AECOM

Submitted to
DTE Electric Company

Submitted by
AECOM
1300 East 9th Street, Suite 500
Cleveland, OH 44114
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CCR Certification:

Periodic Structural Stability Assessment

Inactive Bottom Ash Impoundment

DTE Monroe Power Plant

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Executive Summary

This Coal Combustion Residuals (CCR) Periodic Structural Stability Assessment (SSA) of the Inactive Bottom Ash Impoundment (Inactive BAI) at the DTE Electric Company (DTE) Monroe Power Plant has been prepared in accordance with the requirements specified in the USEPA CCR Rule under 40 Code of Federal Regulations §257.73 (d)(1). All structural stability assessment requirements were evaluated, and the surface impoundment was found to meet all requirements as required within each individual structural stability assessment in §257.73 (d)(1); which is summarized in **Table ES-1**.

Table ES-1 – Certification Summary

Report Section	CCR Rule Reference	Requirement Summary	Requirement Met?	Comments
2.1	§257.73 (d)(1)(i)	*Foundations and Abutments*	Yes	The CCR Unit has stable foundations
2.2	§257.73 (d)(1)(ii)	*Slope Protections*	Yes	The CCR Unit has sufficient slope protection
2.3	§257.73 (d)(1)(iii)	*Dike Compaction*	Yes	The CCR Unit has appropriate dike Compaction
2.4	§257.73 (d)(1)(iv)	*Vegetated Slopes*	Yes	The CCR Unit has vegetated slopes or other forms of protection
2.5	§257.73 (d)(1)(v)	*Spillways*	Yes	The CCR Unit spillways are sufficient for the 1000-year event
2.6	§257.73 (d)(1)(vi)	*Stability and Structural Integrity of Hydraulic Structures*	Yes	Hydraulic structures passing through the base of the unit are free from defects which may negatively affect the operation of the unit
2.7	§257.73 (d)(1)(vii)	*Downstream Slope Inundation / Stability*	Yes	The CCR Unit maintains structural stability during low pool or sudden drawdown of adjacent water body

1 Introduction

1.1 Purpose of the Report

The Inactive BAI is an inactive coal combustion residual (CCR) surface impoundment defined by 40 CFR §257.73. The Initial Structural Stability Assessment of the BAI was performed in 2019 and posted to the facility's operating record on August 30, 2019. The Initial assessment concluded that the CCR unit met the requirements of 40 Code of Federal Regulations (CFR) §257.73 (d). 40 CFR §257.73 (f) requires that periodic structural stability assessments of regulated CCR units be performed at a frequency of at least once every 5 years. The Periodic Structural Stability Assessment presented in this report is to document that the requirements specified in 40 Code of Federal Regulations (CFR) §257.73 (d) continue to be met to support the certification required under each of the applicable regulatory provision for the Inactive BAI.

The following table summarizes the documentation required within the CCR Rule and the sections that specifically respond to those requirements of this assessment.

Table 1-1 – CCR Rule Cross Reference Table

Report Section	Title	CCR Rule Reference
2.1	Foundations and Abutments	§257.73 (d)(1)(i)
2.2	Slope Protection	§257.73 (d)(1)(ii)
2.3	Dike Compaction	§257.73 (d)(1)(iii)
2.4	Vegetated Slopes	§257.73 (d)(1)(iv)
2.5	Spillways	§257.73 (d)(1)(v)
2.6	Stability and Structural Integrity of Hydraulic Structures	§257.73 (d)(1)(vi)
2.7	Downstream Slope Inundation / Stability	§257.73 (d)(1)(vii)

This report presents the periodic update to the initial Structural Stability Analysis as prepared by AECOM for the Inactive BAI. This plan was prepared in response to the Environmental Protection Agency (EPA) adopting the Federal Register 40 CFR Part 257 to regulate the disposal of CCR as solid waste in April 2015. As required by 257.73(d), owners and operators of existing or new CCR surface impoundments must develop a structural stability assessment in accordance with the following:

Regulatory Citation: 40 CFR §257.73 (d); Periodic structural stability assessments.

