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REPORT

Dam Safety Assessment of CCW Impoundments

Kincaid Generation – Slag Field

United States Environmental Protection Agency
Washington, DC

March 24, 2011

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REPORT

13498/46122

Dam Safety Assessment of CCW Impoundments

Kincaid Generation – Slag Field

Prepared for:
US Environmental Protection Agency
Washington, DC

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1. INTRODUCTION

1.1 GENERAL

In response to the coal combustion waste (CCW) impoundment failure at the TVA/Kingston coal-fired electric generating station in December of 2008, the U. S. Environmental Protection Agency (US EPA) has initiated a nationwide program of structural integrity and safety assessments of coal combustion waste impoundments or "management units".

A CCW management unit is defined as a surface impoundment or similar diked or bermed management unit or management units designated as landfills that receive liquid-borne material and are used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Management units also include inactive impoundments that have not been formally closed in compliance with applicable federal or state closure/reclamation regulations.

The US EPA has authorized O'Brien & Gere to provide site specific impoundment assessments at selected facilities. This project is being conducted in accordance with the terms of BPA #EP10W000673, Order No. EP-CALL-0002, dated July 28, 2010.

1.2 PROJECT PURPOSE AND SCOPE

The purpose of this work is to provide Dam Safety Assessment of CCW management units, including the following:

- Identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures
- Note the extent of deterioration, status of maintenance, and/or need for immediate repair
- Evaluate conformity with current design and construction practices
- Determine the hazard potential classification for units not currently classified by the management unit owner or by state or federal agencies

O'Brien & Gere's scope of services for this project includes performing a site specific dam safety assessment of all CCW management units at the subject facility. Specifically, the scope includes the following tasks:

- Perform a review of pertinent records (prior inspections, engineering reports, drawings, etc.) made available at the time of the site visit to review previously documented conditions and safety issues and gain an understanding of the original design and modifications of the facility.
- Perform a site visit and visual inspection of each CCW management unit and complete the visual inspection checklist to document conditions observed.
- Perform an evaluation of the adequacy of the outlet works, structural stability, quality and adequacy of the management unit's inspection, maintenance, and operations procedures.
- Identify critical infrastructure within 5 miles down gradient of management units.
- Evaluate the risks and effects of potential overtopping and evaluate effects of flood loading on the management units.
- Immediate notification of conditions requiring emergency or urgent corrective action.
- Identify all environmental permits issued for the management units
- Identify all leaks, spills, or releases of any kind from the management units within the last 5 years.
- Prepare a report summarizing the findings of the assessment, conclusions regarding the safety and structural integrity, recommendations for maintenance and corrective action, and other action items as appropriate.

This report addresses the above issues for the Slag Field impoundment at the Kincaid Generation facility near Kincaid, Illinois. The above impoundment is owned by Kincaid Generation, LLC (Dominion) and operated by Dominion Energy Services Company (DESCO or Dominion). In the course of this assessment, O'Brien & Gere obtained information from representatives of Dominion and Hanson Professional Services Company (Hanson).

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2. PROJECT/FACILITY DESCRIPTION

The Kincaid Generation facility is located on Route 104, 4 miles west of Kincaid, Illinois in Christian County. The facility operates one surface impoundment for storing CCW called the Slag Field. The dam safety assessment summarized in this report details the August 16, 2010 inspection of the Slag Field.

A site location map is provided as Figure 1.

2.1 MANAGEMENT UNIT IDENTIFICATION

The Slag Field is located in the northeast portion of the site and is identified on Figure 2. The Slag Field is not regulated as a dam by the State of Illinois nor is it listed in the National Inventory of Dams. As a result, the impoundment does not carry applicable identification numbers.

2.2 HAZARD POTENTIAL CLASSIFICATION

US EPA - CCW Impoundment Guidelines

The definitions for the four hazard potentials (Less than Low, Low, Significant and High) to be used in this assessment are included in the US EPA CCW checklist found in Appendix A. Based on the checklist definitions and as a result of this assessment, the hazard potential rating recommended for the Slag Field is **LOW.**

As found in Appendix A, the **LOW** hazard rating is justified as follows:

1. *Failure of the impoundment would result in a release of CCW to adjacent farmland and/or Lake Sangchris. Lake Sangchris is owned by the Kincaid site and therefore property damages would be limited to the owner's property and rural areas.*
2. *Lake Sangchris is a reservoir which was constructed as a water supply for the plant and a receiving water body for hot plant water and subsequently opened to the public for outdoor recreation (boating/fishing). The facility and impoundment are located at the upstream end of the reservoir. Because the impoundment contents are principally slag (bottom ash), the quantity of a release from an embankment breach would be limited and the environmental damage would be limited to the adjacent area in upper reaches of the reservoir.*
3. *Currently, new slag deposited into the impoundment is recovered by a resource recycling company for beneficial reuse. Any material that is unacceptable for reuse is returned to the site and "permanently" deposited in designated potions of the impoundment and "stabilized". (Stabilization is achieved by filling, heavy equipment vehicle traffic, and natural vegetation growth.) As a result, approximately 80 acres of the 178 acres of the impoundment is open water contained by the original dike. The dike in this portion of the impoundment is bounded by farm fields or the plant's "hot ditch". A direct release to Lake Sangchris is unlikely.*

2.3 IMPOUNDING STRUCTURE DETAILS

The following sections summarize the structural components and basic operations of the Slag Field. A diagram of the Slag Field and its relevant features is provided as Figure 3. It should be noted that the site plan shown in Figure 3 was adapted from the original design drawings and 2005 aerial imagery and may not depict all current features. Additionally, photos taken during the visual inspection are incorporated in a Photographic Log provided as Appendix B.

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2.3.1 Embankment Configuration

The Slag Field is comprised of seven embankment dikes which form a complete perimeter around the single impoundment. In general, the crest elevation varies between elevations 605' and 620' while the water surface elevation is maintained between an elevation of 603' and 604'.

2.3.2 Type of Materials Impounded

The Slag Field is utilized for storing slag (bottom ash), boiler slag, waste water and water treatment solids, excavation spoils and dredge spoil. Slag is deposited into the Slag Field via the use of sluice water which is recycled from Slag Field impoundment.

Currently, a third party recycling company recovers the newly deposited slag for beneficial reuse. Under this arrangement, the slag is continually removed from the site and the pond does not require a full scale solids removal effort on an annual or semi-annual basis. Material that is unacceptable for reuse is returned to the site and "permanently" deposited in designated potions of the impoundment and "stabilized". Stabilization is achieved by filling, heavy equipment vehicle traffic, and natural vegetation growth.

2.3.3 Outlet Works

The Slag Field has two designated outlets: the normal recycle outlet and an emergency outlet. A summary of these various outlets works is presented in the following table.

