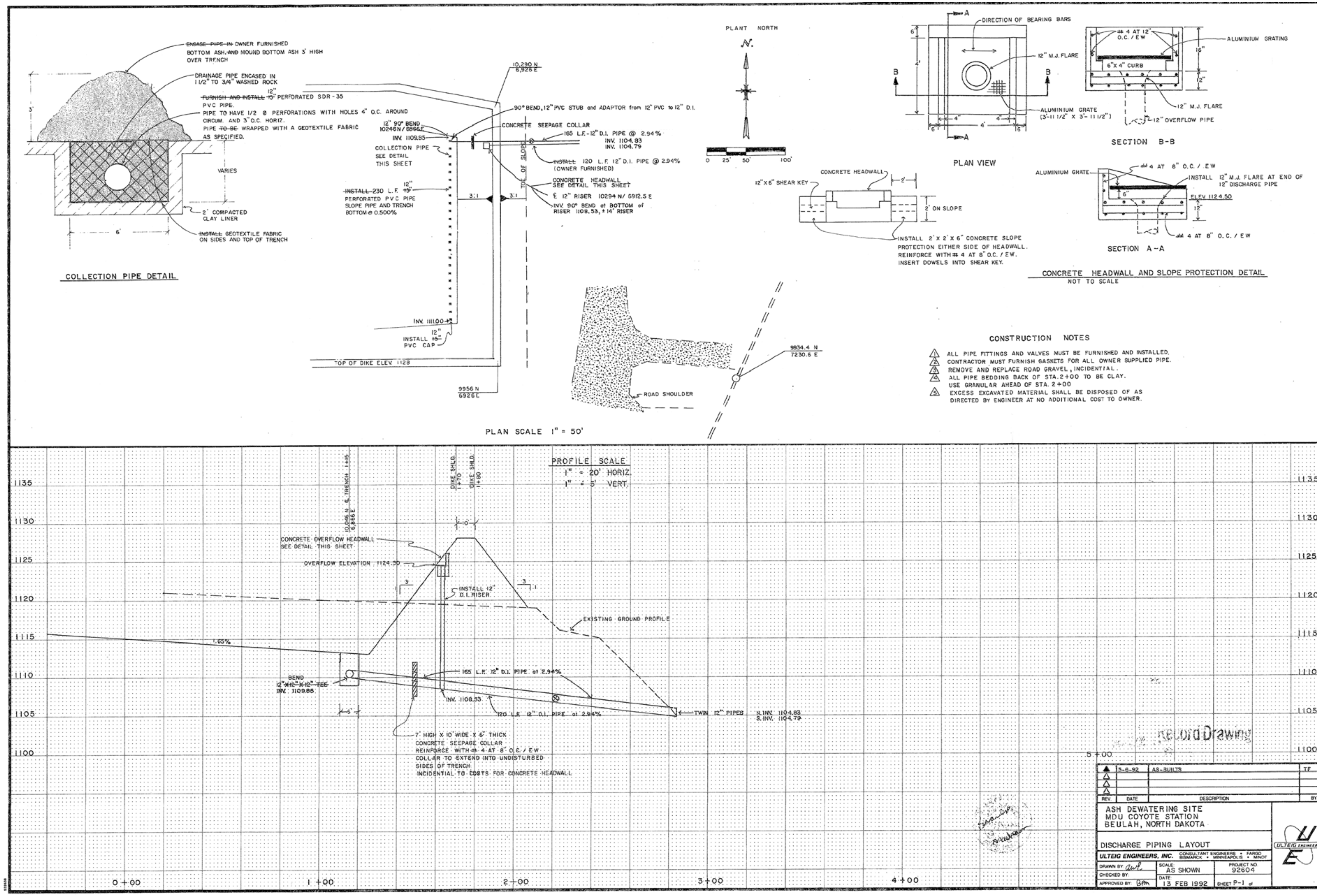
NELSEN POND
PLAN AND CROSS-SECTION PROFILE

COYOTE STATON
OTTER TAIL POWER COMPANY
BEULAH, NORTH DAKOTA

PLATE 4



PROJECT NO. 118953-3	NELSEN POND DISCHARGE PIPING LAYOUT	PLATE 5
DATE: 6-6-11		
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FILE NAME: Coyote Station Plates		

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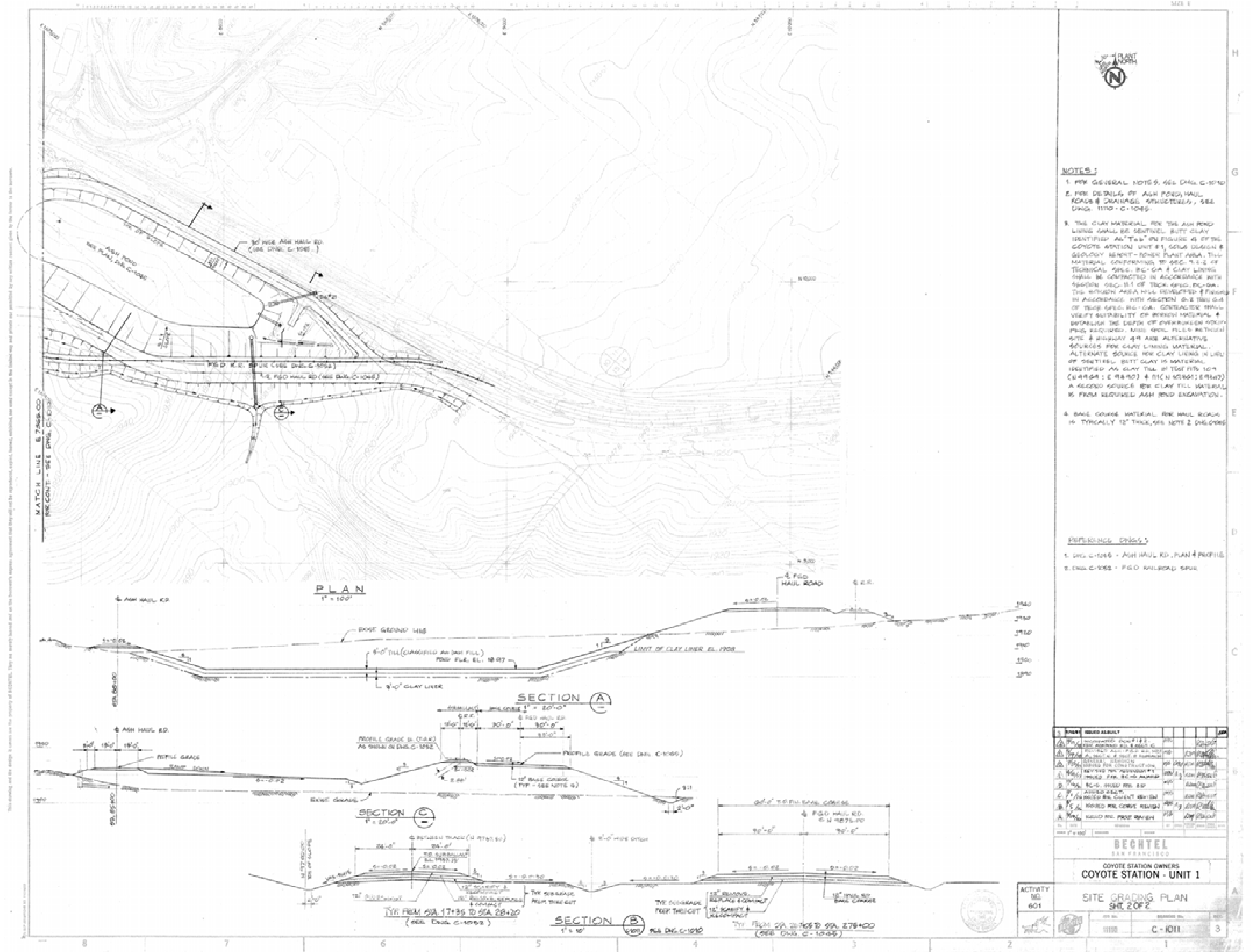

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PROJECT NO.	118953-3
DATE:	6-6-11
DRAWN BY:	B. Piede
CHECKED BY:	C. Larson
FILE NAME:	Coyote Station Plates

ASH POND
SITE GRADING PLAN AND SECTIONS

COYOTE STATON
OTTER TAIL POWER COMPANY
BEULAH, NORTH DAKOTA

PLATE
6

Legend:

- Photo number, location, and direction

Notes: 1) Photographs 17 and 29 not shown on map, but can be seen in Appendix B.
2) Photograph locations are approximate and may not coincide with the coordinates shown on the photo.

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PROJECT NO.	118953-3
DATE:	6-6-11
DRAWN BY:	B. Piede
CHECKED BY:	C. Larson
FILE NAME:	Coyote Station Plates

NELSEN, SLUICE, AND ASH PONDS PHOTOGRAPH LOCATION MAP

COYOTE STATON
OTTER TAIL POWER COMPANY
BEULAH, NORTH DAKOTA

PLATE 7

Appendix A

Site Assessment Evaluation Checklists

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Coyote Station

Date: 5-19-11

Unit Name: Nelsen Pond

Operator's Name: Otter Tail Power Company

Unit I.D.:

Hazard Potential Classification: High Significant Low ✓

Inspector's Name: Charles Larson PE, Brad Piede, EIT

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Monthly		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	Dry		19. Major erosion or slope deterioration?		✓
3. Decant inlet elevation (operator records)?	1110 / 1925		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	NA		Is water entering inlet, but not exiting outlet?		✓
5. Lowest dam crest elevation (operator records)?	1128 / 1943		Is water exiting outlet, but not entering inlet?		✓
6. If instrumentation is present, are readings recorded (operator records)?		✓	Is water exiting outlet flowing clear?		✓
7. Is the embankment currently under construction?		✓	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	✓		From underdrain?		✓
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?		✓	From downstream foundation area?		✓
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways, groin or diversion ditches?		✓	Around the outside of the decant pipe?		✓
15. Are spillway or ditch linings deteriorated?		✓	22. Surface movements in valley bottom or on hillside?		✓
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?		✓
17. Cracks or scarps on slopes?		✓	24. Were Photos taken during the dam inspection?	✓	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

2,3, and 5. Add ~815 to Ulteig Engineers design drawing elevs. to convert to equivalent Bechtel (plant and Ash Pond designer) elev. If known, first value is Ulteig elev. and second value is equivalent Bechtel elev.