- *(1) The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with:*
  - *(i) Stable foundations and abutments;*

- *(ii) Adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown;*

- *(iii) Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;*

- *(iv) Vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection;*

- *(v) A single spillway or a combination of spillways configured as specified in [paragraph (A) and (B)]:*
  (A) All spillways must be either:
  (1) of non-erodible construction and designed to carry sustained flows; or
  (2) earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.
  (B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:
  (1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or
  (2) 1000-year flood for a significant hazard potential CCR surface impoundment; or
  (3) 100-year flood for a low hazard potential CCR surface impoundment.

- *(vi) Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure;*

- *(vii) For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.*

1.2 Brief Description of Impoundment

The DTE Monroe Plant is located in Monroe County Michigan approximately 2 miles east of the city of Monroe. The Monroe Plant was built in the early 1970s and occupies a parcel of land approximately 440 acres in size. The plant buildings, coal pile, and appurtenances associated with power generation reside on the northern (approximately 274 acres) portion of the 440-acre land parcel. The southern portion of the land parcel consists of the Inactive BAI area plus the Process Pond area which together cover approximately 166 acres.

The Inactive BAI is located to the south of the main Monroe Plant area and encompasses an area approximately 86.4 acres in size. The Inactive BAI area was constructed in the late 1960s by building a perimeter dike to surround a low area of the adjacent Lake Erie. The area south of the plant was removed from the Waters of the United States by an Act of Congress prior to plant construction. CCR materials have been placed and allowed to drain into the impoundment from the north, and previously formed a delta that extended about 1/3 of the way into the impoundment. However, at the time of this assessment a majority of the CCR material has been removed as part of ongoing closure of the impoundment. Wastewater flow into the pond ceased on October 21, 2020. Appendix A provides a Site Location Map showing the general location of the project site (**Figure 1)** and an Aerial Site Map of the Inactive BAI **(Figure 2).**

1.2.1 Design and Construction

The Inactive BAI consists of an embankment constructed primarily with rock fill and earth spoils generated during construction of the Monroe Power Plant. The basin was constructed on the existing natural ground surface, which also forms the liner and is primarily used for shore protection. The height of the embankment (from the receiving water body elevation to the top of embankment) is approximately 4 to 6 feet. A road along the top of the crest has

a minimum width of approximately 12 feet and is 20 or more feet wide along the eastern side abutting Lake Erie, which was constructed with additional rock armament for shoreline protection. The northern boundary of the Inactive BAI was formed by the natural ground surface and bottom ash is stored in this area. The southern boundary of the Inactive BAI is a crushed rock embankment that separates the Inactive BAI from the NPDES Process Water Basin to the south.

1.2.2 Outlet Structures

The Inactive BAI has an overflow weir structure, approximately 207.5 feet in length. The weir allows water to overflow from the Inactive Bottom Ash Impoundment into the discharge canal at a maximum flood pool elevation of approximately 575 feet during the 1,000-year inflow design flood event (*CCR Impoundment Inflow Design Flood Control System Plan: Inactive Bottom Ash Impoundment (Area 15), Monroe Power Plant, DTE Energy, Monroe, Michigan* (August 2024)). The overflow weir structure is located approximately 600 feet north of the intersection of the western perimeter dike and the southern perimeter dike.

2 Structural Stability Assessment Description

Regulatory Citation: 40 CFR §257.73 (d)(1);

- *The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with [the standards in (d)(1)(i)-(vii)]:*

The Structural Stability Assessment for the Inactive BAI is described in this section. Information about operational and maintenance procedures was provided by DTE Monroe Power Plant personnel. The DTE Monroe Power Plant follows an established maintenance program that quickly identifies and resolves issues of concern.