Table 2.3 *Summary of Outlet Works at the Slag Field impoundment*

Outlet	DESCRIPTION
Recycle (normal)	» Intake located in screen house » Intake approx elevation 603.5" » 60" Reinforced concrete pipe at base of screen house » Conveys water to recycle pump house
Emergency	» Concrete weir chamber, approx elevation 604.5' » 3 sides of chamber top available to receive flow @ approximately 3' length each » Flow out of emergency chamber manually controlled by valve » 48" corrugated metal pipe at base of chamber » Discharges into open facility discharge channel ("hot ditch")

The Slag Field emergency outfall discharge to Lake Sangchris (via the facility discharge canal or "hot ditch") is permitted as Outfall E01 under NPDES permit #IL0002241.

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3. RECORDS REVIEW

A review of the available records related to design, construction, operation and inspection of the Slag Field was performed as part of this assessment. The documents provided by Dominion are listed below:

Table 3.1 *Summary of Wastewater Pond Complex Documents Reviewed*

Document	Dates	By	Description
Slag Field Design Drawings (limited set)	1964 - 1965	Sargent and Lundy Engineers	Site plan, grading plan, sections and details of the Slag Field
Slag Field Recycle Pump House Addition Drawings (limited set)	1977 - 1978	Harza Engineering Company	Site plan, grading plan, sections and details of the intake structure and 60" line to recycle pump house
Facility Water Diagram	2004	Dominion	Overall facility block diagram summarizing water use at the facility
Dam Inspection Reports	2009 - 2010	Hanson Professional Services	Third party consultant engineer inspection reports
Weekly Plant Inspection Logs	2009 - 2010	Dominion	Visual inspection checklists by facility personnel
NPDES Permit	2000	Illinois EPA(IEPA)	Permit detailing discharge requirements for the Slag Field, 2005 renewal is still pending (Permit IL 0002241)
Department of the Army Permit	2010	US Army Corps of Engineers	Permit for bank stabilization activities in conjunction with the armoring of the northwest embankment with rip-rap (Permit CEMVR-OD-20009-1631)
Hydrogeologic Assessment Report	2010	Civil & Environmental Consultants (CEC)	Third party hydrogeologic assessment around the Slag Field performed at request of Illinois EPA, contains soil boring logs and water level data.

3.1 ENGINEERING DOCUMENTS

Review of the design drawings revealed information on the design details of the Slag Field. Various modifications have been made to the impoundment since its construction. The following is a summary of basic design information.

- The Slag Field was originally constructed during the 1960's when the Kincaid Generation facility was constructed.
- The embankments for the Slag Field are founded on native soils. Additionally, the embankments are reported to be constructed from native soils that were excavated from the site to construct the hot ditch and the water supply canal.
- The Slag Field recycle pumping operation was added in the late 1970's. This effort included the installation of the screen house at the southeast corner of the impoundment and a 60" recycle line along the eastern south embankment to convey recycle water to a pumping station. Various design drawings from this effort were provided by Dominion.
- No indication of construction phase documentation was noted in the records reviewed.
- No indication of geotechnical borings, sampling and analysis utilized in the design of the Slag Field were summarized in the original design documents provided. However, a hydrogeologic assessment around the impoundment was undertaken by Dominion at the request of IEPA in spring 2010. This assessment does provide a snapshot of the existing geologic conditions around the impoundment.
- Slope stability analyses were not observed at the time of the site inspection. However, Dominion retained Hanson Professional Services Company (Hanson) to perform these calculations for the purposes of this

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review effort. The results of slope stability analyses for existing conditions were submitted to O'Brien & Gere on August 18, 2010. The stability analysis methods appear to have been performed in general accordance with USACE Slope Stability Analysis Engineer Manual EM 1110-2-1902, and the computed factors of safety for the various loading conditions and dike sections analyzed appear to meet the minimums required by US Army Corps of Engineers for embankment dams. Additional details regarding the slope stability analyses can be found in Section 3.1.2 below.

- No indication or mention of ash, coal slimes, or other CCW by-products within the dikes or dike foundations was noted in the review of the engineering records listed above.
- No indication of former spills or releases of impounded materials from the Slag Field was noted in the records reviewed.

3.1.1 Stormwater Inflows

Stormwater inflows to Slag Field are minimal. The impounding structures are comprised of diked embankments on all sides which direct storm water away from the impoundment and limit runoff to precipitation that falls directly on the water surface and interior slopes of the dikes. The facility closely monitors the water level in the impoundment, which is normally maintained at approximately 1.5 feet below the lowest crest elevation of the dikes at its south end. The reported facility operation and maintenance practice is to divert slag field water through the wastewater treatment plant effluent discharge (permitted Outfall B01) if the water level is too high or there is an expectation of a large amount of precipitation. The gate of the emergency outlet may be opened to prevent embankment overtopping, but this practice has been employed infrequently (once in the past five years).

3.1.2 Stability Analyses

As noted in Section 3.1, slope stability analyses of the Slag Field dikes were performed on behalf of Dominion by Hanson immediately after the site inspection and submitted to O'Brien & Gere on August 18, 2010.

The stability analysis methods appear to have been performed in general accordance with USACE Slope Stability Analysis Engineer Manual EM 1110-2-1902, with reference to ER1110-2-1806 for seismic stability analysis. A critical section was selected along the western dike where the embankment is at its maximum elevation and its toe is adjacent to Lake Sangchris. Soil profile and phreatic surface information was based upon boring logs from the 2010 Hydrogeologic Assessment Report and parameters from geotechnical testing of similar soils from the surrounding area. Load cases analyzed include normal pool, steady-state seepage, and normal pool, steady-state seepage with seismic load. An additional section was selected in the south dike near the outlet works for analysis under drawdown conditions from a maximum surcharge pool. This section was selected because there is no CCW stockpiled against the upstream slope.

The analyses were performed by modeling the embankment, soil and water surface geometries with Slope/W and using Bishop, Ordinary and Janbu methods to compute minimum factors of safety for critical slip surfaces. The computed factors of safety for the normal pool, steady-state seepage, and drawdown loading conditions and dike sections analyzed appear to meet the minimums required by US Army Corps of Engineers for embankment dams in EM 1110-2-1902. The west dike section has a marginal factor of safety in the steady-state seepage with seismic load case relative to the minimum factor of safety required in EM 1110-2-1902 (0.95 vs. 1.0). However, O'Brien & Gere concurs with Hanson's conclusion that deformation along the failure surface would not lead to embankment overtopping during the maximum credible seismic event.