20. Pond was dry at the time of inspection.

No part of the impoundment was built over wet ash, slag, or other unsuitable material.

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # NA______________ INSPECTOR_Kleinfelder (C. Larson, B. Piede____

Date _5-19-11____

Impoundment Name __Coyote Station____
Impoundment Company __Otter Tail Power Company______________________________________
EPA Region ___8__________________
State Agency (Field Office) Addresss _N/A - No US EPA field office in ND____________
____

Name of Impoundment __Nelsen Pond____
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _________ Update _X_________

	Yes	No
Is impoundment currently under construction?	______	__X____
Is water or ccw currently being pumped into the impoundment?	______	__X____

IMPOUNDMENT FUNCTION: ___Secondary Ash Settling Pond____________________

Nearest Downstream Town : Name ___Beulah, ND________________________________
Distance from the impoundment ___3 miles__________________________
Impoundment
Location: Longitude _101__ Degrees _48___ Minutes _45___ Seconds
Latitude ___47_ Degrees _13___ Minutes _10___ Seconds
State __ND_____ County _Mercer_________________________

Does a state agency regulate this impoundment? YES __X____ NO ______

If So Which State Agency?___North Dakota Dept. of Health - Waste Mgmt. Div__________

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

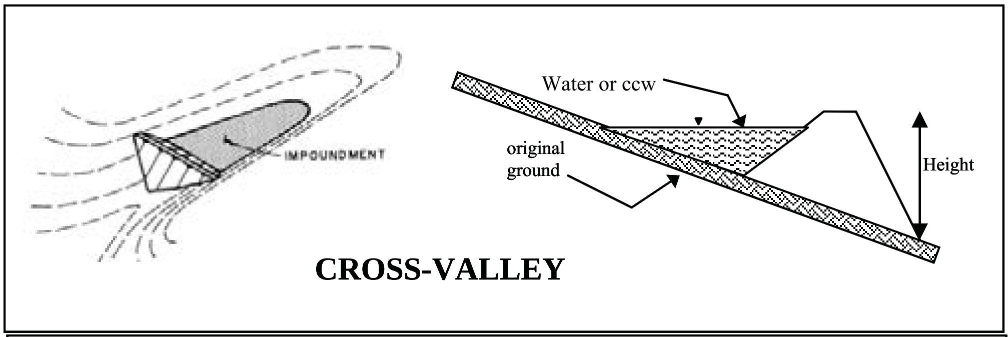
__X___ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

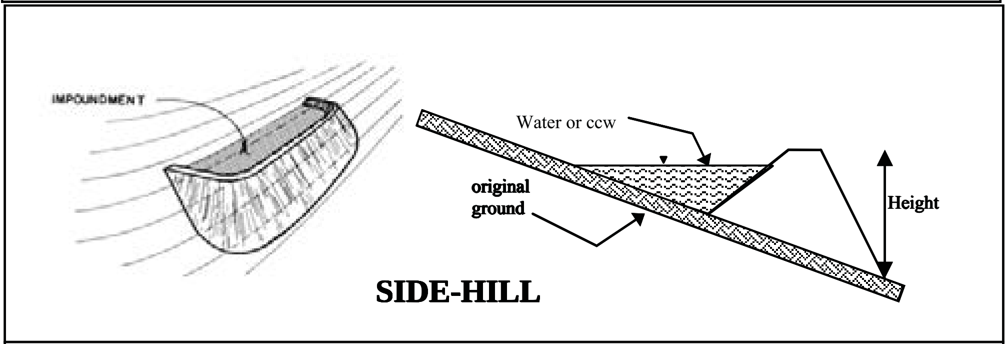
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

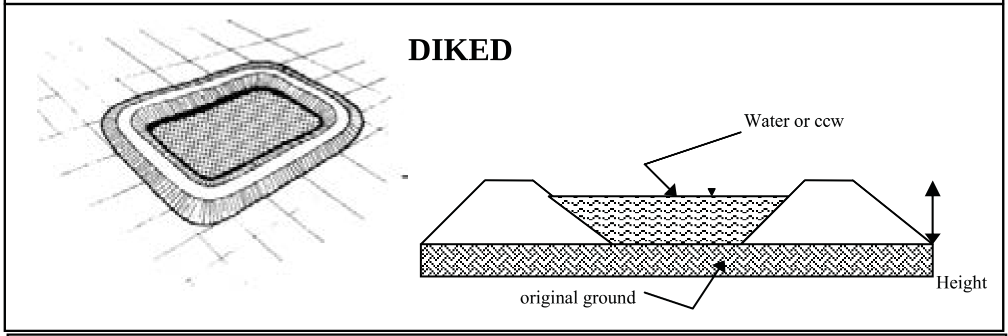
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

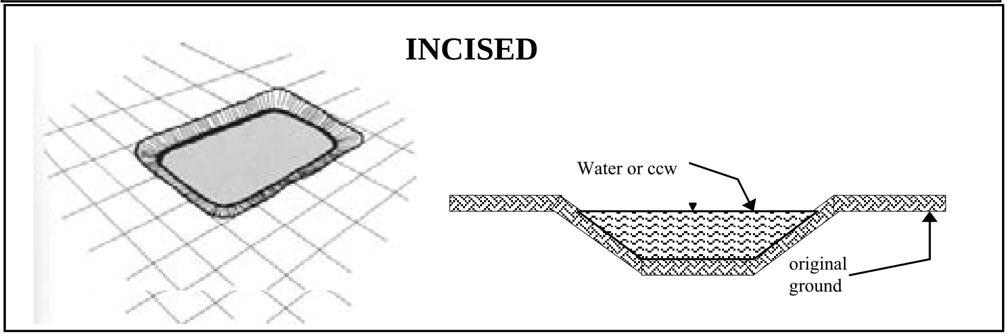
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:
____-No loss of human life anitcipated.________________________________
____-Discharge would likely be contained to Otter Tail Energy's property.__
____-Failure would have low environmental and economic impacts.________
____-Pond typically holds wet ash and water hydraulically dredged from __
_____lower Ash Pond for approx. 3 months, and every 2 or 3 years. The ash
_____material settles, and the maximum water depth is estimated to be _____
_____approx. 9 feet above the settled ash at the south end (deepest part).___
_____At the maximum capy., the estimated volume is approx. 22 ac-ft._____

CONFIGURATION:









_____ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
__X__ Combination Incised/Diked

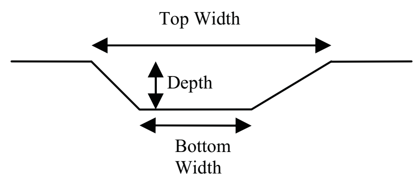
Embankment Height ___11_____ feet   Embankment Material__Earthfill_______
Pool Area ~4.9 max (pond dry)__ acres   Liner __Clay______________________
Current Freeboard _pond dry___ feet   Liner Permeability __unknown______

<u>TYPE OF OUTLET</u> (Mark all that apply)

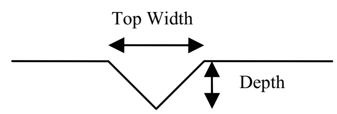
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width

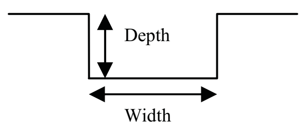
TRAPEZOIDAL



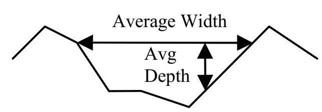
TRIANGULAR



RECTANGULAR

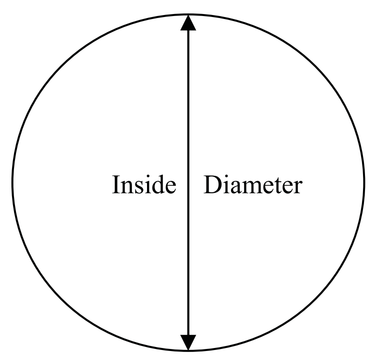


IRREGULAR



__X___ **Outlet**

__12"_ inside diameter



Material
_____ corrugated metal
__X__ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ____________________

Is water flowing through the outlet? YES _______ NO __X_____

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) ________________________________

The Impoundment was Designed By ___Ulteig Engineers__________________________

____

Has there ever been a failure at this site? YES __________ NO ___X_______

If So When? ___________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES _______ NO __X____

If So When? ___________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________NO __X_____

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____________________

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Coyote Station

Date: 5-19-11

Unit Name: Sluice Pond

Operator's Name: Otter Tail Power Company

Unit I.D.:

Hazard Potential Classification: High Significant Low ✓

Inspector's Name: Charles Larson PE, Brad Piede EIT

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Monthly		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	≈1917		19. Major erosion or slope deterioration?		✓
3. Decant inlet elevation (operator records)?	≈1917		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	NA		Is water entering inlet, but not exiting outlet?		✓
5. Lowest dam crest elevation (operator records)?	≈1922		Is water exiting outlet, but not entering inlet?		✓
6. If instrumentation is present, are readings recorded (operator records)?		✓	Is water exiting outlet flowing clear?		✓
7. Is the embankment currently under construction?		✓	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	✓		From underdrain?		✓
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?		✓	From downstream foundation area?		✓
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways, groin or diversion ditches?		✓	Around the outside of the decant pipe?		✓
15. Are spillway or ditch linings deteriorated?		✓	22. Surface movements in valley bottom or on hillside?		✓
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?		✓
17. Cracks or scarps on slopes?		✓	24. Were Photos taken during the dam inspection?	✓	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

2, 3, &5. Elevation was estimated visually in field compared to other known elevations.

20. Water exits sluice pond thru concrete drop inlet in pond bottom to an outlet pipe into Ash Pond. Water is generally clear but contains some fines material that requires periodic hydraulic dredging of Ash Pond material (every 2 to 3 years) into Nelsen Pond for settling, drying, and disposal.

