DTE Energy®

Prepared for

DTE Energy
One Energy Plaza
Detroit, Michigan 48226

2015 ANNUAL INSPECTION REPORT
ASH BASIN EMBANKMENT

MONROE POWER PLANT

Monroe, Michigan

Prepared by

Geosyntec consultants

engineers | scientists | innovators

134 North La Salle Street, Suite 300
Chicago, Illinois 60602

CHE8242H5

January 2016

Geosyntec consultants

134 N. LaSalle Street, Suite 300
Chicago, Illinois 60602
PH 312.658.0500
FAX 312.658.0576
www.geosyntec.com

15 January 2016

Via email

Mr. Joseph Garavaglia
DTE Energy
One Energy Plaza
Detroit, Michigan 48226

Subject: 2015 Annual Inspection Report
Monroe Plant Ash Basin Annual Inspection

Dear Mr. Garavaglia:

Geosyntec Consultants (Geosyntec) is pleased to provide you with the attached final Annual Inspection Report file as a pdf. It is to be placed in the operating record and on the publicly accessible internet website on January 18, 2016 in accordance with 40 CFR 257. Please call if you have any questions.

Sincerely,

Omer Bozok, P.E.
Engineer

Copies to: William Neal, P.E. - DTE Energy
John Seymour, P.E. - Geosyntec

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1. INTRODUCTION

1.1 Overview

The 2015 Annual Inspection Report (AIR) was prepared by Geosyntec Consultants (Geosyntec) to summarize the results of Inspection Monitoring and Maintenance (IMM) program at the DTE Energy (DTE) Monroe Ash Basin Embankment (Ash Basin). The IMM program was prepared to comply with United States Environmental Protection Agency (USEPA) Coal Combustion Residual (CCR) Rule (CCR Rule) published on April 17, 2015 (40 CFR 257.73). Under the CCR Rule, the Ash Basin is an "existing surface impoundment" and must be inspected by a qualified professional engineer on a periodic basis, not to exceed one year.

The results of the inspection document that the Monroe Ash Basin facility was designed, constructed, operated and maintained with generally accepted good engineering standards.

The site is located about one mile southwest of the Monroe Power Plant near Monroe, Michigan, and is bounded on the east by Lake Erie and the Plant discharge canal, on the west by Interstate Highway 75 (I-75), on the south by an agricultural field, and on the north by residential property and Plum Creek.

The Ash Basin was constructed in the early 1970s to contain a 400-acre ash basin to hold sluiced ash. The Ash Basin is constructed with a three and a half mile long embankment using on-site fine grained soils that were excavated within the footprint of the ash basin. Ash and water is pumped to the ash basin using four, above grade, pipelines consisting of steel and high density polyethylene pipes. After treatment in the ash basin water flows out from the ash basin through a discharge structure in accordance with National Pollutant Discharge Elimination System (NPDES) permit #MI0001848.

1.2 Purpose

Inspection, monitoring and maintenance of the embankment are performed by DTE pursuant to the combined monitoring and maintenance program described in IMM program (MONPP – 1301 – Rev. A) and the CCR Rule. The objective of the IMM program is to detect indications of potential slope instability in time to allow planning, design, and implementation of appropriate mitigation measures. Further, the purpose of the inspection under the CCR Rule is "…to ensure that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards." (40CFR 257.83(b)(1)). The purpose is accomplished through periodic visual inspection (and photo-documentation) of the embankment, monitoring of instrumentation intended to detect movement of the embankment, and review of construction and operating records since the last annual inspection.

1.3 Report Organization

The remainder of this report is organized as follows:

- Section 2 - Review of available information: summarizes various historical documents that were reviewed as part of this inspection.
- Section 3 - Inspection Results: summarizes visual observations recorded during inspections of the ash basin facility.
- Section 4 - Instrumentation Monitoring and Survey Results: presents the data from subsurface instrumentation monitoring and bathometry survey of the ash basin.
- Section 5 - Maintenance Activities: describes maintenance activities performed during 2015.
- Section 6 - Evaluation: evaluates the results of the visual inspection and instrumentation monitoring and provides recommendations for corrective actions as needed.
- Section 7 - Conclusion: provides the overall conclusions of the annual inspection.

1.4 Terms of Reference

The annual visual inspection was performed by Mr. Omer Bozok, P.E. and Mr. John Seymour, P.E. of Geosyntec[1], with assistance from DTE's qualified personnel.

The spring and weekly inspections, and monitoring of inclinometers were performed by DTE's qualified personnel.

This report was prepared by Mr. Omer Bozok, P.E. of Geosyntec. The peer review and senior reviews were completed by Mr. John Seymour, P.E. of Geosyntec.

[1] Omer Bozok, P.E. and John Seymour, P.E. of Geosyntec are the qualified professional engineers per the requirements of §257.53 of the CCR Rule. Both engineers have been heavily involved with Monroe Ash Basin since 2009, when the design efforts for the mitigation of the embankment started. Both engineers have extensive knowledge of the site.

2. REVIEW OF AVAILABLE INFORMATION

Geosyntec has been consistently involved with Monroe Ash Basin since 2009, when DTE retained Geosyntec for the design of the embankment mitigation project. As for the basis of annual inspection, Geosyntec reviewed the following documents, some of which were prepared by Geosyntec. These documents are summarized in the table below.

Title	Documentum No.	Prepared by	Year	Content
Monroe Fly Ash Disposal Basin Technical Report	MONPP-0144-77	DTE	1977	Design, construction and operational information.
Inspection, Monitoring and Maintenance Manual	MONPP-1301-Rev. A	Geosyntec	2014	Procedures for inspection, monitoring and maintenance of various facility structures.
Structural Integrity Assessment – Hydraulic Capacity and Safety Factor Assessment		Geosyntec	Ongoing	Results of hydraulic capacity and slope stability analyses.
Fill Plan Alternatives – Rev. B	MONPP-0154-15	Geosyntec	2015	Pros and cons of various fill plan alternatives for the remaining life of the ash basin.
Potential Failure Mode Analysis Results – Rev. 3	MONPP-0152-15	Geosyntec	2015	Results of potential failure mode analysis.
Geotechnical Site Characterization Report	MONPP-0135-10	Geosyntec	2012	Summary of data from various site investigation studies conducted around the perimeter of the embankment.

