DRAFT REPORT

Dam Safety Assessment of CCW Impoundments

J.R. Whiting Plant

United States Environmental Protection Agency
Washington, DC

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J.R. Whiting Plant

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-0003, 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 various impoundments located at the J. R. Whiting facility in Erie, Michigan. These impoundments grouped as Ponds 1 & 2, Ponds 3, 4 & 5, and Pond 6 are owned and operated by Consumers Energy Company (Consumers). In the course of this assessment, O'Brien & Gere obtained information from representatives of Consumers and the State of Michigan Department of Natural Resources and Environment (MDNRE).

2 PROJECT/FACILITY DESCRIPTION

The J. R. Whiting facility is located near the cities of Luna Pier and Erie in Monroe County, Michigan. The facility currently operates three impoundments (Ponds 1, 2 & 6) for storing and/or settling of CCW. Additionally, another three impoundments (Ponds 3, 4 & 5) were recently closed and are in the process of being filled and capped. A summary of the grouped impoundments as inspected is as follows:

- Ponds 1 & 2 – Active
- Ponds 3, 4 & 5 – Inactive, final closure in progress
- Pond 6 - Active

The dam safety assessment summarized in this report details the September 23, 2010 inspection of these above listed impoundments. A site location map is provided as Figure 1.

2.1 MANAGEMENT UNIT IDENTIFICATION

The impoundments are generally located to the east of the generating plant, between the plant and Lake Erie. A facility layout map is provided as Figure 2 and shows the location of the impoundments.

Ponds 1 & 2

The system of Ponds 1 & 2 is currently the primary location for settling of bottom ash. Bottom ash is wet sluiced directly to Pond 2 where it settles. Upon completion of flow through Pond 2, the clarified water passes through to Pond 1 for additional polishing before discharge to the facility intake bay (connected to Maumee Bay).

Ponds 3, 4 & 5

The system of Ponds 3, 4 & 5 was formerly used to settle bottom and fly ash. In 2008, the wet sluicing of CCW ceased and final filling of the area with dry CCW (namely fly ash) began.

Pond 6

Pond 6 is the primary location for storage of fly ash. Dry fly ash is pneumatically pumped to a storage silo near the impoundment. Under normal operating conditions, the material in the silo is then mixed with recycled water from Pond 6 and deposited into the impoundment for storage.

General

The systems of Ponds 1 & 2 and Ponds 3, 4 & 5 do not carry dam identification numbers at either the state or federal level. Pond 6 does not appear to be identified or actively regulated as a dam under state regulations; however it is listed in the National Inventory of dams as unit MI00778.

The State of Michigan licenses Ponds 1 through 6 as Type III industrial Solid Waste Disposal Areas (SWDA) under its Part 115 rules. Under this license, the facility (as a whole) carries facility identification number 397664 and license number 9224.

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 checklists found in Appendix A. Based on the checklist definitions and as a result of this assessment, the hazard potential rating recommended for the various impoundments is summarized below:

Ponds 1 & 2
The hazard potential rating for Ponds 1 & 2 is ***SIGNIFICANT.***

1) *Failure of the embankments would likely result in release of CCW to the owner's property and to Lake Erie (or the backwaters known as Maumee Bay).*

2) *Given the close proximity to Lake Erie and the fact that the embankments were raised with CCW material, it is the belief of the inspection team that the quantity of material that could be released into Lake Erie in the event of a breach could result in significant environmental damage.*

Ponds 3, 4 & 5
The hazard potential rating for Ponds 3, 4 & 5 is ***NOT APPLICABLE.***

Based on the current state of closure for this unit, the inspection team believes a hazard potential rating from a dam safety perspective would not be applicable. This unit of CCW storage would be better regulated as a closed landfill than a surface impoundment because no water enters or exits the area and a crown with a soil cap is currently under construction.

Pond 6
The hazard potential rating for Pond 6 is ***SIGNIFICANT.***

1) *Failure of the embankments would likely result in release of CCW to the owner's property (farmland to the west and wetland to the east are both Consumers property), LaPointe Drain and/or Lake Erie.*

2) *It is the belief of the inspection team that a breach of the embankments could result in the following losses/damage:*

   a) *Property value losses for the shore side residential area in Luna Pier, north of LaPointe drain resulting from the potential of CCW washing up on shore and/or settling near the shore*

   b) *Economic damage to the marina which uses LaPointe drain to access Lake Erie*

   c) *Significant environmental damage to Lake Erie*

2.3 IMPOUNDING STRUCTURE DETAILS

The following sections summarize the structural components and basic operations of the active CCW impoundments at the J. R. Whiting facility. Diagrams of the impoundments and their relevant features are provided as Figures 3 through 5. It should be noted that the site plans shown in Figures 3 through 5 were adapted from 2005 aerial imagery and may not depict all current features. Additionally, photos taken during the visual inspection are incorporated in Photographic Logs provided as Appendices B, C and D.

2.3.1 Embankment Configuration

The J. R. Whiting facility's impoundments are configured as follows:

Ponds 1 & 2

- Four embankments form a complete perimeter around two impoundments
- Surface areas of approximately 7 acres for Pond 1 and 8 acres for Pond 2
- Embankment height ranging from 15' to 19' and crest width of approximately 40' to 50'
- Typical crest elevation is near Elevation 591' while the operating water surface elevations of Ponds 1 & 2 are generally between Elevations 586' and 587'.

- A divideing dike constructed out of ash materials to Elevation 591' is oriented east to west and is located between Ponds 1 & 2.

Ponds 3, 4 & 5

- Four embankments form a complete perimeter around three impoundments, none of which are currently active
- Former surface areas of approximately 10, 37 and 35 acres for Ponds 3, 4, & 5 respectively
- Embankment heights ranging from 15' to 19'
- Typical crest elevations of 587' to 591' existed when the impoundments were active. Under the final filling, capping and grading activities currently underway, a maximum crown elevation of 610' will be constructed down the longitudinal center of the area.

Pond 6

- Four embankments form a complete perimeter around a single impoundment
- Surface area of approximately 32 acres
- Maximum embankment height of approximately 27' with typical crest width of 15' to 20'
- Typical crest elevation is near 600' while the water surface elevation of the impoundment is generally between elevations 597' and 598'.

2.3.2 Type of Materials Impounded

The J.R Whiting impoundments are utilized for storing and/or settling of CCW as follows:

Ponds 1 & 2

Ponds 1 & 2 are the primary location for the settling of bottom ash. In addition to this primary purpose, Ponds 1 & 2 can receive fly ash if needed, and other minor process related wastewater treatment discharges.

Ponds 3, 4 & 5

Ponds 3, 4 & 5 are reported to have received both bottom and fly ash throughout their history. Currently, the final ash placement under the closure activities consists of mainly dry fly ash, which is being diverted from and/or excavated from Pond 6.

Pond 6

Pond 6 is the primary location for storage of fly ash. Under normal operation, fly ash is pumped dry from the plant to the ash silo located at the southwest corner of the impoundment. From there, the fly ash is mixed with recycled water from Pond 6 and sluiced to Pond 6 for deposition.

As mentioned above, fly ash that is normally sent to Pond 6 is being diverted to Ponds 3, 4 & 5 to expedite final closure of these ponds. The diversion operation consists of the dry fly ash being mixed with water and loaded into trucks to transport the damp/wet ash to Ponds 3, 4 & 5.

2.3.3 Outlet Works

The J. R. Whiting CCW impoundments have outlet structures as presented in the following table.

Table 2.3 *Summary of Outlet Works at the J.R. Whiting Impoundments*

Impoundment	DESCRIPTION
Ponds 1 & 2	» 24" diameter pipe through the center dividing dike transfers water from Pond 2 to Pond 1 » 24" diameter stand pipe at approximate elevation 585.5' is located in Southwest corner of Pond 1 » Stand pipe housed in a larger ~48" corrugated metal pipe with a screen at top » Stand pipe transitions to a similarly sized sloped pipe which discharges to the plant intake forebay
Ponds 3, 4 & 5	» Former outlets on south embankment were observed to be sealed and reported to be filled with concrete
Pond 6	» No outlet works designed for continuous discharge of water » A 3" diameter pipe controlled with a hand valve can/is used to drain water from the impoundment when necessary

The main off-site discharge point to Lake Erie for the facility's NPDES permit #MI0001684 is 001A as shown on Figure 3. The outlets from Ponds 1 & 2 and Pond 6 discharge to the site forebay before exiting outfall 001A, and are categorized as "internal" discharge points 001D and 001B, respectively.

3 RECORDS REVIEW

A review of the available records related to design, construction, operation and inspection of the J. R. Whiting CCW impoundments was performed as part of this assessment. The documents provided by Consumers are listed below:

Table 3.1 *Summary of J. R. Whiting Documents Reviewed*

Document	Dates	By	Description
Original Design Drawings & Revisions (Ponds 1 & 2)	1951 (rev thru 1964)	Commonwealth Associates	Original design document detailing Ponds 1 & 2, the intake forebay, discharge channel & dikes, also included details of various revisions
Capacity Estimations (Ponds 1 & 2)	1965	Consumers Energy	Engineering calculations estimating quantity of ash that was needed to fill the final 4' of the impoundments as existing at that time
Original Design Drawings & Revisions (Pond 5)	1972	Hoad Engineers	Original design plan for the addition of Pond 5 to the south of Ponds 3 & 4
New Ash Fields – Alternatives (Ponds 1 & 2)	1977	Soil & Materials Engineers (SME)	Geotechnical investigation and proposed alternatives for reconfiguring Ponds 1 & 2
Geotechnical Investigation – New Ash Field (Pond 6)	1978	Soil & Materials Engineers (SME)	Geotechnical investigation for Pond 6 site and analyses of fly ash and bottom ash from Ponds 1 through 4 planned for use in constructing the embankments for Pond 6
Stability Analysis: All Clay Dike - New Ash Field (Pond 6)	1979	Soil & Materials Engineers (SME)	Stability analysis comparing proposed construction method/resulting factors of safety of an ash core embankment versus an all clay embankment
Dike Distress Investigation (Pond 6)	1979	Soil & Materials Engineers (SME)	Geotechnical investigation undertaken to evaluate and correct failures of the dikes during original construction
Supplemental Dike Distress Investigation (Pond 6)	1980	Soil & Materials Engineers (SME)	Further geotechnical investigation undertaken to evaluate and correct failures/deficiencies of the dike during original construction
Geotechnical Investigation of Ash Pond 6	1980	Woodward Clyde	Geotechnical evaluation and stability analysis based on numerous previous Pond 6 investigations by other consultants
Reconfiguration Design Drawings (Ponds 1 & 2)	1983	Hoad Engineers	Original design document detailing the upgrading of Ponds 1 & 2, into a configuration close to existing configuration
Proposed Dike Stabilizing Measures (Pond 6)	1983	Stoll, Evans, Wood & Associates	Geotechnical investigation and proposed remedial strategy to reinforce the northern portion of the west embankment of Pond 6
Engineering Plan	1991, 1996	Consumers Energy	Preliminary versions of final closure/capping/grading plans for the impoundments at J.R. Whiting
Report of Geotechnical Laboratory and Field Testing (Ponds 3, 4 & 5 and Pond 6)	1992	Materials Testing Consultants (MTC)	Geotechnical borings completed on the northern portion of the west embankment of Pond 6 and borings completed around the southern end of Ponds 3, 4 & 5 (Specifically, Pond 5)
Monitor Well Installation and Hydrogeologic Report (Pond 6)	1993	STS Consultants	Hydrogeologic investigation undertaken as part of SWDA operating permit to confirm that the impoundment was not contributing to the bedrock aquifer
Pond 6 Survey Program Data	1994	Consumers Energy	Surveying data collected around Pond 6 to document dike settlement/movement from 1984 to 1994
Laboratory Testing Services – Fly Ash and Bottom Ash Samples	1995, 1996	Bowser Morner	Summary report of laboratory testing (particle sizes, compression tests, specific gravity, hydraulic conductivity, etc.) performed on fly ash and bottom ash at the site
Standard Buttress Design (Pond 6)	1996	Consumers Energy	Stability calculations for the perimeter buttress which was added to a majority of the impoundment perimeter as well as adequacy to support the future final grade

Table 3.1 *Summary of J. R. Whiting Documents Reviewed*

Document	Dates	By	Description
Ash Ponds 3, 4 & 5 – Final Cover Report	2008	Black & Veatch	Summary report, stability analyses, drawings and specifications, QA/QC plan for final filling of Ponds 3, 4 & 5, constructing the final grade and closure of the impoundments
Final Cover System Report for Ash Pond 6	2008	Black & Veatch	Summary report, stability analyses, drawings and specifications, QA/QC plan for filling Pond 6, constructing the final grade and closure of the impoundment
NPDES Permit	2008	MDNRE	State of Michigan NPDES permit (MI0001864) along with supporting documentation
MDNRE Part 115 Compliance Checklist	2009	MDNRE	State of Michigan inspection checklist noting compliance with Part 115, Type III SWDA authorization
MDNRE Solid Waste Disposal Area Operating Permit (all units)	2009	MDNRE	State of Michigan Permit allowing the facility to dispose of CCW waste in the impoundments as Type III SWDA under Part 115 rules
Inspection Report (all units)	2009	AECOM	Independent consultant inspection report documenting conditions of the embankments in August 2009
Potential Failure Modes Analysis (PFMA) Report (all units)	2009	AECOM	Report documenting a detailed risk analysis in which probable failure scenarios were evaluated/rated and remedial actions were recommended where necessary.