No part of the impoundment was built over wet ash, slag, or other unsuitable material.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # ___NA__________ INSPECTOR_Kleinfelder (C. Larson, B. Piede)___
Date _5-19-11_____________________________________

Impoundment Name __Coyote Station____
Impoundment Company __Otter Tail Power Company________________________________
EPA Region ___8________________
State Agency (Field Office) Addresss __N/A - No US EPA field office in ND____________
____

Name of Impoundment __Sluice Pond____
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ________ Update _X________

	Yes	No
Is impoundment currently under construction?	______	__X____
Is water or ccw currently being pumped into the impoundment?	__X____	______

IMPOUNDMENT FUNCTION: ___Slag Settling Pond_________________

Nearest Downstream Town : Name ___Beulah, ND____________________________
Distance from the impoundment ___3 miles________________________
Impoundment
Location: Longitude _101__ Degrees _48___ Minutes _38___ Seconds
Latitude ___47_ Degrees _13___ Minutes _07___ Seconds
State __ND_____ County _Mercer______________________

Does a state agency regulate this impoundment? YES __X____ NO ______

If So Which State Agency?___North Dakota Dept. of Health - Waste Mgmt. Div.__________

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

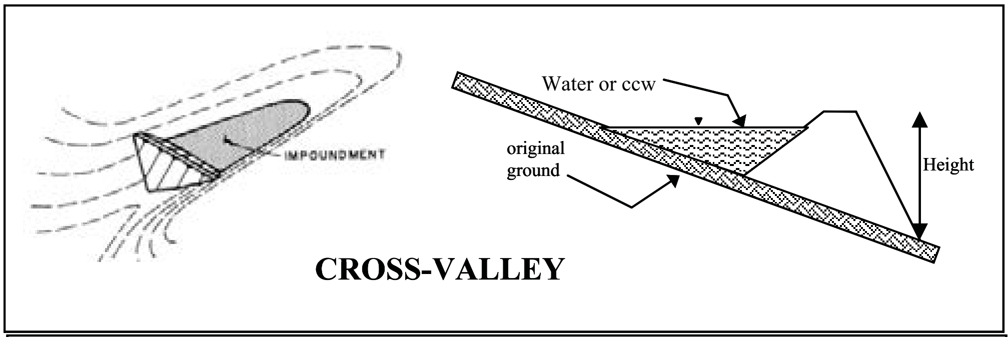
_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

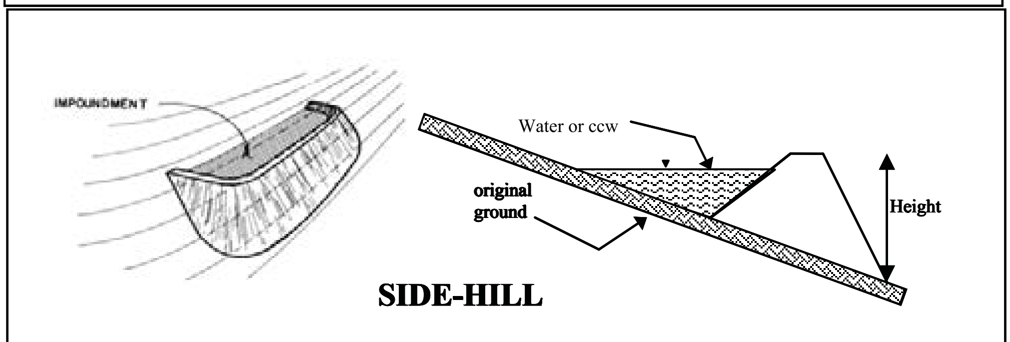
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

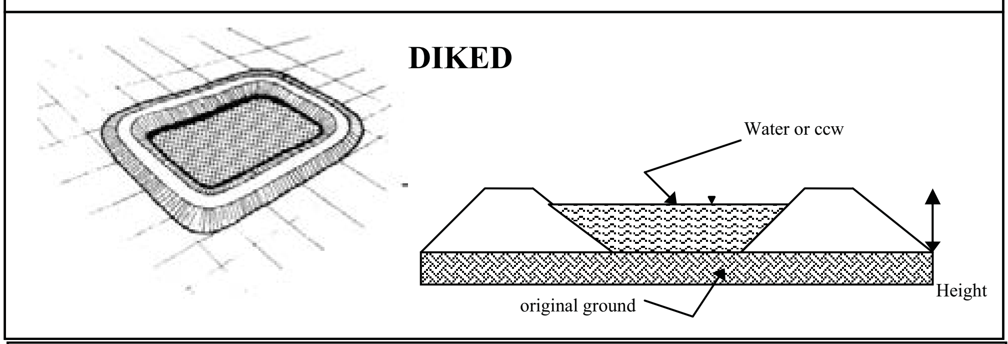
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

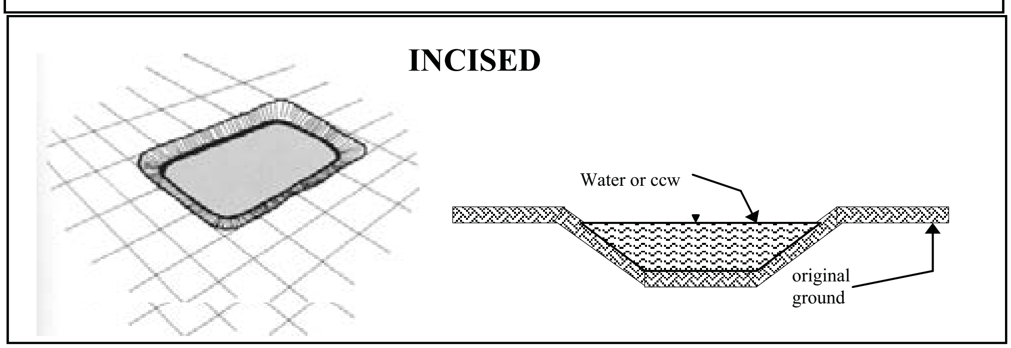
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:
____-No loss of human life anitcipated.________________________________
____-Discharge would be contained to Otter Tail Energy's property.__
____-Failure would have low environmental and economic impacts.________
____-Volume of water in pond is < 1 ac-ft______________________________
____-Pond is incised - risk of uncontrolled release is essentially nil. _______
____
____
____
____
____
____
____
____
____
____

<u>CONFIGURATION</u>:









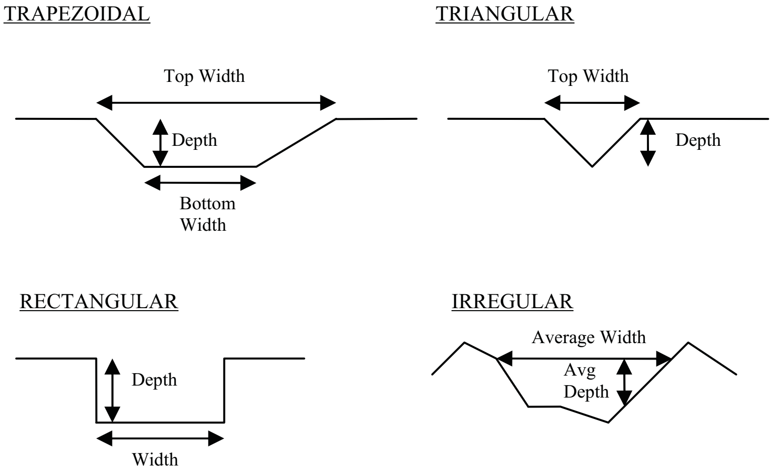
_____ Cross-Valley
_____ Side-Hill
_____ Diked
__X__ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height ___N/A___ feet Embankment Material__Earthfill_______
Pool Area ____~0.5 ac___________ acres Liner __Unknown_________________
Current Freeboard _~4.5___ feet Liner Permeability __Unknown_____________

TYPE OF OUTLET (Mark all that apply)

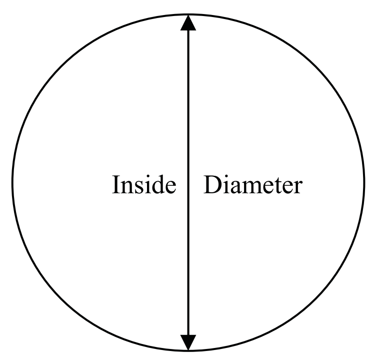
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width



__X___ **Outlet**

__36"_ inside diameter



Material
_____ corrugated metal
_____ welded steel
__X__ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ____________________

Is water flowing through the outlet? YES ___X____ NO _______

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) ________________________________

The Impoundment was Designed By ___Bechtel Engineering_____________________
____

Has there ever been a failure at this site? YES __________ NO ___X_______

If So When? ___________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES _______ NO __X____

If So When? ___________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________NO __X_____

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Coyote Station | Date: 5-19-11

Unit Name: Ash Pond | Operator's Name: Otter Tail Power Company

Unit I.D.: | Hazard Potential Classification: High Significant Low ✓

Inspector's Name: Charles Larson PE, Brad Piede, EIT

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Monthly		18. Sloughing or bulging on slopes?	✓	
2. Pool elevation (operator records)?	1,910.7		19. Major erosion or slope deterioration?		✓
3. Decant inlet elevation (operator records)?	NA		20. Decant Pipes.		
4. Open channel spillway elevation (operator records)?	NA		Is water entering inlet, but not exiting outlet?		✓
5. Lowest dam crest elevation (operator records)?	1,915.0		Is water exiting outlet, but not entering inlet?		✓
6. If instrumentation is present, are readings recorded (operator records)?		✓	Is water exiting outlet flowing clear?		✓
7. Is the embankment currently under construction?		✓	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	✓		From underdrain?		✓
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?		✓	From downstream foundation area?		✓
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways, groin or diversion ditches?		✓	Around the outside of the decant pipe?		✓
15. Are spillway or ditch linings deteriorated?		✓	22. Surface movements in valley bottom or on hillside?		✓
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?		✓
17. Cracks or scarps on slopes?	✓		24. Were Photos taken during the dam inspection?	✓	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # | Comments

2, 5. There is a small discrepency (~ 3 ft) between elevations reported by plant operators and shown on Bechtel drawings. Reported elevs. were provided by plant operators or were estimated visually. It is possible that Ash Haul Road shown on Bechtel drawings was raised approx. 3 feet above original as-built elevs., but no documentation was located to confirm.