Title	Documentum No.	Prepared by	Year	Content
2009 Construction Completion Report	MONPP-0134-09	Geosyntec	2010	Construction information for the 2009 construction.
2010 Construction Completion Report	MONPP-0113-10	Geosyntec	2011	Construction information for the 2010 construction.
2011 Construction Completion Report	MONPP-0132-11	Geosyntec	2012	Construction information for the 2011 construction.
2012 Construction Completion Report	MONPP-0129-12	Geosyntec	2013	Construction information for the 2012 construction.
2013 Construction Completion Report	MONPP-0147-12	Geosyntec	2014	Construction information for the 2013 construction.
2014 Annual Inspection Report	MONPP-0152-14	Geosyntec	2015	Summary of quarterly inspection results for 2014.
Overliner Construction, Phase 1- Construction Quality Assurance Report	MONPP-0155-15	Golder	2015	Construction completion document.
Dust Control Plan	MONPP CCR Fugitive Dust Plan	DTE		Dust control plan.

3. VISUAL INSPECTION RESULTS

DTE performed the following visual inspections in 2015:

- Spring inspection on May 12, 2015;
- Annual inspection (fall inspection) on October 23, 2015 (provided in Appendix A); and
- Weekly inspections since October 17, 2016.

The spring inspection is not required by the CCR Rule, but has been completed in accordance with the IMM Program. DTE's visual inspection for the annual inspection included the embankment crest, exterior slopes of the embankment, ash discharge point, discharge structure, discharge pipe through the embankment, and discharge channel to Lake Erie. Photographs of observed conditions were taken at the time of the inspection.

In addition to spring, annual and weekly inspections, the general condition of the site and embankment was visually inspected by DTE on a daily basis.

No changes to the geometry of the embankment were noticed when compared to 2014 grades. However, the grades within the filled area in the northwest quadrant of the ash basin have been changed and a new access ramp/road has been constructed out over the ash basin. Solid Waste Disposal Area Construction Permit #4147 was issued by the Michigan Department of Environmental Quality (MDEQ) on July 31, 2015 for a vertical extension (above the top of existing ash that is above the water level) of the landfill, and construction activities have been underway continuously since August 2015 and will continue until all of the phases are constructed. The MDEQ approved (via email) the Phase 1 construction quality assurance report and authorized DTE to operate Phase 1 on October 14, 2015. This area receives CCR via trucks from the plant and does not receive sluiced CCR that are a part of the Ash Basin surface impoundment; therefore the vertical extension will be addressed in a separate landfill annual inspection report.

The new access ramp near station 55+00 has not compromised the global structural stability of the Ash Basin embankment.

In general, no sign of distress was observed during the annual inspection on the embankment crest, exterior slopes of the embankment and discharge structure. These structures appeared to be in good condition with the exception of a couple of areas. Non-optimal conditions that were observed during visual inspections are summarized below. These conditions do not represent an immediate concern for the safe operation or stability of the ash basin embankment as discussed in Section 6.

1. Surficial sloughs up to several feet deep were observed on the exterior slope of the embankment at three separate areas: (i) at Station ~67+00 extending approximately 120 ft along the embankment, which damaged the midslope stormwater ditch (see Photographs 37 thru 40 in Appendix A); (ii) from Station 140+00 to 145+00 causing damage to the midslope stormwater ditch (see Photographs 24 thru 26 in Appendix A); and (iii) at Station 162+00 extending approximately 90 ft along the embankment (see Photographs 20 and 21 in Appendix A).

2. An erosion gully approximately one-foot deep was observed on the embankment under the trestle structure, where slurry lines reach the embankment at Station 0+00 (see Photograph 11 in Appendix A).

3. Some of the welds along the western sheet pile flow control wall between the upper beam and sheet pile, and between lower beam and sheet pile appeared to be broken (see Photographs 12 and 13 in Appendix A).

4. A crack, approximately 20-ft long and up to several inches wide, was observed at Station ~122+00 by the outer edge of the crest perimeter road (see Photographs 29 and 30 in Appendix A). Approximately 5-ft long, an inch wide crack was observed in the middle of upper slope at Station 78+50 (see Photograph 36 in Appendix A).

5. An erosion gully, approximately six-inches deep, was observed at the toe of the embankment at Station ~110+00 (see Photographs 31 and 32 in Appendix A). An erosion gully, approximately one-foot deep, was observed at the same station on the other side of the perimeter road away from the embankment (Photograph 33 in Appendix A).

6. An accumulation of pea gravel was observed at the downstream end of the downchutes at multiple locations (Stations 27+00, 32+00, 145+00 and 150+00). The accumulations of pea gravel had been reported in the inspections of previous years and stopped after repairs were implemented. Qualified personnel reported in the spring inspection that the pea gravel accumulation at Station 150+50 increased substantially compared to fall 2014 inspection. This downchute was repaired by the time annual inspection was completed (see Section 5 for more information).

7. The midslope stormwater ditch appeared to lose contact with adjacent soil along the downstream edge at multiple locations. In general, the upslope edge appeared to have good contact with adjacent soil.

8. Numerous holes, approximately two-inch in diameter, were observed on the upslope side of the midslope stormwater ditch between Stations 14+00 and 35+00 (see Photograph 11 in Appendix A); they appeared to be animal burrows.

9. Potholes and ruts on the embankment crest were observed along the southern embankment, which are scattered between Stations 110+00 and 139+00. A separate rut was observed at Station 20+00 (see Photograph 4 in Appendix A).

10. Erosion rills were observed on the access ramp at Station 0+00 (see Photograph 10 in Appendix A).

In addition to non-optimal conditions summarized above, sloughing was observed on the exterior slope of the embankment between spring and fall inspections. Sloughs, up to several feet deep, were observed at Stations 55+00 and 115+00. Both of these areas were repaired by the fall inspection (see Section 5 for more information).

4. INSTRUMENTATION MONITORING AND BATHOMETRY SURVEY RESULTS

4.1 Inclinometers

4.1.1 Inclinometer Monitoring Procedures

Five inclinometers (SIs) are currently being monitored at the embankment. The inclinometer casings were installed from the crest of the embankment to depths of approximately 45 to 50 feet below the crest. The purpose of the inclinometers is to provide a means of measuring horizontal displacement of the ground in which the casing is installed. The inclinometer readings provide values of horizontal displacement at discrete depths (2-ft intervals) in two orthogonal directions (A-axis and B-axis). Plots of horizontal displacement versus depth are generated that provide a vertical profile of the horizontal displacement experienced by the inclinometer casing at the time of the reading.