3.1 ENGINEERING DOCUMENTS AND OTHER HISTORICAL INFORMATION

Review of the design drawings and subsequent inspections and permit documents revealed information on the historical design details of the various J. R. Whiting CCW impoundments. Various modifications have been made to the impoundments since their construction. Based on the available documentation, the following is a summary of the basic design and modification information.

Ponds 1 & 2

- The embankments for Ponds 1 & 2 were part of the original facility construction in 1951 and 1952. Originally configured as one impounding unit, these original earthen embankments were apparently constructed from borrow excavated from the site to an elevation of 580' (approximately 6' high).
- As the original impoundment(s) filled with CCW, the deposited CCW material was reclaimed and used to gradually raise the embankments to their existing height at approximate elevation 590' (an additional 10'). In 1964, the single unit was reported as filled to elevation 590'.
- According to design documents, the ponds were reconfigured in the early 1980's into the two separate units similar to what exists at the site today. Rip-rap armoring was added to a majority of the outboard slope of the east embankment.
- Per AECOM's 2009 inspection efforts, seepage was reported around Ponds 1 & 2 in the mid-1990's. As a result, it was reported that the active level of the ponds was permanently lowered.
- In the last 10 years, an additional inlet piping and diversion dike configuration was added to Ponds 1 & 2 to allow for wet sluicing of fly ash as a back up to the primary use of Pond 6 for fly ash disposal.
- No indication of construction phase documentation was noted in the records reviewed.
- No indication or mention of coal slimes was noted in the review of the engineering records listed above.

- No indication of former spills or releases of impounded materials from Ponds 1 & 2 was noted in the records reviewed.

Ponds 3, 4 & 5

- Ponds 3 & 4 were reported as originally constructed in the late 1960's, although original construction documents were not observed.
- Based on current final cap design documents which include stability analyses, Ponds 3 & 4 were originally constructed of clay embankments which were likely gradually raised to their final elevations using CCW.
- Pond 5 was added around 1972 and was constructed with an ash core and outer clay shell. The clay shell materials were excavated from the site.
- No indication of construction phase documentation was noted in the records reviewed.
- A design for the final closure and cover of Ponds 3, 4 & 5 was first proposed with an 18-inch thick soil cap in the mid-1990s. As the actual closure neared, the MDNRE (formerly known as the Michigan Department of Environmental Quality (MDEQ)), requested that the final cover and cap be revised to include a flexible membrane liner (FML) and 30-inch soil cap. In 2009, the final design was completed.
- In 2008, the sluicing of CCW to Ponds 3, 4 & 5 ceased and the outfall from the impoundment was sealed. Shortly after this time, Consumers began trucking both new and stored CCW from Pond 6 to begin the construction/final filling of the crown.
- Coal slimes within deposited ash were mentioned in the 2009 inspection report by AECOM. However, this reference was made regarding the manner in which the sluiced CCW formerly flowed through the impoundments. These deposited layers would currently be located in the center of the impoundment area undergoing filling and closure and not likely in the embankment structures.
- No indication of former spills or releases of impounded materials from Ponds 3, 4 & 5 was noted in the records reviewed.

Pond 6

- The original embankments for Pond 6 were designed and constructed around 1978 to 1980.
- Numerous significant settlement problems and some slope failures occurred along the west embankment during construction. As a result, various geotechnical evaluations and stability analyses were performed. The final resolution was to reinforce a portion of the west embankment with an interior and exterior soil buttress which was constructed in the early 1980's.
- Detailed construction phase documentation from original construction was not observed in the records reviewed. However a P.E. stamped letter stated that the plans and specifications were followed during the construction of the original embankments.
- A long term surveying program was implemented from the mid 1980's through the mid 1990's to monitor settlement of the embankments. During this time, more partial buttressing and repair work was implemented to remedy deficiencies observed via the surveying program.

- In response to additional settlement problems that were occurring on the original embankments, stability calculations were performed and a perimeter buttress was designed and constructed around 1996 along the majority of the embankments. Two areas, one at the northeast corner and one at the southwest corner, were not buttressed, due to the location of the pump house and ash silo, respectively. According to previous stability calculations, the buttressing was constructed from CCW materials. It is unclear if any drainage tiles were incorporated into the design of the typical buttress section.

- Groundwater pressure relief wells were installed in the southwest portion of the embankment to relieve pore water pressure in the foundation below the embankments. Design and construction documents were not available for this effort, although it was reported to have occurred in the mid 1990's along with the buttress construction.

- No indication or mention of coal slimes 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 Pond 6 was noted in the records reviewed.

3.2 STORMWATER INFLOWS

Ponds 1 & 2 and Pond 6

Stormwater inflows to Ponds 1 & 2 and Pond 6 are minimal. The impounding structures are comprised of embankments on all sides which direct storm water away from the impoundment water surface and limit runoff to precipitation that falls directly on the water surface and interior slopes of the dikes.

The current drawdown capabilities for Pond 6 are limited to a pumping operation and a 3" gravity pipe controlled by a manual valve. Additionally, this unit is typically operated with 2' to 3' of freeboard. Although this structure has almost no additional drainage area, a limited risk of overtopping during a probable maximum flood (PMF) event does exist. (See section 6.2 below for further discussion.)

Ponds 3, 4 & 5

For Ponds 3, 4 & 5, the closure plan for the cap calls for a flexible membrane liner covered by a crowned final grade over the entire area. This design will direct stormwater off the closed impoundment and prevent infiltration of stormwater into the stored CCW. Additionally, a runoff collection berm around the perimeter of the area will direct surface runoff to rip-rap armored discharge chutes which will convey stormwater down the embankment.

3.3 STABILITY ANALYSES

Documentation of stability analyses for the J. R. Whiting facility embankments is as follows:

Ponds 1 & 2

Records of stability analyses are not available for this impoundment.

Ponds 3, 4 & 5

Stability analyses were first performed as part of the original closure plan for this area and were prepared by Consumers. Calculations were performed using PCSTABL5 software based on the soil borings and geotechnical data acquired in 1992. These analyses modeled the future/closed condition of the impoundments and resulted in calculated factors of safety ranging from 1.24 to 1.83 for long-term stability.

More recently, as part of a revised design for the final cover, stability analyses were recalculated in the 2008 *"Ash Ponds 3, 4 & 5 – Final Cover Report"* by Black and Veatch. This effort was performed using SLOPE/W software and was based on the same 1992 soil borings and geotechnical data. Reported calculated factors of safety for the critical embankment sections ranged from 1.27 to 1.35 for long term stability of the future filled/closed condition.

Pond 6

Pond 6 has a long history of documented geotechnical investigations, in situ and laboratory strength testing, and stability analyses due to the inboard and outboard slope failures experienced during initial construction in 1979. Based upon numerous studies by various investigators, the slope failures were attributed to excess pore water pressures developing in a near surface, weak clay layer in the foundation. As a result, part of the north embankment was re-built, the internal and external slopes were buttressed and pressure relief wells were installed along the southern embankment toe in the mid 1990's.

Most of the stability analyses conducted post-failure focused either upon modeling the failure itself or long-term stability after final closure. The only apparent, relevant stability analyses for the existing configuration of Pond 6 were performed as part of the buttress design prepared by Consumers in 1996. Calculations were performed using PCSTABL5 software and resulted in calculated factors of safety ranging from 1.40 to 2.06 for long-term stability of the buttressed embankments. However, this analysis does not appear to evaluate typical dam safety loading conditions and apparently ignores the absence of a buttress on the south dike.

It is noted that stability analyses by Black & Veatch in 2008 and the PFMA by AECOM in 2009 focus upon stability model calibration and final closure safety factors rather than performance under operating conditions. The PFMA report acknowledges some legitimate confusion regarding the loading conditions and embankment configuration used by Consumers and Black & Veatch.

3.4 INSTRUMENTATION

Instrumentation in the form of staff gages only is present at Ponds 1 & 2 and Pond 6.

Ponds 1 & 2

A staff gage is located at the bottom ash inlet piping. The pond level is not regularly recorded.

Pond 6

A staff gage was reported to be located on the pump intake platform; however, this was not verified during the inspection. The pond level is not regularly recorded.

No instrumentation has been installed to monitor the phreatic surface within the embankments for the J. R. Whiting ponds.

Settlement markers were historically used at Pond 6 for a surveying program. The surveying program ended in the mid-1990's and the location of the markers was not observed at the time of the inspection.

3.5 PREVIOUS INSPECTIONS

Consumers does not have a formalized dam safety related inspection schedule for the J.R. Whiting Ponds. However, the facility does perform inspection rounds each shift (three times per day) which do include a walkthrough of the CCW impoundments.

Additionally, the MDNRE performs a quarterly inspection of the J. R. Whiting ponds in accordance with the site's Part 115 Type III SWDA operating license. This inspection is a walkthrough documenting the compliance with the permitted disposal practices at the site and does not have a dam safety component.

Finally, in the wake of the TVA Kingston failure, Consumers retained the services of a third party consultant (AECOM) to perform a facility-wide inspection and PFMA. These two exercises were completed in 2009. During the inspection portion of these efforts, AECOM made the following conclusion:

- *Those areas of the facility that could be readily observed are generally in satisfactory condition and no major deficiencies were identified which could immediately jeopardize continued safe and reliable operation of the project structures. However, visual inspection of the dike slopes and toe areas were difficult due to the heavy vegetation present* (AECOM, December 2009).

Additionally, the following recommendations were made:

- *Re-assessment of stability safety factors using existing embankment geometry and operating conditions for Ponds 1 & 2 and Pond 6.*
- *Install embankment perimeter monitoring wells to monitor phreatic water surface conditions through the embankments at Ponds 1 & 2 and Pond 6.*
- *Remove the trees (including roots) and shrubs on the downstream slopes of the perimeter dikes, where present. In addition, the tall grass should be cut at least once per year to facilitate adequate visual inspection of the slopes. Stump holes should be backfilled with compacted granular fill. Current vegetative maintenance on Pond 6 dikes should be maintained.*
- *Fill animal burrows with compacted granular fill and maintain rodent control program.*
- *Repair or install riprap along the exterior perimeter dike at the discharge channel, forebay, intake channel (Maumee Bay) and Lake Erie where needed* (AECOM, December 2009).

Finally, AECOM recommended that although informal daily rounds are made, a formal, documented dam safety inspection program should be implemented.

At the time of O'Brien & Gere's inspection in September 2010, the aforementioned conditions were observed as remaining in a similar state to the conditions observed during AECOM's 2009 inspection. A formal dam safety inspection program is currently being established; however, it has not yet been implemented.

3.5 OPERATOR INTERVIEWS

Three facility personnel and one State of Michigan MDRNE representative took part in portions of the inspection proceedings. The following is a list of participants for the inspection at the J. R. Whiting facility.

Table 3.3 *List of Participants*

Name	Affiliation	Title
Harold "J.R." Register	Consumers Energy – Corporate Engineering	Senior Engineer
Gerald "Frank" Rand	Consumers Energy – J. R. Whiting Facility	Facility Environmental Lead
Neil Dziedzic	Consumers Energy – J. R. Whiting Facility	Plant Business Manager
Patrick Brennan	MDNRE – Waste and Hazardous Materials Division	Environmental Engineer
Scott Cormier, PE	O'Brien & Gere	Vice President
Steven Snider, PE	O'Brien & Gere	Project Manager
Jason Huber, PE	O'Brien & Gere	Project Engineer

Interviewed personnel demonstrated a good working knowledge of the facility CCW impoundments, and provided general plant operational background and historical documentation. The representative from MDNRE's Waste and Hazardous Materials Division was able to provide additional information regarding the historical closure planning for the impoundments at the site. These personnel, excluding Mr. Dziedzic, also accompanied O'Brien & Gere throughout the visual inspections to answer questions and to provide additional information as needed in the field.