3.1.3 Modifications from Original Construction

Based on the records review and discussions with plant personnel, the Slag Field has undergone various modifications since its original construction. These modifications are summarized as follows:

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- The screen house and recycle pumping operation was added in the late 1970's (Appendix B – Photo 2)
- The impoundment was dredged in the mid 1980's with dredged slag placed along interior slopes of portions of the impoundment perimeter. Under the current operation, this deposited slag is essentially a permanent feature. (Appendix B – Photos 6 & 9)
- Over time, the inlet piping has been changed to various configurations (i.e, lengthened, shortened, rerouted to different locations, etc.) Details of these variations were not provided. As observed during this inspection, the inlet piping consisted of eight open discharge pipes which discharge slag and water onto a rock reinforced area (Appendix B – Photo 20).
- In the mid 1980's a portion of the north embankment which is adjacent to Lake Sangchris was repaired for erosion protection purposes. The existing condition is a benched embankment with a coarse aggregate cover. Plans or engineering documents for this repair were not available for review. (Appendix B – Photo 11)
- Beginning in 2009 an extensive tree removal and regrading effort was undertaken. This effort is approximately 75% complete to date. Stump and debris removal along with grading and vegetation establishment remains to be completed on portions of the north and east embankments. (Appendix B – Photos 7, 8 & 10)
- Earlier in 2010, rip-rap armoring was undertaken along the downstream toe of the northwest embankment to repair and protect this area from wave erosion from the lake. This effort is approximately 75% complete with minor regrading items remaining. (Appendix B – Photos 13 & 14)

3.1.4 Instrumentation

Instrumentation is present at one location at the Slag Field impoundment. This instrumentation consists of gauge markings on the screen house foundation to monitor pool elevation. This level is observed and recorded three times daily (once per shift). (Appendix B – Photo 2)

No instrumentation is present to monitor the phreatic surface within or settlement of the embankments at the Slag Field impoundment.

3.2 PREVIOUS INSPECTIONS

During the inspection, the Slag Field was reported to have the following inspection schedule:

- Facility, Visual Walkthrough– Weekly
- Third Party, Professional Engineer – Annual

For the most recent third party inspection, Dominion retained the services of Hanson Professional Services (Hanson) to provide a dam safety inspection in March 2010. Hanson made two recommendations during their inspection as summarized below:

1) Continue rip-rap repair of wave eroded toe of northwest embankment
2) Continue tree removal/regarding efforts along east and north embankments

At the time of O'Brien & Gere's inspection:

- Item 1 was nearly complete with new rip-rap placed along a majority of the target area.
- Item 2 was still in progress with stump removal and regrading remaining along the north embankment and debris clean up/regarding remaining along the north portion of the east embankment.

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3.3 OPERATOR INTERVIEWS

Numerous plant and corporate personnel took part in the inspection proceedings. The following is a list of participants for the inspection of the Slag Field:

Table 3.3 *List of Participants*

Name	Affiliation	Title
Julie Lynch	Dominion – Kincaid Generation	Environmental Compliance Coordinator
Don Torricelli	Dominion – Kincaid Generation	Technical Specialist
Bruce Rahar	Dominion – Kincaid Generation	Operation & Maintenance Supervisor
Al Rinozzi	Dominion – Kincaid Generation	Technical Support Supervisor
Donald Hintz, PG	Dominion – Corporate	Environmental Consultant
James Knutelski, PE	Hanson Professional Services	Geotechnical Engineer
Scott Cormier, PE	O'Brien & Gere	Vice President
Gary Emmanuel, PE	O'Brien & Gere	Project Manager
Jason Huber, PE	O'Brien & Gere	Project Engineer

Facility personnel provided a good working knowledge of the Slag Field, provided general plant operation background and provided requested historical documentation. In addition to the facility personnel, a representative from Hanson, the plant's geotechnical consultant, was present to provide additional information from previous impoundment inspections. These personnel also accompanied O'Brien & Gere throughout the visual inspections to answer questions and to provide additional information as needed in the field.

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4.VISUAL INSPECTION

The following sections summarize the inspection of the Slag Field, which occurred on August 16, 2010. At the time of the inspection, O'Brien & Gere completed an EPA inspection checklist for the Slag Field, which was submitted electronically to EPA on August 23, 2010. A copy of the completed inspection checklist is included as Appendix A.

4.1 GENERAL

The weather on the date of the inspection was clear and approximately 85 degrees. The visual inspection consisted of a thorough site walk along the perimeter of the Slag Field. O'Brien & Gere team members made observations along the toe, outboard slope, and crest of the embankments, and along exposed portions of the inboard slopes. O'Brien & Gere also observed the inlet/outlet structures and current operation.

Photos of relevant features and conditions observed during the inspection were taken by O'Brien & Gere and are provided in Appendix B. A site plan of the Slag Field is presented as Figure 3 and provides photograph locations and directions.

4.2 SUMMARY OF FINDINGS

The following observations were made during the inspection:

- The Slag Field was observed in normal operation at the time of the visual inspection with the water level in the pond observed near its typical level. Water was observed flowing freely into the impoundment at the inlet piping and flowing freely out of the impoundment into the screen house chamber. (Appendix B – Photo 20)
- The ongoing process of removing trees and woody vegetation from the outer embankment slopes has left the slopes with an irregular surface in many areas, spotty vegetation in some areas and other more specific conditions described below.
- Erosion of the slope was observed at the western portion of the south embankment. (Appendix B – Photo 18)
- Minor gully erosion was observed in the downstream slope where the north portion of southwestern embankment meets the western embankment.
- A wet area near the toe of the north embankment was observed. It was reported that the adjacent agricultural fields are tiled and that this area is the discharge point for the field tiles.
- Existing stumps were observed in place along the eastern portion of the north embankment. (Appendix B – Photo 10)
- Stump remnants and woody debris remained along a significant portion of the east embankment from the ongoing clearing activities. Surface vegetation was also missing in these areas with much of the area in need of surface grading. (Appendix B – Photos 7 & 8)
- The rip-rap placement on the northwest embankment was observed to be nearly complete. (Appendix B – Photos 13 & 14)
- A large percentage of the western half of the impoundment was observed to be permanently filled with slag.
- The placement and grading of non-recyclable slag along the upstream slope of the north embankment was observed in progress. (Appendix B – Photos 9 & 12)

5. CONCLUSIONS

Based on the ratings defined in the EPA Task Order Performance Work Statement (Satisfactory, Fair, Poor and Unsatisfactory), the information reviewed and the visual inspection, the overall condition of the Slag Field is considered to be **FAIR**. Acceptable performance is expected under all loading conditions; however, some deficiencies/irregularities exist that require repair and/or additional monitoring. These items include the following:

- Erosion of the slope at the western portion of the south embankment
- Stump removal, regrading and proper vegetation establishment along the east and north embankments are in need of completion
- Finish grading and rip-rap placement at the toe of the northwest embankment are in need of completion

The owner has implemented regular inspections and maintenance which enable the impoundment to be kept in good working order. Additionally, the owner has initiated a program of tree and woody vegetation removal and revegetation with the goal of facilitating appropriate long term maintenance and monitoring of the impoundment's embankment slopes. Interviews with plant engineering personnel responsible for the operation of the impoundment indicate that a regular operations plan is in use at the Kincaid Generation facility with respect to water level, use and release management and slag stabilization. The regular operating procedures of the facility do not appear to be impacting the structural integrity of the impounding embankments.