The orientation of the A-axis and B-axis are unique to the individual inclinometer casing. In general, the positive A-axis corresponds to a direction oriented outward from the basin and approximately perpendicular to the embankment crest station baseline. The B-axis is oriented parallel to the embankment crest station baseline.

4.1.2 Displacement versus Instrumentation Accuracy

DTE collected the inclinometer readings in March 2015 and monthly since September 2015. Appendix B presents a tabulation of the magnitude of incremental and total horizontal displacements in the A-axis and B-axis directions obtained from the readout data. The tabulation also includes values of the displacement accuracy of the instrumentation based on criteria from Slope Indicator Company (manufacturer of the inclinometer instrumentation). Slope Indicator Company estimates that system field accuracy is ±0.3 in. per 100 ft. (±7.6 mm per 30 m), which includes a combination of random and systematic errors. The current A-axis displacements at SI-6, SI-7 and SI-8 are above the estimated accuracy of the instrumentation. The remaining inclinometers are below or slightly above the estimated accuracy of the instrumentation.

4.1.3 Characterization of Displacement versus Depth Profile Plots

The horizontal displacement versus depth profiles are summarized below for the latest readings (December 2015). These conditions do not represent an immediate concern for the safe operation or stability of the ash basin embankment as discussed in Section 6

4.1.3.1 *Inclinometer SI-4*

- A-axis direction

  - Cumulative displacement versus depth profile curve characterization: Cumulative displacements are minor and less than instrumentation accuracy.
  - Maximum cumulative displacement magnitude and direction: +0.10 inch at 2 feet below the top of the casing.
- B-axis direction
  - Cumulative displacement versus depth profile curve characterization: Cumulative displacements are minor and less than instrumentation accuracy.
  - Maximum cumulative displacement magnitude and direction: -0.11 inch at 2 feet below the top of the casing.

4.1.3.2 *Inclinometer SI-5*

- A-axis direction
  - Cumulative displacement versus depth profile curve characterization: Cumulative displacements are minor and generally less than instrumentation accuracy.
  - Maximum cumulative displacement magnitude and direction: +0.23 inch at 2 feet below the top of the casing.
- B-axis direction
  - Cumulative displacement versus depth profile curve characterization: Cumulative displacements are minor and less than instrumentation accuracy.
  - Maximum cumulative displacement magnitude and direction: +0.05 inch at 2 feet below the top of the casing.

4.1.3.3 *Inclinometer SI-6*

- A-axis direction
  - Cumulative displacement versus depth profile curve characterization: Cantilever type movement was observed with the outward-trend starting approximately 25 feet below top of casing with slight gradual increase in slope of curve in upper 15 feet.
  - Maximum cumulative displacement magnitude and direction: +0.55 inch at 6 feet below the top of the casing.
- B-axis direction
  - Cumulative displacement versus depth profile curve characterization: Cumulative displacements are minor and less than instrumentation accuracy.
  - Maximum cumulative displacement magnitude and direction: 0.05 inch at 6 feet below the top of the casing.

4.1.3.4 *Inclinometer SI-7*

- A-axis direction
  - Cumulative displacement versus depth profile curve characterization: Cantilever type movement was observed with the outward-trend starting approximately 25 feet below top of casing.
  - Maximum cumulative displacement magnitude and direction: +0.46 inch at 2 feet below the top of the casing.
- B-axis direction
  - Cumulative displacement versus depth profile curve characterization: Cumulative displacements are minor and less than instrumentation accuracy.
  - Maximum cumulative displacement magnitude and direction: -0.09 inch at 4 feet below the top of the casing.

4.1.3.5 *Inclinometer SI-8*

- A-axis direction
  - Cumulative displacement versus depth profile curve characterization: Cantilever type movement was observed with the outward-trend starting approximately 30 feet below top of casing.
  - Maximum cumulative displacement magnitude and direction: +0.48 inch at 2 feet below the top of the casing.
- B-axis direction
  - Cumulative displacement versus depth profile curve characterization: Cumulative displacements are minor and generally less than instrumentation accuracy.
  - Maximum cumulative displacement magnitude and direction: +0.22 inch at 2 feet below the top of the casing.

4.2 Bathometry Survey Results

The bathometry survey of the ash basin was performed by DTE survey crew in mid-October 2015. The following were observed or estimated based on the survey results.

1) Water level at the time of survey was at elevation 608.2 ft[2], which is lower than the operation water level of 609 ft.

[2] Elevations referred to in this report are based on National Geodetic Vertical Datum of 1929 (NGVD29).

2) Approximately 70 percent of the ash basin footprint is filled with ash above the water level.

3) The maximum water depth is approximately 38 ft, with the bottom of the ash at approximately elevation 570.2 ft.

4) The maximum ash thickness is approximately 50 ft, measured from the top of ash at approximate elevation 613 ft to the bottom of the ash basin, which is at approximate elevation 563 ft. The minimum thickness of ash is approximately 7 ft. As for comparison to the previous year, the maximum and minimum ash thicknesses were 50 ft and 6 ft, respectively.

5) As of the time of the bathymetry:

    a. the remaining capacity of the Ash Basin is approximately 4.2 million cubic yards

    b. approximately 23 million cubic yards of ash is deposited in the ash basin

    c. approximately 32 million gallons of water is impounded in the ash basin

5. MAINTENANCE ACTIVITIES PERFORMED IN 2015

The following maintenance activities were performed in 2015 prior to the annual inspection:

- Exterior slope of the embankment, where up to several feet deep sloughs were observed at Stations approximately 55+00 and 115+00, were repaired by replacing sloughed soil with compacted aggregate. MDOT 6AA coarse aggregate was placed as the base aggregate and capped with MDOT 21AA dense graded aggregate. A downchute consisting of MDOT 6AA was constructed at Station 115+00 to convey stormwater to the toe of the embankment (see Photograph 46 in Appendix A). No downchute was constructed for the slough repair at Station 55+00, because the sloughed area was by the toe of the embankment (see Photograph 47 in Appendix A).
- The HDPE downchute at Station 150+50 was replaced with a rock downchute (see Photograph 48 in Appendix A).
- DTE is currently in the process of repairing the sloughed areas at Stations 67+00, from Station 140+00 to 145+00, and Station 162+00. The repair procedure consists of replacing sloughed soil with compacted aggregate (combination of MDOT 6AA and 21AA), and re-anchoring or replacing the existing midslope stormwater ditch with a drainage system consisting of a perforated pipe culvert and a 3-inch gravel fill.
- The sluice lines were moved in 2015 into two areas:
    - Along the south side, the discharge point was moved to approximately Station 115+00.
    - Along the north side, new 12-inch HDPE sluice piping was added from Station 0+00 that extends to Station 23+00 along the embankment crest. At Station 23+00 the pipe extends inward westerly to discharge at Station 104+00 (across from south embankment).