4 VISUAL INSPECTION

The following sections summarize the inspection at the J.R. Whiting facility, which occurred on September 23, 2010. At the time of the inspection, O'Brien & Gere completed three US EPA inspection checklists for the facility (one for Ponds 1 & 2, one for Ponds 3, 4 & 5 and one for Pond 6), which were submitted electronically to US EPA on October 4, 2010. Copies of the completed inspection checklists are included as Appendix A.

4.1 GENERAL

The weather on the date of the inspection was clear and approximately 80 degrees. The visual inspection consisted of a thorough site walk along the perimeter of the impounding structures. O'Brien & Gere examined the outboard toe (where visible), outboard slope (where visible), crest, and exposed portions of the inboard slopes above waterline (where visible). 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 Appendices B through D. Site plans of the impoundments are presented as Figures 3 through 5 and provide photograph locations and directions.

4.2 SUMMARY OF FINDINGS

Locations for the observations listed below are noted on the Site Plans included as Figures 3 through 5. The following observations were made during the inspection:

Ponds 1 & 2

- Ponds 1 & 2 were observed in both operational and shutdown conditions. Ash is sluiced during one shift per day. During the morning, sluice water was observed flowing freely in and out of the impoundment. In the afternoon, the minor miscellaneous NPDES treatment flows were observed.
- Inspection of the outboard slopes of Ponds 1 & 2 was difficult due to heavy vegetation on the four embankments, as well as mature trees on the east embankment.
- A few mature trees were observed on the inboard slopes of Ponds 1 & 2.
- A wet area was observed along the roadway at the toe of the north embankment. This appeared to be a poorly drained area due to runoff from the roadway from recent heavy rains (approximately one day prior).
- Rodent burrows were observed at Pond 1 on the inboard slope of the east embankment.
- A natural drainage swale (1' to 2' deep, 5' to 6' wide) was observed in the wooded area at the toe of the outboard slope of the northern portion of the east embankment.
- A minor eroded area was observed adjacent to and just west of the inlet side of the transfer pipe between Ponds 1 & 2.

Ponds 3, 4 & 5

- Heavy vegetation and mature trees were observed on the outboard slopes around the full perimeter of Ponds 3, 4 & 5.

- The final cap was present over an estimated two-thirds of the former impoundment, with the remainder of final fly ash placement in progress.
- Hydro-seeding over the completed portions of the newly graded cap was in progress during the inspection.
- The capped former outfall was observed at the central portion of the south embankment. No water or seepage around the pipe was observed.

Pond 6

- Rodent burrows were observed at numerous locations on the outboard slopes of the embankments.
- Minor erosion was noted on the gravel access roads up the slopes at the southeast and southwest corners of the impoundment.
- Minor erosion was noted on the outboard slopes of the original embankments, where the original embankment meets the 1990's buttress. This observation was made at one location on the east embankment and one location on the west embankment.
- Ponding water was observed in a low spot at the toe of the northeast corner of the embankments near the pump house. Drainage tiles were reportedly installed in the farm field to the west and discharge to this area. Water was observed to be slowly discharging (<1 GPM) into this area from these tiles at the time of the inspection. The pumphouse is reported to have the capability of pumping water out of this drainage collection area and into LaPointe Drain or into Pond 6.
- Minor scarping was observed along the water surface at the inboard slope of the east embankment.
- An approximate 200' to 400' length of minor scarping and evidence of insufficient drainage (very dry, cracked clayey surface and sparse vegetation) was observed at the base of the west embankment outboard slope where the original embankment meets the top of the 1990's buttress.

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 J. R. Whiting impoundments is as follows:

Ponds 1 & 2

Ponds 1 & 2 are considered to be in **FAIR** condition. Acceptable performance is likely under all loading conditions because of the substantial freeboard, the wide crest, and the modest driving head. However, it should be noted that the records indicate the Pond 1 & 2 embankments were raised with CCW materials. It is unlikely that this raising was performed using a documented/engineered construction process. Additionally, no stability analyses are available to confirm that the embankments meet prevailing slope stability factors of safety. Deficiencies/irregularities do exist that require repair and/or additional monitoring. These items include the following:

- Rodent burrows and minor erosion
- Vegetation and trees around the full impoundment area

Ponds 3, 4 & 5

It is the opinion of the inspection team that a rating for Ponds 3, 4 & 5 is **NOT APPLICABLE** given the virtual completion of filling, capping and final closure. In accordance with the facility's MDNRE Part 115 Type III SWDA license, this closure process is monitored quarterly by the MDNRE.

Pond 6

Pond 6 is considered to be in **FAIR** condition**.** Acceptable performance is expected under all loading conditions although it is unclear if the embankments meet current prevailing slope stability factors of safety, or if current site operating procedures would allow for discharge of the Spillway Design Flood (SDF) rainfall through the 3" outlet pipe without overtopping of the embankment.

Deficiencies/irregularities do exist that require repair and/or additional monitoring. These items include the following:

- Rodent burrows and minor erosion
- Minor scarping
- A poorly drained area on the top part of the buttress on the south portion of the west embankment

General

The regular operating procedures of the facility appear to be adequate for maintaining the structural integrity of the active impounding embankments (Ponds 1 & 2 and Pond 6). To the extent that visual inspection was possible, the impoundments did not appear to exhibit major visual deficiencies that would suggest urgent action is necessary.

No formal, documented inspection system is currently in place to track conditions and manage deficiencies. The sitewide impoundment system was recently inspected by a third party consultant, AECOM. Conditions do not appear to have changed significantly since the AECOM inspection in August 2009. The 2009 inspection report appeared to be comprehensive and may constitute an appropriate baseline for an inspection program.

6 RECOMMENDATIONS

O'Brien & Gere recommends that additional maintenance of the embankments is performed to correct the miscellaneous deficiencies cited above, based on the findings of our visual inspection and review of the available records for the J. R. Whiting facility impoundments.

6.1 URGENT ACTION ITEMS

No urgent action items are recommended.

6.2 REPAIRS/LONG TERM IMPROVEMENT

The following items should be considered for improvement of the stability and/or operation of the impoundments:

Ponds 1 & 2

- The inboard slopes should have trees removed, heavy vegetation (phragmites) regularly trimmed, and rodent burrows filled.
- The outboard slopes should have heavy vegetation (phragmites, shrubs) and mature trees removed to facilitate future inspection. Upon completion of removal activities, any irregularities in the slope surfaces should be repaired and appropriate vegetation or rip rap armoring should be implemented as needed to protect the embankments.
- Since stability calculations have not been performed for Ponds 1 & 2, the facility should consider stability analyses to demonstrate compliance with prevailing dam safety criteria for normal pool with steady state seepage, maximum surcharge pool, and seismic loading conditions.
- A SDF analysis should also be considered to demonstrate that the embankments will not be overtopped during a PMF-level storm event.

Pond 6

- Rodent burrows, minor erosion and scarping should be repaired around the perimeter of the impoundment
- The area with evidence of standing water on the southern portion of the west embankment should be monitored. The area should be regraded to establish positive drainage if standing water and/or poor drainage continues.
- The facility should consider performing slope stability analyses for the Pond 6 embankments with its current configuration to demonstrate compliance with prevailing dam safety criteria for normal pool with steady state seepage, maximum surcharge pool, and seismic loading conditions.
- The facility should consider evaluating the installation of emergency drawdown facilities, if the current operating procedures and the 3" outlet pipe are not adequate for reliable drawdown of the pond, or if the pipe has insufficient capacity. A SDF analysis would likely demonstrate that the embankments will not be overtopped during a PMF-level storm event and aid in the evaluation of spillway design if found necessary.

6.3 MONITORING AND FUTURE INSPECTION

General

A formal dam safety inspection program should be implemented for the active impoundments. An appropriate inspection program might consist of the following:

- Monthly impoundment inspection by facility personnel noting basic conditions such as pond levels, inlet and outlet conditions, erosion, rodent burrows, seepage, etc.
- Annual detailed assessment by a third party professional engineer or corporate engineering staff.

Pond 3, 4 & 5

As previously noted in Section 5, the future monitoring and inspection for this area should proceed in accordance with MDNRE Part 115 Rules. Additional future inspection of this unit from a dam safety perspective will not likely provide additional value to the operation of the area, since it is no longer hydraulically operational.

Pond 6

According to records, the former surveying program ended in the mid-1990's, around the time that the buttress was installed along the majority of the impoundment. There have been no observations of settlement, slope deformations or seepage since then. However, given the long history of failures, settlement and numerous modifications to the Pond 6 embankments, a detailed quarterly or semi-annual inspection program performed by a professional engineer or corporate engineering staff is recommended.

6.4 TIME FRAME FOR COMPLETION OF REPAIRS/IMPROVEMENTS

Ponds 1 & 2

The tree and heavy vegetation removal from the inboard slopes and any minor erosion and rodent burrows repairs should be completed within one year of this inspection.

For the outboard slopes, a systematic sequence of vegetation removal should be implemented within three years of this inspection as follows:

1) Heavy vegetation (phragmites, shrubs) should be removed first, making the true condition of the embankment slopes more visible.
2) As heavy vegetation is removed, appropriate surface repair should be completed where practical (slope regrading, proper vegetative cover reestablished and/or rip rap added).
3) A systematic tree removal program should then be planned and executed, by which a certain percentage of trees and stumps are removed per year or are removed associated to the perceived risk they present to embankment stability.
4) Upon removal of trees and stumps according to the established program, areas disturbed by tree removal should be repaired as described in #2 above.

Pond 6

Repair of the rodent burrows, minor erosion and scarping observed around the impoundment should be completed within one year of this inspection.

6.5 CERTIFICATION STATEMENT

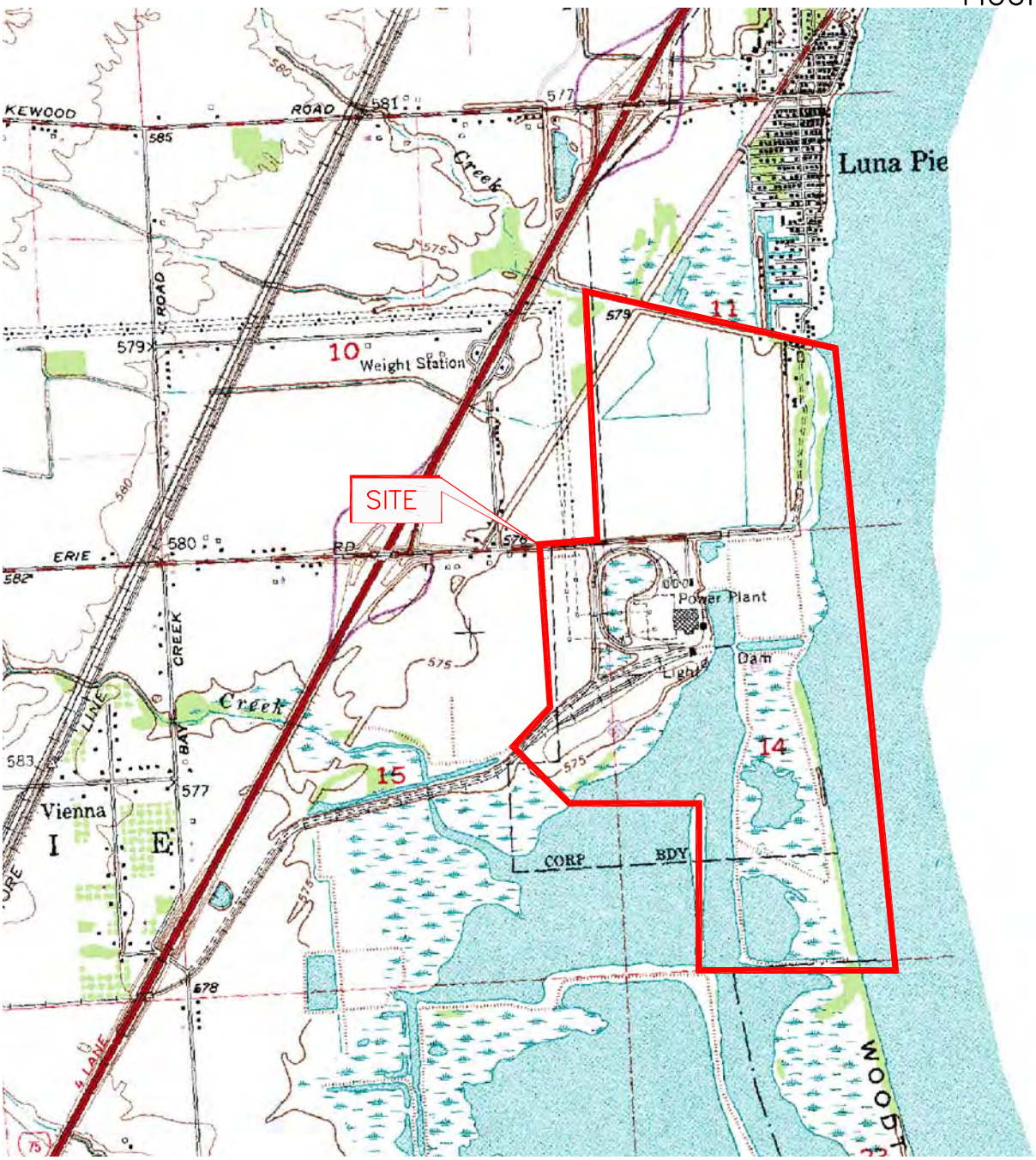
I acknowledge that the following management units located at the Consumers Energy J. R. Whiting facility referenced herein was personally inspected by me on September 23, 2010 as were found to be in the following conditions:

Ponds 1 & 2	*Ponds 3, 4 & 5*	*Pond 6*
~~SATISFACTORY~~	~~SATISFACTORY~~	~~SATISFACTORY~~
FAIR	~~FAIR~~	***FAIR***
~~POOR~~	~~POOR~~	~~POOR~~
~~UNSATISFACTORY~~	~~UNSATISFACTORY~~	~~UNSATISFACTORY~~
	RATING NOT APPLICABLE	

Signature: _____ Date: _____

Scott L. Cormier, PE
MI PE # 39613

FIGURE 1



ADAPTED FROM: ERIE SW, U.S.G.S. 7.5 MIN. QUAD, 1967 , PHOTO REVISED 1979

QUADRANGLE LOCATION

US EPA – DAM SAFETY INSPECTION
OF CCW IMPOUNDMENTS
J. R. WHITING PLANT – ERIE, MI

SITE LOCATION MAP

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

SCALE: 1:24000

FILE NO. 46122–008
OCTOBER 2010

O'BRIEN & GERE

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10/11/10 JPH div078

FHills I:\13498\46122\Doc\Dwg\Sheets\JR Whiting\009

FIGURE 2

NORTH

NOTES:
1. INSPECTION PERFORMED 9/23/10
2. AERIAL PHOTO DATED 2005 OBTAINED FROM MICHIGAN CENTER FOR GEOGRAPHIC INFORMATION (MCGI) DATA LIBRARY WEBSITE

US EPA

DAM SAFETY INSPECTION OF CCW IMPOUNDMENTS

J.R. WHITING PLANT
ERIE, MI

FACILITY LAYOUT MAP

1"=1000' 1000 0 1000
APPROXIMATE SCALE

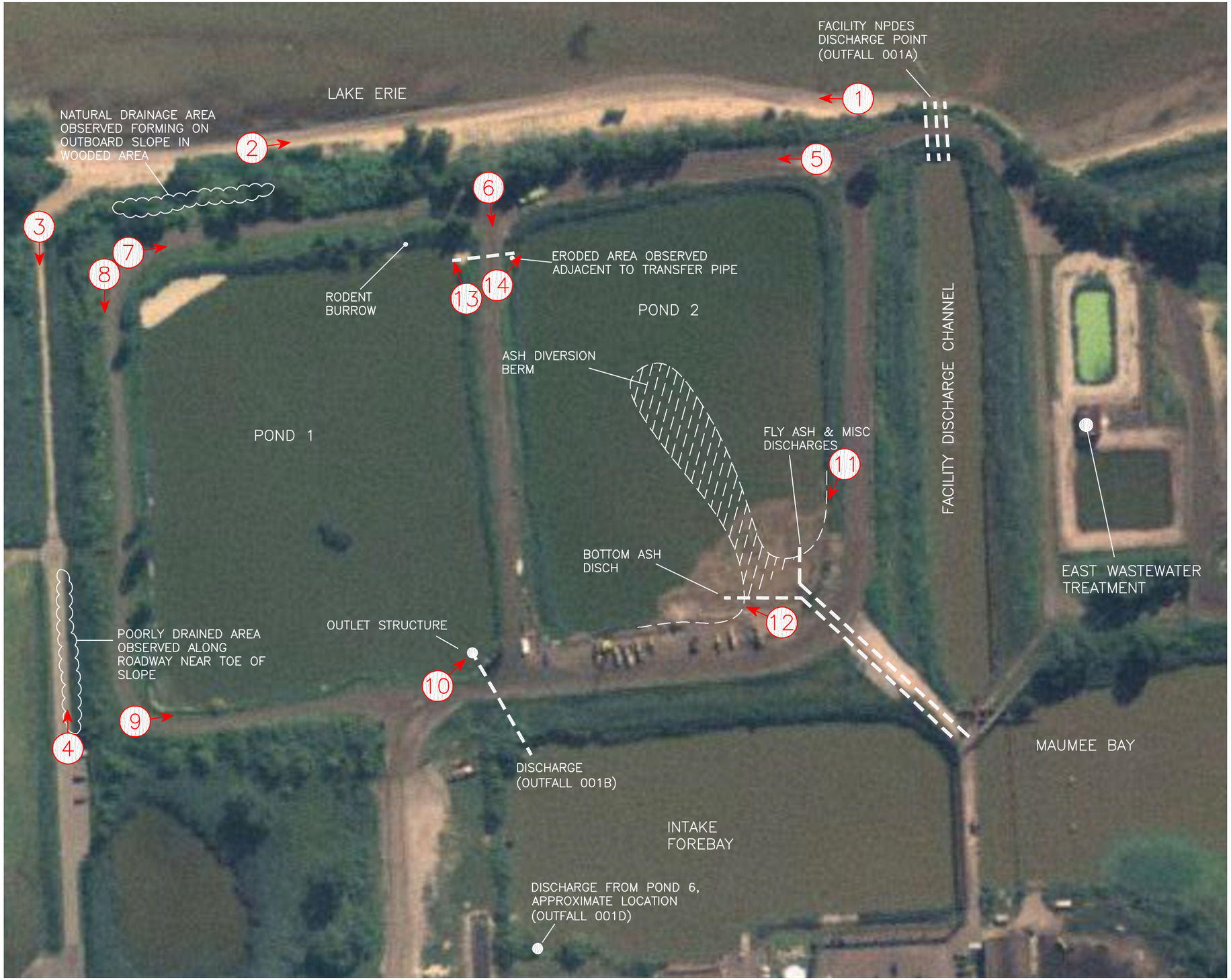
FILE NO. 13498.46122-009
OCTOBER 2010

O'BRIEN & GERE

10/21/10 JPH div078

FHills I:\13498\46122\Doc\Dwg\Sheets\JR Whiting\009

FIGURE 3



NORTH

NOTES:

1. INSPECTION PERFORMED 9/23/10
2. AERIAL PHOTO DATED 2005 OBTAINED FROM MICHIGAN CENTER FOR GEOGRAPHIC INFORMATION (MCGI) DATA LIBRARY WEBSITE
3. TREES AND/OR HEAVY VEGETATIVE GROWTH WAS OBSERVED AROUND FULL PERIMETER OF IMPOUNDMENT AT TIME OF INSPECTION HINDERING OR PREVENTING DETAILED OBSERVATIONS

LEGEND

(#) — PHOTO DIRECTION
APPENDIX B PHOTO REFERENCE

US EPA

DAM SAFETY INSPECTION OF CCW IMPOUNDMENTS

J.R. WHITING PLANT
ERIE, MI

SITE PLAN
PONDS 1 & 2

1"=150' 150 0 150
APPROXIMATE SCALE

FILE NO. 13498.46122-009
OCTOBER 2010

O'BRIEN & GERE

10/21/10 JPH div078

FHills I:\13498\46122\Doc\Dwg\Sheets\JR Whiting\009

FIGURE 4

NORTH

NOTES:

1. INSPECTION PERFORMED 9/23/10
2. HATCHED AREA REPRESENTS APPROXIMATE AREA OF PONDS 3, 4 & 5 COMPLEX WHICH HAVE BEEN COMPLETED WITH ASH FILL, FLEXIBLE MEMBRANE LINER AND FINAL SOIL COVER
3. NOTE HEAVILY VEGETATED, TREE-LINED SLOPES AROUND PERIMETER OF AREA
4. AERIAL PHOTO DATED 2005 OBTAINED FROM MICHIGAN CENTER FOR GEOGRAPHIC INFORMATION (MCGI) DATA LIBRARY WEBSITE

LEGEND

— PHOTO DIRECTION
— APPENDIX C PHOTO REFERENCE

US EPA

DAM SAFETY INSPECTION OF CCW IMPOUNDMENTS

J.R. WHITING PLANT
ERIE, MI

SITE PLAN
PONDS 3, 4 & 5

1"=350' 350 0 350
APPROXIMATE SCALE

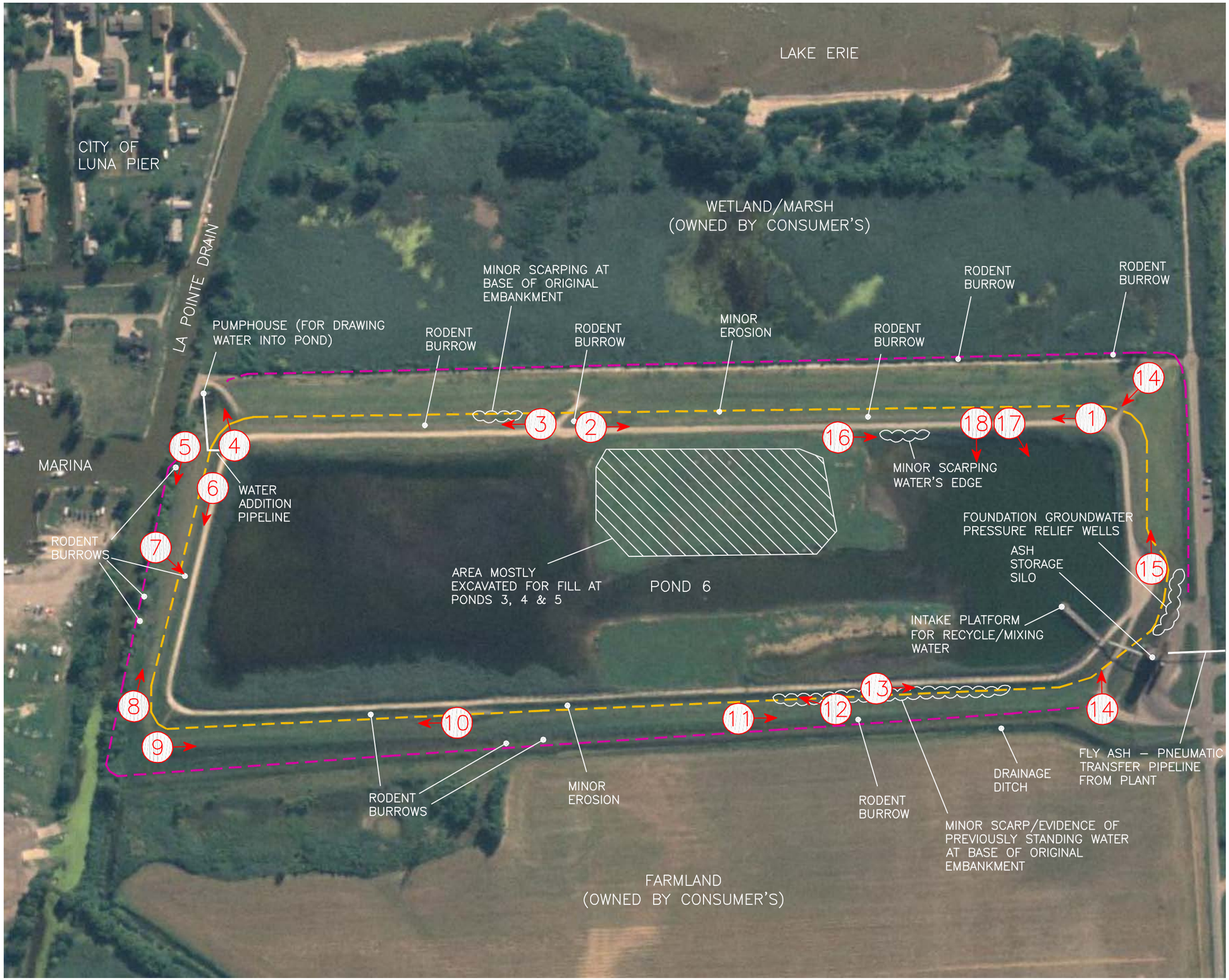
FILE NO. 13498.46122-009
OCTOBER 2010

O'BRIEN & GERE

10/21/10 JPH div078

FHills I:\13498\46122\Doc\Dwg\Sheets\JR Whiting\009

FIGURE 5



NORTH

NOTES:
1. INSPECTION PERFORMED 9/23/10
2. AERIAL PHOTO DATED 2005 OBTAINED FROM MICHIGAN CENTER FOR GEOGRAPHIC INFORMATION (MCGI) DATA LIBRARY WEBSITE
3. CURRENT INTERNAL DIKE CONFIGURATION IS DIFFERENT THAN DEPICTED

LEGEND

— PHOTO DIRECTION
— APPENDIX D PHOTO REFERENCE

TOE OF BUTTRESS OUTLINE

TOE OF ORIGINAL EMBANKMENT OUTLINE

US EPA

DAM SAFETY INSPECTION OF CCW IMPOUNDMENTS

J.R. WHITING PLANT
ERIE, MI

SITE PLAN
POND 6

1"=250' 250 0 250
APPROXIMATE SCALE

FILE NO. 13498.46122-009
OCTOBER 2010

O'BRIEN & GERE

10/21/10 JPH div078

FIGURES

APPENDICES

APPENDIX A

Visual Inspection Checklists

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: JR Whiting Plant	Date: September 23, 2010
Unit Name: Ponds 1 & 2	Operator's Name: Consumer's Energy
Unit I.D.:	Hazard Potential Classification: High **Significant** Low
Inspector's Name: Steve Snider, 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?	Per shift		18. Sloughing or bulging on slopes?	see	notes
2. Pool elevation (operator records)?	~586.3'		19. Major erosion or slope deterioration?	see	notes
3. Decant inlet elevation (operator records)?	~586.3'		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	~590.0'		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?	X	
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?	see	notes
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?	see	notes
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?	see	notes	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.