The plant and corporate engineering staffs maintain weekly and annual inspection documents in a well organized manner. However, the availability original design drawings and/or as-built conditions drawings was limited and could be improved.

Based on these findings, O'Brien & Gere is of the opinion that the operations and maintenance procedures being practiced and implemented at the Slag Field are adequate.

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6. RECOMMENDATIONS

Based on the findings of our visual inspection and review of the available records for the Slag Field, O'Brien & Gere recommends that additional maintenance of the embankments be performed to correct the erosion, drainage, and other miscellaneous deficiencies cited above.

6.1 URGENT ACTION ITEMS

No urgent action items are recommended.

6.2 REPAIRS/LONG TERM IMPROVEMENT

Based on the August 16, 2011 inspection, the following repairs were recommended:

- The slope erosion observed at the western portion of the south embankment should be repaired
- Completion of the rip-rap reinforcement project should continue as planned
- Completion of the stump removal, regrading and vegetation establishment should continue as planned
- Record drawings of work conducted should be completed/remain on file

As noted in Section 6.4, Dominion has reportedly completed the above items prior to this final report. No additional long term repairs are recommended.

6.3 MONITORING AND FUTURE INSPECTION

The gully erosion observed at the in the downstream slope where the north portion of southwestern embankment meets the western embankment should be monitored. The area does have some vegetation established; however, should the condition of this area be observed to worsen it should be repaired immediately.

O'Brien & Gere recommends that Dominion continue with its current schedule of weekly inspection and annual third party inspections.

O'Brien & Gere also recommends that upon completion of grading and vegetation establishment on the north and east embankments, Dominion should continue with its plans for regular mowing and active vegetation management. Active management of vegetation will prevent the growth of woody vegetation, prevent erosion, and facilitate inspection on the embankment slopes.

6.4 TIME FRAME FOR COMPLETION OF REPAIRS/IMPROVEMENTS

Dominion has reported that the repair of the slope erosion in the western portion of the south embankment was completed as of October 19, 2010.

Dominion has reported that the rip-rap placement along the northwest embankment was completed as of November 17, 2010.

Dominion has reported that the stump removal and regrading of the north and east embankments was completed as of October 18, 2010. Reseeding was conducted in December 2010. Following these efforts vegetation establishment is planned for completion by June 2011. O'Brien & Gere recommends that Dominion continue as planned to fully establish and manage the vegetated cover of these embankments.

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6.5 CERTIFICATION STATEMENT

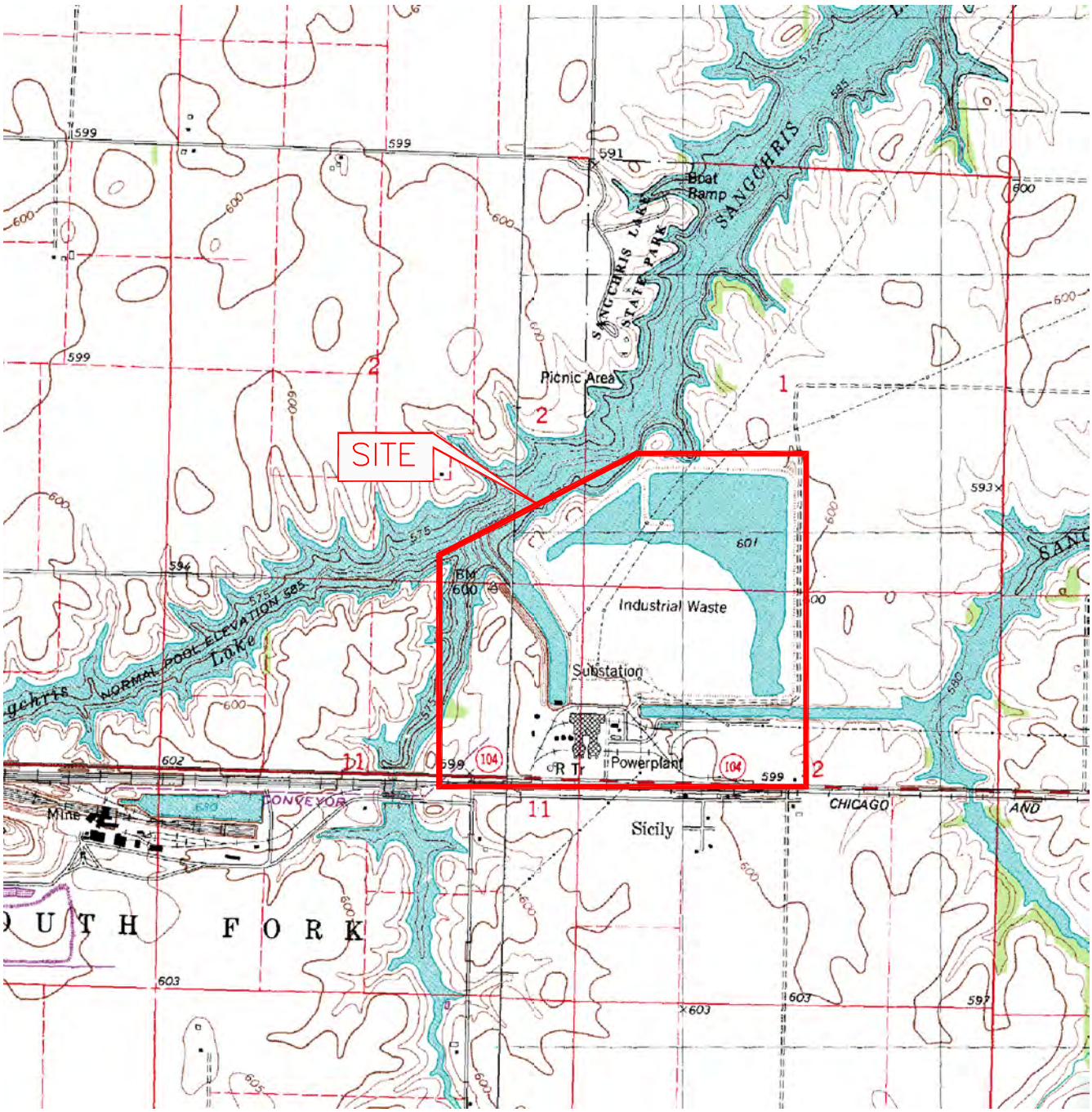
I acknowledge that the Slag Field management unit at the Kincaid Generation Facility referenced herein was personally inspected by me on August 16, 2010 as was found to be in the following condition:

~~SATISFACTORY~~
FAIR
~~POOR~~
~~UNSATISFACTORY~~

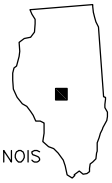
Signature: _____ Date: 3/24/11

Scott L. Cormier, PE
IL PE # 062-055575

FIGURE 1



ADAPTED FROM: PAWNEE 1976 & KINCAID 1998 QUADS, IL – U.S.G.S. 7.5 MIN. QUAD



QUADRANGLE LOCATION

US EPA – DAM SAFETY INSPECTION OF
CCW IMPOUNDMENTS
KINCAID GENERATION – KINCAID, IL

SITE LOCATION MAP

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

FILE NO. 13498/46122–004
MARCH 2011

SCALE: 1:24000

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I:\13498\46122\Doc\Dwg\Sheets\Kincaid\004_site loc.dwg

3/18/11 JPH div 078

I:\13498\46122\Doc\Dwg\Sheets\Kincaid\005_Site Layout.dwg

FIGURE 2

NORTH

NOTES:
1. BASE PHOTO FOR DRAWING DATED 2005, CERTAIN SITE CONDITIONS MAY NOT BE DEPICTED
2. BASE DRAWING OBTAINED FROM THE ILLINOIS GEOSPATIAL DATA CLEARINGHOUSE WEBSITE

US EPA

DAM SAFETY INPECTION OF CCW IMPOUNDMENTS

KINCAID GENERATION
KINCAID, IL

SITE LAYOUT MAP

1"=800' 800 0 800

FILE NO. 13498.46122-005
MARCH 2011

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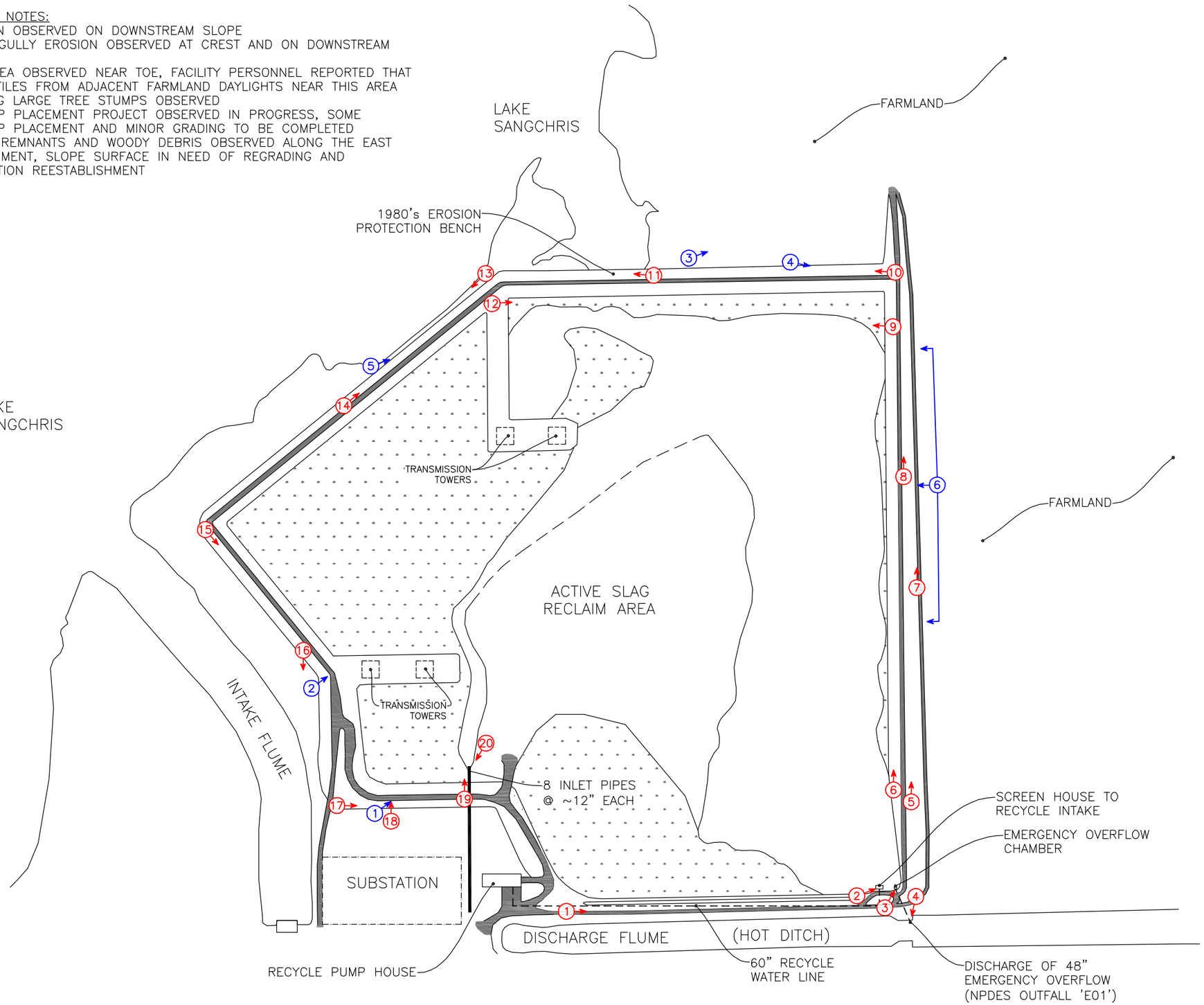
3/18/11 JPH div078

FHills I:\PROJECTS\13498\46122\Doc\Dwg\Sheets\Kincaid\006

FIGURE 3

INSPECTION NOTES:

1. EROSION OBSERVED ON DOWNSTREAM SLOPE
2. MINOR GULLY EROSION OBSERVED AT CREST AND ON DOWNSTREAM SLOPE
3. WET AREA OBSERVED NEAR TOE, FACILITY PERSONNEL REPORTED THAT DRAIN TILES FROM ADJACENT FARMLAND DAYLIGHTS NEAR THIS AREA
4. EXISTING LARGE TREE STUMPS OBSERVED
5. RIP–RAP PLACEMENT PROJECT OBSERVED IN PROGRESS, SOME RIP–RAP PLACEMENT AND MINOR GRADING TO BE COMPLETED
6. STUMP REMNANTS AND WOODY DEBRIS OBSERVED ALONG THE EAST EMBANKMENT, SLOPE SURFACE IN NEED OF REGRADING AND VEGETATION REESTABLISHMENT



NORTH

LEGEND

- APPENDIX B PHOTO REFERENCE – ARROW DEPICTS ORIENTATION OF PHOTO
- VISUAL INSPECTION OBSERVATION – ARROW DENOTES LOCATION OF OBSERVATION(S) – SEE INSET NOTES
- GRAVEL SERVICE DRIVE
- PERMANENTLY STORED SLAG

US EPA

DAM SAFETY INSPECTION OF CCW IMPOUNDMENTS

KINCAID GENERATION
KINCAID, IL

SITE PLAN

1"=500' 500 0 500

FILE NO. 13498.46122–006
MARCH 2011

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3/18/11 JPH div078

APPENDIX A

Visual Inspection Checklist

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Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Dominion - Kincaid Generation	Date: August 16, 2010
Unit Name: Slag Field	Operator's Name: Dominion Energy Services Company
Unit I.D.:	Hazard Potential Classification: High Significant Low
Inspector's Name: Gary Emmanuel, PE & Scott Cormier, PE	

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?	Multiple		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	603.5'		19. Major erosion or slope deterioration?	X	
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	604.5'		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	605.0'		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?	N/A	
7. Is the embankment currently under construction?	X		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)?	N/A		From underdrain?	N/A	
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?	N/A	
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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
	See list of notes on next page for comments.

