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October 11, 2021

Illinois Power Resources Generating, LLC
7800 South Cilco Lane
Bartonville, Illinois, 61607

Subject: USEPA CCR Rule and IEPA Part 845 Rule Applicability Cross-Reference
2021 USEPA CCR Rule Periodic Certification Report
Ash Pond, Edwards Power Plant, Bartonville, Illinois

At the request of Illinois Power Resources Generating, LLC (IPRG), Geosyntec Consultants (Geosyntec) has prepared this letter to document how the attached 2021 United States Environmental Protection Agency (USEPA) CCR Rule Periodic Certification Report (Report) was prepared in accordance with both the Federal USEPA CCR Rule[1] and the state-specific Illinois Environmental Protection Agency (IEPA) Part 845 Rule[2]. Specific sections of the report and the applicable sections of the USEPA CCR Rule and Illinois Part 845 Rule are cross-referenced in **Table 1**. A certification from a Qualified Professional Engineer for each of the CCR Rule sections listed in **Table 1** is provided in Section 9 of the attached Report. This certification statement is also applicable to each section of the Part 845 Rule listed in **Table 1.**

Table 1 – USEPA CCR Rule and Illinois Part 845 Rule Cross-Reference

Report Section	USEPA CCR Rule		Illinois Part 845 Rule	
3	§257.73 (a)(2)	Hazard Potential Classification	845.440	Hazard Potential Classification Assessment[3]
4	§257.73 (c)(1)	History of Construction	845.220(a)	Design and Construction Plans (Construction History)
5	§257.73 (d)(1)	Structural Stability Assessment	845.450 (a) and (c)	Structural Stability Assessment
6	§257.73 (e)(1)	Safety Factor Assessment	845.460 (a-b)	Safety Factor Assessment
7	§257.82 (a)(1-3)	Adequacy of Inflow Design Control System Plan	845.510(a), (c)(1), (c)(3)	Hydrologic and Hydraulic Capacity Requirements / Inflow Design Flood Control System Plan
	§257.82 (b)	Discharge from CCR Unit	845.510(b)	Discharge from CCR Surface Impoundment

[1] United Stated Environmental Protection Agency, 2015. *40 CFR Parts 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule.*
[2] State of Illinois, Joint Committee on Administrative Rule, Administrative Code (2021). *Title 35: Environmental Protection, Subtitle G: Waste Disposal, Chapter I: Pollution Control Board, Subchapter j: Coal Combustion Waste Surface Impoundment, Part 845 Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments.*
[3] "Significant" and "High" hazard, per the CCR Rule[1], are equivalent to Class II and Class I hazard potential, respectively, per Part 845[2].

CLOSING

This letter has been prepared to demonstrate that the content and Qualified Professional Engineer Certification of the 2021 Periodic USEPA CCR Rule Certification Report fulfills the corresponding requirements of Part 845 of Illinois Administrative Code listed in **Table 1**.

Sincerely,

John P. Seymour, P.E.
Senior Principal

Lucas P. Carr, P.E.
Senior Engineer

2021 USEPA CCR RULE PERIODIC CERTIFICATION REPORT
§257.73(a)(2), (c), (d), (e) and §257.82
ASH POND
Edwards Power Plant
Edwards, Illinois

Submitted to

Illinois Power Resources Generating, LLC

7800 South Cilco Lane
Bartonville, Illinois 61607

Submitted by

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engineers | scientists | innovators

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October 11, 2021

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EXECUTIVE SUMMARY

This Periodic United States Environmental Protection Agency (USEPA) Coal Combustion Residuals (CCR) Rule [1] certification report (Periodic Certification Report) for the Ash Pond (AP) at the Edwards Power Plant (EPP)[1], also known as the Edwards Power Station (EDW), has been prepared in accordance with Rule 40, Code of Federal Regulations (CFR) §257, herein referred to as the "CCR Rule" [1]. The CCR Rule requires that initial certifications for existing CCR surface impoundment, completed in 2016 and subsequently posted originally on the Illinois Power Resource Generating LLC CCR Website; ([2], [3], [4], [5], [6]). These documents are to be updated on a five-year basis.

The initial certification reports developed in 2016 and 2017 were independently reviewed by Geosyntec ([2], [7], [3], [8], [4], [5], [6]). Additionally, field observations, interviews with plant staff, updated engineering analyses, and evaluations were performed to compare conditions in 2021 at the AP relative to those of the 2016 and 2017 initial certifications. These tasks determined that updates are not required for the Hazard Potential Classification. However due to changes at the site, updates were required and were performed for the:

- History of Construction Report,
- Initial Structural Stability Assessment,
- Initial Safety Factor Assessment, and
- Initial Inflow Design Flood Control System Plan.

Geosyntec's evaluations of the initial certification reports and updated analyses identified that the AP meets all requirements for hazard potential classification, history of construction reporting, structural stability, safety factor assessment, and inflow design flood control system planning. **Table 1** provides a summary of the initial 2016 certifications and the updated 2021 periodic certifications.

[1] The AP is also referred to as ID Number W1438050005-01, Ash Pond by the Illinois Environmental Protection Agency (IEPA); CCR unit ID 301 by IPRG; and IL50710 within the National Inventory of Dams (NID) maintained by the Illinois Department of Natural Resources (IDNR). Within this document it is referred to as the AP.

Table 1 – Periodic Certification Summary

	CCR Rule Reference	Requirement Summary	2016 Initial Certification		2021 Periodic Certification	
			Requirement Met?	Comments	Requirement Met?	Comments
Hazard Potential Classification						
3	§257.73(a)(2)	Document hazard potential classification	Yes	Impoundment was determined to have High hazard potential classification [2].	Yes	No changes were identified that may affect this requirement.
History of Construction						
4	§257.73(c)(1)	Compile a history of construction	Yes	A history of Construction report was prepared for the AP. [3].	Yes	A letter listing updates to the History of Construction Report is provided in **Attachment C**.
Structural Stability Assessment						
5	§257.73(d)(1)(i)	Stable foundations and abutments	Yes	Foundations and abutments were found to be stable [8].	Yes	Foundations and abutments were found to be stable after performing updated slope stability analyses.
	§257.73(d)(1)(ii)	Adequate slope protection	Yes	Slope protection was adequate [8].	Yes	No changes were identified that may affect this requirement.
	§257.73(d)(1)(iii)	Sufficiency of dike compaction	Yes	Dike compaction was sufficient for expected ranges in loading conditions [8].	Yes	Dike compaction was found to be sufficient after performing updated slope stability analyses.
	§257.73(d)(1)(iv)	Presence and condition of slope vegetation	Yes	Vegetation was present on interior and exterior slopes and is maintained [8].	Yes	No changes were identified that may affect this requirement.
	§257.73(d)(1)(v)(A) and (B)	Adequacy of spillway design and management	Yes	Spillway was adequately designed and constructed and was expected to adequately manage flow during the calculated Probable Maximum Flood (PMF) [8].	Yes	Spillways were found to e adequately design and constructed and are expected to adequately manager flow during the PMF, after performing updated hydrologic and hydraulic analyses.
	§257.73(d)(1)(vi)	Structural integrity of hydraulic structures	No	Requirement could not be certified in 2016 due to inability to complete a CCTV inspection of all hydraulic structures.	Yes	An inspection was completed in 2020 and met all structural stability requirements. [8].
	§257.73(d)(1)(vii)	Stability of downstream slopes inundated by water body.	Not Applicable	Inundation of exterior slopes was not expected; this requirement was not applicable [8].	Not Applicable	No changes were identified that may affect this requirement.
Safety Factor Assessment						
6	§257.73(e)(1)(i)	Maximum storage pool safety factor must be at least 1.50	Yes	Safety factors were calculated to be 1.54. [5].	Yes	Safety factors from updated slope stability analyses were calculated to be 1.54 and higher.
	§257.73(e)(1)(ii)	Maximum surcharge pool safety factor must be at least 1.40	Yes	Safety factors were calculated to be 1.54 [5].	Yes	Safety factors from updated slope stability analyses were calculated to be 1.58 and higher.
	§257.73(e)(1)(iii)	Seismic safety factor must be at least 1.00	Yes	Safety factors were calculated to be 1.08 [5].	Yes	Safety factors from updated slope stability analyses were calculated to be 1.08 and higher.
	§257.73(e)(1)(iv)	For dike construction of soils that have susceptible to liquefaction, safety factor must be at least 1.20	Not Applicable	Dike soils were not susceptible to liquefaction [5].	Not Applicable	No changes were identified that may affect this requirement.
Inflow Design Flood Control System Plan						
7	§257.82(a)(1), (2), (3)	Adequacy of inflow design control system plan.	Yes	Flood control system adequately managed inflow and peak discharge during the calculated probable maximum flood (PMF) conditions [8].	Yes	The flood control system was found to adequately manage inflow and peak discharge during the PMP, 24-hour, Inflow Design Flood, after performing updated hydrologic and hydraulic analyses.
	§257.82(b)	Discharge from CCR Unit	Yes	Discharge from the CCR Unit is routed through a NPDES-permitted outfall during both normal and PMP, 24-hour Inflow Design Flood conditions [6].	Yes	Discharge from the CCR Unit is routed through a NPDES-permitted outfall during both normal and PMP, 24-hour Inflow Design Flood conditions, after performing updated hydrologic and hydraulic analyses.

SECTION 1

INTRODUCTION AND BACKGROUND

This Periodic United States Environmental Protection Agency (USEPA) Coal Combustion Residual (CCR) Rule [1] Certification Report was prepared by Geosyntec Consultants (Geosyntec) for Illinois Power Resources Generating LLC (IPRG), to document the periodic certification of the Ash Pond (AP) at the Edwards Power Plant (EPP), also known as the Edwards Power Station (EDW), located at 7800 South Cilco Lane Bartonville, Illinois 61607. The location of EPP is provided in **Figure 1**, and a site plan showing the location of the AP is provided in **Figure 2**.

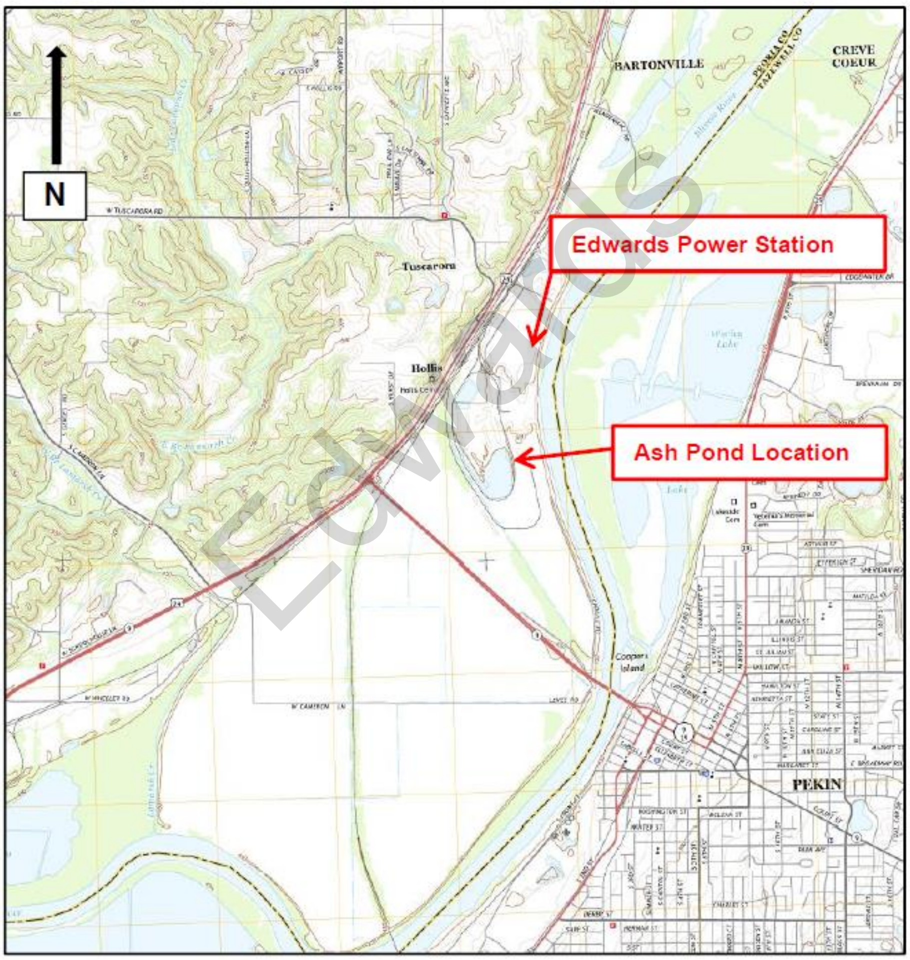


Figure 1 – Site Location Map (from AECOM, 2016)