Date: 9/23/2010
Site: Consumer's Energy - J.R. Whiting Plant - Erie, MI
Impoundment: Ponds 1 & 2

Checklist Number	Description/Notes
1	Inpsection rounds at the facility are made once per shift (3 times/day) and include a visual check of CCW impoundment conditions. Notes of the rounds were not observed at the time of this inspection. No regular dam safety specific inspections are currently made by the facility, although in the wake of the TVA Kingston event, Consumer's Energy did contract the services of AECOM to complete an inpsection and potential failure mode analysis in 2009.
6	A sight gage is located at the inlet to Pond 2. This level was not reported as recorded during the per shift inspection rounds.
8	No documentation of original construction reports or original specifications were available.
9	All four embankments surrounding Ponds 1 & 2 are heavily vegetated with phragmites (common reeds) and other shrubery making detailed inspection difficult, (see attached photos). Specifically, the east embankment along Lake Erie was observed to have many large trees (approximately 24" to 36"diameter) growing on it and at the toe of the slope.
17, 18, 19, 21	Trees and/or heavy vegetative growth was observed on the embankments around the full perimeter of the impoundment at the time of the inpsection. As such, the slopes of this impoundment were difficult to observe and detailed observations could not be made.
23	Water is present against the downstream toe at the south portion of the west embankment and along the full length of the south embankment. The full length of the east embankment is near the Lake Erie shoreline, however, a sizeable width of sandy beach exists between the toe of the embankment and the waters of Lake Erie

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
A	9/23/10

DESCRIPTION

View looking north

Outboard side of south portion of east embankment of Ponds 1 & 2

Note heavy vegetative growth on slope at left

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
B	9/23/10

DESCRIPTION

View looking west.

Outboard side of north embankment of Ponds 1 & 2

Note heavy vegetative growth on slope at left

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
C	9/23/10

DESCRIPTION

View looking north

View along crest of east embankment

Note mature tree line at right

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
D	9/23/10

DESCRIPTION

View looking south

Inboard side of west embankment of Ponds 1 & 2

Note heavy vegetative growth at right

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # MI 0001864 INSPECTOR Steve Snider, PE and Scott Cormier, PE

Date September 23, 2010

Impoundment Name Ponds 1 & 2

Impoundment Company Consumer's Energy

EPA Region V

State Agency (Field Office) Addresss Jackson District Office
301 E. Louis Glick Hwy, Jackson, MI 49201

Name of Impoundment Ponds 1 & 2

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

New _____ Update NPDES X Last Renewal Issued - May 2008

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

IMPOUNDMENT FUNCTION: Primary purpose for settling of bottom ash, has capability to settle fly ash if needed, also receives discharge from miscellaneous process wastewater and sanitary wastewater treatment processes

Nearest Downstream Town : Name Luna Pier, MI

Distance from the impoundment <1 mile

Impoundment Location:

Longitude -83 Degrees 26 Minutes 43.2456 Seconds

Latitude 41 Degrees 47 Minutes 33.9678 Seconds

State Michigan County Monroe

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

If So Which State Agency? Michigan Department of Natural Resources and Environment (MDNRE) - Waste and Hazardous Materials Division (WHMD)

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.

__X__ **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.

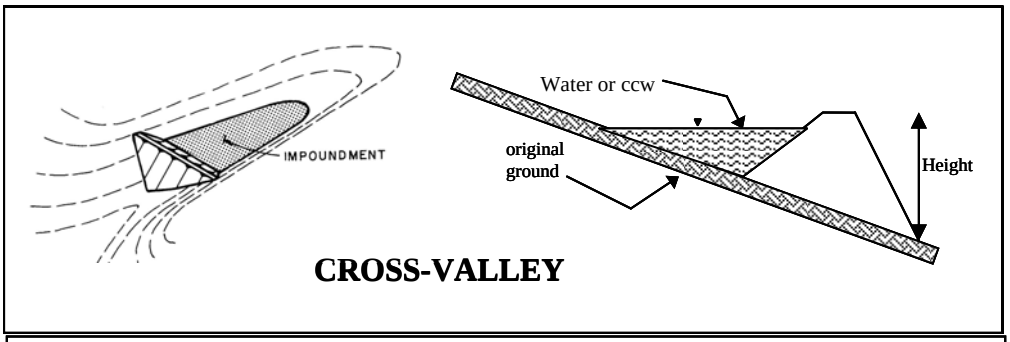
_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

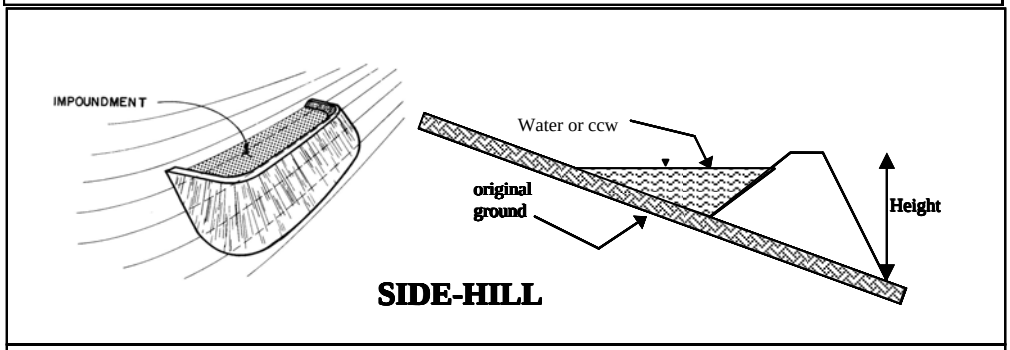
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

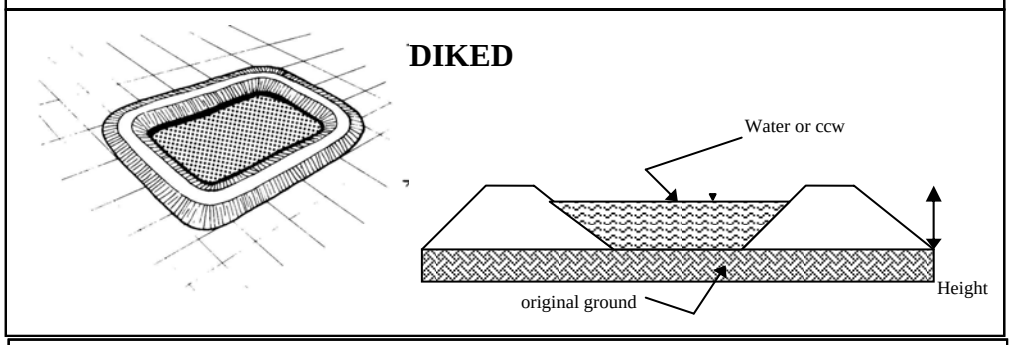
1. Failure of embankments would likely result in release of CCW to the owner's property and to Lake Erie (or the backwaters known as Maumee Bay).

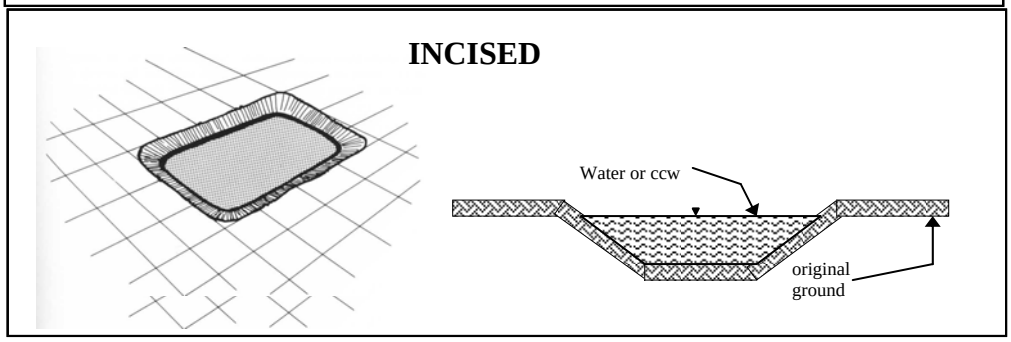
2. Given the close proximity to Lake Erie and the fact that the embankments were raised using ash material, it is the belief of the inspection team that the quantity of material that could be released into Lake Erie in the event of a breach could result in significant environmental damage.

CONFIGURATION:









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

Original berms (elevation 574.5' to 580') constructed in 1950's out of native fill excavated from site. As ash filled the ponds until the early 1980's, ash was used to gradually raise the berms to existing elevation 590' during this time. In early 1980s the interior of this area was reworked into it's current configuration

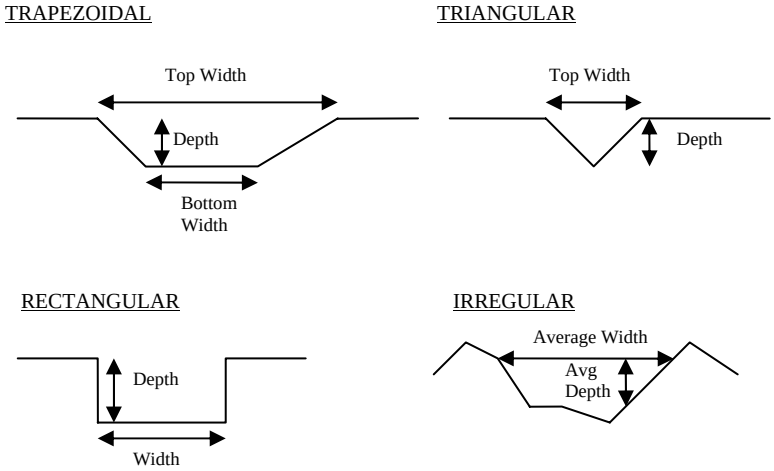
Embankment Height ~ 19' Max feet
Embankment Material see note above
Pool Area see note below acres
Liner None
Current Freeboard 3.5 - 4.0 feet
Liner Permeability N/A

Pool Areas
Pond 1 - 8 Acres
Pond 2 - 7 Acres
Total - 15 Acres

TYPE OF OUTLET (Mark all that apply)

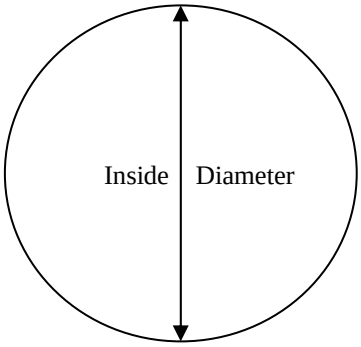
N/A **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

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



X **Outlet** Outlet weir is ~48" diameter circular corrugated metal standpipe around a 24" drop structure

~24" inside diameter



Material
X corrugated metal
_____ welded steel
_____ 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 Original 1950's berms to 580' - unknown
Gradual Raising to 590' with ash - not designed
1983 Re-configuration - Hoad 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 __X____ NO _____

If So When? __~1990_____

IF So Please Describe: _____

According to the AECOM December 2009 report, around 1990 seepage was observed around Ponds 1 & 2. As a result the pond levels were reported to be permanently lowered.