2.1 Foundation and Abutments

Regulatory Citation: 40 CFR §257.73 (d)(1);

- *(i) Stable foundations and abutments;*

Background and Assessment

The stability of the foundations was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate the slip surfaces passing though the foundations.

At depth, the site is founded on very stiff to hard silty clay (CL-ML) and silt (ML) till. Moving up the profile, the foundation soils consist of interbedded soft to very soft cohesive silts and clays; and loose to medium dense sand and gravel soils. The slope stability analyses exceed the criteria listed in §257.73(e)(1)(iv) for slip surfaces passing through the foundation (including the post-liquefaction loading condition). Therefore, the foundation soils are considered to be stable under all loading conditions. The slope stability analyses are discussed in the CCR certification report: *Periodic Safety Factor Assessment Area 15 DTE Monroe Power Plant* (August 2024). Current and past performance of the dikes, which includes no failures or other signs of instability during service, is further evidence of stable foundations.

Conclusion and Recommendation

Based on the conditions observed by AECOM, the Inactive BAI was designed and constructed with stable foundations.

Therefore, the Inactive BAI meets the requirements in §257.73 (d)(1)(i).

2.2 Slope Protection

Regulatory Citation: 40 CFR §257.73 (d)(1);

- (ii) Adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown;

Background and Assessment

The adequacy of slope protection was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

The perimeter dikes have natural slope protection in place. Both inner and outer slopes of the pond, are heavily vegetated with shrubs as well as smaller plants. In addition to vegetation, the exterior slopes of the perimeter dikes are covered with rip-rap which has an approximate median diameter of 2-4 feet. Interior slopes of the impoundment have relatively calm water having little to no wave action. Therefore, reeds and thickets on the water's edge provide adequate slope protection.

Conclusion and Recommendation

Based on this evaluation, adequate slope protection was designed at the Inactive BAI. In addition, the heavily vegetated dike slopes keep the dike material slope protected and in place. Large bare/unprotected areas were not observed by AECOM and there is no evidence of significant areas of erosion or wave action degradation.

Sudden drawdown of the pool in the Inactive BAI is not expected to occur. See Section 2.7 of this report for further information on sudden drawdown.

Therefore, the Inactive BAI meets the requirements in §257.73 (d)(1)(ii).

2.3 Dike Compaction

Regulatory Citation: 40 CFR §257.73 (d)(1)

- (iii) Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;

Background and Assessment

The density of the dike materials was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the dike over the range of expected loading conditions as defined within §257.73 (d)(1).

Based on the geotechnical field evaluations, the perimeter dikes were found to be constructed of fill material consisting of a variety of interlayered materials including sand (USCS type SP, SP-SM, SW), gravel (GP), silty sand (SM), lean clay (CL), silty clay (CL-ML), organic silt as topsoil (OL), asphalt and cobbles. Uncorrected Standard Penetration Test (SPT) resistance values (N-values) in the embankment ranged widely between 3 and 65 blows per foot (bpf) with an average of 17 bpf, indicating a generally medium dense apparent density which is indicative of well-compacted materials. Slope stability analyses exceed the criteria listed in §257.73(e)(1)(i) through (iv) for slip surfaces passing through the dike. The slope stability analyses are discussed in the CCR certification report: *Periodic Safety Factor Assessment Area 15 DTE Monroe Power Plant* (August 2024).

Conclusion and Recommendation

Based on the conditions observed by AECOM, the Inactive BAI was designed and constructed with sufficient dike compaction.

Therefore, the Inactive BAI meets the requirements in §257.73 (d)(1)(iii).

2.4 Vegetated Slopes

Regulatory Citation: 40 CFR §257.73 (d)(1)

- *(iv) Vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection;*[1]

Background and Assessment

The adequacy of slope vegetation was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

As reported in Section 2.2, the perimeter dikes have natural slope protection in place. Both inner and outer slopes of the pond are heavily vegetated with shrubs, smaller plants, reeds and thickets. In addition to vegetation, the exterior slopes of the perimeter dikes are covered with large rip-rap which has an approximate median diameter of 2 to 4 feet.