US EPA ARCHIVE DOCUMENT

Date: 8/16/2010
Site: Dominion - Kincaid Slag Field - Kincaid, IL

Checklist Number	Description/Notes
1	Weekly inpsection performed by plant personnel. Records provided back through August 2009. Annual inspection peformed by a 3rd party PE. 2009 and 2010 inspection documents provided.
6	A sight gage located on a concrete foundation of the screen building is recorded once per shift (3 times daily).
7	Active tree/brush removal and stump hole filling is currently in progress along all embankments. Active installation of rip rap is nearing completion on the northwest embankment.
8	No documentation of original construction reports or original specifications were available.
9	A significant number of trees existed on the impoundment through early 2009. The cutting of the last large trees was completed earlier in 2010 with some stump removal remaining/in progress.
10	An undulating crest was observed due to traffic from heavy equipment used to recover bottom ash and remove trees/stumps. This was concluded as not representing any significant settlement.
18	Numerous surface irregularities were observed on the north and east embankments due to the ongoing grubbing/stump removal. As part of this improvement activity, plans for finished grading and reseeding to maintain appropriate vegetative cover are in place.
19	One location on downstream slope at western end of south embankment showed signs of significant deterioration/erosion at a location where a large stump was removed. Plans are in place to repair this location. Additionally, the rip rap repair project along the northwest embankment is being undertaken to repair wave erosion from the lake.
23	The waters of Lake Sangchris are adjacent to the downstream toe of a portion of the north embankment and a portion of the northwest embankment.

US EPA ARCHIVE DOCUMENT

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # IL0002241

INSPECTOR Scott Cormier, PE & Gary Emmanuel, PE

Date August 16, 2010

Impoundment Name Slag Field

Impoundment Company Kincaid Generation, LLC

EPA Region V

State Agency (Field Office) Addresss 1 Natural Resources Way
Springfield, IL 62702

Name of Impoundment Slag Field Berm

(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: Dewatering of slag (bottom ash)

Nearest Downstream Town : Name Rochester, IL

Distance from the impoundment 10 - 12 miles (approximate)

Impoundment Location:

Longitude -89 Degrees 29 Minutes 32.6 Seconds

Latitude 39 Degrees 35 Minutes 44.3 Seconds

State IL County Christian

Does a state agency regulate this impoundment? YES _____ NO X

If So Which State Agency? N/A

US EPA ARCHIVE DOCUMENT

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:

Refer to following page for hazard rating reasoning.

US EPA ARCHIVE DOCUMENT

Date: 8/16/2010
Site: Dominion - Kincaid Slag Field - Kincaid, IL

Note #	Description
1	Failure of the impoundment would result in a release of CCW to adjacent farmland and/or Lake Sangchris. Lake Sangchris is owned by the Kincaid site and therefore property damages would be limited to the owner's property and rural areas.
2	Lake Sangchris is a reservoir which was constructed as a water supply for the plant and a receiving water body for hot plant water and subsequently opened to the public for outdoor recreation (boating/fishing). The facility and impoundment are located at the upstream end of the reservoir. Because the impoundment contents are principally slag (bottom ash), the quantity of a release from an embankment breach would be limited and the environmental damage would be limited to the adjacent area in upper reaches of the reservoir.
3	Currently, new slag deposited into the impoundment is recovered by a resource recycling company for beneficial reuse. Any material that is unacceptable for reuse is returned to the site and "permanently" deposited in designated potions of the impoundment and "stabilized". (Stabilization is achieved by filling, heavy equipment vehicle traffic, and natural vegetation growth.) As a result, approximately 80 acres of the 178 acres of the impoundment is open water contained by the original dike. The dike in this portion of the impoundment is bounded by farm fields or the plant's "hot ditch". A direct release to Lake Sangchris is unlikely.