Seepage was not readily observed during this September 2010 US EPA inspection effort by O'Brien & Gere. However, once again due to the dense vegetation on the slopes, identification of seepage was greatly inhibited.

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES x NO _____

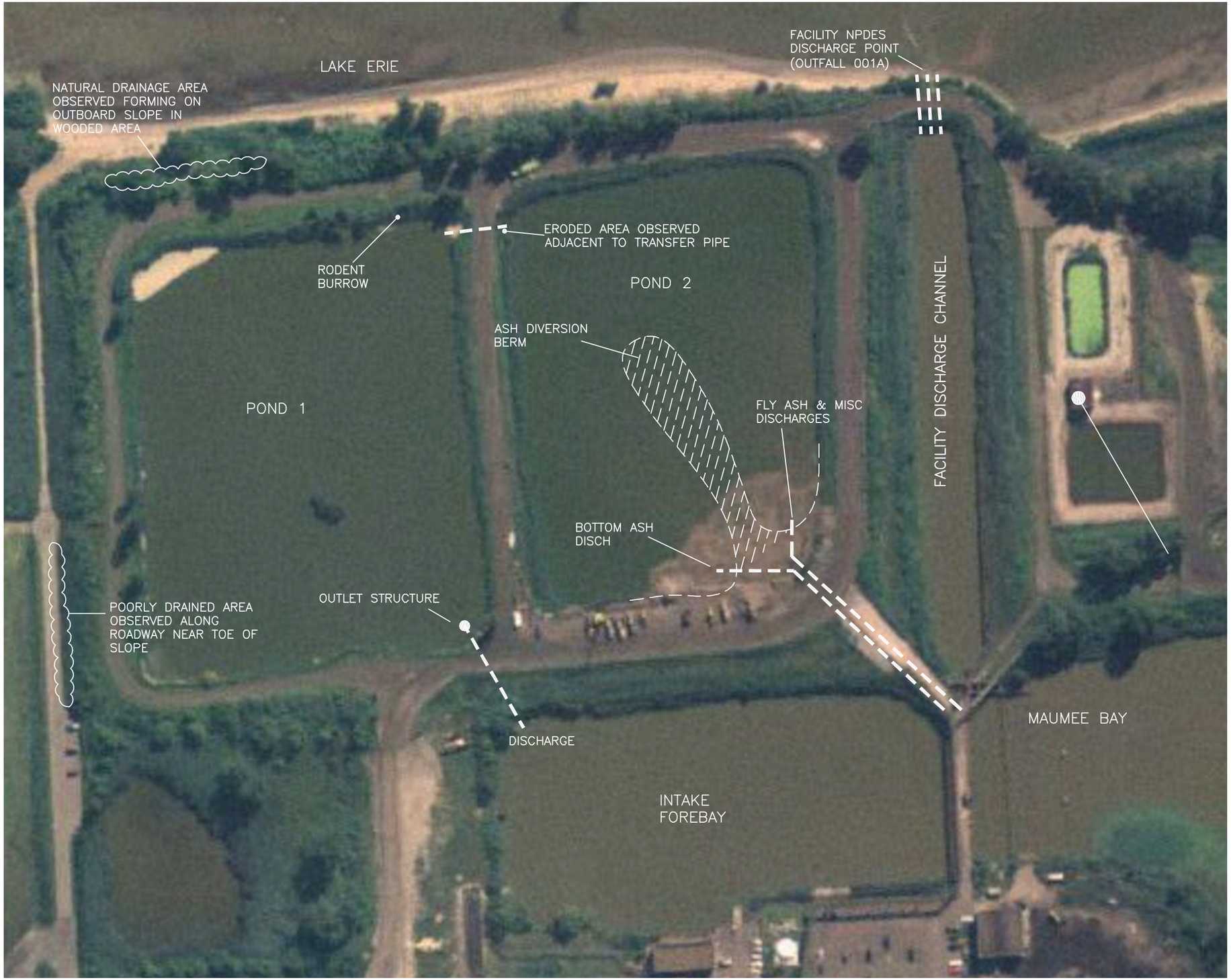
If so, which method (e.g., piezometers, gw pumping,...)? Permanent lowering of pool elevation

If so Please Describe :

As noted on previous page, the pond levels were reported to be permanently lowered. The condition has not been noted since the lowering effort.

FHills I:\13498\46122\Doc\Dwg\Sheets\JR Whiting\007

FIGURE 1



NORTH

NOTES:

1. INSPECTION PERFORMED 9/23/10
2. AERIAL PHOTO DATED 2005 OBTAINED FROM MICHIGAN CENTER FOR GEOGRAPHIC INFORMATION (MCGI) DATA LIBRARY WEBSITE
3. TREES AND/OR HEAVY VEGETATIVE GROWTH WAS OBSERVED AROUND FULL PERIMETER OF IMPOUNDMENT AT TIME OF INSPECTION HINDERING OR PREVENTING DETAILED OBSERVATIONS

US EPA

DAM SAFETY INSPECTION OF CCW IMPOUNDMENTS

J.R. WHITING PLANT
ERIE, MI

CHECKLIST
OBSERVATION NOTES
PONDS 1 & 2

1"=150' 150 0 150
APPROXIMATE SCALE

FILE NO. 13498.46122-007
SEPTEMBER 2010

O'BRIEN & GERE

9/30/10 JPH div078

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: JR Whiting Plant	Date: September 23, 2010
Unit Name: Ponds 3, 4 & 5	Operator's Name: Consumer's Energy
Unit I.D.:	Hazard Potential Classification: ~~High~~ ~~Significant~~ ~~Low~~
Inspector's Name: Steve Snider, 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?	Per shift		18. Sloughing or bulging on slopes?	see notes	
2. Pool elevation (operator records)?	N/A, see notes		19. Major erosion or slope deterioration?	see notes	
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	~590'		Is water exiting outlet, but not entering inlet?	N/A	
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?	see notes	
9. Trees growing on embankment? (If so, indicate largest diameter below)	X		At isolated points on embankment slopes?	see notes	
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?	see notes	
11. Is there significant settlement along the crest?		X	Over widespread areas?	see notes	
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?	see notes	
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?	N/A		"Boils" beneath stream or ponded water?	see notes	
14. Clogged spillways, groin or diversion ditches?	N/A		Around the outside of the decant pipe?	see notes	
15. Are spillway or ditch linings deteriorated?	N/A		22. Surface movements in valley bottom or on hillside?	see notes	
16. Are outlets of decant or underdrains blocked?	N/A		23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?	see notes		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 notes/photos on following pages

Date: 9/23/2010
Site: Consumer's Energy - J.R. Whiting Plant - Erie, MI
Impoundment: Ponds 3, 4 & 5

Checklist Number	Description/Notes
1	Inspection rounds at the facility are made once per shift (3 times/day) and include a visual check of CCW impoundment conditions. Notes of the rounds were not observed at the time of this inspection. No regular dam safety specific inspections are currently made by the facility, although in the wake of the TVA Kingston event, Consumer's Energy did contract the services of AECOM to complete an inspection and potential failure mode analysis in 2009.
2	Wet sluicing of ash to Ponds 3, 4 & 5 ceased operation in 2008. In accordance with a closure plan submitted to the State of Michigan, Consumer's Energy is currently completing final dewatered ash fill placement and constructing the final cover. The final dewatered ash fill placement and cover construction is complete over approximately 1/2 to 2/3 of the area as shown in the attached observation notes sketch. Anticipated completion of the final cover over the full area of this unit is 2011 - 2012.
7	In conjunction with the decommissioning/closure of these ponds, the final cover and grade is currently under construction in the center of the former impoundment complex area. Additionally, a runoff diversion berm and engineered run-off let down areas have recently been completed around the perimeter of the covered area and at various locations on the slopes, respectively.
17, 18, 19, 21	Trees and/or heavy vegetative growth was observed on the embankments around the full perimeter of the impoundment at the time of the inspection. As such, the slopes of this impoundment were difficult to observe and detailed observations could not be made.
23	Water is present against the downstream toe on three sides of the embankment. To the north there is the facility discharge channel and to the west and south is Maumee Bay. Lake Erie is located along the east embankment, however, a sizeable width of beach is located between the toe of the embankment and the waters of Lake Erie.

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
A	9/23/10

DESCRIPTION

View looking south

Newly constructed runoff berm and engineered "let down" area on western edge of landfill/former impoundments

Note trees/vegetative growth on slope at right

Photo directed along western crest of former impoundments

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
B	9/23/10

DESCRIPTION

View looking east

Freshly seeded/straw covered final grade at southern end of impoundments

Note trees/vegetative growth on slope at right

Photo directed along southern crest of former impoundments

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
C	9/23/10

DESCRIPTION

View looking east

Application of seed and straw cover at center/top of landfill/former impoundments

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
D	9/23/10

DESCRIPTION

View looking south from north end of landfill/former impoundments

Photo is directed along center of former impoundments. Note haul road for placement of final ash in landfill

Depressed area in center of photo is last area where ash was wet sluiced to former impoundments

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # MI 0001864 INSPECTOR Steve Snider, PE and Scott Cormier, PE

Date September 23, 2010

Impoundment Name Ponds 3, 4 & 5

Impoundment Company Consumer's Energy

EPA Region V

State Agency (Field Office) Addresss Jackson District Office
301 E. Louis Glick Hwy, Jackson, MI 49201

Name of Impoundment Ponds 3, 4 & 5

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

New _____ Update NPDES X Last Renewal Issued - May 2008

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

IMPOUNDMENT FUNCTION: Storage of fly and bottom ash

Nearest Downstream Town : Name Luna Pier, MI

Distance from the impoundment <1 mile

Impoundment Location:

Longitude -83 Degrees 26 Minutes 40.6602 Seconds

Latitude 41 Degrees 47 Minutes 4.1892 Seconds

State Michigan County Monroe

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

If So Which State Agency? Michigan Department of Natural Resources and Environment (MDNRE) - Waste and Hazardous Materials Division (WHMD)

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

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

__N/A__ **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.

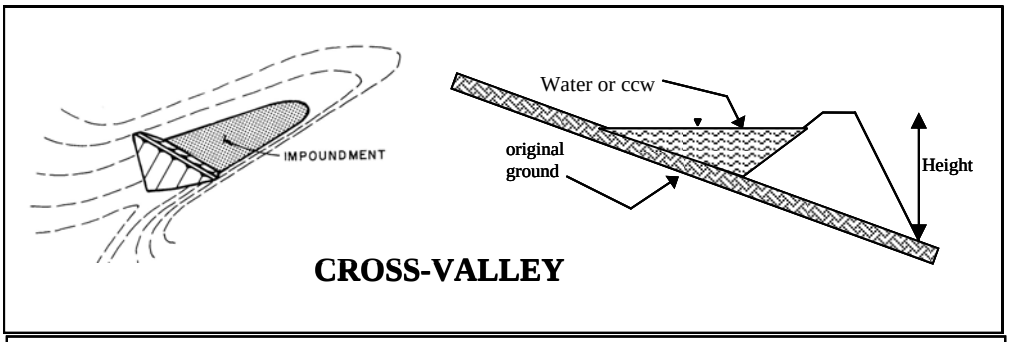
__N/A__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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.