  The new locations of the sluice discharge points do not affect embankment stability.

6. EVALUATION

6.1 Visual Inspection

Non-optimal conditions noted from the 2015 annual inspections are discussed below:

- Sloughs observed on the embankment at Stations 67+00, from 142+00 to 145+00, and at 162+00 do not represent an immediate concern for global stability of the ash basin embankment; these sloughs were reportedly repaired after the annual inspection and will be further inspected in 2016.

- Approximately one-foot deep erosion gully that was observed on the embankment under the trestle structure does not represent an immediate concern for the safe operation or stability of the ash basin embankment; the repair was reportedly made in accordance with the IMM Manual after the annual inspection and will be further inspected in 2016.

- Multiple broken welds that were observed at the discharge structure do not represent an immediate concern for the safe operation or stability of the ash basin embankment. DTE is currently working on designing modifications to the discharge structure and repair of the broken welds.

- The crack that was observed at the top of the embankment at Station 122+00 does not represent an immediate concern for the safe operation or stability of the ash basin embankment. The crack should be monitored on a regular basis at a frequency of once every 30 days (maximum).

- Erosion features observed by the toe of the embankment and by the lower perimeter road at Station 110+00 do not represent an immediate concern for the safe operation or stability of the ash basin embankment; however, these erosion features can be a source of sediment in stormwater runoff. The repair was reportedly made in accordance with the IMM Manual after the annual inspection and will be further inspected in 2016.

- Isolated problems with the midslope ditch bedding (i.e. pea stone) washing out were observed at downchutes at Stations 27+00, 32+00 and 145+00. The observed problems do not represent an immediate concern for the safe operation or stability of the ash basin embankment. However, these downchutes shall be fixed in accordance with IMM Manual to reduce erosion along downchutes.

- The gap between midslope ditch flap and adjacent ground was observed at various sections along the embankment. These gaps do not represent an immediate concern for the safe operation or stability of the ash basin. However, gaps on the upstream side of the

midslope ditch shall be filled in accordance with IMM Manual to direct stormwater into the midslope ditch.

- Numerous approximately two-inch diameter holes, which appeared to be animal burrows, do not represent an immediate concern for the safe operation or stability of the ash basin embankment. However, animal burrows should be maintained in accordance with IMM Manual.

- Potholes and ruts on the embankment crest do not represent an immediate concern for the safe operation or stability of the ash basin embankment. However, they should be maintained within a year in accordance with IMM Manual.

- Erosion rills observed on the access ramp at Station 110+00 do not represent an immediate concern for the safe operation or stability of the ash basin embankment. The repair was reportedly made in accordance with the IMM Manual after the annual inspection and will be further inspected in 2016.

6.2 Inclinometer Monitoring

Results of the second 2015 inclinometer survey show that most horizontal displacement values are near or less than the instrumentation accuracy. The maximum cumulative displacement for all of the inclinometers is 0.55-inches at 4 ft below top of the casing at SI-6. There is no visible movement trend for SI-4 and SI-5. Cantilever type movement is observed for SI-6, SI-7 and SI-8. There is no evidence of structurally significant movement of the embankment at the monitored locations that would suggest a detrimental change in the condition of the embankment or a reduction in the stability of the structure.

7. CONCLUSION AND CERTIFICATION

The annual visual inspection did not identify evidence of structural weakness or instability.

Based on the annual inspection results and review of the available data, the Monroe Ash Basin facility was designed, constructed, operated and maintained with generally accepted good engineering standards.

Certified by:

_____ Date 1/13/16

Omer Bozok, P.E. Michigan License Number 6201062700
Engineer

_____ Date 1/13/2016

John Seymour, P.E. Michigan License Number 620103356
Senior Principal

8. REFERENCES

Durham Geo Slope Indicator. Digitilt Inclinometer Probe Data Sheet. 2011. <http://www.slopeindicator.com/instruments/readout-datamate.html>

APPENDIX A

2015 ANNUAL INSPECTION (FALL INSPECTION) FORMS AND PHOTOS

DTE Energy

MONROE POWER PLANT ASH BASIN ANNUAL INSPECTION

Name of Surface Impoundment: Monroe Ash Basin
Surface Impoundment ID Number:
Owner: DTE Energy
Operator: DTE Energy
Site Conditions: Dry, high 60s.

Qualified Engineer: Omer Bozok and John Seymour
Date: 23-Oct-15
Weather: Dry, high 60s, cloudy
Precipitation (since last inspection): 0.1 in.

I. Crest

1. Describe the condition of the crest. Are there any depressions, ruts, or holes on the crest? (Provide size, location, etc.)
The general condition of the crest is in good condition around the ash basin perimeter. The crest is level in general with the exception of multiple areas where ruts and potholes were observed. No cracks were observed on the crest. Most potholes and ruts were observed along the southern embankment and scattered between Stations 110+00 and 139+00. Another rut was observed at Station 20+00.

2. Are there are cracks on the crest? If there are, describe depth, length, width, location and direction of cracking, etc.
No cracks were observed on the crest.

3. Are there any trees or other undesired vegetation on the crest? ___ Yes X No
If 'Yes', describe (type of vegetation, size, location, etc.)

4. Other observations on the crest (changes since last inspection, etc.):
Tire rut was observed along the outer edge of the crest (see Photograph 4).

II. Embankment Slopes

1. How would you describe the vegetation on the downstream slope? (Check all that apply)

X Recently Mowed	Other (describe):
X Slope surface visible	Approximately 800-ft long stretch between Stations 4+00 and 12+00 had
X Overgrown (Greater than 6-in.)	vegetation with height up to approximately 12 in. Additional care was given to
X Good Cover	inspection in this area. The slope surface was visible and did not impede
___ Sparse	inspection.