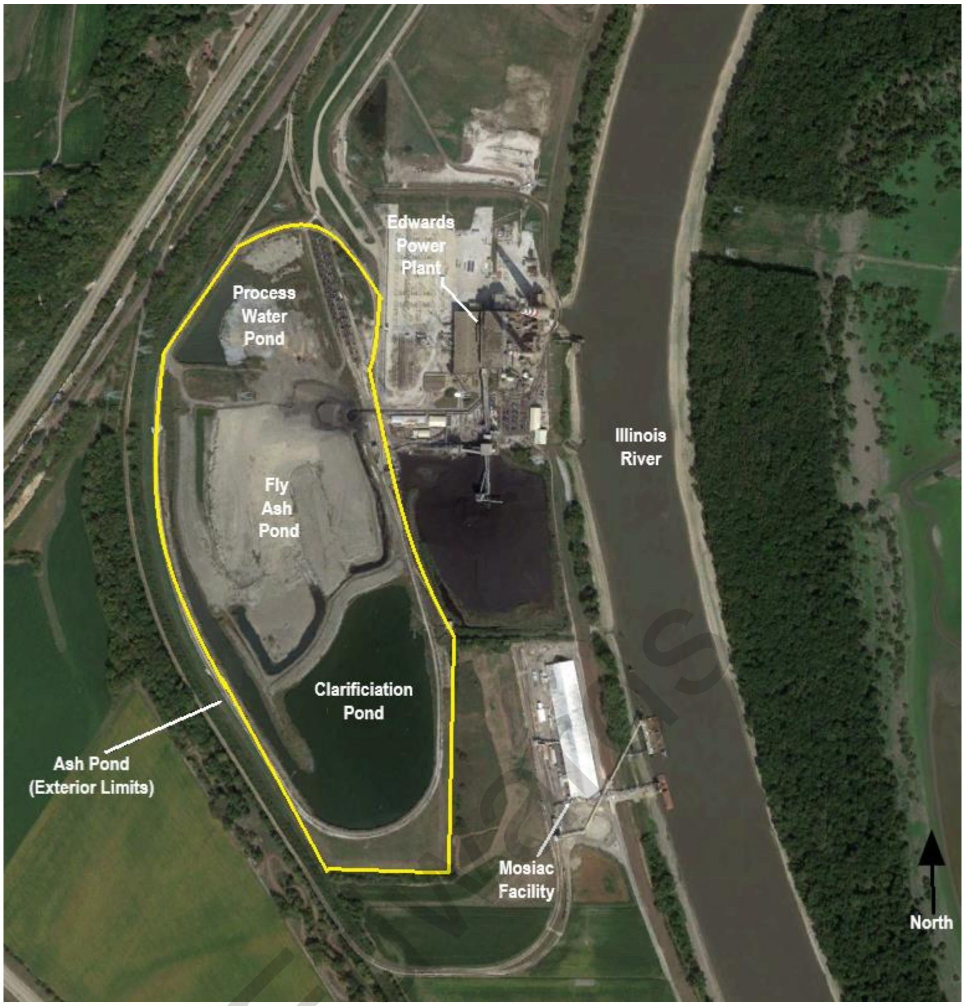


Figure 2 – Site Plan (September 2017)

1.1 AP Description

The AP receives CCR materials and plant process water from the Edwards Power Plant through sluice pipes that discharge into the eastern side of the Ash Pond, immediately west of the Edwards Power Plant. Within the AP, there are three separate sub-basins: The Process Water Pond, the Fly Ash Pond, and the Clarification Pond. The Process Water Pond is located within the northwest portions of the AP, and receives water from miscellaneous sumps, pumps, and processes at the Edwards Power Plant, as well as stormwater. The Process Water Pond transmits outflow to the Clarification Pond, which is located in the southern portion of the AP, through a 24-inch diameter corrugated metal pipe (CMP) culvert. At the time of the initial certification the Fly Ash Pond received sluiced bottom ash and fly ash from the plant and directed it into a settling channel, where ash was mechanically dipped out and stacked in windrows within the Fly Ash Pond [8].

The Fly Ash Pond discharges into the Clarification Pond through a reinforced concrete pipe (RCP) culvert. The Clarification Pond then discharges the clear water to the Illinois River through a 36-

inch diameter vertical drop inlet spillway structure (invert elevation[2] of 447.2 ft), with a skimmer/trash rack structure. Original design drawings indicate that the vertical “morning glory” spillway is a vertical CMP; however, 2004 design drawings for replacement of the skimmer/trash rack indicate that the vertical portions of the spillway may have been replaced with RCP pipe at some time. The pipe material has not been verified as it is typically submerged and high flows into the pipe have prevented inspection. Within the embankment, the spillway structure transitions to a nearly horizontal 36-inch diameter CMP that discharges to the Illinois River at the NPDES outfall. A flap gate backflow prevention device is present at the pipe’s discharge [8].

A sanitary sewer force main, consisting of six-inch diameter high-density polyethylene (HDPE) pipe, crosses the Ash Pond, between the Process Water Pond and the Fly Ash Pond, and is buried at a shallow depth within the Ash Pond. However, the pipe penetrates the west dike of the Ash Pond at a depth of approximately 10 feet. The pipe was installed in 2008 and transmits sewer flow from east to west [8]. It is discharged into a sewer main along the northwest perimeter of the Edwards Power plant property.

The AP earthen embankments were constructed in the 1960s and an engineered raise of the embankment was completed in 2004 to facilitate the addition of a rail loop at the crest of the embankment. The engineered raise included increasing the dike height from its original elevation of approximately 455 feet (based on the 2015 Maurer-Stutz survey) to approximately 460 feet (Clarification Pond) and 461 feet (Process Water Pond) using fly ash as a beneficial use material. The maximum height above the exterior grade of the current embankment is approximately 29 feet. Within the southern portions of the Clarification Pond, the rail loop was constructed approximately 250 feet inside the crest of the earthen embankment out of crushed stone. This effectively cut off a portion of the AP from the Clarification Pond, creating an area which was filled with CCR and vegetated. The original embankment acts as the perimeter of the AP at the southern end of the filled and vegetated area and was also raised in 2004 to a similar elevation as the remainder of the embankment [8].

The perimeter embankment forms the exterior of the impoundment on all but the northeast side of the AP. The northeast side is bordered by the Edwards Power Plant building grounds and switch yard which are at approximately the same elevation as the top of the pond embankment. The perimeter dike was constructed to include a crest width ranging from approximately 15 to 42 feet with narrower crest widths along the northern portion of the embankment, and wider crest widths along the south, east, and west sides of the embankment. Both the rail loop and a gravel crest access road are located at the crest of the embankment.

Based on 2015 LiDAR data from the State of Illinois, the exterior slopes have orientations ranging from 2.5H:1V (southern end of AP) to 3.4H:1V (western side of AP). The interior slopes have a typical orientation of 2H:1V. Based on the 2015 Maurer-Stutz survey, minimum crest elevations range from 458.8 feet for the Process Water Pond to 459.6 feet for the Clarification Pond, although

[2] All elevations in this report are in the North American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

the typical crest elevations are similar to the design crest elevations of 460 feet and 461 feet for each pond, respectively [8]. These elevations and slopes have not been altered since the initial certification.

Initial certifications for the AP for Hazard Potential Classification (§257.73(a)(2)), History of Construction (§257.73(c)), Structural Stability Assessment (§257.73(d)), Safety Factor Assessment (§257.73(e)(1)), and Inflow Design Flood Control System Plan (§257.82) were completed by Stantec and AECOM in 2016 and 2017 and subsequently posted to IPRG's CCR Website ([2], [3], [4], [5], [6]). Additional documentation for the initial certifications included a detailed operating record reports containing calculations and other information prepared for the hazard potential classification by Stantec [7] and for the structural stability assessment, safety factor assessment, and inflow design flood control system plan by AECOM [8]. These operating record reports were not required to be posted and were not posted to IPRG's CCR Website.

1.2 Report Objectives

These following objectives are associated with this report:

- Compare site conditions from 2015/2016, when the initial certifications were developed, to site conditions in 2020/2021, when data for the periodic certification was obtained, and evaluate if updates are required to the:
    - §257.73(a)(2) Hazard Potential Classification [2];
    - §257.73(c) History of Construction [3];
    - §257.73(d) Structural Stability Assessment [4];
    - §257.73(e) Safety Factor Assessment [5], and/or
    - §257.82 Inflow Design Flood Control System Plan [6].
- Independently review the Hazard Potential Classification ([2], [7]), Structural Stability Assessment ([4], [8]), Safety Factor Assessment ([5], [8]), and Inflow Design Flood Control System Plan ([6], [8]) reports to determine if updates may be required based on technical considerations.
    - The History of Construction report [3] was not independently reviewed for technical considerations, as this report contained historical information primarily developed prior to promulgation of the CCR Rule [1] for the AP CCR unit at EPP, and did not include calculations or other information used to certify performance and/or integrity of the impoundments under §257.73(a)(2), §257.73(c)-(e), or §257.82.

- Confirm whether the AP meets all of the requirements associated with §257.73(a)(2), (c), (d), (e), and §257.82, and provide recommendations for compliance with these sections of the CCR Rule [1], if necessary.

SECTION 2

COMPARISION OF INITIAL AND PERIODIC SITE CONDITIONS

2.1 Overview

This section describes the comparison of conditions at the AP between the start of the initial CCR certification program in 2015 and 2016 (initial conditions) and subsequent collection of periodic certification site data in 2020 and 2021 (periodic conditions).

2.2 Review of Annual Inspection Reports

Annual onsite inspections for the AP were performed between 2016 and 2020 ([9], [10], [11], [12], [13]) and were certified by a licensed professional engineer in accordance with §257.83(b). Each inspection report provided the following information relative to the previous inspection:

- A statement that no changes in geometry of the impounding structure were observed since the previous inspection.
- Information on maximum recorded instrumentation readings and water levels.
- Approximate volumes of impounded water and CCR at the time of inspection.
- A statement that no appearances of actual or potential structural weakness or other disruptive conditions were observed
- A statement that no other changes which may have affected the stability or operation of the impounding structure were observed.

In summary, the reports did not indicate any significant changes to the AP between 2015 and 2020. No signs of instability, structural weakness, or changes which may have affected the operation or stability of the AP were noted in the inspection reports.

2.3 Review of Instrumentation Data

Four piezometers, P001, P002, P003 and P004, are present at the AP and were monitored monthly by IPRG between October 28, 2015 and May 13, 2021 [14]. Geosyntec reviewed the piezometer data to evaluate if significant fluctuations, partially increases in phreatic levels, may have occurred between development of the initial structural stability and factor of safety certifications ([8], [4], [5]) and May 13, 2021. Available piezometer readings are plotted in **Attachment A**. The location of the piezometers used for monitoring of phreatic level in AP is shown in **Figure 3**.

Figure 3 – AP Pond Monitoring Well Locations
(Not to Scale, adapted from AECOM, 2015)

In summary, only minor changes in phreatic conditions were observed in the available piezometric data. Phreatic levels varied by a maximum of 2.5 feet. These changes do not significantly differ from the phreatic levels utilized for the initial structural stability and factor of safety certifications ([8], [4], [5]).

2.4 Comparison of Initial to Periodic Topographic Surveys

The initial topographic survey of the AP, conducted by Maurer-Stutz, Inc. in 2015 [15], was compared to the periodic topographic survey of the AP, conducted by IngenAE, LLC (IngenAE) in 2020 [16], using AutoCAD Civil3D 2021 software. This comparison quantified changes in the volume of CCR placed within the AP and considered volumetric changes above and below the starting water surface elevation (SWSE) used for the 2016 inflow design flood control plan hydraulic analysis [8] as required by 40 CFR §257.82. Potential changes to embankment geometry were also evaluated. This comparison is presented in side-by-side views of each survey in **Drawing 1** and a plan view isopach map denoting changes in ground surface elevation in **Drawing 2**. A summary of the water elevations and changes in CCR volumes is provided in **Table 2**.