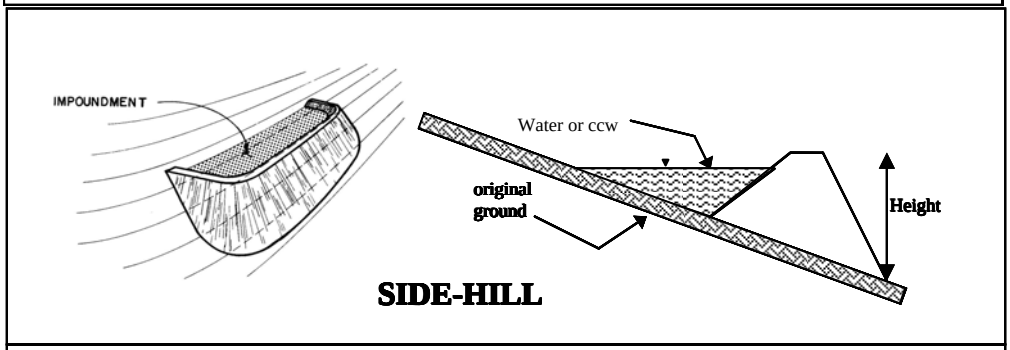
__N/A__ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

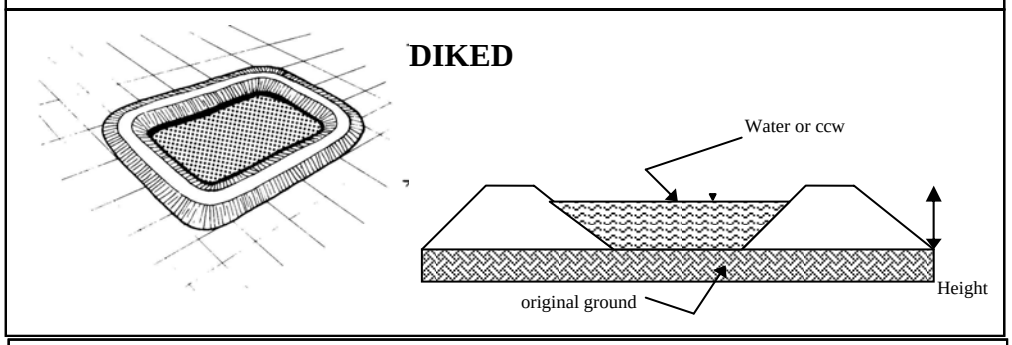
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

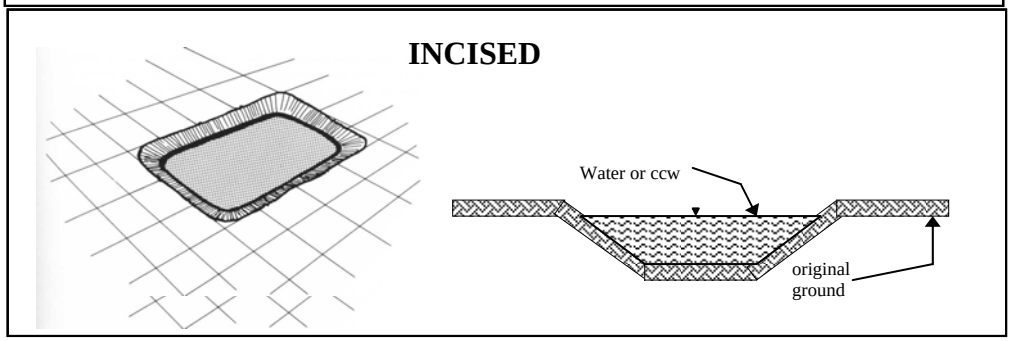
Based on the observations and discussions from the inspection, it is the belief of the inspection team that this unit is best treated as a landfill. Furthermore, dam safety rules no longer apply to this storage unit and therefore no hazard rating can justifiably be assigned.

CONFIGURATION:









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

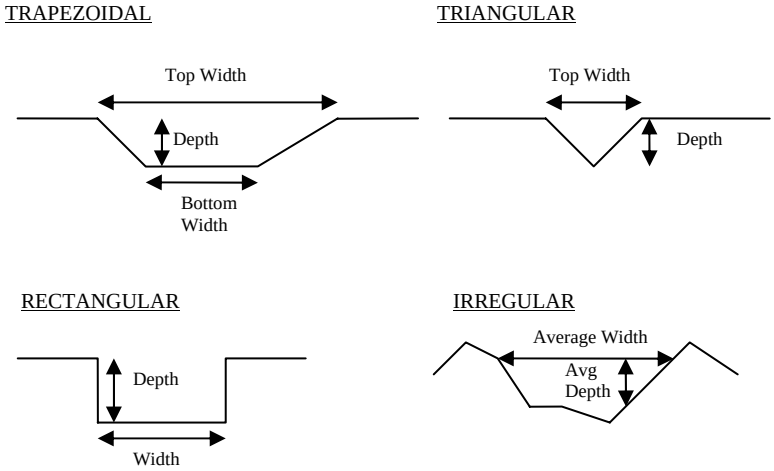
Original embankments up to estimated elevation 580' were constructed from native fill excavated from the site. Raising to final height of 590' was assumed to be constructed from ash material.

Embankment Height Approx. 19' feet Embankment Material see notes above
Pool Area Approx 82 Acres acres Liner None
Current Freeboard N/A feet Liner Permeability N/A

TYPE OF OUTLET (Mark all that apply)

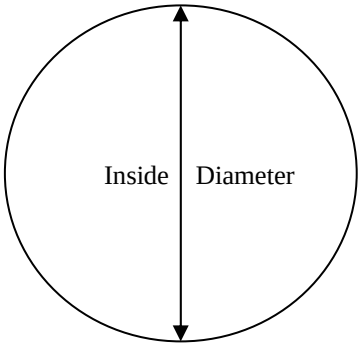
N/A **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

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



N/A **Outlet**

_____ inside diameter



Material
_____ corrugated metal
_____ 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 Unknown

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 : _____

FHills i:\13498\46122\Doc\Dwg\Sheets\JR Whiting\007

FIGURE 1

NORTH

NOTES:

1. INSPECTION PERFORMED 9/23/10
2. HATCHED AREA REPRESENTS APPROXIMATE AREA OF PONDS 3, 4 & 5 COMPLEX WHICH HAVE BEEN COMPLETED WITH ASH FILL, FLEXIBLE MEMBRANE LINER AND FINAL SOIL COVER
3. NOTE HEAVILY VEGETATED, TREE-LINED SLOPES AROUND PERIMETER OF AREA
4. AERIAL PHOTO DATED 2005 OBTAINED FROM MICHIGAN CENTER FOR GEOGRAPHIC INFORMATION (MCGI) DATA LIBRARY WEBSITE

US EPA

DAM SAFETY INSPECTION OF CCW IMPOUNDMENTS

J.R. WHITING PLANT
ERIE, MI

CHECKLIST OBSERVATION NOTES PONDS 3, 4 & 5

1"=350' 350 0 350

APPROXIMATE SCALE

FILE NO. 13498.46122-007
SEPTEMBER 2010

O'BRIEN & GERE

9/30/10 JPH div078

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: JR Whiting Plant	Date: September 23, 2010
Unit Name: Pond 6	Operator's Name: Consumer's Energy
Unit I.D.:	Hazard Potential Classification: High **Significant** Low
Inspector's Name: Steve Snider, 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?	Per shift		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	~596'		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	not known		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	~600'		Is water exiting outlet, but not entering inlet?	N/A	
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)?	X		From underdrain?	X	
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?	N/A		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.

Date: 9/23/2010
Site: Consumer's Energy - J.R. Whiting Plant - Erie, MI
Impoundment: Pond 6

Checklist Number	Description/Notes
1	Inpsection rounds at the facility are made once per shift (3 times/day) and include a visual check of CCW impoundment conditions. Notes of the rounds were not observed at the time of this inspection. No regular dam safety specific inspections are currently made by the facility, although in the wake of the TVA Kingston event, Consumer's Energy did contract the services of AECOM to complete an inpsection and potential failure mode analysis in 2009.
3	A 3" gravity decant pipe was reported as the means to draw down the impoundment. This pipe was not observed during the inspection.
6	A sight gage is located at the platform to the recycle intake pump platform located at the south west corner of the impoundment. This level was not reported as recorded during the per shift inspection rounds.
8	The original specifications were not available at the time of the inspection. However a document from the residing engineer during construction was observed stating that the embankments were constructed according to project plans and specifications.
17	Minor scarping was observed along a portion of the east and west embankments as noted on the observation sketch attached to this checklist.
19	Major erosion was not observed during the inspection. Minor erosion was noted at various locations on slopes and on access ramps/roads as noted on the observation sketch attached to this checklist.
21	A series of foundation groundwater pressure relief wells are located around the south west corner of the impoundment. During this inspection, very minor flows were observed from these wells on the order of much less than 1 GPM (0.1 GPM)
23	Water is permanently located against the downstream toe of the exterior buttress on two sides. La Pointe drain is present along the length of the north embankment. A marshy/wetland area is present along the length of the east embankment. Additionally, a drainage ditch that conveys/holds water during wet weather periods is located at the toe of the west embankment.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # MI 0001864 INSPECTOR Steve Snider, PE and Scott Cormier, PE

Date September 23, 2010

Impoundment Name Pond 6

Impoundment Company Consumer's Energy

EPA Region V

State Agency (Field Office) Addresss Jackson District Office
301 E. Louis Glick Hwy, Jackson, MI 49201

Name of Impoundment Pond 6

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

New _____ Update NPDES X Last Renewal Issued - May 2008

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

IMPOUNDMENT FUNCTION: Storage of fly ash

Nearest Downstream Town : Name Luna Pier, MI

Distance from the impoundment <1 mile

Impoundment Location:

Longitude -83 Degrees 26 Minutes 51.2016 Seconds

Latitude 41 Degrees 47 Minutes 53.9514 Seconds

State Michigan County Monroe

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

If So Which State Agency? Michigan Department of Natural Resources and Environment (MDNRE) - Waste and Hazardous Materials Division (WHMD)

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.

__X__ **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:

1. Failure of embankments would likely result in release of CCW to the owner's property, the La Pointe drain and/or to Lake Erie.

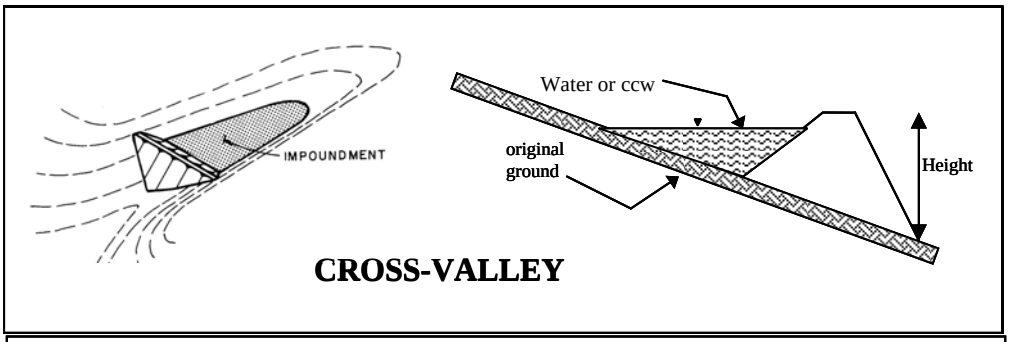
2. It is the belief of the inspection team that a breach of the embankments could result in the following losses/damages:

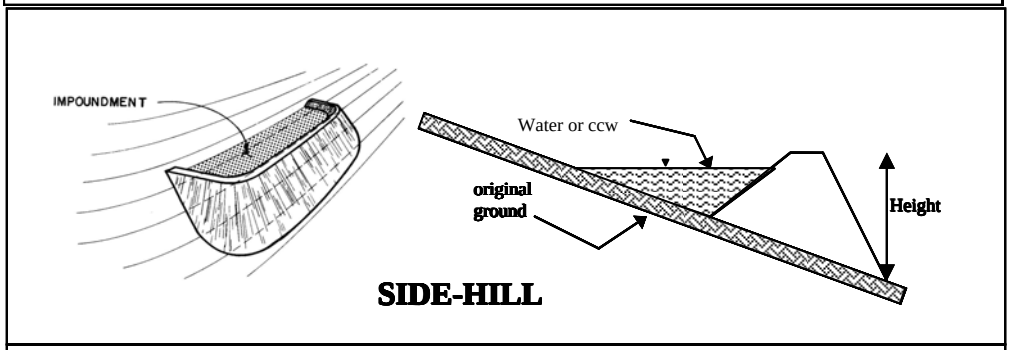
   A. Property value losses for the shoreside residential area in Luna Pier north of La Pointe drain due to potential ash washing up on shore and or settling near the shore.