2. Are there any areas of hydrophilic (lush, water-loving) vegetation on downstream slope? ___ Yes X No
If 'Yes', describe (size, location, severity, etc.) Hydrophilic vegetation was only observed within the areas along the toe of the embankment that were delineated as wetlands.

3. Are there any trees or other undesired vegetation on the downstream slope? X Yes ___ No
If 'Yes', describe (type of vegetation, size, location, etc.) No trees were observed. However, various types of weeds were observed scattered across on the embankment slopes from Station 60+00 to 155+00.

4. Are there any depressions, heave, holes, or erosion on the downstream slope? X Yes ___ No
If 'Yes', describe (size, location, severity, etc.) Various sloughs and heaves were observed on three separate locations (Stations ~67+00, ~143+00, and ~162+00). See Photographs 20, 21, 24 - 26, 37 - 40 for more information. Erosion gully was observed under the pipe trestle at Station 0+00 (see Photograph 11).

Name of Surface Impoundment: Monroe Ash Basin **Qualified Engineer:** Omer Bozok and
Surface Impoundment ID Number: John Seymour

5. Are there any cracks, sloughs, or indications of slope distress on the downstream slopes? ___ Yes ___ No
If 'Yes', describe (size, location, severity, etc.) See comments for Item 4. In addition, cracks were observed at two separate locations. At Station ~122+00, up to couple of inches wide, ~20-ft long crack was observed close to crest road (see Photographs 29 and 30). At Station78+50, in the middle section of the upper slope, an inch wide, five-feet long crack was observed (see Photograph 36). These two areas should be monitored regularly.

6. Are there wet areas on the downstream slope? ___ Yes X No
If 'Yes', describe (size, location, etc.)

7. Are there any active seeps (flowing water) from the slope of the embankment? ___ Yes X No
If 'Yes', describe (size, location, flow quantity and color, etc.)

8. Are there any active seeps or wet areas at the toe of the embankment? ___ Yes X No
If 'Yes', describe (size, location, etc.) No active seeps were observed. Standing/running water was observed in the areas delineated as wetlands and within the stormwater channel at the southeast corner of the ash basin.

9. Are there any animal burrows (larger than 2 in.) on the downstream slope? X Yes ___ No
If 'Yes', describe (size, extent, location, etc.) Numerous holes in ~2-in diameter, appeared to be animal burrows, were observed on the upslope side of the midslope stormwater ditch between Stations 14+00 and 35+00 (see Photograph 3).

10. Other observations on the downstream slope (changes since last inspection, etc.):

III. Surface Impoundment Conditions

1. Is the in-flow piping to the surface impoundment obstructed? ___ Yes X No
If 'Yes', describe (type of debris, reason for obstruction, etc.)

2. What is the water level in the surface impoundment today?
Maximum Pool Level / Datum 609 ft / NGVD29
Pool Level is 608.3 ft / NGVD29

3. Is there any erosion protection around the impoundment (e.g., riprap)? X Yes ___ No
If 'Yes', describe what type and its condition (riprap - adequate, inadequate, obstructed, etc.) The most inner perimeter of the ash basin is covered with ash and phragmites obscuring the majority of the ash basin upstream slope. Historical documents indicate that riprap was placed along the upper portion of the embankment and can be observed at the edge of the crest road in many places.

Name of Surface Impoundment: Monroe Ash Basin **Qualified Engineer:** Omer Bozok and John Seymour

Surface Impoundment ID Number:

4. Is there CCR build-up above the water surface? X Yes ___ No

If 'Yes', describe (size of area, location, severity, etc.) Approximately 70 percent the ash basin is at capacity and above the water elevation.

5. Other observations around the impoundment (changes since last inspection, etc.):

Slurry lines #1, 3 and 6 were extended from Station 129+00 to Station 115+00 with 12-in diameter HDPE pipes. Slurry line #4 was extended from Station 0+00 to 23+00 with 12-in diameter HDPE pipe along the crest of the embankment; from Station 23+00 the pipe is extended inward to discharge into the ash basin at Station 96+00. For the north west quadrant of the ash basin, Solid Waste Disposal Area Construction Permit #4147 was issued by the Michigan Department of Environmental Quality (MDEQ) on July 31, 2015 for a vertical extension (above the top of existing ash that is above the water level) of the landfill, and construction activities have been underway continuously since August 2015 and will continue until all of the phases are constructed.

IV. Discharge Structure and Channel

1. Are there any cracks or breaks in concrete or steel parts of the discharge structure? (If 'Yes' report the location and severity). Multiple welds connecting the sheetpile wall to upper and lower beams seem to be broken. Otherwise, the discharge structure is appeared to be in working condition.

2. How would you describe the overall condition of discharge structure? (Check all that apply)

- X Functioning Normally
- ___ Not Functional
- ___ Deteriorated
- X Damaged
- X Adequate
- ___ Inadequate

Other (describe):

3. Is water flowing freely through the discharge structure? X Yes ___ No

If 'No', describe (type of debris, reason for obstruction, etc.)

4. Are there any cracks, sloughs, or indications of slope distress on the upstream slope in the vicinity of discharge structure? If 'Yes', describe (size or area, location, severity, etc.)

No sign of distress.

5. Describe the turbidity of discharge from the concrete outlet. Water coming out of the discharge structure is clear.

6. Is the weir at the downstream of discharge channel in working condition? Yes

If 'No', describe the issue.

DTE Energy

MONROE POWER PLANT ASH BASIN ANNUAL INSPECTION

Name of Surface Impoundment: Monroe Ash Basin **Qualified Engineer:** Omer Bozok and John Seymour

Surface Impoundment ID Number:

V. Slurry Piping

1. Are there any breaks or leaks along the embankment? ___ Yes X No

If 'Yes', describe (the line #, location, severity, etc.)

VI. Repairs, Maintenance, Action Items

1. Has any routine maintenance been conducted since the last inspection? X Yes ___ No

If 'Yes', describe. Reconstruction of sloughed areas is currently underway.

2. Have any repairs been made since the last inspection? ___ Yes X No

If 'Yes', describe.

3. Has this inspection identified any need for repair or maintenance? X Yes No

If 'Yes', describe and state the urgency of maintenance. "Urgent" for maintenance that should be conducted as soon as possible, "Moderate" for maintenance that should be conducted within three months, and "Not Urgent" for maintenance that can be conducted in a year.