Table 2 – Initial to Periodic Survey Comparison

Initial Surveyed Pool Elevation (ft)	444.53
Periodic Surveyed Pool Elevation (ft)	447.32
Initial §257.82 Starting Water Surface Elevation (SWSE) (ft)	447.2
Total Change in CCR Volume (CY)	+126,383 (Fill)
Change in CCR Volume Above SWSE (CY)	+90,315 (Fill)
Change in CCR Volume Below SWSE (CY)	+36,069 (Fill)

The comparison indicated that approximately 126,000 CY of CCR was placed in the AP between the initial and periodic surveys. The comparison also indicated a net fill of approximately 90,000 CY of CCR above the SWSE from the IDF and a fill of approximately 36,000 CY of CCR below the SWSE. The surveys also indicated that many interior channels (i.e., serpentines) were filled in, with some fill being placed below the SWSE. Therefore, the site grading has changed significantly since the initial certifications were developed. No significant changes to embankment geometry appeared to have occurred between the initial and periodic surveys.

2.5 Comparison of Initial to Periodic Aerial Photography

Initial aerial photographs of the AP collected by Weaver in 2015 [17] were compared to periodic aerial photographs collected by IngenAE in 2020 [16] to visually evaluate if potential site changes (i.e., changes to the embankment, outlet structures, limits of CCR, other appurtenances) may have occurred. Additionally, an aerial photograph provided by ERIS in 2019 [18] was used for additional comparisons and during the periodic site visit. A comparison of these aerial photographs is provided in **Drawing 2**, and the only change that was identified was all but one of the serpentine ponds have been filled in and do not retain water.

2.6 Comparison of Initial to Periodic Site Visits

An initial site visit to the AP was conducted by AECOM in 2015 and documented with a Site Visit Summary and corresponding photographs [19]. A periodic site visit was conducted by John Seymour, P.E. of Geosyntec on June 10, 2021. The site visit was intended to evaluate potential changes at the site since the initial certifications were prepared (i.e., modification to the embankment, outlet structures or other appurtenances, limits of CCR, maintenance programs, repairs), in addition to performing visual observations of the AP to evaluate if the structural stability requirements (§257.73(d)) were still met. The site visit included walking the perimeter of the AP, visually observing conditions, recording field notes, and collecting photographs. The site visit is documented in a photographic log provided in **Attachment B**. A summary of significant findings from the periodic site visit is provided below:

- All but one of the serpentine ponds were filled in with ash as observed in the site walk and as shown by comparison of aerial photograph.

2.7 Interview with Power Plant Staff

An interview with Mark Davis, Environmental Manager of the Edwards Power Plant was conducted by Mr. John Seymour, P.E. of Geosyntec on June 10, 2021. Mr. Davis was employed at EPP between 2015 and 2021. The interview included a discussion of included a discussion of potential changes that that may have occurred at the AP since development of the initial certifications ([2], [3], [4], [5], [6]). A summary of the interview is provided below.

- Were any construction projects completed for the AP since 2015, and, if so, are design drawings and/or details available?
  - Ash placement in the North Pond that filled in all but one serpentine pond.
- Were there any changes to the purpose of the AP since 2015?
  - In 2017, one of the two serpentine settling channels in the AP was filled in with ponded ash (dewatered/dredged). Only one channel was needed, as all conditioned fly ash was being hauled to the Duck Creek Landfill. Only bottom ash is sluiced to the pond, which is then dredged, dewatered, and stored in the AP.
  - Beginning in 2019 conditioned ash was placed in the North Pond (Process Water Pond) area. Placement of ash was in accordance with the closure design developed by Hanson and Associates.
  - Currently placing unmarketable, conditioned fly ash in the South (Fly Ash) Pond.
- Were there any changes to the to the instrumentation program and/or physical instruments for the AP since 2015?
  - No.
- Have area-capacity curves for the AP been prepared since 2015?
  - No.
- Were there any changes to spillways and/or diversion features for the AP completed since 2015?
  - No.
- Were there any changes to construction specifications, surveillance, maintenance, and repair procedures for the AP since 2015?
  - The site AP O&M Manual and Emergency Action Plan was revised in 2020.

  - An internal inspection of the AP discharge tunnel was completed in 2020; records were reviewed.

- Were there any instances of dike and/or structural instability for the AP since 2015?

  - No; only minor slope erosion has occurred and were addressed as needed.

SECTION 3

HAZARD POTENTIAL CLASSIFICATION - §257.73(a)(2)

3.1 Overview of Initial HPC

The Initial Hazard Potential Classification (Initial HPC) was prepared by Stantec Consulting Services, Inc. (Stantec) in 2016 ([2], [7]), following the requirements of §257.73(a)(2). The Initial HPC included the following information:

- Performing a visual analysis to evaluate potential hazards associated with a failure of the AP perimeter dike, along the east and west embankments of the AP, as the AP is contained by natural high ground to the northeast and south.
- Evaluation of potential breach flow paths were evaluated using elevation data and aerial imagery to evaluate potential impacts to downstream structures, infrastructure, frequently occupied facilities/areas, and waterways [2].
- While a breach map is not included within the Initial HPC, it is included within the Emergency Action Plan [20].

The volume transfer analysis indicated potential impacts to intermittently occupied structures consisting of a motocross and ATV park as well as mobile home trailers. For the motocross and ATV park, the Initial HPC concluded that neither breach would be likely to result in a probable loss of human life by federal standards, as occupancy is not constant. However, due to the probable loss of life within the trailers, the initial HPC recommended a "High" hazard potential classification for the AP [2].

3.2 Review of Initial HPC

Geosyntec performed a review of the Initial HPC ([2], [7]), in terms of technical approach, input parameters, and assessment of the results. The review included the following tasks:

- Review of all report documentation and figures
- Check that correct CCR Rule guidance is referenced and adhered to
- Review of appropriate failure mode selections
- Review for changes to the site and surrounding area
- Review that appropriate breach analysis methodology, model software, and inputs were utilized

- Check that selected HPC is appropriate per results of the breach analysis

Geosyntec performed a review of the Initial HPC ([2], [7]), in terms of technical approach, input parameters, assessment of the results, and applicable requirements of the CCR Rule [1]. No significant technical issues were noted within the technical review, although a detailed review (e.g., check) of the calculations was not performed as the Initial HPC utilized a visual assessment.

3.3 Summary of Site Changes Affecting the Initial HPC

No new structures, infrastructure, frequently occupied facilities/areas, or waterways were present in the probable breach area indicated in the Initial HPC [2].

3.4 Periodic HPC

Geosyntec recommends retaining the "High" hazard potential classification for the AP, per §257.73(a)(2), based on the lack of site changes occurring since the initial HPC was developed, as described in **Section 3.3** no updates to the Initial HPC report ([2], [7]) are recommended at this time.

SECTION 4

HISTORY OF CONSTRUCTION REPORT - §257.73(c)

4.1 Overview of Initial HoC

The Initial History of Construction report (Initial HoC) was prepared by AECOM in 2016 [3], following the requirements of §257.73(c). The Initial HoC included the following information for each CCR surface impoundment:

- The name and address of the owner/operator,
- Location maps,
- Statements of purpose,
- The names and size of the surrounding watershed,
- A description of the foundation and abutment materials,
- A description of the dike materials,
- Approximate dates and stages of construction,
- Available design and engineering drawings,
- A summary of instrumentation and map of instrument locations,
- A statement that area-capacity curves are not available,
- Information on spillway structures,
- A statement that construction specifications are not readily available,
- Inspection and surveillance plans, and
- Information on operational and maintenance procedures.

4.2 Summary of Site Affecting the Initial HoC

Two significant changes were identified at the site that occurred after development of the initial HoC [3] report and are described below:

- A state identification number (ID) of W1438050005-01 was assigned to the AP by the Illinois Environmental Protection Agency (IEPA).
- Revised area-capacity curves and spillway design calculations for the AP were prepare das part of the periodic Inflow Design Flood Control System Plan, as described in **Section 6.3**.

A letter documenting changes to the HoC report is provided in **Attachment C**.

SECTION 5

STRUCTURAL STABILITY ASSESSMENT - §257.73(d)

5.1 Overview of Initial SSA

The Initial Structural Stability Assessment (Initial SSA) was prepared by AECOM in 2016 ([4], [8]), following the requirements of §257.73(d)(1), and included the following evaluations:

- Stability of dike foundations, dike abutments, slope protection, dike compaction, and slope vegetation,
- Spillway stability including capacity, structural stability and integrity; and
- Downstream slope stability under sudden drawdown conditions for a downstream water body.

The Initial SSA concluded that the AP met all structural stability requirements for §257.73(d)(1)(i)-(v) and (vii). A recommended CCTV inspection was completed in 2020 after the inspection could not be completed as part of the initial 2016 certification. It covered the hydraulic structures that pass through the dike of the AP, consisting of the CMP primary spillway outlet pipe and the high-density polyethylene (HDPE) sewer force main to verify that the AP meets the stability and structural integrity criteria for hydraulic outfall structures, per §257.73(d)(1)(vi). Over 750 ft of pipe were inspected after terminating when the camera became blocked by a permanent sample probe. The pipe appeared to be intact and flowing normally.

The Initial SSA referenced the results of the Initial Structural Factor Assessment (Initial SFA) ([5] [8]) to demonstrate stability of the stability of foundations and abutments (§257.73(d)(1)(i)) and sufficiency of dike compaction (§257.73(d)(1)(iii)) portions of the SSA criteria. This included stating that slope stability analyses for slip surfaces passing through the foundation met or exceeded the criteria listed in §257.73(e)(1), for the stability of foundations and abutments. For the sufficiency of dike compaction, this included stating that slope stability analyses for slip surfaces passing through the dike also met or exceeded the §257.73(e)(1) criteria.

5.2 Review of Initial SSA

Geosyntec performed a review of the Initial SSA ([4], [8]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing photographs collected in 2015 and used to demonstrate compliance with §257.73(d)(1)(i)-(vii).

- Reviewing geotechnical calculations used to demonstrate the stability of foundations, per §257.73(d)(1)(i) and sufficiency of dike compaction, per §257.73(d)(1)(iii), in terms of supporting geotechnical investigation and testing data, input parameters, analysis methodology, selection of critical cross-sections, and loading conditions.

- Review of the methodology used to demonstrate that a downstream water body that could induce a sudden drawdown condition, per §257.73(d)(1)(vii), is not present.

- Completeness and technical approach of closed-circuit television (CCTV) inspections used to evaluate the stability of hydraulic structures, per §257.73(d)(1)(vi).

No significant technical issues were noted within the technical review, although a detailed review (e.g., check) of the calculations was not performed.

5.3 Summary of Site Changes Affecting the Initial SSA

Several changes at the site that occurred after development of the Initial SSA were identified. These changes will require updates to the Initial SSA. Each change and the recommended updates to the Initial SSA ([4], [8]) are described below:

- The Initial SSA utilized the results of the Initial Inflow Design Flood Control System Plan (IDF) to demonstrate compliance with the adequacy of spillway design and management (§257.73(d)(1)(v)(A)-(B)). The Initial IDF was subsequently updated to develop a Periodic IDF, based on site changes, as discussed in **Section 7**.

- The Initial SSA utilized the slope stability analysis results of the Initial Safety Factor Assessment (SFA) as part of the compliance demonstration for the stability of foundations and abutments (§257.73(d)(1)(i)) and sufficiency of dike compaction (§257.73(d)(1)(iii)) as discussed in **Section 5.1**. The Initial SFA slope stability analyses were subsequently updated to develop a Periodic SFA, based on site changes, as discussed in **Section 6**.

5.4 Periodic SSA

The Periodic SFA (**Section 6**) indicates that foundations and abutments are stable and dike compaction is sufficient for expected ranges in loading conditions, as slope stability factors of safety were found to meet or exceed the requirements of §257.73(e)(1). Therefore, the requirements of §257.73(d)(1)(i) and §257.73(d)(1)(iii) are met for the Periodic SSA.

The Periodic IDF (**Section 7**) indicates that spillways are adequately designed and constructed to adequately manage flow during the PMF flood, as the spillways can adequately manage flow during peak discharge from the PMP storm event without overtopping of the embankments. Therefore, the requirements of §257.73(d)(1)(v)(A)-(B) are met for the Periodic SSA.

SECTION 6

SAFETY FACTOR ASSESSMENT - §257.73(e)(1)

6.1 Overview of Initial SFA

The Initial Safety Factor Assessment (Initial SFA) was prepared by AECOM in 2016 ([5], [8]), following the requirements of §257.73(e)(1). The Initial SFA included the following information:

- A geotechnical investigation program with in-situ and laboratory testing;
- An assessment of the potential for liquefaction in the dike and foundation soils;
- The development of ten slope stability cross-sections for limit equilibrium stability analysis utilizing GeoStudio SLOPE/W software; and
- The analysis of all cross-sections for maximum storage pool, maximum surcharge pool, and seismic loading conditions.
    - Liquefaction loading conditions were not evaluated as liquefaction-susceptible soil layers were not identified in the either the embankments or foundation soils.