Conclusion and Recommendation

Based on this evaluation, the vegetation on the perimeter dikes slopes has adequate vegetated slopes. There are no substantial bare areas observed, however, there are many areas that are overgrown and over vegetated. Though no immediate issue has been observed due to the overgrowth, continual operational and maintenance procedures should be updated to regularly manage vegetation growth.

Therefore, the Inactive BAI meets the requirements in §257.73 (d)(1)(iv).

2.5 Spillways

Regulatory Citation: 40 CFR §257.73 (d)(1)

- *(v) single spillway or a combination of spillways configured as specified in [paragraph (A) and (B)]:*

  (A) All spillways must be either:

  (1) of non-erodible construction and designed to carry sustained flows; or
  (2) earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

  (B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

  (1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or
  (2) 1000-year flood for a significant hazard potential CCR surface impoundment; or
  (3) 100-year flood for a low hazard potential CCR surface impoundment.

Background and Assessment

Industrial process water and storm water discharge from the Inactive BAI into the cooling water discharge channel via an overflow weir spillway. The spillway consists of a 207.5-foot long sharp-crested steel weir which discharges onto a riprap apron and then into the cooling water discharge canal. The normal water surface elevation of the

[1] As modified by court order issued June 14, 2016, Utility Solid Waste Activities Group v. EPA, D.C. Cir. No. 15-1219 (order granting remand and vacatur of specific regulatory provisions).

Inactive BAI is approximately 574.50 ft (Plant Datum) and the state ordinary high water elevation of Lake Erie/the cooling water discharge channel is 571.63 ft (Plant Datum).

Hydrologic and hydraulic analyses were completed to evaluate the capacity of the spillway relative to inflow estimated for the 1,000-year flood event for the significant hazard potential Inactive BAI. The capacity of the spillway was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The hydrologic and hydraulic analyses are discussed in the *CCR Impoundment Inflow Design Flood Control System Plan: Inactive Bottom Ash Impoundment (Area 15), Monroe Power Plant, DTE Energy, Monroe, Michigan* (August 2024).

Conclusion and Recommendation

The spillway was designed to prevent erosion. The steel weir spillway is non-erodible material while the downstream outlet apron is lined with rip-rap and vegetation.

Hydraulic analysis found that the spillway can adequately manage flow during peak discharge resulting from the 1,000-year storm event without overtopping of the embankments. The peak water elevation is 574.91 feet during the inflow design flood, and the minimum crest elevation of the Inactive BAI dike is 575.94 feet, resulting in 1.03 feet of freeboard. This also indicates that the design of the spillway is adequate to carry sustained flows. Operational and maintenance procedures are in place to remove debris or other obstructions from the spillway, if observed after normal inspections. As a result, these procedures are appropriate for maintaining the spillway.

Therefore, the Inactive BAI meets the requirements in §257.73 (d)(1)(v).

2.6 Stability and Structural Integrity of Hydraulic Structures

Regulatory Citation: 40 CFR §257.73 (d)(1)

- *(vi) Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure*

Background and Assessment

The stability and structural integrity of hydraulic structures penetrating the dike of the Inactive BAI was evaluated using design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM during the annual inspection performed in July 2024.

The only hydraulic structure that penetrates the embankment is the weir that acts as the primary spillway. This structure is approximately 207.5 feet in width and appears to be in good condition, although there is some vegetative growth along the outlet channel. This vegetative growth does not currently appear to affect the operation or stability of the spillway.

Conclusion and Recommendation

Based on this evaluation, the primary spillway structure did not display any areas of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris that may negatively affect the operation of the structure. Operational and maintenance procedures are in place to remove debris or other obstructions from the hydraulic structures, and address any deficiencies, as evidenced by conditions observed by AECOM. As a result, these procures are appropriate for maintaining the stability and structural integrity of the hydraulic structure.