The embankment at the existing slough locations (Stations ~67+00, ~143+00, and ~162+00) should be reconstructed as soon as possible. Erosion gullies observed on the slope at Station 0+00 and at the toe of the embankment at Station 10+00 are considered as "moderate" urgency and should be addressed in the next three months. Ruts and potholes observed on the crest road are considered as "not urgent", but should be addressed within a year.

VIII. Photography

Photographs can be taken of notable features. List of photographs:

	Location	Direction of Photo	Description
i.	SEE THE ATTACHED PHOTO LOG.		
ii.			
iii.			
iv.			
v.			
vi.			
vii.			
viii.			
ix.			
x.			

DTE ENERGY

Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 1 Date: 23 October 2015 Comments: Photo taken at Station ~22+00, facing west. The northern embankment between Stations 4+00 and 45+00 appeared to have uniform slopes without sign of distress.	
Photograph 2 Date: 23 October 2015 Comments: Photo taken at Station ~16+00, facing east. The northern embankment between Stations 4+00 and 45+00 appeared to have uniform slopes without sign of distress.	

DTE ENERGY

Photographic Record

Client: Detroit Edison	Project Number:
Site Name: Monroe Power Plant Ash Basin	Site Location: Monroe, MI

Photograph 3 Date: 23 October 2015 Comments: Numerous holes in ~2-in diameter, appeared to be animal burrows, were observed on the upslope side of the midslope stormwater ditch between Stations 14+00 and 35+00.	
Photograph 4 Date: 23 October 2015 Comments: Photo taken at Station ~20+00, facing west. The crest between Stations 4+00 and 45+00 appeared to be level without sign of distress. A localized rutting by the outer edge of the road was observed at this station.	

DTE ENERGY

Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 5 Date: 23 October 2015 Comments: Photo taken at Station ~20+00, facing east. The crest between Stations 4+00 and 45+00 appeared to be level without sign of distress.	
Photograph 6 Date: 23 October 2015 Comments: Photo taken at Station ~18+00, facing west. The midslope stormwater ditch appeared to have good contact with adjacent soil between Stations 14+00 and 35+00.	

DTE ENERGY

Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 7 Date: 23 October 2015 Comments: Photo taken at Station ~18+00, facing north. The downchute at this station appeared to be in good condition.	
Photograph 8 Date: 23 October 2015 Comments: Photo taken at Station ~12+00, facing east. The northern embankment between Stations ~4+00 and ~12+00 had vegetation that was approximately 12-in long. Additional care was given to inspection in this area.	

DTE ENERGY

Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 9 Date: 23 October 2015 Comments: The northern embankment between Stations ~4+00 and ~12+00 had vegetation that was approximately 12-in long. Additional care was given to inspection in this area.	
Photograph 10 Date: 23 October 2015 Comments: Photo taken at Station ~2+00, facing south. Erosion rills were observed on access ramps at Station 0+00.	

DTE ENERGY

Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 11

Date: 23 October 2015

Comments: Photo taken at Station 0+00 under the pipe trestle. Approximately a foot deep gully was observed under the northern most pipe. No ash was observed on the slope.

Photograph 12

Date: 23 October 2015

Comments: Photo taken at Station 179+00 at the discharge structure. Water level in the ash basin was approximately at 606.8 ft (IGLD55) = 608.3 ft (NGVD29) at the time of inspection.

DTE ENERGY

Photographic Record

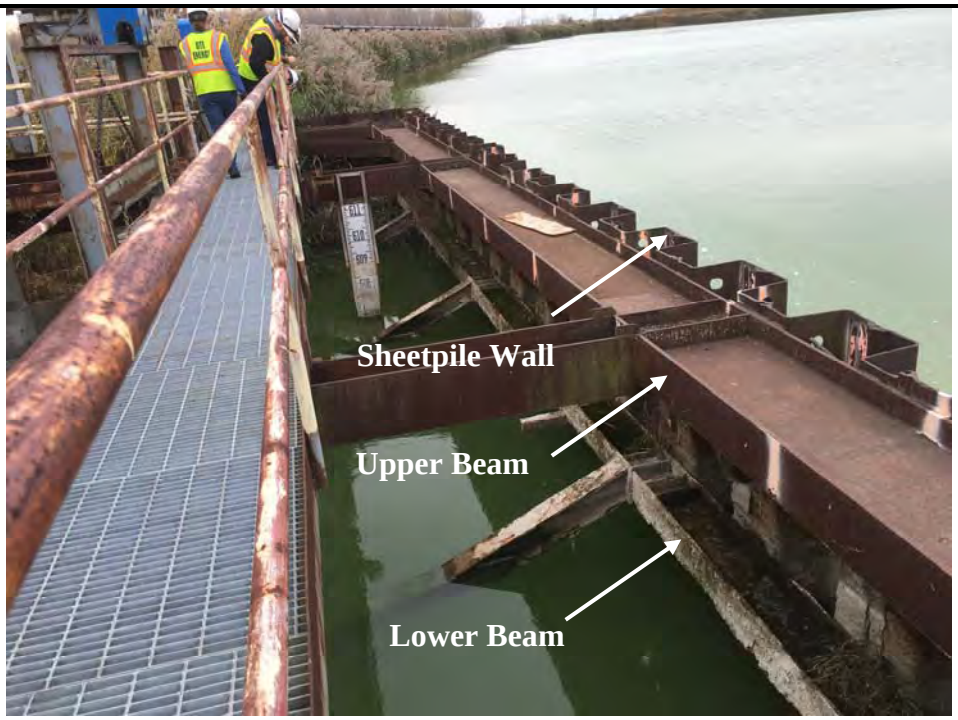
Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 13

Date: 23 October 2015

Comments: Photo taken at Station 179+00 at the discharge structure, facing south. Some of the welds between the beam and Sheetpile wall appeared to be cracked. DTE is currently in the process of design and repair of broken welds.



Photograph 14

Date: 23 October 2015

Comments: Photo taken at Station 179+00 at the discharge structure. Water flows through the discharge pipes without obstructions.

DTE ENERGY

Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 15

Date: 23 October 2015

Comments: Photo taken at Station 179+00 at the discharge outlet. Water appeared to be clear coming out of the discharge outlet pipes, indicating no internal erosion.

Photograph 16

Date: 23 October 2015

Comments: Photo taken at Station ~169+00, facing south. The eastern embankment between Stations 4+00 and 162+00 appeared to have uniform slopes without sign of distress.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 17

Date: 23 October 2015

Comments: Photo taken at Station ~167+00, facing south. The eastern embankment between Stations 4+00 and 162+00 appeared to have uniform slopes without sign of distress.