17. Minor scarps on the southeast waterside embankment toe.

18. Sloughing on the west waterside embankment. Cause unknown.

No part of the impoundment was built over wet ash, slag, or other unsuitable material.

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # ___NA__________ INSPECTOR_Kleinfelder (C. Larson, B. Piede)_
Date _5-19-11______________________________________

Impoundment Name __Coyote Station____
Impoundment Company __Otter Tail Power Company____________________________________
EPA Region ___8_________________
State Agency (Field Office) Addresss _N/A - No US EPA field office in ND____________
____
Name of Impoundment __Ash Pond____
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _________ Update _X_________

	Yes	No
Is impoundment currently under construction?	_______	__X____
Is water or ccw currently being pumped into the impoundment?	__X____	_______

IMPOUNDMENT FUNCTION: ___Ash Settling Pond___________________

Nearest Downstream Town : Name ___Beulah, ND_______________________________
Distance from the impoundment ___3 miles__________________________
Impoundment
Location: Longitude _101__ Degrees _48___ Minutes _35___ Seconds
Latitude ___47_ Degrees _13___ Minutes _01___ Seconds
State __ND_____ County _Mercer________________________

Does a state agency regulate this impoundment? YES __X____ NO ______

If So Which State Agency?___North Dakota Dept. of Health - Waste Mgmt. Div._______

<u>HAZARD POTENTIAL</u> (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

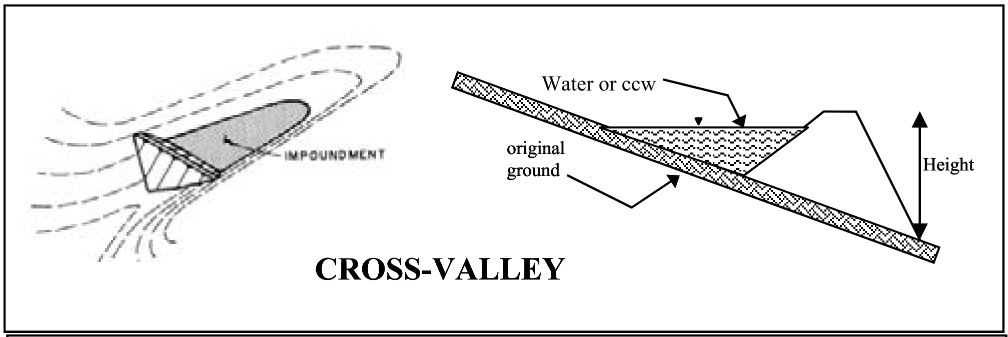
____-No loss of human life anticipated.__________________________________

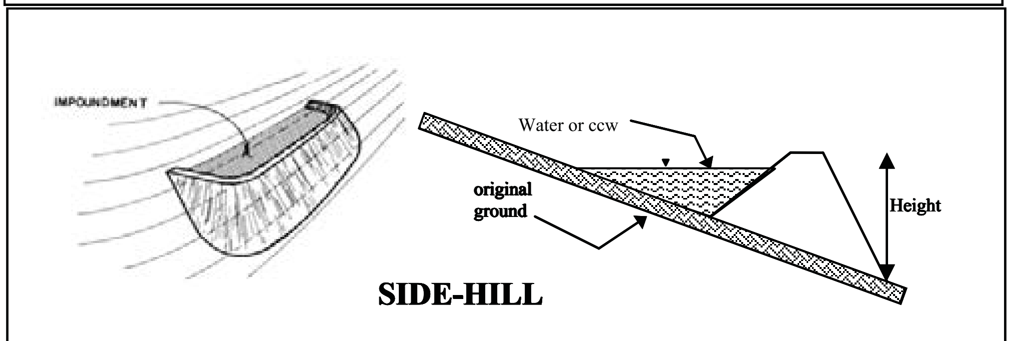
____-Discharge would likely be contained to Otter Tail Energy's property.__

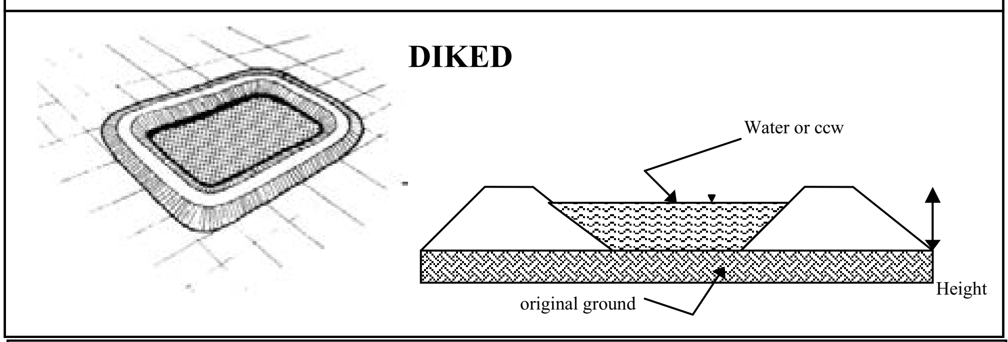
____-Failure would have low environmental and economic impacts.________

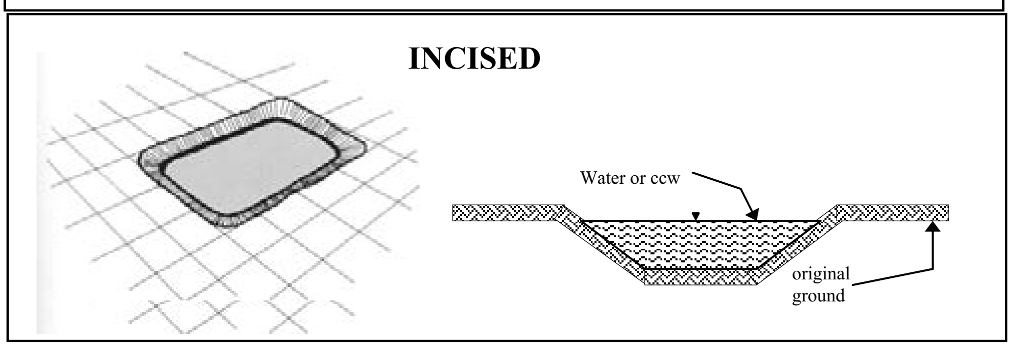
____-Pond is incised - risk of uncontrolled release is essentially nil. ______

CONFIGURATION:









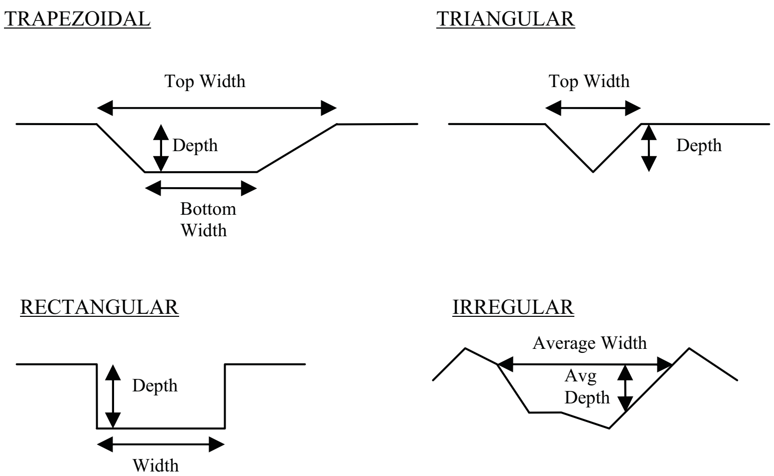
_____ Cross-Valley
_____ Side-Hill
_____ Diked
__X__ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height ___N/A_____ feet   Embankment Material__Earthfill_______
Pool Area ____6_____________ acres   Liner __Clay______________________
Current Freeboard _~4 __ feet   Liner Permeability __~1 ft/yr_____________

TYPE OF OUTLET (Mark all that apply)

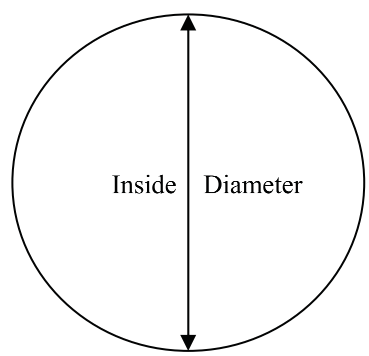
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width



__X___ **Outlet**

__48"_ inside diameter



Material
_____ corrugated metal
_____ welded steel
__X__ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ______________________

Is water flowing through the outlet? YES ___X____ NO _______

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) ___________________________________

The Impoundment was Designed By ___Bechtel Engineering_______________________
____

Has there ever been a failure at this site? YES __________ NO ___X_______

If So When? ___________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES _______ NO __X____

If So When? ___________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________NO __X_____

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____

Additional questions To Ask While conducting Coal Ash Site assessments

The purpose of the following questions is to identify each part of the equipment sequence that handles fly ash, bottom ash, boiler slag, and Flue gas desulfurization sludges from the point of generation to the CCR impoundments or into "dry" disposal.

FLY ASH

1. Exactly how is it generated at the boiler? Describe equipment used to initially collect it (steel box, etc).

   Combustion of lignite occurs in a cyclone-fired boiler. Fly ash is the lighter ash that is carried through the boiler convection pass by the combustion gases. Once the fly ash laden flue gas exits the boiler, it enters the spray dryer flue gas desulfurization (FGD) unit where the lime slurry is injected. The lime chemically reacts with the sulfur dioxide present in the flue gas to form calcium sulfate. From there, the material enters the baghouse where the co-mingled fly ash and flue gas desulfurization residue mixture are collected in a dry state on the filter bags. Sonic horns periodically cause the bags to vibrate shedding the residue which is collected in the collection hoppers below.

2. How is it moved from point of generation to storage? Describe each piece of equipment used to move it. Does this equipment have containment?