The Inactive BAI meets the requirements in §257.73 (d)(1)(vi).

2.7 Downstream Slope Inundation / Stability

Regulatory Citation: 40 CFR §257.73 (d)(1)

- *(vii) For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.*

Background and Assessment

The structural stability of the impoundment slopes of the Inactive BAI was evaluated by comparing the location of the impoundment relative to adjacent water bodies using published United States Geological Survey (USGS) topographic maps, aerial imagery, and conditions observed in the field by AECOM.

Bodies of water are adjacent to the impoundment slopes of the Inactive BAI. Adjacent water bodies to the perimeter dikes are bordered by Lake Erie to the east and a channel that carries cooling water discharged from the power plant to the west, which is also fed by Plum Creek.

Conclusion and Recommendation

Water level differential between the exterior lake level and Inactive BAI level is approximately 2 to 3 feet. The relatively stable water elevation of Lake Erie indicates that it is highly unlikely that there would be a rapid drawdown event that would negatively impact the Inactive BAI.

Based on this evaluation, the requirements in §257.73 (d)(1)(vii) are not applicable to the Inactive BAI, as inundation of the downstream slopes is not expected to occur.

3 Conclusions

The Structural Stability Assessment for the Inactive BAI adequately addresses design criteria as required by the CCR Rule. It presents all supplemental information and verification of design as required. Therefore, the Structural Stability Assessment meets the requirements for certification.

The contents of this report, specifically **Section 2**, represent the Structural Stability Assessment for this CCR unit.

4 Certification

This Certification Statement documents that the Inactive BAI at the DTE Monroe Power Plant meets the requirements specified in 40 CFR §257.73 (d). The Inactive BAI is an inactive CCR surface impoundment as defined by 40 CFR §257.53.

CCR Unit: DTE Monroe Power Plant Inactive BAI

I, Vikram Gautam, being a Registered Professional Engineer in good standing in the State of Michigan, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the structural stability assessment meets the requirements of 40 CFR § 257.73 (d).