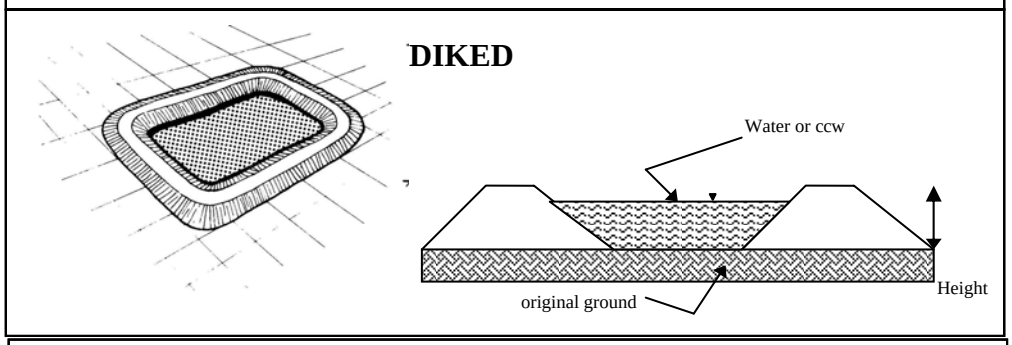
   B. Economic damage to the marina which uses La Pointe drain to access Lake Erie

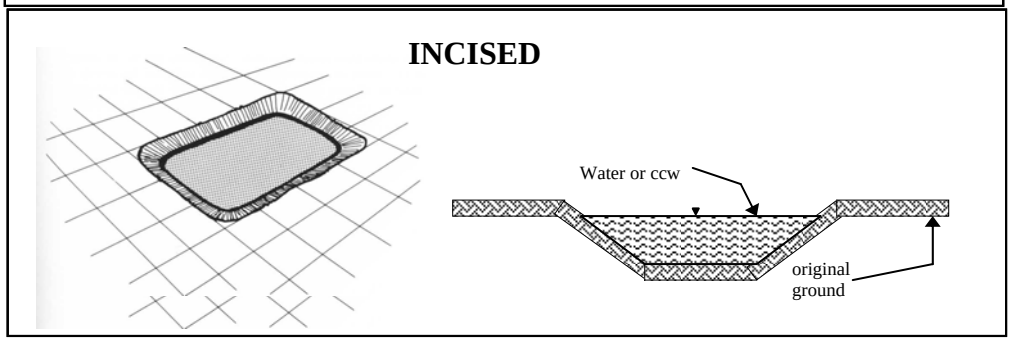
   C. Significant environmental damage to Lake Erie

CONFIGURATION:









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

Original berms constructed around 1980 out of native clay excavated from site. Due to documented structural instabilities, additional buttressing, both interior and exterior, has been constructed at various locations around the embankment. It is believed that most of the buttressing was constructed out of ash materials.

Embankment Height Approx. 27' feet

Pool Area Approx 32 Acres acres

Current Freeboard 3.5 - 4.0 feet

Embankment Material see notes above

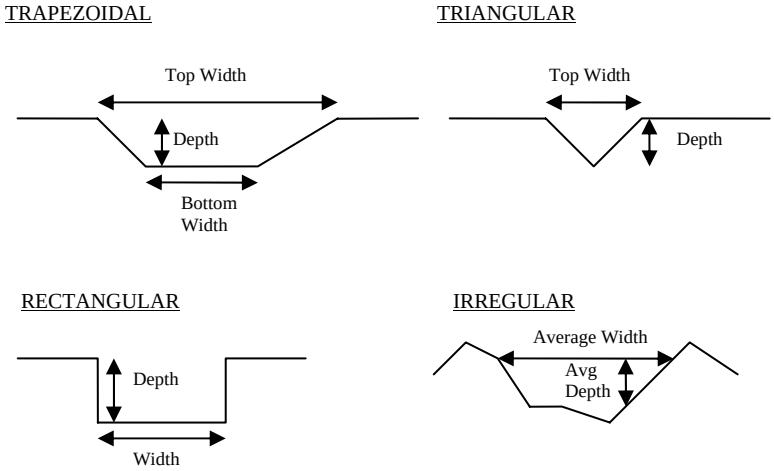
Liner None

Liner Permeability N/A (however, documentation reported that the embankment soils have permeability of <1 x 10^{-7} cm/sec)

TYPE OF OUTLET (Mark all that apply)

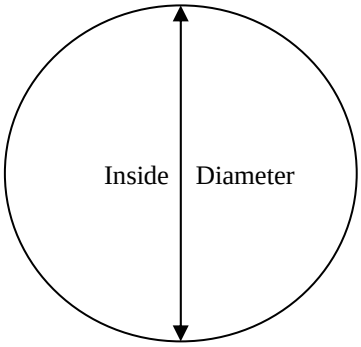
N/A **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

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



X **Outlet**

~3" inside diameter



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

Is water flowing through the outlet? YES _____ NO X

_____ **No Outlet**

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

The Impoundment was Designed By Original berms - Hoad Engineers
Various buttressing efforts were investigated and remedial strategies suggested by Various consultants (Soil & Materials Engineers, Woodward Clyde, Stoll Evans & Woods)

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

If So When? Early 1980's

If So Please Describe :

The Pond 6 embankments have had documented failures during original construction and shortly after the impoundment was constructed. Numerous efforts were made to repair failaure and stabilize major deformations/settling of the original embankments up until the Mid 1990's.

These efforts included rebuilding a portion of the embankment, constructing interior buttressing (selected locations), and constructing exterior buttressing (majority of impoundment perimeter.

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 X NO _____

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

If so Please Describe :

A series of foundation groundwater pressure relief wells were constructed around the southwest corner of the embankment to reduce ground water levels around the base of this area of the impoundment.

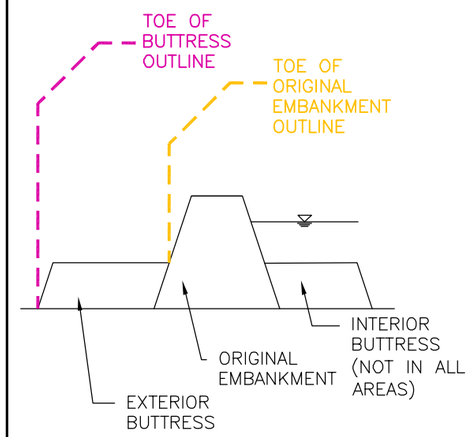
Additionally, based on historical documents, it appears that some temporary piezometers were used to monitor/verify that excess pore water pressure was not occurring during reconstruction/repair activities.

FHills I:\13498\46122\Doc\Dwg\Sheets\JR Whiting\007

FIGURE 1

NOTES:

1. INSPECTION PERFORMED 9/23/10
2. AERIAL PHOTO DATED 2005 OBTAINED FROM MICHIGAN CENTER FOR GEOGRAPHIC INFORMATION (MCGI) DATA LIBRARY WEBSITE
3. CURRENT INTERNAL DIKE CONFIGURATION IS DIFFERENT THAN DEPICTED



TYPICAL SECTION
(NOT TO SCALE)

US EPA

DAM SAFETY INSPECTION OF CCW IMPOUNDMENTS

J.R. WHITING PLANT
ERIE, MI

CHECKLIST OBSERVATION NOTES POND 6

FILE NO. 13498.46122–007
SEPTEMBER 2010

O'BRIEN & GERE

9/30/10 JPH div078

APPENDIX B

Photographic Log – Ponds 1 & 2

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
1	9/23/10

DESCRIPTION

View looking north

Outboard side of south portion of east embankment

Note heavy vegetative growth on slope at left, Lake Erie at right

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
2	9/23/10

DESCRIPTION

View looking south

Outboard side of north portion of east embankment

Note heavy vegetative growth on slope at right, lake Erie at left

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
3	9/23/10

DESCRIPTION

View looking west

Outboard side of north embankment

Note heavy vegetative growth on slope at left

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
4	9/23/10

DESCRIPTION

View looking east

Outboard side of north embankment

Note heavy vegetative growth at right

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
5	9/23/10

DESCRIPTION

View looking north

View along crest of east embankment

Note mature tree line at right

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
6	9/23/10

DESCRIPTION

View looking west

View along crest of center road between Ponds 1 & 2

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
7	9/23/10

DESCRIPTION

View looking south

View along crest of east embankment

Note mature tree line at left and mature trees near impoundment water surface at right

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
8	9/23/10

DESCRIPTION

View looking west

View along inboard slope and crest of north embankment

Note heavy vegetative growth at right and mature trees near impoundment water surface

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
9	9/23/10

DESCRIPTION

View looking south

Inboard side of west embankment

Note heavy vegetative growth at right

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
10	9/23/10

DESCRIPTION

View looking east

View of outlet intake structure in southwest corner of Pond 1

Note mature tree growing on divider road between Ponds 1 & 2

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
11	9/23/10

DESCRIPTION

View looking west

Inlet piping for fly ash (back up use) and miscellaneous process wastewaters into Pond 2

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
12	9/23/10

DESCRIPTION

View looking east

Inlet piping for bottom ash into Pond 2

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
13	9/23/10

DESCRIPTION

View looking east

View of outlet end (in Pond 1) of transfer pipe between Ponds 1 & 2

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
14	9/23/10

DESCRIPTION

View looking south

View of inlet end (in Pond 2) of transfer pipe between Ponds 1 & 2

An eroded area was observed adjacent to this pipe (right of pipe in picture) but is hidden from view by vegetation

APPENDIX C

Photographic Log – Ponds 3, 4 & 5

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
1	9/23/10

DESCRIPTION

View looking northeast

Newly constructed runoff berm and engineered "let down" area on western edge of landfill/former impoundments

Note trees/vegetative growth on slope at left

Photo directed along western crest of former impoundments

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
2	9/23/10

DESCRIPTION

View looking south

Newly constructed runoff berm at left, original embankment slope at right

Note trees/vegetative growth on slope at right

Photo directed along western crest of former impoundments

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
3	9/23/10

DESCRIPTION

View looking south

Newly constructed runoff berm and engineered "let down" area on western edge of landfill/former impoundments

Note trees/vegetative growth on slope at right

Photo directed along western crest of former impoundments

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
4	9/23/10

DESCRIPTION

View looking east

Freshly seeded/straw covered final grade at southern end of impoundments

Note trees/vegetative growth on slope at right

Photo directed along southern crest of former impoundments

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
5	9/23/10

DESCRIPTION

View looking east

View along newly constructed final cover and runoff berm on southern portion of former impoundments

Note stairway down to former outfall, former outfall pipes were observed to be sealed

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
6	9/23/10

DESCRIPTION

View looking west

View along newly constructed final cover and runoff berm on southern portion of former impoundments

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
7	9/23/10

DESCRIPTION

View looking east

Application of seed and straw cover at center/top of landfill/former impoundments

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
8	9/23/10

DESCRIPTION

View looking south from north end of landfill/former impoundments

Photo is directed along center of former impoundments. Note haul road for placement of final ash in landfill

Depressed area in center of photo is last area where ash was wet sluiced to former impoundments

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
9	9/23/10

DESCRIPTION

View looking north.

View along crest of former embankment

Slope to the left is stored ash in footprint of former impoundment, final cover yet to be placed over subject area of photo

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
10	9/23/10

DESCRIPTION

View looking south

View along crest of former east embankment

Final cover has been completed and seeded

APPENDIX D

Photographic Log – Pond 6

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
1	9/23/10

DESCRIPTION

View looking north

View along crest and upper outboard slope of south portion of east embankment

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
2	9/23/10

DESCRIPTION

View looking south

View along upper outboard slope of south portion of east embankment

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
3	9/23/10

DESCRIPTION

View looking north

View along crest and upper outboard slope of north portion of east embankment

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
4	9/23/10

DESCRIPTION

View looking northeast

View of intake water pumphouse that draws water out of LaPointe Drain to get water into impoundment

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
5	9/23/10

DESCRIPTION

View looking west

View along lower outboard slope of north embankment

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
6	9/23/10

DESCRIPTION

View looking west

View along crest of north embankment

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
7	9/23/10

DESCRIPTION

View looking south

Rodent burrow observed on north embankment

Typical of rodent burrows observed around this impoundment

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
8	9/23/10

DESCRIPTION

View looking east

View along lower outboard slope of north embankment

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
9	9/23/10

DESCRIPTION

View looking south

View along lower outboard slope of north portion of west embankment

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
10	9/23/10

DESCRIPTION

View looking north

View along upper outboard slope of north portion of west embankment

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
11	9/23/10

DESCRIPTION

View looking south

View along lower outboard slope of south portion of west embankment

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
12	9/23/10

DESCRIPTION

View looking northwest

View of minor scarp at base of upper outboard slope on west embankment

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
13	9/23/10

DESCRIPTION

View looking south

View of seasonal wet area (currently dry) at base of upper outboard slope at south portion of west embankment

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
14	9/23/10

DESCRIPTION

<u>Left photo</u>

View looking east

Minor erosion observed on access roadway at southwest corner of embankment

<u>Right photo</u>

View looking west

Minor erosion observed on access roadway at southeast corner of embankment

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
15	9/23/10

DESCRIPTION

View looking east

View along upper slope of southern embankment

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
16	9/23/10

DESCRIPTION

View looking south

View long inboard side of east embankment

Note minor scarping/wave eroded areas along water's edge

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
17	9/23/10

DESCRIPTION

View looking southwest

View of recycle water/blend water intake platform and fly ash storage silo from across impoundment

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
US EPA	CONSUMER'S ENERGY – J.R. WHITING	13498|46122

PHOTO NO.	DATE:
18	9/23/10

DESCRIPTION

View looking northwest

View of recycle water being circulated in pond from across impoundment