US EPA ARCHIVE DOCUMENT

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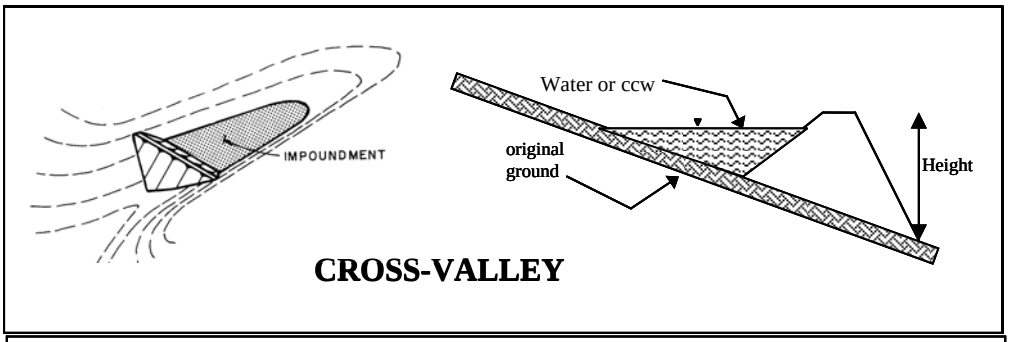
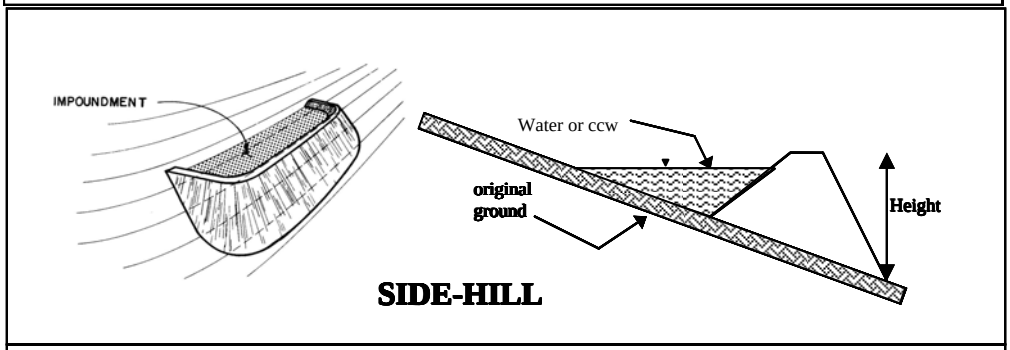
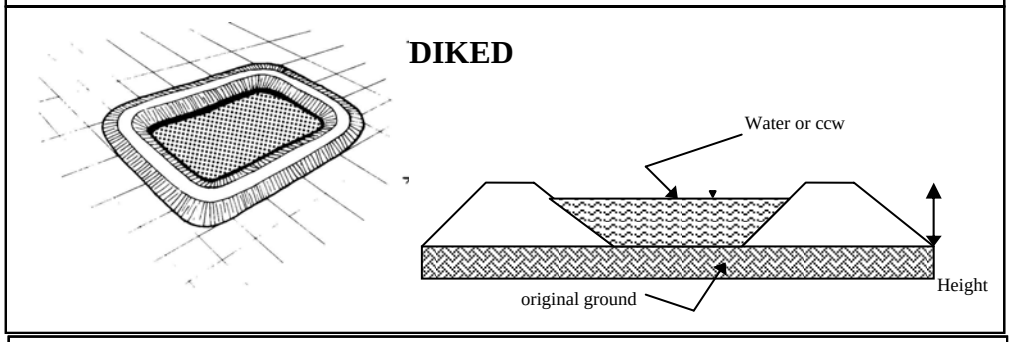
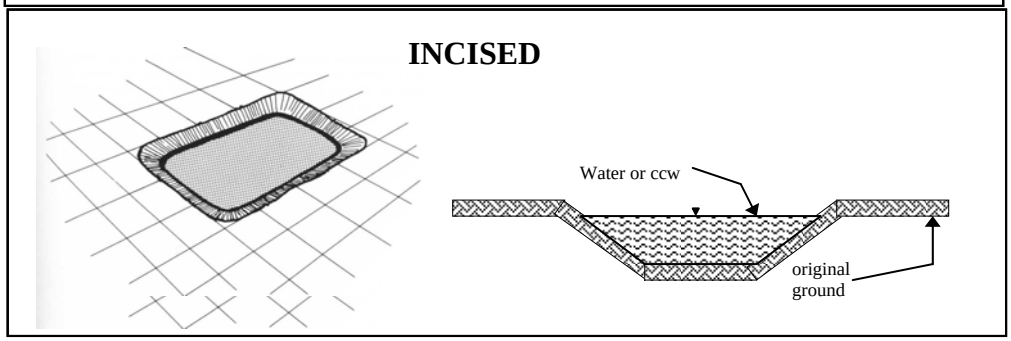
CONFIGURATION:









_____ Cross-Valley
_____ Side-Hill
__X__ Diked (All 7 sides)
_____ Incised (form completion optional)
_____ Combination Incised/Diked

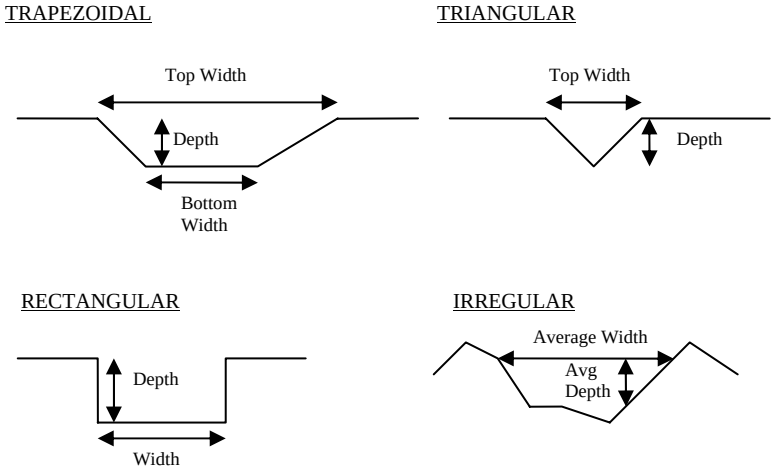
Embankment Height __35__ feet
Pool Area __178 total, 80 in use__ acres
Current Freeboard __1.5__ feet

Embankment Material __Native glacial till, primarily silt and clay__
Liner __N/A__
Liner Permeability __N/A__

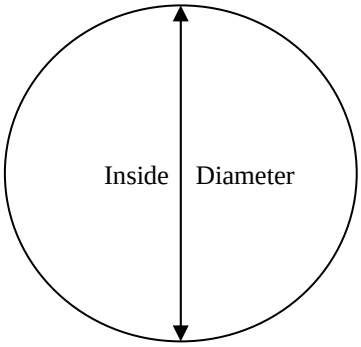
TYPE OF OUTLET (Mark all that apply)

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

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



X **Outlet** (Emergency outlet, normally closed, controlled via manually operated valve)
48" inside diameter



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

Is water flowing through the outlet? YES _____ NO X

_____ **No Outlet**

X **Other Type of Outlet** (specify) 60" Gravity line to pump station for recycle of all sluice water