The Initial SFA concluded that the AP met all safety factor requirements, per §257.73(e), as all calculated safety factors were equal to or higher than the minimum required values.

6.2 Review of Initial SFA

Geosyntec performed a review of the Initial SFA ([5], [8]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing geotechnical calculations used to demonstrate the acceptable safety factors, per §257.73(e)(1), in terms of:
    - Completeness and adequacy of supporting geotechnical investigation and testing data;
    - Completeness and approach of liquefaction triggering assessments;
    - Input parameters, analysis methodology, selection of critical cross-sections, and loading conditions utilized for slope stability analyses; and
    - Reviewing the contents vs. the applicable CCR Rule requirements [1].

No significant technical issues were noted within the technical review, although a detailed review (e.g., check) of the calculations was not performed.

6.3 Summary of Site Changes Affecting the Initial SFA

Two changes at the site that occurred after development of the Initial SFA were identified. These changes required updates to the Initial SFA and are described below:

- Significant amount of CCR (up to 20 ft high) were placed below and above the SWSE in the Process Water Pond, thereby potentially applying additional load to the AP dike than was present at the time of the Initial SFA.

- The Periodic IDF (**Section 7)** found that the normal pool elevation within the Process Water Pond increased from 449.5 to 450.4 ft, and within Clarification Pond increased from 447.2 to 447.3 ft. This resulted in increases of 0.9 and 0.1 ft, respectively, adding more water loading on the embankment dikes than was considered in the Initial SFA for the maximum storage pool and seismic loading conditions (§257.73(e)(1)(i) and (iii)). Peak water surface elevations during the IDF also increased from 457.8 to 458.6 ft within the Process Water Pond, and from 457.4 to 457.5 within the Clarification Pond resulting in 0.8 and 0.1 ft, respectively. This resulted in an increase of water loading on the embankment dikes than was considered in the Initial SFA for the maximum surcharge pool loading conditions (§257.73(e)(1)(i)).

6.4 Periodic SFA

Geosyntec revised existing slope stability analyses associated with the Initial SFA ([5], [8]), for the ten cross-sections (A, B, C, D, E, F, G, H, I, and J) previously evaluated to account for site changes, as described in **Section 6.3**. The following approach and input data were used to revise the analyses:

- Ground surface geometry was revised for all the loading conditions in cross-section "B" using the 2021 site survey [16] to account for the changes that occurred to CCR grades.

- Water levels in the AP for the maximum storage pool, and seismic slope stability analysis loading conditions were increased to El. 450.4 and El. 447.3 ft for Process Water Pond cross-sections (i.e., A, B, and J) and Clarification Pond cross-sections (i.e., C, D, E, F, G, H, and I), respectively, based on the Periodic IDF.

- Water levels in the AP for the maximum surcharge pool slope stability analysis loading conditions were increased to El. 458.6 and El. 457.5 ft for Process Water Pond cross-sections (i.e., A, B, and J) and Clarification Pond cross-sections (i.e., C, D, E, F, G, H, and I), respectively, based on the Periodic IDF.

- All other analysis input data and settings from the Initial SFA ([5], [8]), were utilized, including, but not limited to, subsurface stratigraphy and soil strengths, phreatic conditions, ground surface geometry, software package and version, slip surface search routines and methods, and input data for the seismic analyses.

Factors of safety from the Periodic SFA are summarized in Table 3 and confirm that the AP meets the requirements of §257.73(e)(1). Slope stability analysis output associated with the Periodic SFA is provided in **Attachment D**.

Table 3 – Factors of Safety from Periodic SFA

	Structural Stability Assessment (§257.73(d)) and Safety Factor Assessment (§257.73(e))			
Cross-Section	**Maximum Storage Pool §257.73(e)(1)(i) Minimum Required = 1.50**	**Maximum Surcharge Pool[1] §257.73(e)(1)(ii) Minimum Required = 1.40**	**Seismic §257.73(e)(1)(iii) Minimum Required = 1.00**	**Dike Liquefaction §257.73(e)(1)(iv) Minimum Required = 1.20**
A	2.02	2.02	1.35	N/A
B	1.59	1.59	1.22	N/A
C	1.83	1.82	1.09	N/A
D	1.79	1.79	1.18	N/A
E	1.54*	1.54*	1.11	N/A
F	2.31	2.31	1.08*	N/A
G	2.12	2.12	1.13	N/A
H	2.08	2.08	1.08*	N/A
I	2.26	2.26	1.30	N/A
J	2.55	1.97	2.08	N/A

Notes:
*Indicates critical cross-section (i.e., lowest calculated factor of safety out of the ten cross-sections analyzed)
N/A – Loading condition is not applicable.

SECTION 7

INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN - §257.82

7.1 Overview of Initial IDF

The Initial Inflow Design Flood Control System Plan (Initial IDF) was prepared by AECOM in 2016 ([6], [8]) following the requirements of §257.82. The Initial IDF included the following information:

- A hydraulic and hydrologic analysis was performed for the PMF design flood event because of the hazard potential classification of "high", which corresponded to a peak surcharge elevation of 457.8 feet in the Process Water Pond and 457.4 feet in the Fly Ash Pond and Clarification Pond.

- The Initial IDF utilized a HydroCAD Version 10 model to evaluate spillway flows and pool level increases during the design flood, with a SWSE of 449.5 ft for the Process Water Pond and 447.2 ft for the Fly Ash Pond and Clarification Pond.

The Initial IDF concluded that the AP met the requirements of §257.82, as the peak water surface elevation estimated by the HydroCAD model was 457.8 ft, relative to a minimum AP dike crest elevation of 458.8 ft in the Process Water Pond and 457.4 ft, relative to a minimum AP dike crest elevation of 459.6 ft in the Fly Ash Pond and Clarification Pond. Therefore, overtopping was not expected. The Initial IDF also evaluated the potential for discharge from the CCR unit and determined that discharge in violation of the existing NDPES for the AP was not expected, as all discharge from the AP during both normal and inflow design flood conditions was expected to be routed through the existing spillway and NDPES-permitted outfall.

7.2 Review of Initial IDF

Geosyntec performed a review of the Initial IDF ([6], [8]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing the return interval used vs. the hazard potential classification.

- Reviewing the rainfall depth and distribution for appropriateness.

- Performing a high-level review of the inputs to the hydrological modeling.

- Reviewing the hydrologic model parameters for spillway parameters, starting pool elevation, and storage vs. the reference data.

- Reviewing the overall Initial IDF vs. the applicable requirements of the CCR Rule [1].

Several comments were identified during review of the Initial IDF. The comments are described below:

- The initial IDF certification used the National Resource Conservation Service (NRCS) TR-60 Emergency Spillway and Freeboard (ESFB) rainfall distribution. This is a distribution NRCS utilizes in making determination and analysis of auxiliary spillway flow depth and duration. The electronic model files for the initial IDF were unavailable; therefore, the "Spillway Emergency" [21] storm type provided by HydroCAD was used for the updated IDF, which replicates the NRCS 24-hour ESFB design hydrograph rainfall distribution.
    - The ESFB rainfall distribution was found by NRCS to be an accurate representation of a 24-hour Probable Maximum Precipitation (PMP) event per a study applying different rainfall distributions to 24-hour PMP storm events for purposes of evaluating existing high-hazard dams east of the 105th meridian [22]. The following are excerpts from the NRCS study:
        - *"The dimensionless conversion of the ESFB distribution from a 6-hour to a 24-hour pattern has been used with PMP events in a number of states where 24-hour storms are required as a part of the State's dam safety criteria and approval process……Although the ESFB Distribution and the World Curve distribution were developed from entirely independent data sources, the distributions are similar when compared on a volume-duration basis. The world curve supports the ESFB."*
        - *"The World Curve Distribution is a valid basis for design of high hazard structures…It would seem logical to use the World Curve distribution for PMP size event"*
    - The NRCS study [22]found the NRCS ESFB is comparable to the World Curve. The World Curve is developed from worldwide maximum rainfall records and deemed by NRCS to be logical to use for a PMP size event and valid for design of high hazard structures.

7.3 Summary of Site Changes Affecting the Initial IDF

Two changes at the site that occurred after development of the Initial IDF were identified. These changes required updates to the Initial IDF and are described below:

- Approximately 100,030 CY of CCR were placed above the SWSE utilized for the Initial IDF certification in the Process Water Pond, thereby altering the stage-storage curve relative to the Initial IDF. Filling in of the serpentine channel system above and below the SWSE also occurred; however, the storage capacity of the serpentine channels was disregarded in the Initial IDF for conservatism in the model and the filling of the serpentine channels did not have to be accounted for in the updated IDF.

- In 2020, the surveyed water surface elevation (WSE) was 450.4 ft within the Process Water Pond and 447.3 ft in the Clarification Pond [16]; this is higher than the SWSE used in the Initial IDF by 0.9 ft and 0.1 ft, respectively, thereby the SWSE utilized in the Initial IDF were no longer consistent with conditions observed in 2020.

7.4 Periodic IDF

Geosyntec revised the HydroCAD model associated with the Initial IDF to account for the revised rainfall distribution type and additional CCR placement, as described in **Sections 7.2** and **7.3**. The following approach and input data were used for the revised analyses and are referenced in **Attachment E** as appropriate:

- The name of the "Cooling Pond" node in the model was changed to "Process Water Pond" for consistency with the text portion of the 2016 IDF Certification.

- Stage-storage (i.e., area-capacity) curves for both the Process Water Pond and Clarification Pond were updated based on the 2020 site survey [16].

    - A revised stage-volume curve for the AP was prepared based on measuring the storage volume of the AP every two-foot increment of depth from: (i) an elevation at the bottom of the Clarification Pond (434 ft) to an elevation of 460 ft, and (ii) an elevation at the bottom of the Process Water Pond (444 ft) to an elevation of 460 ft. This analysis identified an overall increase of 810 CY (0.5 ac-ft) of storage volume at the Clarification Pond and an overall decrease of 100,030 CY (62 ac-ft) of storage volume from the Cooing Pond compared to the storage volumes used in the 2016 Initial IDF Certification.

- The SWSE within the Process Water Pond was updated from 449.5 ft to 450.4 ft to reflect the 2020 site survey [16]. The discharge structure invert elevation is 449.2 ft; however, the greater elevation of the invert structure and the surveyed WSE was used as the SWSE to provide conservatism in the model.

- The SWSE within the Clarification Pond was updated from 447.2 ft to 447.3 ft to reflect the 2020 site survey [16]. The vertical spillway elevation is 447.2 ft; however, the greater elevation of the invert structure and the surveyed WSE was used as the SWSE to provide conservatism in the model.

- The rainfall distribution type was updated to the "Spillway Emergency" storm type provided by HydroCAD [21], which replicates the NRCS 24-hour ESFB distribution.

- The initial IDF assumed that the tailwater conditions in the Illinois River during the IDF was the historic high-water elevation at Peoria Lock and Dam (NOAA Gauging Station

PRAI2) of 456.7 ft; however, the NOAA gauging station shows a historic high-water elevation of 456.57 ft. Therefore, a link was added in the updated model downstream of the Clarification Pond to represent the Illinois River historic high-water elevation of 456.57 ft at Peoria Lock and Dam [23].

- Drainage area characteristics were updated based on the 2020 site survey, as follows:
    - For the Process Water Pond Watershed, the open water surface area was updated from 5.2 acres to 1.2 acres and the CCR surface was updated from 13.2 acres to 17.2 acres.
    - For the North Ash Pond Watershed, the open water surface area was updated from 4.4 acres to 0.6 acres and the CCR surface was updated from 10.3 acres to 14.1 acres.
    - For the South Ash Pond Watershed, the open water surface area was updated from 4.3 acres to 1.2 acres and the CCR surface was updated from 15.1 acres to 18.2 acres.
    - For the Clarification Pond Watershed, the open water surface area was updated from 25.1 acres to 19.7 acres and the CCR surface was updated from 10.7 acres to 16.1 acres
- Pipes
    - The following updates were made for the 24-inch corrugated metal pipe (CMP) outlet from the Process Water Pond based on the 2020 site survey:
        - The upstream invert elevation was updated from 449.5 ft to 449.15 ft and downstream invert elevation was updated from 449.5 ft to 447.93 ft.
        - The length was updated from 80 ft to 104 ft.