   The dry co-mingled fly ash/FGD residue is pneumatically conveyed in pipes under air pressure from the baghouse collection hoppers to a silo for intermediate storage. The containment is the steel piping.

3. Describe the type of equipment is used to store it. Describe the engineering characteristics of each of these storage units (silos, tanks, size, construction type (steel). Does this equipment have containment?

   The intermediate storage is a steel storage silo with a capacity of 186,667 cubic feet. The containment is the steel silo.

4. How is it moved from storage to final disposal? Describe each piece of equipment Does this equipment have containment?

   The dry co-mingled fly ash/FGD residue is wetted with water for dust control as it drops from the elevated intermediate storage silo into the off-road earth-moving equipment. The residue is then transported to the permitted on-site landfill. The containment is the transport vehicle.

Bottom Ash

5. Exactly how is it generated at the boiler? Describe equipment used to initially collect it (steel box, etc).

   Not applicable. Bottom ash is not generated by the cyclone-fired boiler at Coyote Station.

6. How is it moved from point of generation to storage? Describe each piece of equipment used to move it. Does this equipment have containment?

7. Describe the type of equipment is used to store it. Describe the engineering characteristics of each of these storage units (silos, tanks, size, construction type (steel). Does this equipment have containment?

8. How is it moved from storage to final disposal? Describe each piece of equipment Does this equipment have containment?

Boiler Slag

9. Exactly how is it generated at the boiler? Describe equipment used to initially collect it (steel box, etc).

   The lignite is burned in the cyclone-fired boiler. The heavy ash residue is in a molten state which flows from the bottom of the boiler into two water-filled tanks (slag tanks) located below the boiler. When the molten slag comes in contact with the quenching water, it fractures, crystallizes, and forms pellets. This boiler slag material is made up of hard, black, angular particles that have a smooth, glassy appearance.

10. How is it moved from point of generation to storage? Describe each piece of equipment used to move it. Does this equipment have containment?

    The slag is sluiced from the two slag tanks to a de-watering pond in water-filled pipes that are under pressure provided by sluice pumps. The pumps and piping are the containment.

11. Describe the type of equipment is used to store it. Describe the engineering characteristics of each of these storage units (silos, tanks, size, construction type (steel). Does this equipment have containment?

    The two slag tanks are constructed of steel. Each tank has a capacity of approximately 115 tons of the slag/water mixture. The earthen de-watering pond has a capacity of 220,000 cubic feet. The equipment is the containment.

12. How is it moved from storage to final disposal? Describe each piece of equipment Does this equipment have containment?

    The de-watered slag that is disposed is removed from the de-watering pond to the permitted on-site landfill by front-end loaders and off-road earth moving equipment. Slag that is beneficially used is moved off-site by conventional modes of transportation such as truck and railcar.

Flue Gas Desulfurization Sludge

13. Exactly how is it generated at the boiler? Describe equipment used to initially collect it (steel box, etc).

    Not applicable. Sludge is not produced at Coyote Station. The FGD residue is dry – see response to fly ash section.

14. How is it moved from point of generation to storage? Describe each piece of equipment used to move it. Does this equipment have containment?

15. Describe the type of equipment is used to store it. Describe the engineering characteristics of each of these storage units (silos, tanks, size, construction type (steel). Does this equipment have containment?

16. How is it moved from storage to final disposal? Describe each piece of equipment Does this equipment have containment?

Appendix B

Response Letter to the EPA's Section 104(e) Request for Information

215 South Cascade Street
PO Box 496
Fergus Falls, Minnesota 56538-0496
218 739-8200
www.otpco.com

September 2, 2010

OTTER TAIL POWER COMPANY

Mr. Craig Duffiey
U.S. Environmental Protection Agency (5304P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Dear Mr. Duffiey:

Subject: Otter Tail Power Company - Coyote Station
Response to EPA CERCLA Section 104(e) Request for Information
Dated August 24, 2010

Accompanying this letter are Otter Tail Power Company's (Otter Tail) Responses to the EPA Comprehensive Environmental Response, Compensation and Liability Act Section 104(e) Request for Information dated August 24, 2010 for Coyote Station. Otter Tail received the Request on August 30, 2010.

Otter Tail does not consider its Responses confidential information or trade secrets. Otter Tail is not aware of any documents that are responsive to this request.

I certify that the information contained in this response to EPA's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of this response for which I cannot personally verify their accuracy, I certify under penalty of law that this response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Sincerely,

Ward Uggerud

Ward Uggerud
Senior Vice President

Otter Tail Power Company - Coyote Station
Response to EPA CERCLA Section 104(e) Request for Information
Received August 30, 2010

Otter Tail Power Company provides the following Responses to each corresponding Request concerning the Coyote Station as provided in Enclosure A to the August 24, 2010 EPA Request for Information (Request).

Coyote Station operates three surface impounds that are responsive to this Request. Based on the plant descriptions, they are sluice pond, the ash pond and the Nelson Pond or decant pond. The responses are provided with respect to these three ponds.

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the units(s). If the unit(s) does not have a rating, please note that fact.

Response: None of the management units have been rated relative to the National Inventory of Dams criteria.

2. What year was each management unit commissioned and expanded?

Response: The following are the management unit commissioning dates:

Sluice Pond:	1981
Ash Pond:	1981
Nelson Pond:	1992

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash; (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other," please specify the other types of materials that are temporarily or permanently contained in the unit(s).

Response: All of the pond management units provide only temporary storage for dewatering purposes. The water that is collected is reused for plant process purposes. The material temporarily stored in each pond is identified as follows:

Sluice Pond: boiler slag and other (economizer ash, air heater wash water, boiler fire-side wash water)

Ash Pond: other (water and fine material carry-over from the Sluice Pond and decant water from Nelson Pond, plant site and coal-pile runoff, plant sump drains, water treatment system wastewater, and sewage house effluent)

Nelson Pond: other (material dredged from Ash Pond) The dredged material is decanted in Nelson Pond and the remaining solids are subsequently removed for final disposal at an onsite landfill.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management unit(s) under the supervision of a Professional Engineer?

Response: All three management units were designed by third-party professional engineers. General visual management unit inspections are performed by the plant engineering staff.

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the management unit(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

Response: The company has not conducted a formal safety (structural integrity) assessment of the management units.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

Response: The management units have not been inspected or evaluated for safety by a State or Federal official.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management units(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

Response: As noted in response to Request No. 7 above, the management units have not been inspected or evaluated for safety by a State or Federal official.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of material currently stored in each of the management unit(s). Please

provide the date that the volume measurement(s) was taken. Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.

Response: The surface area (acres), total storage capacity, the estimated volume of material currently stored in each management unit, the date the volume measurements were taken, and the maximum height of each management unit are provided in the following table.

Management unit	Surface area (acres)	Total storage capacity (cubic yards)	Estimated volume of material currently stored	Date volume measurements were taken	Maximum height of each management unit
Sluice pond	Approx. 1 acre	Approximately 8150 cubic yards	Pond dredged on on-going basis on Monday through Friday schedule		0 feet excavated management unit
Ash pond	Approx. 4 acres	Approx. 64,530 cubic yards	Pond dredged in June of 2010 – Estimated current volume of 10,000 to 13,000 cubic yards	September 1, 2010	0 feet excavated management unit
Nelson pond	Approx. 5 acres	Approx. 148,540 cubic yards	Nelson Pond excavated following dewatering in 2009. Approx. 31,731 cubic yards transferred to Nelson Pond from Ash Pond in 2010	September 1, 2010	12.21 feet

9. Please provide a brief history of known spills or unpermitted released from the unit within the last ten years, whether or not these were reported to State of Federal regulatory agencies. For

purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

Response: There are no known spills or unpermitted releases to surface water or to land from any of the three management units within the last ten years.

10. Please identify all current legal owner(s) and operator(s) at the facility.

Response: The legal owners and operator of the facility are as follows:

Northern Municipal Power Agency

Montana-Dakota Utilities Co., a Division of MDU Resources Group, Inc,

NorthWestern Corporation d/b/a NorthWestern Energy, and

Otter Tail Power Company, a wholly owned subsidiary of Otter Tail Corporation

Otter Tail Power Company is the designated operator of Coyote Station.

Appendix C

Excerpts from Bechtel's Coyote Station Unit 1 Soils Design and Geology Report

COYOTE STATION
UNIT 1

Soils Design & Geology Report

POWER PLANT AREA

BC-009
09

Prepared for

MINNESOTA POWER AND LIGHT COMPANY
MINNKOTA POWER COOPERATIVE, INC.
MONTANA-DAKOTA UTILITIES CO.
NORTHWESTERN PUBLIC SERVICE COMPANY
OTTER TAIL POWER COMPANY

APRIL 1976

REVISED DECEMBER 1976

COYOTE STATION

UNIT I

SOILS DESIGN & GEOLOGY REPORT

POWER PLANT AREA

TABLE OF CONTENTS

SUMMARY

Coyote Station will be a lignite-fired power plant located 3 miles south of Beulah in Mercer County, North Dakota. This power plant is being built for Minnesota Power and Light Company, Minnkota Power Cooperative, Inc., Montana-Dakota Utilities Co., Northwestern Public Service Company, and Otter Tail Power Company. This report describes the subsurface conditions and presents foundation recommendations and design criteria for the power plant area, including the turbine building, boiler building, precipitator, cooling tower, chimney, auxiliary structures, and ash pond. The live coal storage structure, sludge pond, and the make-up water supply system will be considered in separate reports.

At the site, till consisting of preconsolidated stiff-to-hard sandy clay extends from the ground surface to depths ranging between 55 and 85 feet. Generally underlying the till is a stratum referred to as pre-till, ranging from a highly plastic clay to a fine sand. This layer is between 0 and 100 feet thick. Underlying the pre-till stratum is the Sentinel Butte Formation, consisting of preconsolidated, hard, medium-to-highly-plastic clays, with layers of silty sand and lignite. The design parameters of each of the soils are described in the text.

The site is suitable for supporting the power plant foundations. The turbine building, boiler building, and precipitator will be founded on mats 4 to 8 feet thick, with bearing pressures of 1.5 to 4.5 ksf.