The Impoundment was Designed By Sargent & Lundy

US EPA ARCHIVE DOCUMENT

Has there ever been a failure at this site? YES _____ NO ____X_____

If So When? _____

If So Please Describe : _____

US EPA ARCHIVE DOCUMENT

Has there ever been significant seepages at this site? YES _____ NO __X_____

If So When? _____

IF So Please Describe: _____

US EPA ARCHIVE DOCUMENT

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 : _____

US EPA ARCHIVE DOCUMENT

8/16/10

KINCAID, IL

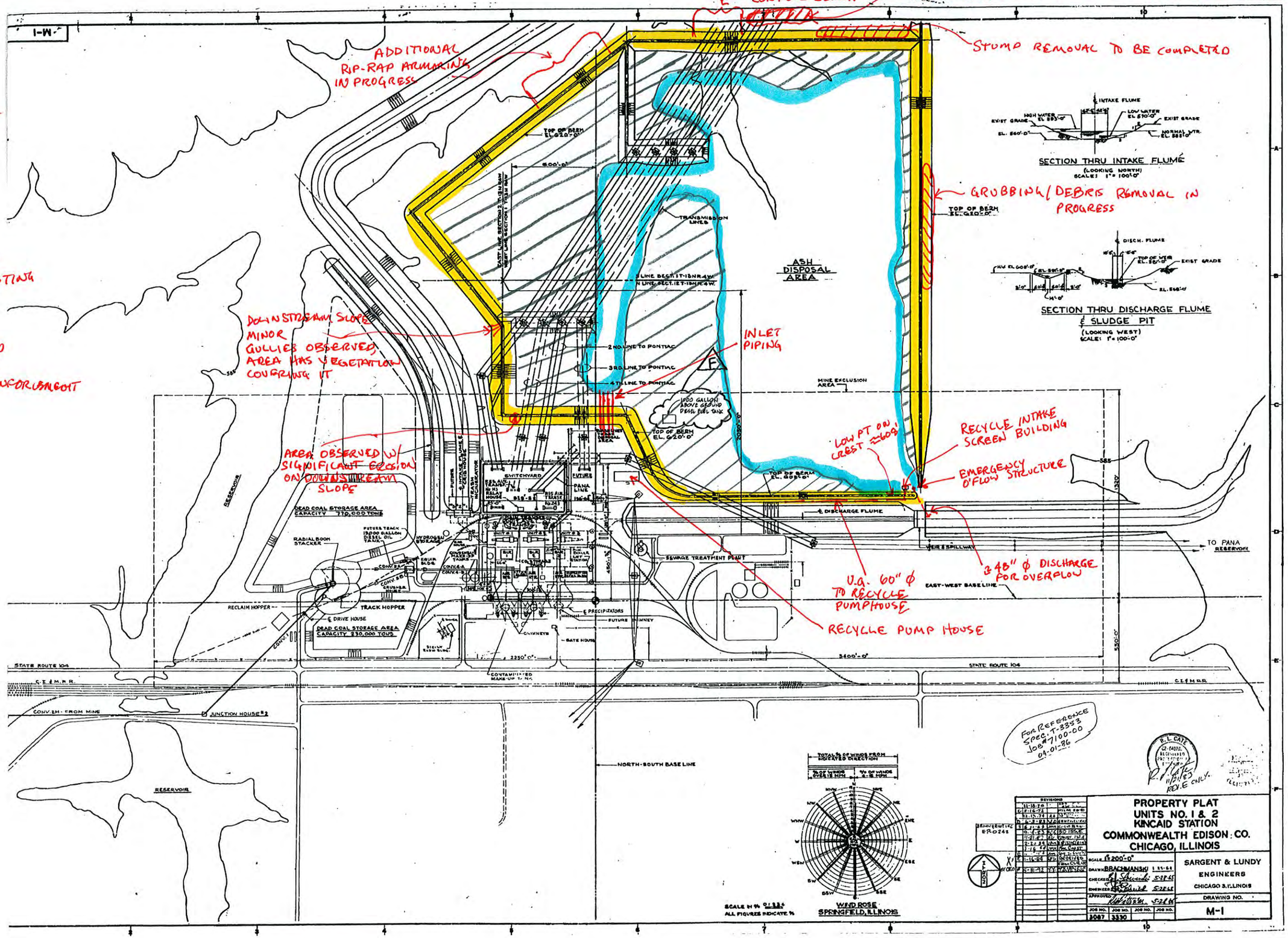
CCW IMPOUNDMENT INSPECTION

SLAG FIELD

LENGTH OF BERM INSPECTED

OUTLINE OF EXISTING WATER SURFACE

"PERMANENTLY" STORED SLAG (TYPICALLY PLACED ALONG UPSTREAM SLOPES FOR REINFORCEMENT PURPOSES)



APPENDIX B

Photo Logs

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: Kincaid Generation – Slag Field	Location: Kincaid, IL

Orientation: East

Description: View along access road at toe of east portion of south embankment, Discharge Flume (Hot Ditch) at right.

Date: 8/16/10

Photo Number: 1

Photographer: JPH

Orientation: Northeast

Description: View of screen house for recycle intake.

Note gage markings on building foundation. This level observed/ recorded multiple times daily.

Date: 8/16/10

Photo Number: 2

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: Kincaid Generation – Slag Field	Location: Kincaid, IL

Orientation: East

Description: View of emergency overflow structure and emergency valve stem and actuator

Date: 8/16/10

Photo Number: 3

Photographer: JPH

Orientation: South

Description: View of emergency overflow outlet into "hot ditch" (NPDES Outfall 'E01')

Date: 8/16/10

Photo Number: 4

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: Kincaid Generation – Slag Field	Location: Kincaid, IL

Orientation: North

Description: View along crest of east embankment

Note condition of mowed area versus not mowed area

Date: 8/16/10

Photo Number: 5

Photographer: JPH

Orientation: North

Description: View along crest of east embankment

Note "permanent" areas of slag on interior side of embankment

Date: 8/16/10

Photo Number: 6

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: Kincaid Generation – Slag Field	Location: Kincaid, IL

Orientation: Northwest

Description: View of east embankment from toe of embankment.

Note grubbing in progress and size of trees/brush removed.

Date: 8/16/10

Photo Number: 7

Photographer: JPH

Orientation: North

Description: View along crest of east embankment.

Note condition of downstream embankment slope where grubbing has been recently completed

Date: 8/16/10

Photo Number: 8

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: Kincaid Generation – Slag Field	Location: Kincaid Generation – Slag Field

Orientation: West

Description: View along interior side of north embankment

Note placement of reject slag in progress by contracted recycling company.

Date: 8/16/10

Photo Number: 9

Photographer: JPH

Orientation: West

Description: View along exterior side of north embankment

Note trees have been cut and grubbing/stump removal to be completed

Date: 8/16/10

Photo Number: 10

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: Kincaid Generation – Slag Field	Location: Kincaid, IL

Orientation: West

Description: View along section of north embankment, area repaired to protect against wave erosion in 1980's

Date: 8/16/10

Photo Number: 11

Photographer: JPH

Orientation: East

Description: View along interior side of north embankment

Note placement of reject slag in progress by contracted recycling company.

Date: 8/16/10

Photo Number: 12

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: Kincaid Generation – Slag Field	Location: Kincaid, IL

Orientation: Southwest

Description: View along toe of northwest embankment

Note rip rap erosion protection placement in progress

Date: 8/16/10

Photo Number: 13

Photographer: JPH

Orientation: Northeast

Description: View along crest of northwest embankment

Note rip rap erosion protection placement in progress at toe of exterior slope

Date: 8/16/10

Photo Number: 14

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: Kincaid Generation – Slag Field	Location: Kincaid, IL

Orientation: South

Description: View along crest of southwest embankment

Date: 8/16/10

Photo Number: 15

Photographer: JPH

Orientation: South

Description: View along west embankment

Date: 8/16/10

Photo Number: 16

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: Kincaid Generation – Slag Field	Location: Kincaid, IL

Orientation: East

Description: View along toe of west portion of south embankment

Note well casing in photo used for a recent hydro-geological study completed by owner, well is not used for monitoring phreatic water levels within embankment

Date: 8/16/10

Photo Number: 17

Photographer: JPH

Orientation: North

Description: View of eroded slope from toe on west portion of south embankment

Date: 8/16/10

Photo Number: 18

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: Kincaid Generation – Slag Field	Location: Kincaid, IL

Orientation: North

Description: View along discharge piping into slag field.

Note contracted recycling company's slag recovery piles/staging area along sides of inlet waterway

Date: 8/16/10

Photo Number: 19

Photographer: JPH

Orientation: Southwest

Description: View of discharge piping and flow into slag field

Date: 8/16/10

Photo Number: 20

Photographer: JPH

US EPA ARCHIVE DOCUMENT