All other input data and settings from the Initial IDF HydroCAD model were utilized, including, but not limited to software package and version, 24-hour PMP rainfall depth, runoff method, analysis time span and analysis time step.

The results of the Updated IDF are summarized in **Table 4** and confirm that the AP meets the requirements of §257.82(a)-(b), as the peak water surface elevation does not exceed the minimum perimeter dike crest elevations. Additionally, all discharge from the AP is routed through the existing spillway system to the NPDES-permitted outfall, during both normal and IDF conditions. Updated area-capacity curves and HydroCAD model output is provided in **Attachment E**.

Table 4 – Water Levels from updated Periodic IDF

	Process Water Pond			Clarification Pond		
Analysis	**Starting WSE (ft)**	**Peak WSE (ft)**	**Min. Dike Crest Elevation (ft)**	**Starting WSE (ft)**	**Peak WSE (ft)**	**Min. Dike Crest Elevation (ft)**
Initial IDF	449.5	457.8	458.8	447.2	457.4	459.6
Periodic IDF Update	450.4	458.6	458.8	447.3	457.5	459.6
Initial to Periodic Change[1]	+0.9	+0.8	-	+0.1	+0.1	-

Notes:
[1]Postive change indicates increase in the WSE relative to the Initial IDF, negative change indicates decrease in the WSE, relative to the Initial IDF.

SECTION 8

CONCLUSIONS

The AP at EPP was evaluated relative to the USEPA CCR Rule periodic assessment requirements for:

- Hazard potential classification (§257.73(a)(2)),
- History of Construction reporting (§257.73(d)),
- Structural stability assessment (§257.73(d)),
- Safety factor assessment (§257.73(e)), and
- Inflow design flood control system planning (§257.82).
- Based on the evaluations presented herein, the referenced requirements are satisfied.

Based on the evaluations presented herein, the referenced requirements are satisfied for this CCR unit.

SECTION 9

CERTIFICATION STATEMENT

CCR Unit: Illinois Power Resources Generating, LLC, Edwards Power Plant, Ash Pond

I, John P. Seymour, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this 2021 USEPA CCR Rule Periodic Certification Report, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the periodic assessment of the hazard potential classification, history of construction report, structural stability, safety factors, and inflow design flood control system planning, dated October 2021, were conducted in accordance with the requirements of 40 CFR §257.73(a)(2), (c), (d), (e), and §257.82.

John Seymour

10/11/2021
Date

JOHN P. SEYMOUR
062-040562
LICENSED
PROFESSIONAL
ENGINEER
STATE OF ILLINOIS

Exp. 11/30/2021

SECTION 10

REFERENCES

[1] United States Environmental Protection Agency, 40 CFR Parts 257 and 261; Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, 2015.

[2] Stantec Consulting Services Inc., "Initial Hazard Potetnial Classification Assessment, EPA Final CCR Rule, Ash Pond,Edwards Power Plant, Peoria County, Illinois," Fenton, MO, October 12, 2016.

[3] AECOM, "History of Construction, USEPA Final CCR Rule, Edwards Power Plant, Bartonville, Illinois," October 2016.

[4] AECOM, "CCR Rule Report: Initial Structural Stability Assessment For Ash Pond At Edwards Power Plant," St. Louis, MO, October 2016.

[5] AECOM, "CCR Rule Report: Initial Safety Factor Assessment For Ash Pond At Edwards Power Plant," St. Louis, MO, October 2016.

[6] AECOM, "CCR Rule Report: Initial Inflow Design Flood Control System Plan For East Ash Pond At Edwards Power Plant," St. Louis, MO, October 2016.

[7] Stantec Consulting Services, Inc., "Documentation of Initial Hazard Potential Classification Assessment, Ash Pond, Edwards Power Plant, Bartonville, Illinois," October 12, 2016.

[8] AECOM, "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for Ash Pond at Edwards Power Plant," St. Louis, MO, October 2016.

[9] J. Knutelski and J. Campbell, "Annual CCR Surface Impoundment Inspection Report (per 40 CFR 257.83(b)(2)), Edwards Power Plant, Ash Pond," August 29, 2016.

[10] J. Knutelski and J. Campbell, "Annual CCR Surface Impoundment Inspection Report (per 40 CFR 257.83(b)(2)), Edwards Power Plant, Ash Pond," August 30, 2017.

[11] S. Arends, "Annual Inspection by a Qualified Professional Engineer, 40 CFR §257.83(b), Edwards Power Plant, Ash Pond," August 29, 2018.

[12] J. Knutelski, "Annual Inspection by a Qualified Professional Engineer, 40 CFR 257.83(b), Edwards Power Plant, Ash Pond," September 05, 2019.

[13] J. Knutelski, "Annual Inspection by a Qualified Professional Engineer, 40 CFR §257.83(b), Edwards Power Plant, Ash Pond," November 06, 2020.

[14] Geosyntec Consultants, "Edwards Piezo Measurements_20160211," 2021.

[15] M.-S. Inc., "Edwards Power Plant, 2015 Topogaphy," Dynegy, Collinsville, IL, July 2015.

[16] IngenAE, "Luminant, Illinois Power Rescources Generating, LLC, Edwards Power Plant, December 2020 Topography," Earth City, Missouri, March 12, 2021.

[17] Weaver Consultants Group, "Dynegy, Collinsville, IL, 2015 - Edwards 2015 Existing Aerial Photograph Existing Site Conditions," Collinsville, IL, October 2015.

[18] Envrionmental Risk Information Services (ERIS), "Edwards Power Plant," Toronto ON, CA, 2019.

[19] AECOM, "Draft CCR Unit Initial Site Visit Summary, Dynegy CCR Compliance Program," June 24, 2015.

[20] Illinois Power Resources Generating, "Emergency Action Plan," 2017.

[21] HydroCadTM Software Solutions, LLC, "HydroCad Stormwater Modeling System, Version 10," Chocorua, New Hampshire, 2016.

[22] J. N. Riely and R. C. Moore, "Comparison of Temporal Rainfall Distributions for Near Probable Maximum Precipitation Storm Events for Dam Design," National Water Management Center, National Resources Conservation Service (NRCS), Little Rock, Arkansas.

[23] National Oceanic and Atmospheric Administration, "Advanced Hydrologic Prediction Service, Illinois River at Peoria Lock and Dam," [Online]. Available: https://water.weather.gov/ahps2/hydrograph.php?wfo=ilx&gage=prai2&prob_type=stage&source=hydrograph. [Accessed 18 August 2021].

DRAWINGS

INITIAL SURVEY
07-23-2015 TOPOGRAPHY

PERIODIC SURVEY
02-23-2021 TOPOGRAPHY

NOTES:

1. THE INITIAL SURVEY WAS TAKEN FROM THE DRAWING TITLED "TOPOGRAPHIC AND BATHYMETRIC SURVEY, DYNEGY - EDWARDS POWER STATION - BARTONVILLE, IL", PREPARED BY MAURER-STUTZ, INC., DATED JULY 23, 2015.
2. THE PERIODIC SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "LUMINANT, ILLINOIS POWER RESOURCES GENERATING, LLC, EDWARDS POWER STATION, DECEMBER 2020 TOPOGRAPHY", PREPARED BY INGENAE, DATED FEBRUARY 23, 2021.
3. ALL SURVEY DATA WAS COLLECTED IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND NORTH AMERICAN DATUM OF 1983 (NAD83) FOR VERTICAL AND HORIZONTAL COORDINATES, RESPECTIVELY.