The chimney foundation will consist of an octagonal mat, 74 feet wide and 10 feet thick, with a bearing pressure of 3.9 ksf. These foundations are identical to those of the Big Stone Plant constructed in Grant County, South Dakota. The total settlements of the major plant structures are estimated to be:

Structure	Gross Total Settlement (inches)
Turbine Building	0.8 to 5.2
Boiler Building	2.2 to 6.5
Precipitator	1.1 to 3.2
Chimney	2.8
Condensate Tank	2.9
Raw Water Storage Tank	3.3
Cooling Tower	0.7

The auxiliary structures may be founded on spread footings or mats. A chart is presented for estimating the settlements of various footing sizes under different loads for the auxiliary structures.

The ash pond will be excavated, requiring no embankments. To assure that seepage losses from the pond are within tolerable limits, the pond should be lined with 3 feet of compacted clay. With a clay lining, the seepage losses from the pond are estimated to be less than 1/4 cfs. Pond slopes of 3 horizontal to 1 vertical are recommended.

Cuts as deep as 40 feet and fills as high as 100 feet will be required to establish plant grade. After removal of topsoil, the excavated materials will be suitable for use as fill. Permanent cut-and-fill slopes less than 50 feet high should be 3 horizontal to 1 vertical. Fill slopes more than 50 feet high should be 4 horizontal to 1 vertical. Temporary excavation slopes may be cut at 1-1/2 horizontal to 1 vertical for depths down to 20 feet. Compaction criteria are presented for the fill. The allowable bearing capacity is 2 ksf for switchyard and administration building foundations.

Except in the ash pond area, the ground water table is in the Sentinel Butte Formation at about El. 1820, 120 feet below plant grade. In the ash pond area, the ground water table is in the pre-till stratum, between El.1843 and 1876, 21 to 54 feet below the pond bottom at El.1897.

All excavations and cuts will be above the ground water table. Water accumulation in excavations can be handled by pumping from sumps. Lateral earth pressure coefficients are presented for design of below-grade structures.

The maximum depth of frost penetration is estimated to be 7 feet.

The plant access road should be designed for a subgrade with a CBR value of 4. Recommendations for road sections and railroad embankments are presented.

1. INTRODUCTION

1.1 General

The Coyote Plant is located in Mercer County about 3 miles south of the town of Beulah and abcut 60 miles northwest of Bismarck, North Dakota.

The plant site is adjacent to the Beulah Mine which is operated by the Knife River Coal Mining Company. It is planned that the plant will be fueled throughout its life by lignite supplied from the Beulah Mine.

1.2 Project Description

The project consists of a single 440 MW unit with provision for a second unit. The make-up water supply system will provide the requirements for two units. The coal handling facilities will supply coal for one unit with provisions for future expansion.

The power plant will consist of a turbine building, boiler building, precipitator, cooling tower and chimney identical to those at the Big Stone Unit 1 which was constructed during 1971-74 in Grant County, South Dakota (Bechtel, 1971). Additional facilities in the plant area include auxiliary structures, an ash pond, sludge pond, coal handling facilities, and other related structures. The make-up water supply system consists of two pumping stations, 25 miles of make-up water pipeline, surge pond, evaporation pond, and blowdown pipelines. One of the pumping stations is located on the Missouri River 25 miles east of the plant site, and the other is located at the surge pond. The surge pond will contain approximately 1050 acre-feet of water behind a 60-foot high dam. The dam axis will be approximately 1300 feet long. The evaporation pond will have a surface area of 300 acres with a capacity of 1500 acre-feet. The pipelines will consist of 36" I.D. pipe between the Missouri River and the surge pond, 30" I.D. between the surge pond and the cooling tower, 12" and 15" I.D. blowdown pipelines between the cooling tower and the Missouri River, and 8" I.D. pipe between the ash pond and the evaporation pond.

The locations of the various components of the project are shown on Figure 1, Project Location Plan.

1.3 Purpose and Scope

The purpose of this design report is as follows:

a) To describe the subsurface investigations and laboratory testing

b) To describe the subsurface conditions and the soil characteristics

c) To present foundation recommendations and design critieria

The scope of this design report encompasses the following facilities:

a) Power block area

- o turbine building
- o turbine pedestal
- o boiler building
- o auxiliary boiler
- o precipitator load center
- o precipitator
- o circulating water pipelines
- o condensate tank
- o cooling tower
- o raw water storage tank

b) Chimney

d) Auxiliary structures

- o flyash silo
- o flue gas desulfurization system
- o limestone storage silo
- o 45-day limestone storage pile
- o limestone mill
- o slurry tanks
- o fuel oil storage tanks
- o pump building
- o transfer house

d) Ash pond

e) Additional facilities

- o administration building
- o switchyard
- o storage area
- o emergency reclaim hopper
- o access road
- o railroad spurs
- o coal yard garage and service building

In addition, the report presents design recommendations concerning the use of on-site soils for backfill and embankments, cut slopes, and deep excavations.

Separate reports will be issued for the following facilities:

a) Live coal storage building (design and method of construction under study)

b) Sludge pond (capacity and location under study)

c) Make-up water supply system

10. ASH POND

10.1 Description

The ash pond is located 2,200 feet east of the boiler building as shown on Figure 2. The water surface area at maximum pond level will be about 4 acres. After completing analyses of slope stability and seepage (presented in Sections 10.2 and 10.3, respectively), the proposed bottom of the ash pond was raised from El. 1885 (shown in Figures 2 and 25) to El. 1897. The crest and the maximum pond level remain at El. 1910 and El. 1907, respectively. The slopes are unchanged at 3 horizontal to 1 vertical. The bottom width of the ash pond is 220 ft and the capacity is approximately 40 acre-feet.

The effect of the change of the ash pond bottom elevation is to increase the slope stability factors of safety and to reduce the seepage rate.

Water levels in observation wells installed in the ash pond area indicate that the ground water table is between El. 1843 and 1876, 21 to 54 feet below the pond bottom at El. 1897 . The pond will be excavated entirely in till. The bottom of the excavation will be approximately 14 feet above the pre-till soil, the top 30 feet of which is clay.

10.2 Slope Stability

The maximum cut section was analyzed for stability. This section E-E, is shown on Figure 25. The location of Section E-E is shown on Figure 2.

Three cases of slope stability were analyzed: end-of-construction, long-term, and long-term with rapid drawdown. The undrained shear strengths of the soils, based on unconsolidated-undrained triaxial test results, were used in the end-of-construction analyses. The undrained shear stengths of the till and the pre-till clay are 1.6 and 1.8 ksf, respectively. The drained shear stength, based on consolidated-drained triaxial tests, was used for the long-term analyses. For the till and pre-till clay, a conservative effective cohesion of 400 psf and an effective friction angle of 26^{0} were used. The drained shear strength was based on consolidated-drained triaxial tests of samples from the live coal storage area. The effective friction angle of the pre-till sand was conservatively selected to be 32^{0}, based on blow counts. A value of 30^{0} was used for the effective friction angle of the Sentinel Butte soil (Smith, 1953). A summary of the soil design parameters used in the stability analyses is presented on Figure 25.

The minimum factors of safety and location of the critical circles were determined using stability charts presented in Duncan and Buchignani (1975).

For the end-of-construction case the ground water table was assumed to be at El. 1875. For the long-term stability case the water table was assumed to be at the maximum pond level, El. 1907. The long-term with rapid drawdown case was analyzed with the pond level dropping from El. 1907 to 1895, while the water table in the adjacent soil remained at El. 1907. The minimum factors of safety are as follows:

Condition	Minimum Factor of Safety (Pond Bottom at El. 1885)
End-of-Construction	1.5
Long-Term	2.7
Long-Term with Rapid Drawdown (El. 1907 to 1895)	2.5

The results of the stability analyses, including the location of the critical circles, are presented on Figure 25.

10.3 Seepage Analysis

Seepage losses for both the lined and unlined pond cases were calculated using the following form of Darcy's Law:

$$Q = K_v A I$$

where:

Q = seepage rate (ft^3/yr)

K_v = vertical permeability (ft/yr)

A = average cross-sectional area through which seepage discharges (ft^2)

I = hydraulic gradient

The analysis of seepage through the unlined pond assumes saturated flow from the pond bottom to the water table, without buildup of a ground water mound. The permeabilities of the till and pre-till deposits are assumed to be the effective permeability (10 ft/yr) as discussed in Section 3.3. The sectional area through which seepage is assumed to occur (2.1×10^5 ft^2) is based on the wetted surface area of the pond at the maximum pool elevation of 1907 ft MSL. The hydraulic gradient was determined using: (1) maximum pool elevation; (2) an average water table elevation of 1859 ft MSL (see Section 3.4); and (3) the pond bottom elevation of 1885 ft MSL. Under these conditions, seepage losses through the unlined pond are estimated to be 3.9×10^6 ft^3/yr or 0.12 cfs.