Photograph 18

Date: 23 October 2015

Comments: Photo taken at Station ~165+00, facing north. The crest of the eastern embankment between Stations 4+00 and 155+00 appeared to be level without sign of distress.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 19

Date: 23 October 2015

Comments: Photo taken at Station ~163+00, facing northwest. The eastern embankment between Stations 4+00 and 162+00 appeared to have uniform slopes without sign of distress.

Photograph 20

Date: 23 October 2015

Comments: Photo taken at Station ~162+00, facing north. Sloughs, cracks and heave were observed on the slope along ~90 ft of the embankment. DTE is currently in the process of design and repair of the embankment at this location.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 21

Date: 23 October 2015

Comments: Photo taken at Station ~162+00. Sloughs, cracks and heave were observed on the slope along ~90 ft of the embankment. DTE is currently in the process of design and repair of the embankment at this location.

Photograph 22

Date: 23 October 2015

Comments: Photo taken at Station ~155+00, facing southwest. The crest of the southeastern embankment between Stations 139+00 and 155+00 appeared to be level without sign of distress.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 23

Date: 23 October 2015

Comments: View of the southeastern embankment from Station 155+00, facing southwest.

Photograph 24

Date: 23 October 2015

Comments: Photo taken at Station ~145+00, facing west. Sloughs, cracks and heave were observed on the embankment between Stations 140+00 and 145+00. DTE is currently in the process of design and repair of the embankment at this location.

DTE ENERGY

Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 25

Date: 23 October 2015

Comments: Photo taken at Station ~145+00, facing west. Sloughs, cracks and heave were observed on the embankment between Stations 140+00 and 145+00. DTE is currently in the process of design and repair of the embankment at this location.

Photograph 26

Date: 23 October 2015

Comments: Photo taken at Station ~143+00, facing east. Sloughs, cracks and heave were observed on the embankment between Stations 140+00 and 145+00. DTE is currently in the process of design and repair of the embankment at this location.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 27

Date: 23 October 2015

Comments: Photo taken at Station ~130+00, facing east. The crest of the southern embankment between Stations 110+00 and 139+00 appeared to be generally level without sign of distress. Several ruts and potholes were observed.

Photograph 28

Date: 23 October 2015

Comments: Photo taken at Station ~127+00, facing east. The southern embankment between Stations 110+00 and 139+00 appeared to have uniform slopes without sign of distress, except ~20-ft long stretch at Station ~122+00 (see Photographs 29-31).

DTE ENERGY
Photographic Record

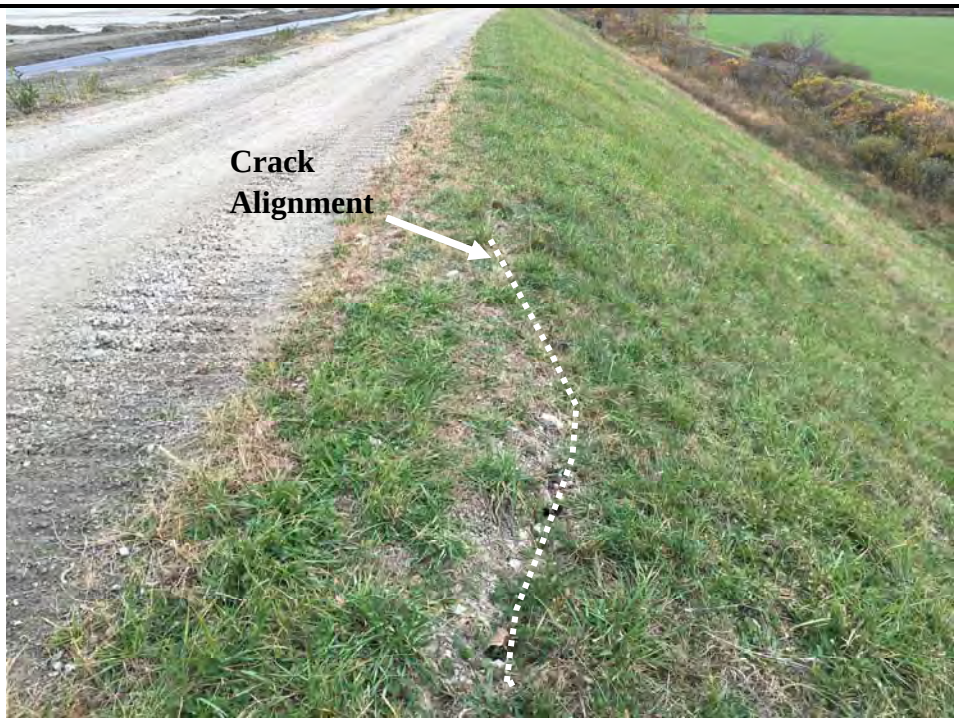
Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 29

Date: 23 October 2015

Comments: Photo taken at Station ~122+00, facing east. Up to a couple of inches wide ~20-ft long crack was observed along the upper embankment by the road.



Photograph 30

Date: 23 October 2015

Comments: Photo taken at Station ~122+00, facing east. Up to a couple of inches wide ~20-ft long crack was observed along the upper embankment by the road. Rutting was also observed on the road immediately adjacent to the crack.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 31 Date: 23 October 2015 Comments: Photo taken at Station ~110+00, facing north. Erosion was observed at the toe of the embankment. Aggregate that was previously placed washed out.	
Photograph 32 Date: 23 October 2015 Comments: Photo taken at Station ~110+00, facing south. Erosion was observed at the toe of the embankment. Aggregate that was previously placed washed out.	

DTE ENERGY

Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 33 Date: 23 October 2015 Comments: Photo taken at Station ~110+00, facing north. Erosion was observed along the side of the perimeter road (away from the embankment).	
Photograph 34 Date: 23 October 2015 Comments: Photo taken at Station ~100+00, facing west. The southern embankment between Stations 88+00 and 110+00 appeared to have uniform slopes without sign of distress.	

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 35

Date: 23 October 2015

Comments: Photo taken at Station ~75+00, facing south. The western embankment between Stations 88+00 and 69+00 appeared to have uniform slopes without sign of distress, except a small section (see Photograph 36).