0 500

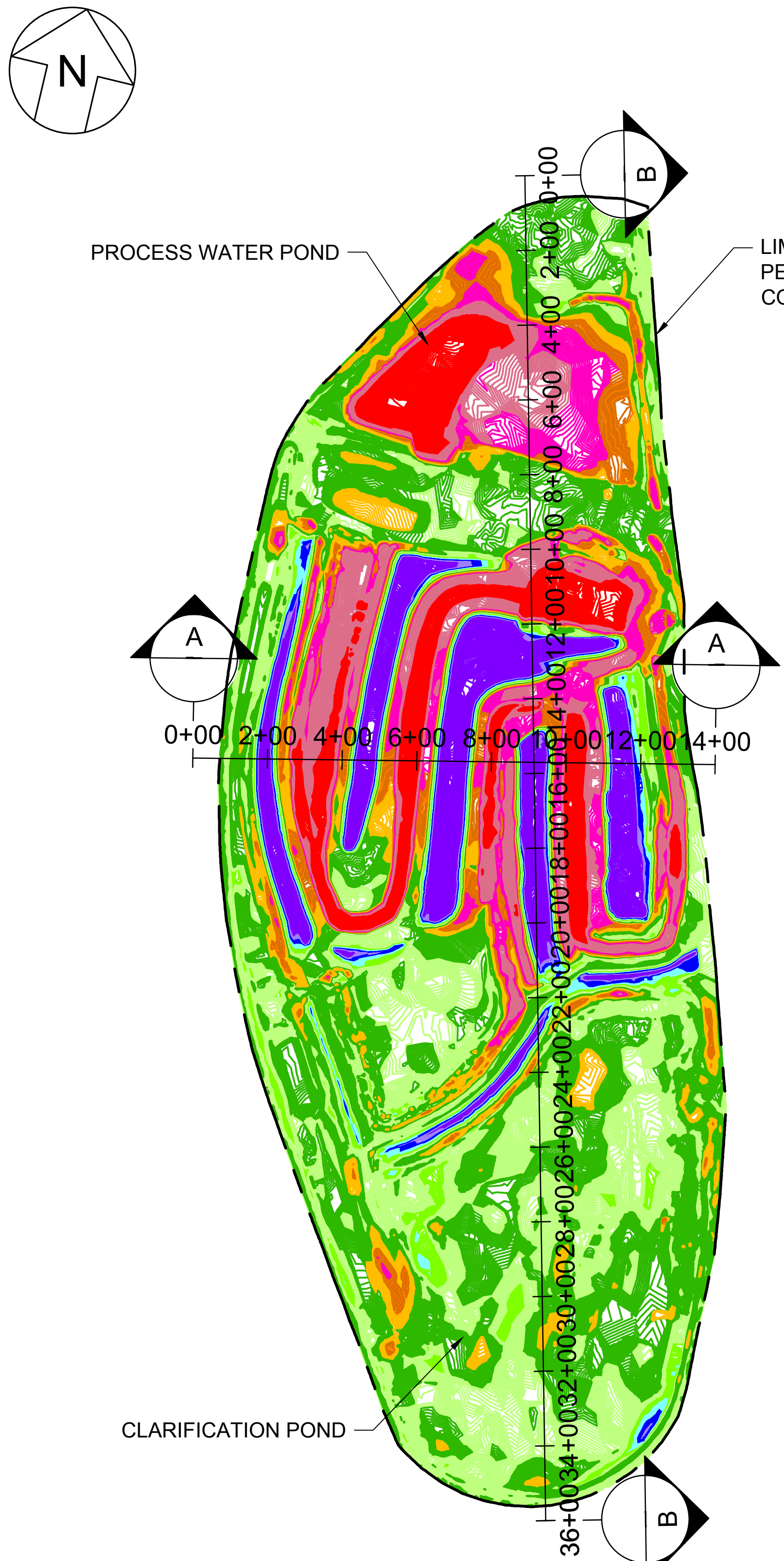
SCALE IN FEET

INITIAL TO PERIODIC SURVEY COMPARISON
ASH POND
EDWARDS POWER PLANT
PEORIA, ILLINIOS

Geosyntec consultants

DRAWING 1

GLP8027.04 | MAY 2021



0 500
SCALE IN FEET

ISOPACH CONTOUR KEY		
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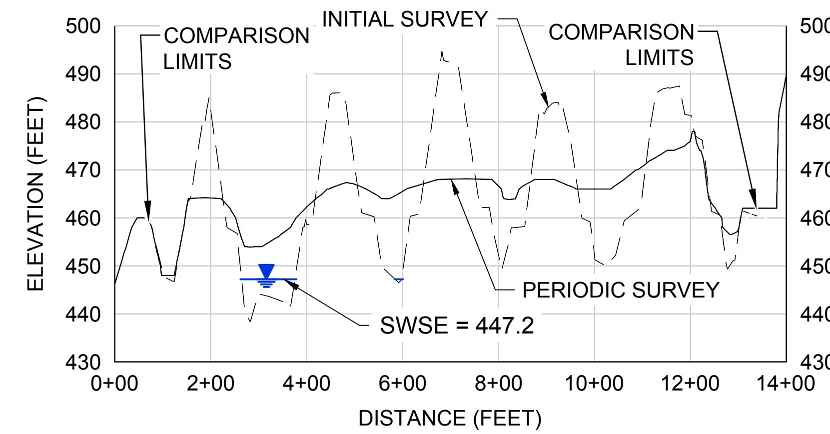
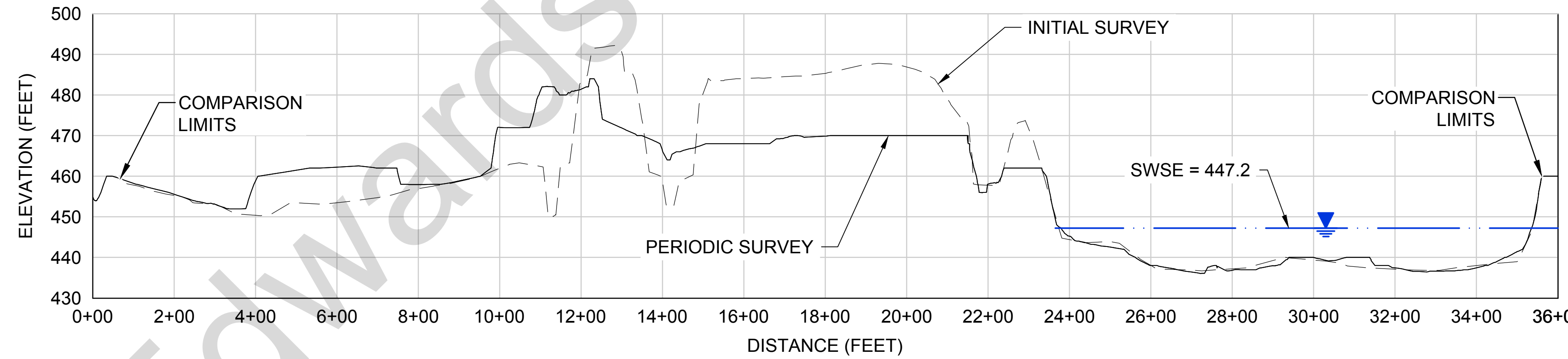
	-10	-8
	-8	-6
	-6	-4
	-4	-2
	-2	0
	0	2
	2	4
	4	6
	6	8
	8	10
	10	19



SECTION A



SECTION B

0 40
VERT: SCALE IN FEET

0 400
HORZ: SCALE IN FEET

INITIAL TO PERIODIC SURVEY COMPARISON SUMMARY			
SURFACE IMPOUNDMENT	CUT	FILL	NET (CU. YD.)
ASH POND	243,495	369,878	126,383 (FILL)
ABOVE SWSE	224,416	314,732	90,315 (FILL)
BELOW SWSE	19,080	55,149	36,069 (FILL)

NOTES:

1. THE INITIAL SURVEY WAS TAKEN FROM THE DRAWING TITLED “TOPOGRAPHIC AND BATHYMETRIC SURVEY, DYNEGY - EDWARDS POWER STATION - BARTONVILLE, IL”, PREPARED BY MAURER-STUTZ, INC., DATED JULY 23, 2015.
2. THE PERIODIC SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED “LUMINANT, ILLINOIS POWER RESOURCES GENERATING, LLC, EDWARDS POWER STATION, DECEMBER 2020 TOPOGRAPHY”, PREPARED BY INGENAE, DATED FEBRUARY 23, 2021.
3. ALL SURVEY DATA WAS COLLECTED IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND NORTH AMERICAN DATUM OF 1983 (NAD83) FOR VERTICAL AND HORIZONTAL COORDINATES, RESPECTIVELY.
4. THE STARTING WATER SURFACE ELEVATION (SWSE) OF THE ASH POND IS EL. 447.2 FT, AS NOTED IN THE REPORT TITLED “CCR CERTIFICATION REPORT: INITIAL STRUCTURAL STABILITY ASSESSMENT, INITIAL SAFETY FACTOR ASSESSMENT, AND INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN FOR ASH POND AT EDWARDS POWER STATION”, PREPARED BY AECOM, DATED OCTOBER, 2016.

SURVEY CPMPARISON ISOPACH
ASH POND
EDWARDS POWER STATION
PEORIA, ILLINIOS

Geosyntec consultants

GLP8027.04 | AUGUST 2021

FIGURE 2

P:\CADD\PROJECTS\VISTRA PONDS\EDWARDS\FIGURES\ISOPACH-1 - Last Saved by: KHanavec on 8/30/21

INITIAL AERIAL
07-23-2015 IMAGERY

PERIODIC AERIAL
02-23-2021 IMAGERY

NOTES:

1. THE INITIAL IMAGERY WAS TAKEN FROM THE DRAWING TITLED "TOPOGRAPHIC AND BATHYMETRIC SURVEY, DYNEGY - EDWARDS POWER STATION - BARTONVILLE, IL", PREPARED BY MAURER-STUTZ, INC., DATED JULY 23, 2015.
2. THE PERIODIC IMAGERY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "LUMINANT, ILLINOIS POWER RESOURCES GENERATING, LLC, EDWARDS POWER STATION, DECEMBER 2020 TOPOGRAPHY", PREPARED BY INGENAE, DATED FEBRUARY 23, 2021.

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SCALE IN FEET

INITIAL TO PERIODIC AERIAL IMAGERY COMPARISON ASH POND EDWARDS POWER STATION PEORIA, ILLINIOS	
Geosyntec consultants	DRAWING 3
GLP8027.04 / MAY 2021	

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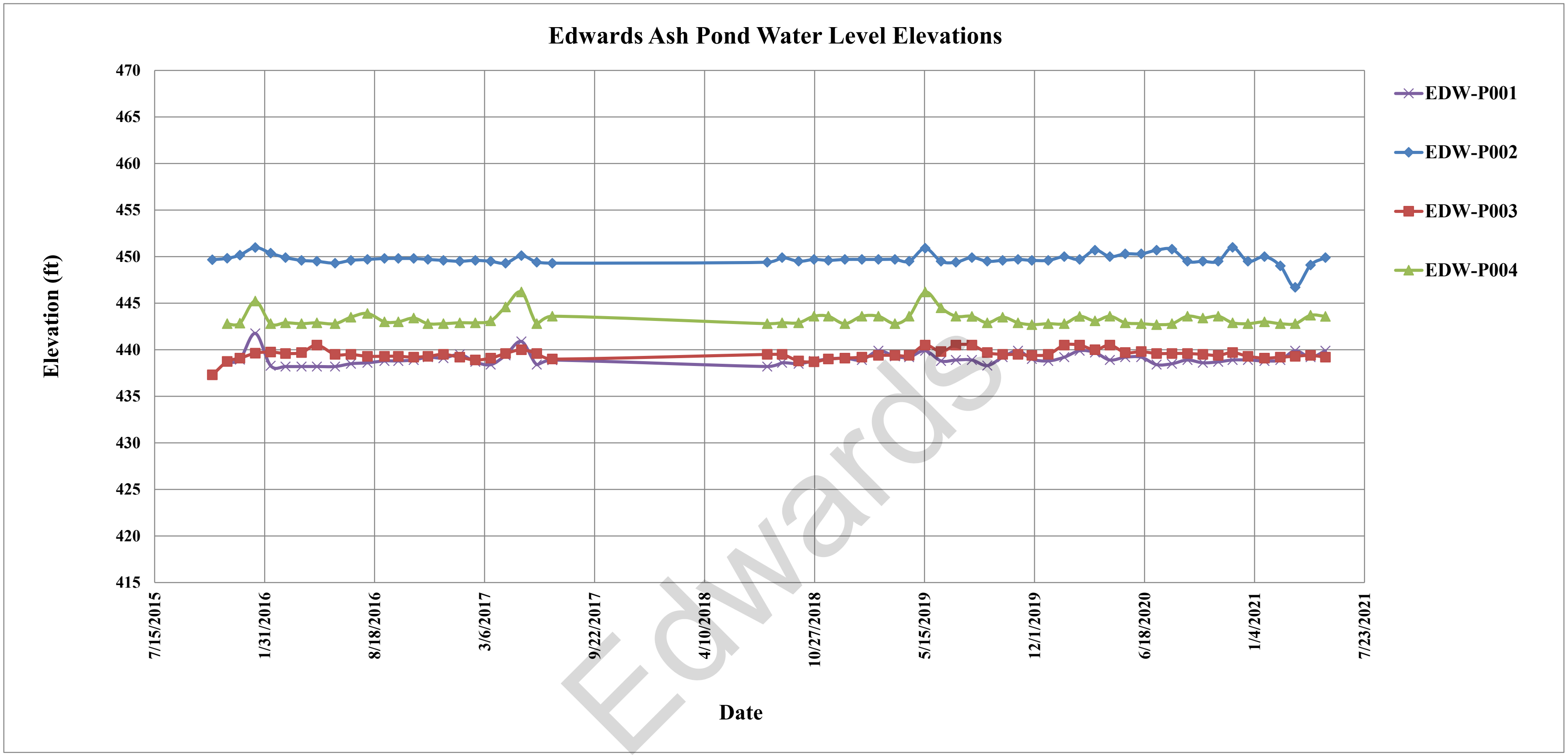
ATTACHMENTS

Attachment A

AP Piezometer Data Plots



NOTES:
1. Piezometer data was taken from the spreadsheet titled "Edwards Piezo Measurements_20160211", provided by the Edwards Power Plant.

PIEZOMETER DATA PERIODIC CERTIFICATION EDWARDS POWER PLANT EDWARDS, ILLINOIS		
Geosyntec consultants		Figure A-1
GLP8027	6/15/2021	

Attachment B

AP Site Visit Photolog

GEOSYNTEC CONSULTANTS
Photographic Record

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond	**Site:** Edwards Power Plant

Photo: P-1

Date: 6/10/2021

Direction Facing: S

Comments: Slope along access road to former acid building. Pond is to the right beyond the train.

Photo: P-2

Date: 6/10/2021

Direction Facing: E

Comments: Rip rap placed on steeper slope in place of grass.

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond	**Site:** Edwards Power Plant

Photo: P-3 **Date:** 6/10/2021 **Direction Facing:** S **Comments:** Crest of dam and inside of pond.	
Photo: P-4 **Date:** 6/10/2021 **Direction Facing:** SW **Comments:** Drop inlet spillway structure	

Site Owner: Illinois Power Generating Company **Project Number:** GLP8027

CCR Unit: Ash Pond **Site:** Edwards Power Plant

Photo: P-5

Date: 6/10/2021

Direction Facing: Down

Comments: Drop inlet morning glory spillway structure from above.

Photo: P-6

Date: 6/10/2021

Direction Facing: NW

Comments: Pond divider dike.

GEOSYNTEC CONSULTANTS
Photographic Record

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond	**Site:** Edwards Power Plant

Photo: P-7	
Date: 6/10/2021	
Direction Facing: S	
Comments: Crest of filled and covered area at south end of pond outside of tracks.	

Photo: P-8	
Date: 6/10/2021	
Direction Facing: W	
Comments: Slope of filled and covered area at south end of AP.	

Site Owner: Illinois Power Generating Company **Project Number:** GLP8027

CCR Unit: Ash Pond **Site:** Edwards Power Plant

Photo: P-9

Date: 6/10/2021

Direction Facing: W

Comments: Water at toe of slope in ditch.

Photo: P-10

Date: 6/10/2021

Direction Facing: NE

Comments: Bottom ash sluiced into clean out area. Pooled bottom ash is to be drained and disposed of on site.

GEOSYNTEC CONSULTANTS
Photographic Record

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond	**Site:** Edwards Power Plant

Photo: P-11

Date: 6/10/2021

Direction Facing: W

Comments: Piled ash is higher than the crest of dam.

Photo: P-12

Date: 6/10/2021

Direction Facing: NNW

Comments: West end of bottom ash clean-out area.

Site Owner: Illinois Power Generating Company **Project Number:** GLP8027

CCR Unit: Ash Pond **Site:** Edwards Power Plant

Photo: P-13

Date: 6/10/2021

Direction Facing: SSE

Comments: Piled ash and concrete debris on the left.

Photo: P-14

Date: 6/10/2021

Direction Facing: NNW

Comments: Filled "serpentine" and ash fill to the right placed higher than the crest.

GEOSYNTEC CONSULTANTS **Photographic Record**	
Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond	**Site:** Edwards Power Plant

Photo: P-15	
Date: 6/10/2021	
Direction Facing: ENW	
Comments: Ash fill placed higher than the crest; left one remaining serpentine pond to the left.	