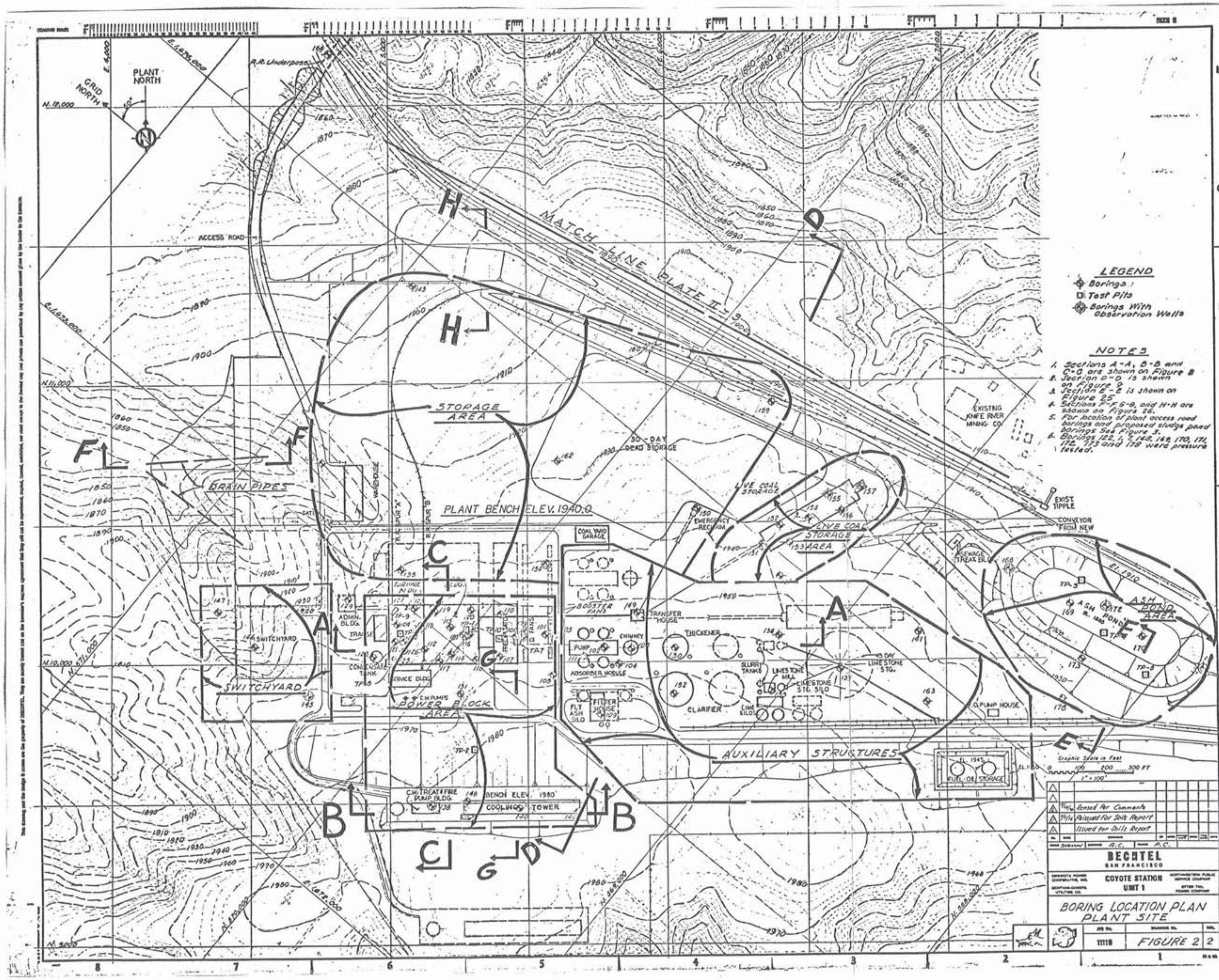
Because of the difficulty of accurately measuring the effective permeability of unsaturated materials, and inherent limitations in the general assumptions made in this analysis, the calculated seepage rate is an approximation only. Further, as discussed in Section 3.3, there is a possibility that open joints or fractures would provide localized zones of high permeability. It would be difficult to preclude this possibility prior to construction, even with intensive investigation. Should such zones be present, seepage losses would be considerably higher. Therefore, to assure that seepage from the ash pond is within tolerable limits, the pond should be lined with three feet of compacted Sentinel Butte clay.

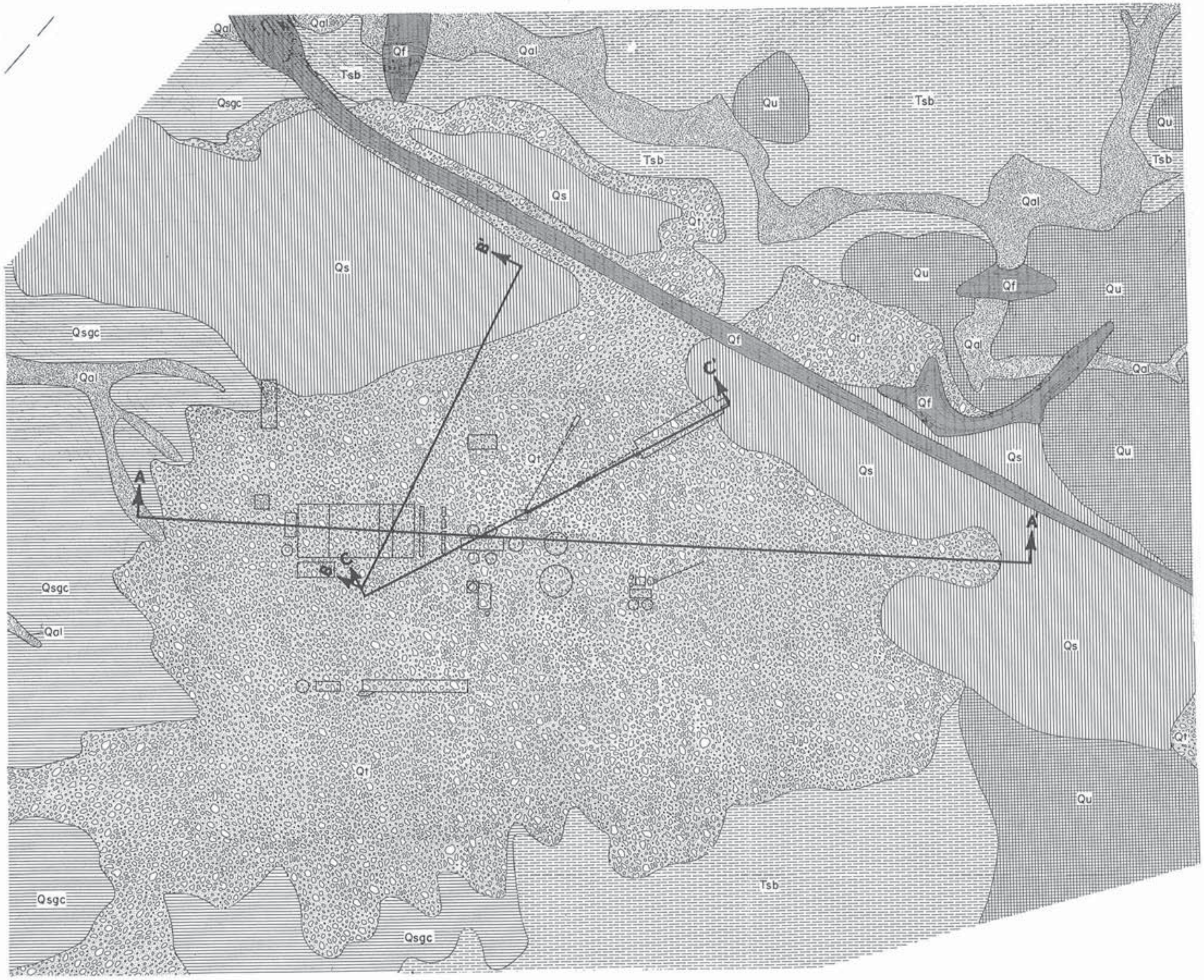
Analysis of seepage losses through the lined pond assumes that the total hydraulic head developed between maximum pool elevation and the bottom of the liner is dissipated across the three-foot-thick liner. A permeability of 1.0 ft/yr was used for the clay liner. This permeability was based conservatively on laboratory tests of compacted samples of Sentinel Butte clay (see Table 10). With these parameters, seepage through the clay liner, with the pond full, is calculated to be 1.8×10^6 ft^3/yr or 0.06 cfs. With this rate of seepage from the pond, a ground water mound will form beneath the pond, reaching the liner within approximately eight years. Once the water table mound reaches the liner, seepage rates will decline slightly. However, due to the uncertainties associated with construction, design, selection of parameters, and the integrity of the liner during the 40-year life of the station facilities, a safety factor of 4 is applied to the calculated seepage rate, yielding a design rate of 0.24 cfs (pond bottom at El. 1885).

Sentinel Butte clay is available from outcrops 1000 feet north of the pond, from spoil piles east of the ash pond, or from required excavations of the evaporation pond. The lining should be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D 1557 modified to a compactive energy of 20,000 ft/lbs per cubic foot at a water content higher than optimum.

Periodic maintenance of the clay lining may be required to repair any damage to the integrity of the lining caused by erosion, frost action or drying out.

FIGURES


LEGEND
Borings
Test Pits
Borings With Observation Wells
NOTES
1. Sections A-A, B-B and C-C are shown on Figure 8
2. Section D-D is shown on Figure 9
3. Section E-E is shown on Figure 25
4. Sections F-F, G-G, and H-H are shown on Figure 26.
5. For location of plant access road borings and proposed sludge pond borings See Figure 3.
6. Borings 122, 1, 7, 168, 169, 170, 171, 172, 173 and 178 were pressure tested.
PLANT NORTH
GRID NORTH
MATCH LINE PLATE II-3
ACCESS ROAD
R.R. Underpass
STORAGE AREA
30-DAY DEAD STORAGE
LIVE COAL STORAGE
LIVE COAL STORAGE AREA
PLANT BENCH ELEV. 1940.0
DRAIN PIPES
WAREHOUSE
SWITCHYARD
ADMIN. BLDG.
CONDENSATE TANK
SERVICE BLDG.
C.W. PUMPS
POWER BLOCK AREA
BOOSTER FANS
TRANSFER HOUSE
CHIMNEY
THICKENER
ABSORBER MODULE
FLY ASH SILO
FILTER HOUSE
SLURRY TANKS
LIMESTONE MILL
LIMESTONE STG. SILO
45 DAY LIMESTONE STG.
CLARIFIER
LIME SILO
COAL YARD GARAGE
EMERGENCY RECLAIM
AUXILIARY STRUCTURES
PUMP HOUSE
FUEL OIL STORAGE
C.W. TREAT & FIRE PUMP BLDG.
BENCH ELEV. 1980'
COOLING TOWER
EXISTING KNIFE RIVER MINING CO.
EXIST. TIPPLE
CONVEYOR FROM NEW
SEWAGE TREAT. BLDG.
ASH POND AREA
ASH POND SITE
Graphic Scale in Feet
0 100 200 300 FT
1" = 100'
Revised Per Comments
Released For Soils Report
Issued For Soils Report
R.C.
R.C.
BECHTEL
SAN FRANCISCO
COYOTE STATION
UNIT 1
BORING LOCATION PLAN
PLANT SITE
11118
FIGURE 2
2