Vikram K. Gautam
Printed Name

8/30/2024
Date

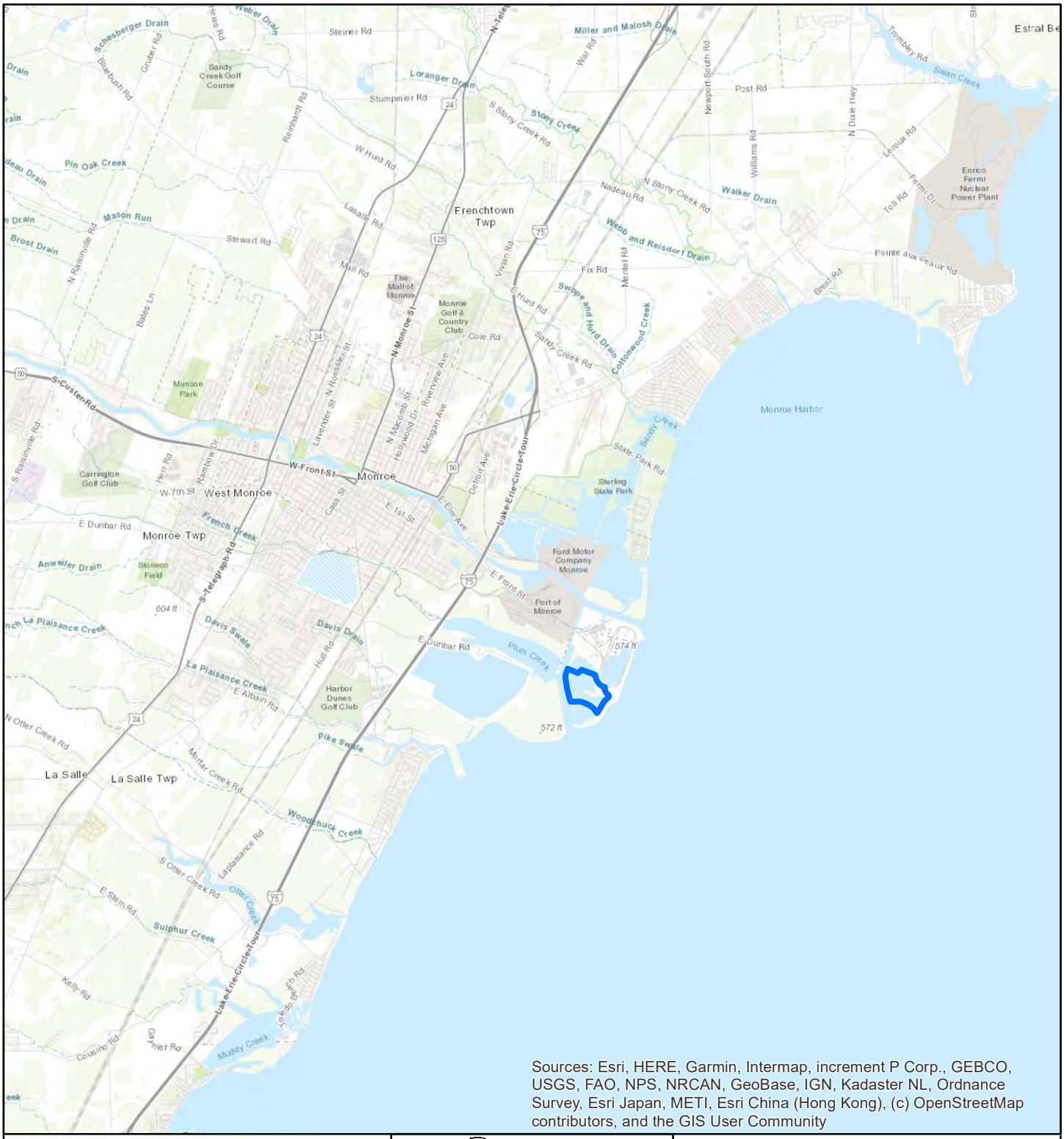
5 Limitations

Background information, design basis, and other data have been furnished to AECOM by DTE, or collected by AECOM through various field investigations, which AECOM has used in preparing this report. AECOM has relied on this information as furnished and is not responsible for the accuracy of this information. Our recommendations are based on available information from previous and current investigations. These recommendations may be updated as future investigations are performed.

The conclusions presented in this report are intended only for the purpose, site location, and project indicated. The recommendations presented in this report should not be used for other projects or purposes. Conclusions or recommendations made from these data by others are their responsibility. The conclusions and recommendations are based on AECOM's understanding of current plant operations, maintenance, stormwater handling, and ash handling procedures at the station, as provided by DTE. Changes in any of these operations or procedures may invalidate the findings in this report until AECOM has had the opportunity to review the findings and revise the report if necessary.

This development of the Structural Stability Assessment was performed in accordance with the standard of care commonly used as state-of-practice in our profession. Specifically, our services have been performed in accordance with accepted principles and practices of the engineering profession. The conclusions presented in this report are professional opinions based on the indicated project criteria and data available at the time this report was prepared. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

Appendix A
Figures



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

Ash Impoundment Boundary

N

0 1 2 Miles

DTE Monroe Power Plant

FIGURE 1
SITE LOCATION MAP

DATE: 08/30/2024
PROJECT NO.: 60733958

Legend

Ash Impoundment Boundary

0 500 1,000 Feet

N

DTE Monroe Power Plant

FIGURE 2
AERIAL SITE MAP

DATE: 08/30/2024
PROJECT NO.: 60516675

About AECOM

AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With nearly 100,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and collaborative technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. A Fortune 500 company, AECOM serves clients in more than 100 countries and has annual revenue in excess of $19 billion.

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AECOM
1300 East 9th Street
Suite 500
Cleveland, OH 44114