Attachment C

Periodic History of Construction Report Update Letter

Geosyntec consultants

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Chesterfield, MO 63005
PH 636-812-0800
www.geosyntec.com

October 11, 2021

Illinois Power Resources Generation, LLC
7800 South Cilco Lane
Bartonville, Illinois 61607

Subject: Periodic History of Construction Report Update Letter
USEPA Final CCR Rule, 40 CFR §257.73(c)
Edwards Power Plant
Bartonville, Illinois

Geosyntec Consultants (Geosyntec) has prepared this Letter at the request of Illinois Power Resources Generation (IPRG) to document updates to the Initial History of Construction (HoC) report for the Edwards Power Plant (EPP), also known as the Edwards Power Station (EPS). The Initial HoC report was prepared by AECOM in October of 2016 [1] in accordance with 40 Code of Federal Regulations (CFR) §257.73(c) of the United States Environmental Protection Agency (USEPA) Coal Combustion Residuals Rule, known as the CCR Rule [2]. This letter also includes information required by Section 845.220(a)(1)(B) (Design and Construction Plans) of the state-specific Illinois Environmental Protection Agency (IEPA) Part 845 CCR Rule [3] that is not expressly required by §257.73(c).

BACKGROUND

The CCR Rule required that, by October 17, 2016, Initial HoC reports to be compiled for existing CCR surface impoundments with: (1) a height of five feet or more and a storage volume of 20 acre-feet or more, or (2) a height of 20 feet or more. The Initial HoC report was required to contain, to the extent feasible, the information specified in 40 CFR §257.73(c)(1)(i)-(xii). The Initial HoC report for EPP, which included the existing CCR surface impoundment, the Ash Pond (AP), was prepared and subsequently posted to IPRG's CCR Website prior to October 17, 2016.

The CCR Rule requires that Initial HoC to be updated if there is a significant change to any information complied in the Initial HoC report, as listed below:

§ 257.73(c)(2): If there is a significant change to any information complied under paragraph (c)(1) of this section, the owner or operator of the CCR unit must update the relevant information and place it in the facility's operating record as required by § 257.105(f)(9).

IRPG retained Geosyntec to review the Initial HoC report, review reasonably and readily available information for the AP generated since the Initial HoC report was prepared, and perform a site visit to EPP to evaluate if significant changes may have occurred since the Initial HoC report was prepared. This Letter contains the results of Geosyntec's evaluation and documents significant changes that have occurred at the AP and EPP, as they pertain the requirements of §257.73(c)(1)(i)-(xii)

UPDATES TO HISTORY OF CONSTRUCTION REPORT

Geosyntec's evaluation for the EPP AP determined that no known significant changes requiring updates to the information in the Initial HoC report pertaining to pertaining to §257.73(c)(1)(ii-viii) of the CCR Rule had occurred since the Initial HoC report had been developed.

However, Geosyntec's evaluation determined that significant changes at the EPP AP pertaining to §257.73(c)(1) (i),(ix)-(x) of the CCR Rule had occurred since the Initial HoC report had been developed. Additionally, information how long the CCR surface impoundments have been operating and the types of CCR in the surface impoundments, as required by Section 845.220(a)(1)(B) of the Part 845 Rule were not included in the Initial HoC report, as this information is not required by the CCR Rule. Each change and the subsequent updates to the Initial HoC report is described within this section.

Section 845.220(a)(1)(B): A statement of ... how long the CCR surface impoundment has been in operation, and the types of CCR that have been placed in the surface impoundment.

<u>*Ash Pond*</u>

The AP is in operation since 1960. As of the date of this report, the AP has been present for approximately 61 years.

CCR placed in the AP has been used to store and dispose sluiced bottom ash and fly ash and to clarify water, including non-CCR station process wastewaters, prior to discharge in accordance with the station's NPDES permit [1].

§ 257.73(c)(1)(i): The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

The state identification number (ID) for the AP have been assigned by the Illinois Environmental Protection Agency (IEPA). The ID is listed in **Table 1**.

Table 1 – IEPA ID Numbers

CCR Surface Impoundment	State ID
Ash Pond	W1438050005-01

§ 257.73(c)(1)(ix): Area-capacity curves for the CCR unit.

Updated area-capacity curves were prepared for the Process Water Pond and the Clarification Pond for the AP in 2021. These curves are provided in **Figures 1** and **2**.

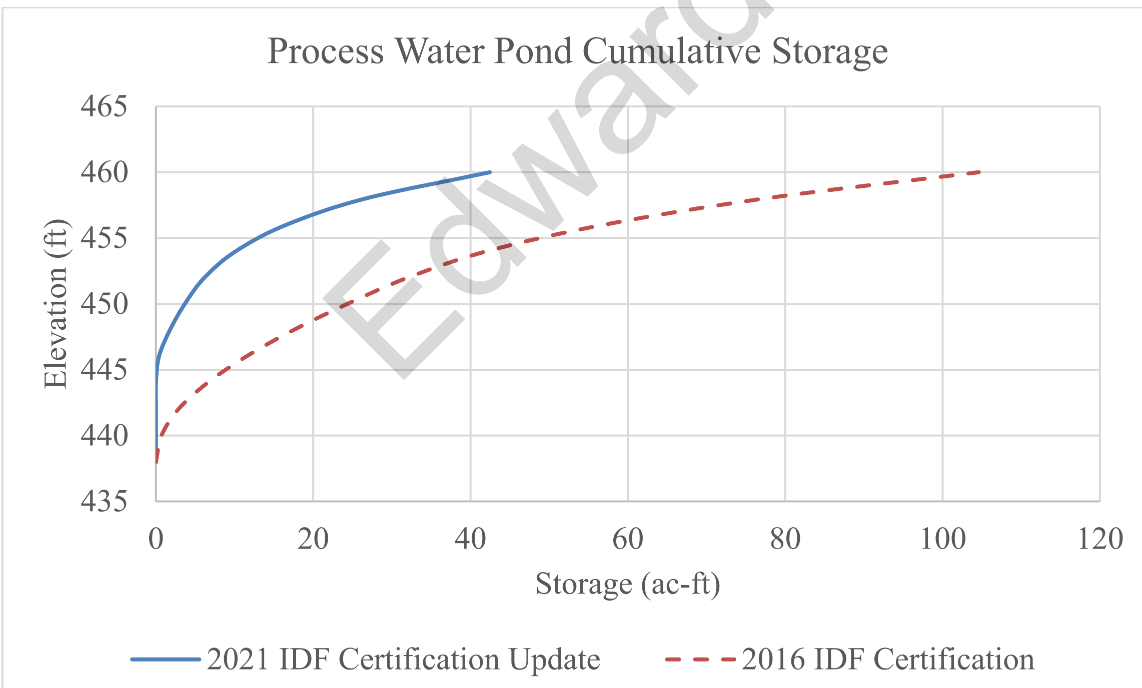


Figure 1 – Area-Capacity Curve for Ash Pond – Process Water Pond

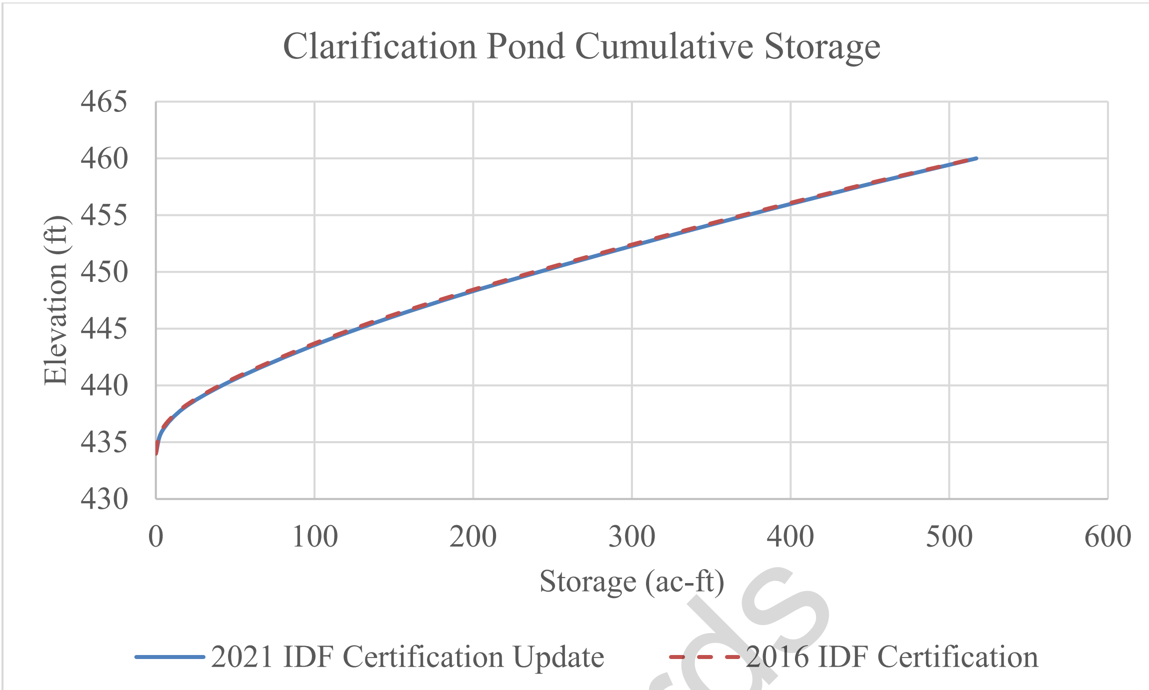


Figure 2 – Area-Capacity Curve for Ash Pond – Clarification Pond

§ 257.73(c)(1)(x): A description of each spillway and diversion design features and capacities and calculations used in their determination.

Updated discharge capacity calculations for the existing spillways were prepared in 2021 using HydroCAD 10 modeling software. The calculations indicate that the AP has sufficient storage capacity and will not overtop the embankments during the 1,000 year 24-hour rainfall event. The results of the calculations are provided in **Table 2**.

Table 2 – Results of Updated Discharge Capacity Calculations

	Process Water Pond	Clarification Pond
Approximate Berm Minimum Elevation[1], ft	458.8	459.6
Approximate Emergency Spillway Elevation[1], ft	Not Applicable	Not Applicable
Starting Water Surface Elevation[1] (SWSE), ft	450.4	447.3
Peak Water Surface Elevation[1] (PWSE), ft	458.6	457.5
Time to Peak, hr	9.3	24.6
Surface Area[2], ac	7.3	29.2
Storage[3], ac-ft	27.2	265.3
Notes:		

[1]Elevations are based on the NAVD88 datum [2]Surface area is defined as the water surface area at the PWSE [2]Storage is defined as the volume between the SWSE and PWSE

CLOSING

This letter has been prepared to document Geosyntec's evaluation of changes that have occurred at the AP at the EPP since the Initial HoC was developed, based on reasonably and readily available information provided by IPRG, observed by Geosyntec during the site visit, or generated by Geosyntec as part of subsequent calculations.

Sincerely,

John Seymour, P.E.
Senior Principal

Lucas P. Carr, P.E.
Senior Engineer

REFERENCES

[1] AECOM, "History of Construction, USEPA 40 CFR § 257.73(c), Edwards Power Station, Bartonville, IL," October 2016.

[2] United Stated Environmental Protection Agency, "40 CFR Parts 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule, 2015," 2015.