Photograph 36

Date: 23 October 2015

Comments: Photo taken at Station ~78+50. An inch wide, five-feet long crack was observed on the middle of upperslope (upslope of the midslope stormwater ditch).

DTE ENERGY

Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 37

Date: 23 October 2015

Comments: Photo taken at Station ~67+00, facing east. Sloughs and heave were observed on the embankment that stretch ~120 ft along the embankment. DTE is currently in the process of design and repair of the embankment at this location.

Photograph 38

Date: 23 October 2015

Comments: Photo taken at Station ~67+00, facing east. Sloughs and heave were observed on the embankment that stretch ~120 ft along the embankment. DTE is currently in the process of design and repair of the embankment at this location.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 39

Date: 23 October 2015

Comments: Photo taken at Station ~67+00, facing west. Sloughs and heave were observed on the embankment that stretch ~120 ft along the embankment. DTE is currently in the process of design and repair of the embankment at this location.

Photograph 40

Date: 23 October 2015

Comments: Photo taken at Station ~67+00, facing west. Sloughs and heave were observed on the embankment that stretch ~120 ft along the embankment. DTE is currently in the process of design and repair of the embankment at this location.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 41

Date: 23 October 2015

Comments: Photo taken at Station ~60+00, facing west. The northern embankment between Stations 45+00 and 49+00 appeared to have uniform slopes without sign of distress, except the sloughed area at Station ~67+00.

Photograph 42

Date: 23 October 2015

Comments: Photo taken at Station ~59+00, facing east. The crest between Stations 45+00 and 69+00 appeared to be level without sign of distress.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 43

Date: 23 October 2015

Comments: Photo taken at Station ~125+00, facing west. HDPE Slurry lines along the southern embankment.

Photograph 44

Date: 23 October 2015

Comments: Photo taken at Station ~115+00, facing north. Slurry appears to flow without obstructions.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 45

Date: 23 October 2015

Comments: Midslope stormwater ditch appeared to lose contact with adjacent soil along the downstream edge at multiple locations.

Photograph 46

Date: 23 October 2015

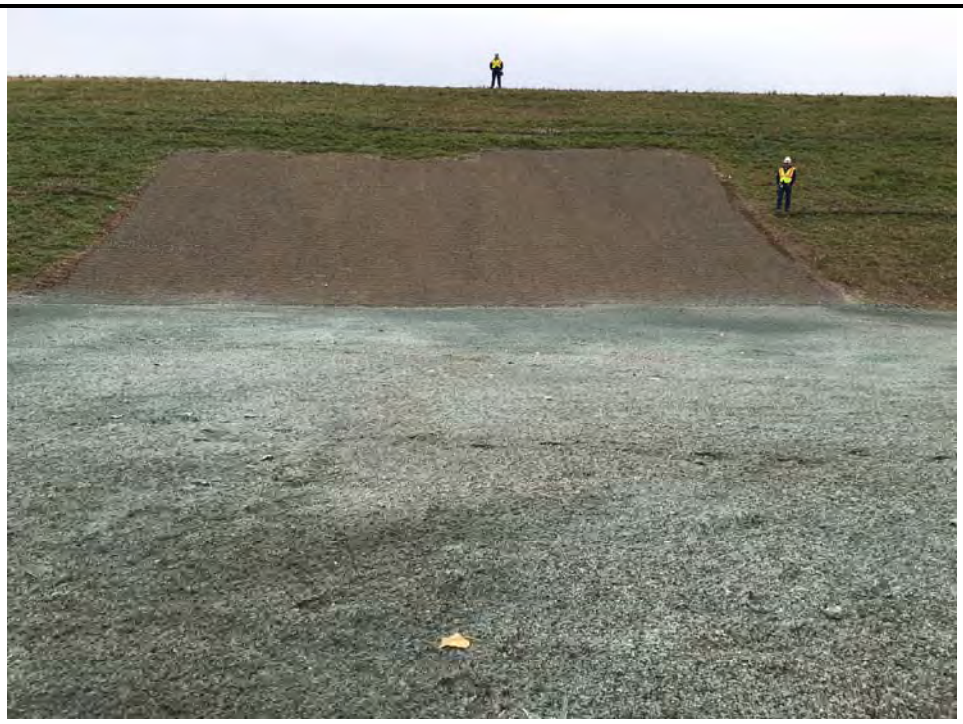
Comments: Photo taken at Station 115+00, facing north. The embankment after slough repairs. Sloughing was observed between spring and fall inspections.

DTE ENERGY
Photographic Record

Client: Detroit Edison | Project Number:

Site Name: Monroe Power Plant Ash Basin | Site Location: Monroe, MI

Photograph 47



Date: 23 October 2015

Comments: Photo taken at Station 55+00, facing south. The embankment after slough repairs. Sloughing was observed between spring and fall inspections.

Photograph 48

Date: 23 October 2015

Comments: HDPE downchute at Station 150+50 was replaced with rock downchute.

APPENDIX B
SUMMARY OF SLOPE INCLINOMETER READINGS

APPENDIX B - SUMMARY OF INCLINOMETER DISPLACEMENTS AND ESTIMATED ACCURACY
DTE Monroe Ash Basin

SI #	Incremental Displacement for December 2015 (in.)		Cumulative Displacement for December 2015 (in.)		Depth (feet)	Estimated System Accuracy At Top Of Casing [1] (inch)
	A-Axis	B-Axis	A-Axis	B-Axis		
4	-0.02 to 0.03	-0.006 to 0.007	0.00 to 0.10	-0.01 to 0.02	49	+/- 0.15
5	-0.01 to 0.09	-0.002 to +0.007	0.00 to 0.23	0.00 to 0.05	49	+/- 0.15
6	-0.17 to 0.06	-0.005 to +0.03	0.00 to 0.55	-0.01 to 0.05	45	+/- 0.14
7	0.00 to 0.04	-0.09 to -0.00	-0.01 to 0.46	-0.09 to 0.0	45	+/- 0.14
8	0.00 to 0.06	-0.009 to 0.069	0.00 to 0.48	-0.04 to 0.22	56	+/- 0.17

NOTES:
1) Based on Slope Indicator Company Inc. estimated system accuracy of +/- 0.3 inches per 100 feet (or 50 readings at 2-ft intervals).
2) The A-Axis is perpendicular to the embankment and the B-Axis is parallel to the embankment. Positive movements in the A-Axis correspond to movements towards the outside of the embankment and vice-versa.