EXPLANATION

- Qf — Spoil & Fill
- Qal — Recent Alluvium
- Qs — Sand & Gravel (Late Pleistocene or Recent)
- Qu — Sand & Gravel, Qsgc and Qs, Undifferentiated
- Qt — Till (Pleistocene)
- Qsgc — Sand & Gravel w/gray clay interbeds (Miocene to Pleistocene?)
- Tsb — Sentinel Butte Formation (Tertiary-Paleocene)

NOTE:
Geologic sections are shown on Figure 5

0 200 400 600 800
SCALE IN FEET

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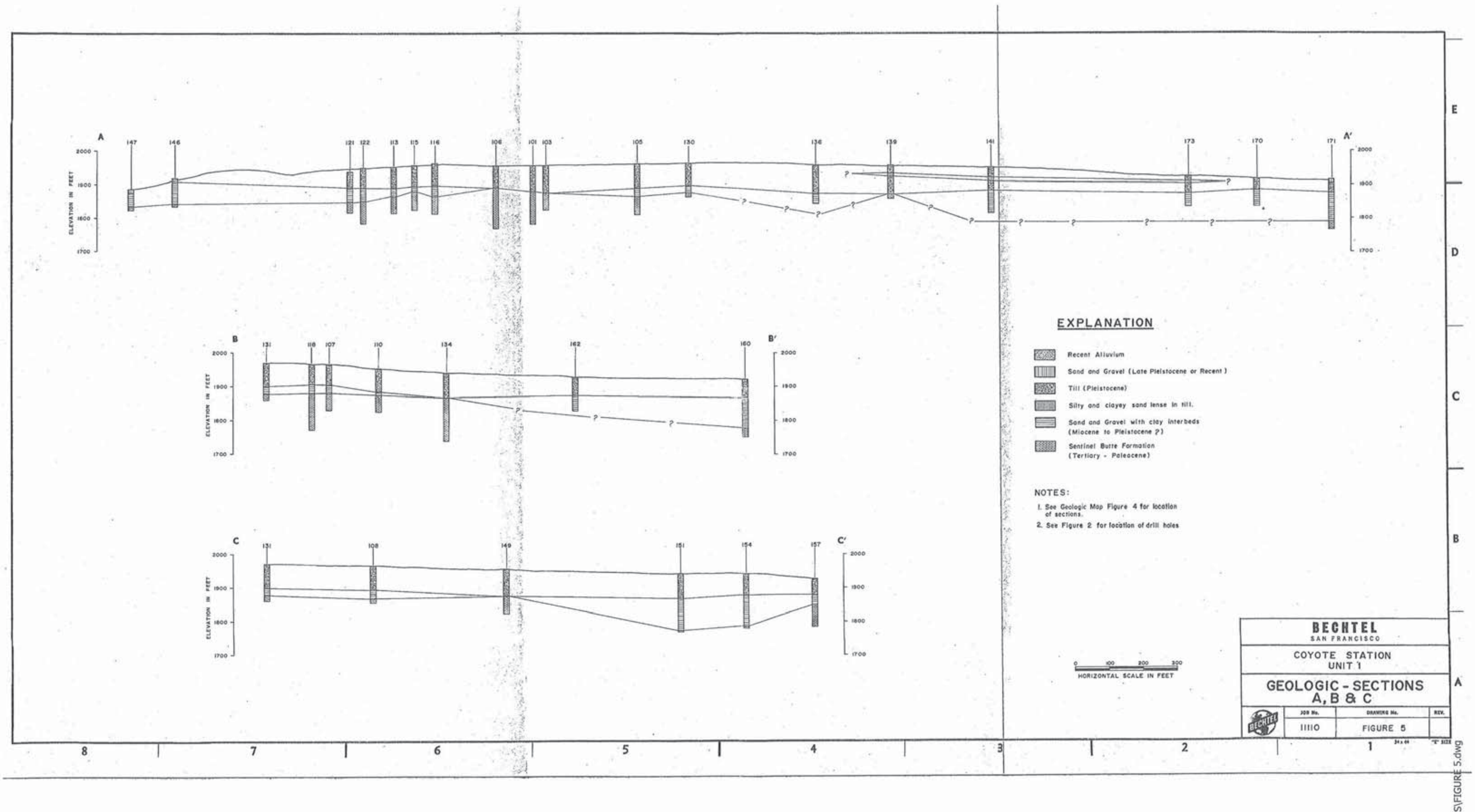
COYOTE STATION-UNIT 1

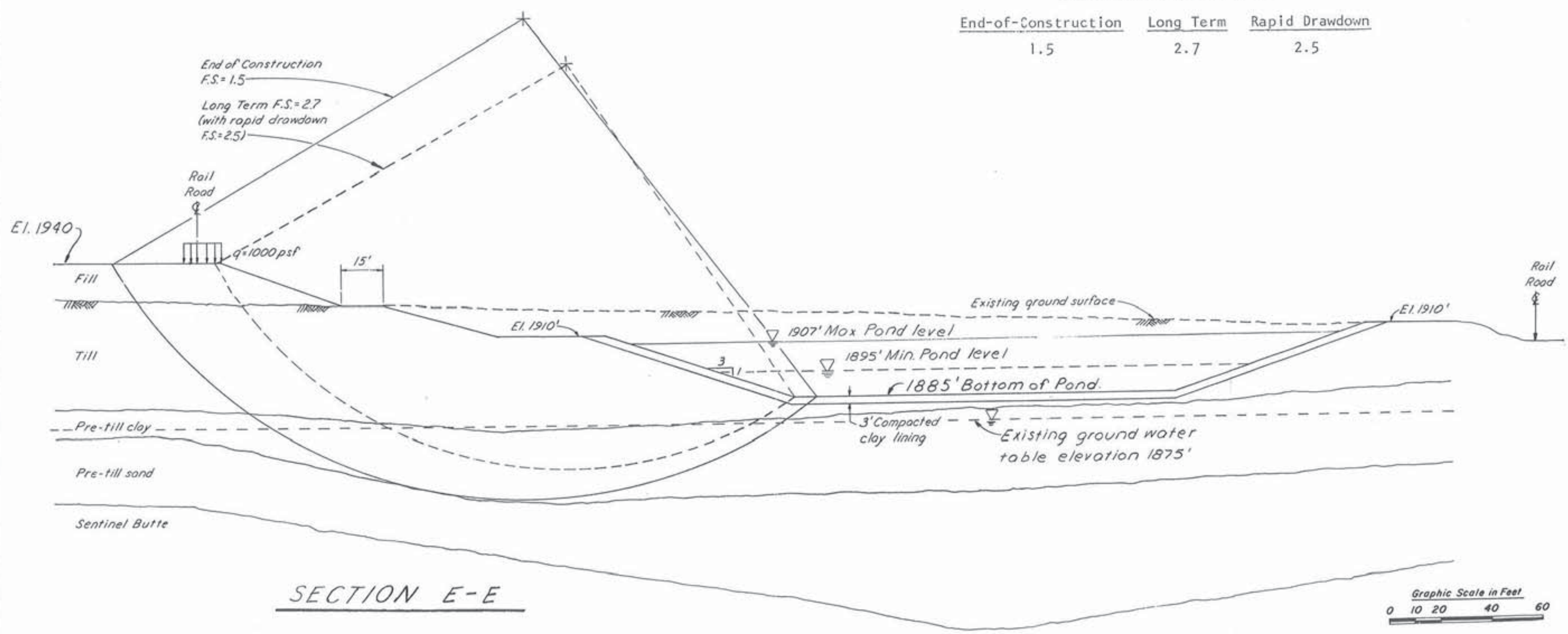
GEOLOGIC MAP-PLANT SITE

JOB No.	DRAWING No.	REV.
11110	FIGURE 4	

22 X 34 "D" SIZE



A
A′
147
146
121
122
113
115
116
106
101
103
105
130
136
139
141
173
170
171
ELEVATION IN FEET
2000
1900
1800
1700
B
B′
131
118
107
110
134
162
160
C
C′
108
149
151
154
157
EXPLANATION
Recent Alluvium
Sand and Gravel (Late Pleistocene or Recent)
Till (Pleistocene)
Silty and clayey sand lense in till.
Sand and Gravel with clay interbeds (Miocene to Pleistocene ?)
Sentinel Butte Formation (Tertiary - Paleocene)
NOTES:
1. See Geologic Map Figure 4 for location of sections.
2. See Figure 2 for location of drill holes
0 100 200 300
HORIZONTAL SCALE IN FEET
BECHTEL
SAN FRANCISCO
COYOTE STATION
UNIT 1
GEOLOGIC - SECTIONS
A, B & C
JOB No.
11110
DRAWING No.
FIGURE 5
REV.
J:\SCANS\FIGURE 5.dwg



SECTION E-E

MINIMUM FACTORS OF SAFETY

End-of-Construction	Long Term	Rapid Drawdown
1.5	2.7	2.5

SOIL DESIGN PARAMETERS

Soil Type	Total Density (pcf)	End of Construction Cohesion (ksf)	End of Construction Ø (Degrees)	Long Term Cohesion (ksf)	Long Term Ø (Degrees)
Fill	124	1.6	0	0.3	15
Till	125	1.6	0	0.4	26
Pre-till Clay	120	1.8	0	0.4	26
Pre-till Sand	120	0	32	0	32
Sentinel Butte	130	8.0	0	0	30

NOTES:

1. Minimum factors of safety and location of critical circles was determined using stability charts in Duncan and Buchignani (1975).
2. Railroad loading was used in end of construction condition only.
3. for location of section see Boring location plant, plant site, Figure 2.

ISSUED FOR SOILS REPORT

SCALE SHOWN — O.J.S.

BECHTEL
SAN FRANCISCO

COYOTE STATION
UNIT I

FLY ASH POND
STABILITY ANALYSIS

JOB No. 11110- | DRAWING No. FIGURE 25 | REV. 1