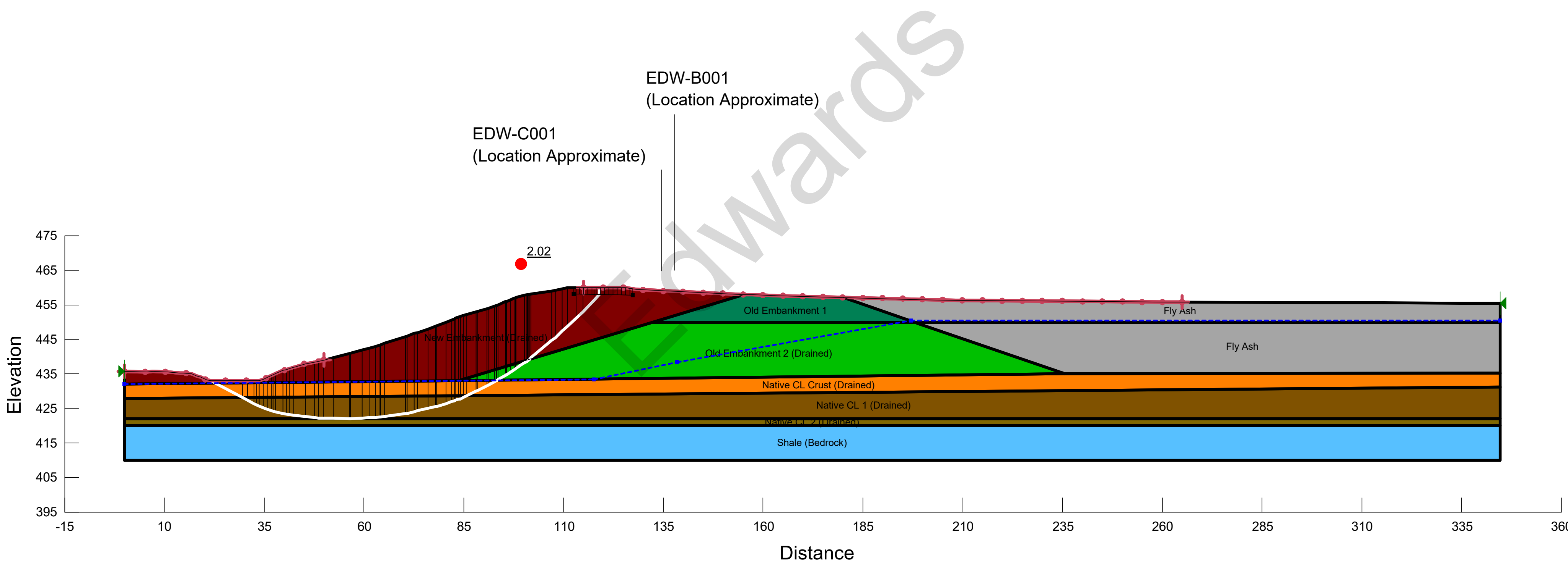
[3] Illinois Environmental Protection Agency, "35 Ill. Adm. Code Part 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments," Springfield, IL, 2021.

Attachment D

Periodic Structural Stability and Safety Factor Assessment Analyses

Edwards Power Plant
Cross-section A
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



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Edwards Power Plant
Cross-section A
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
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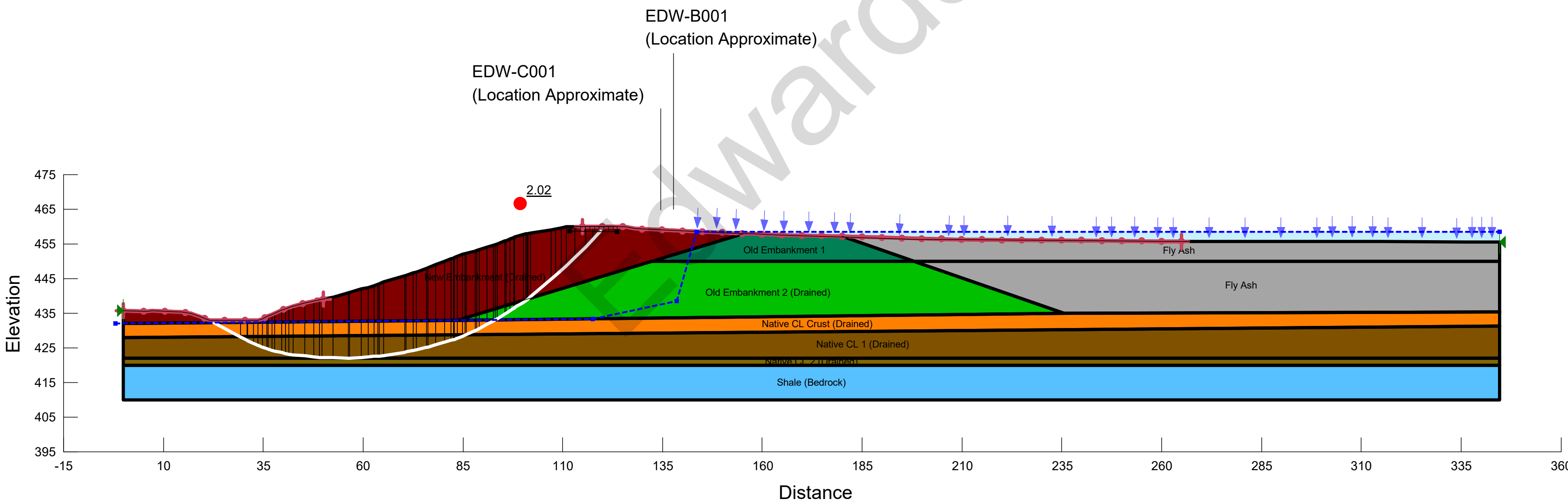

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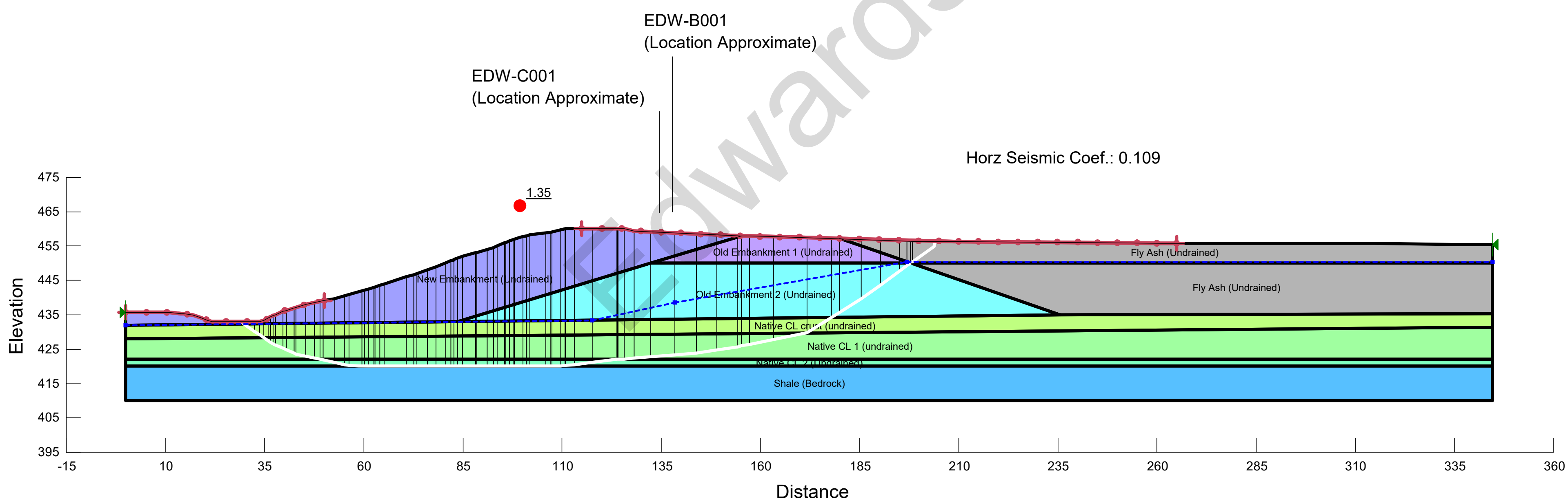
Edwards Power Plant
Cross-section A
Slope Stability - Seismic

Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1



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Edwards Power Plant
Cross-section B
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
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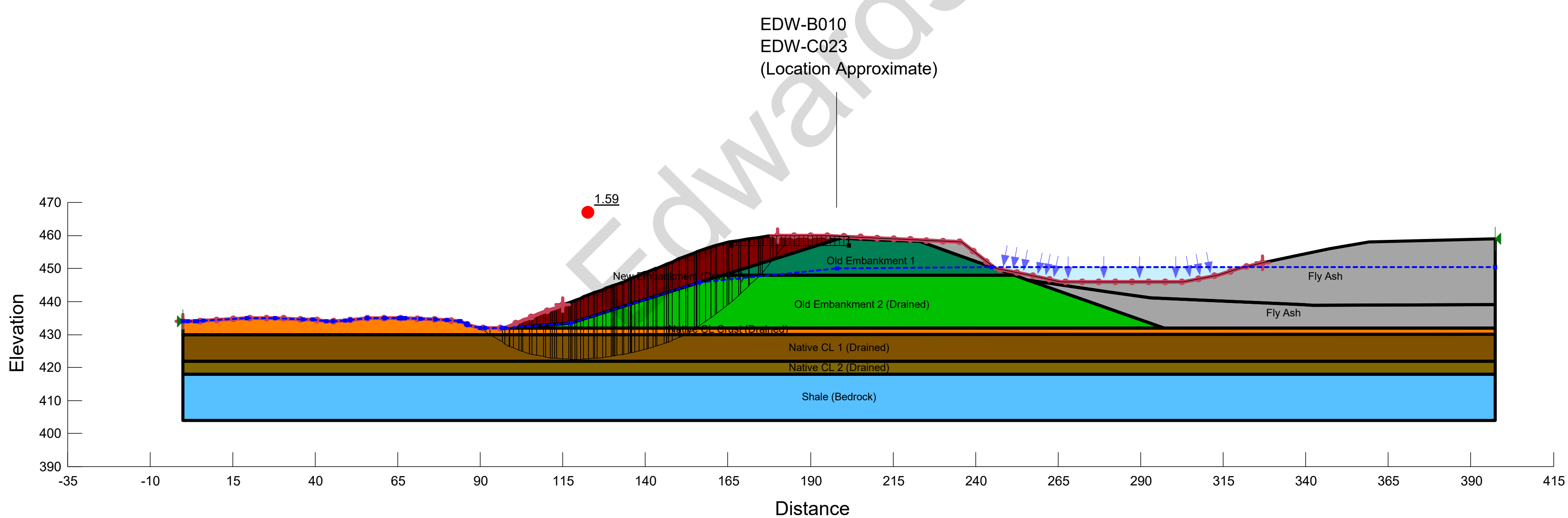
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1



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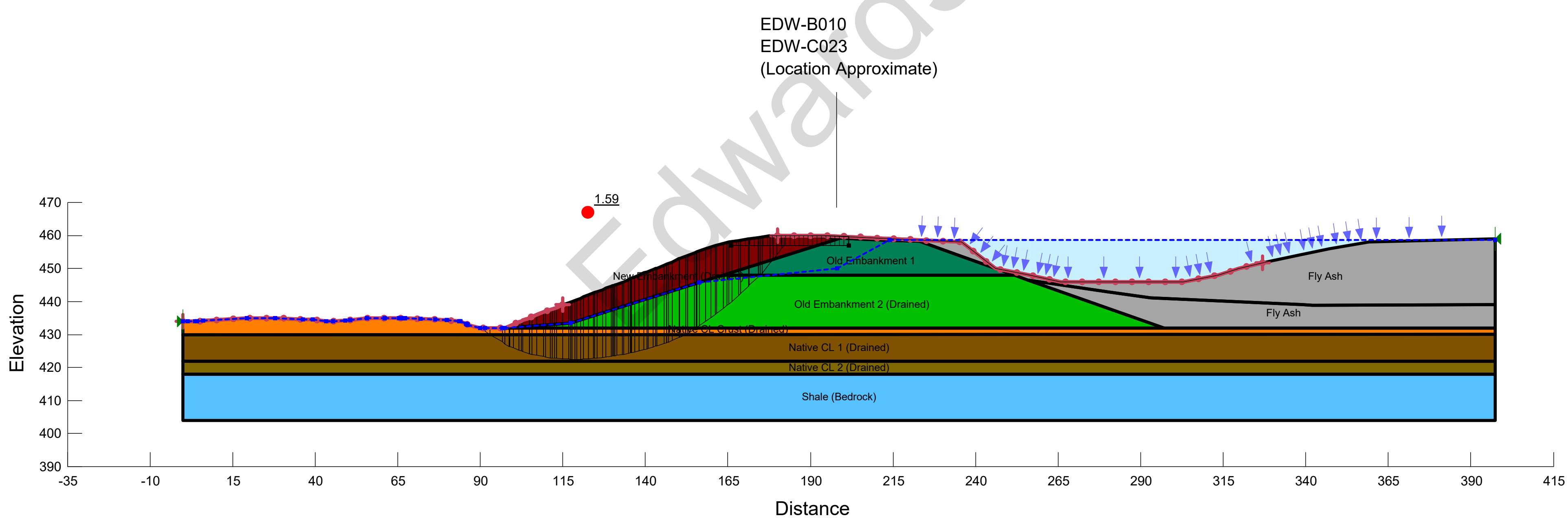
Edwards Power Plant
Cross-section B
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1



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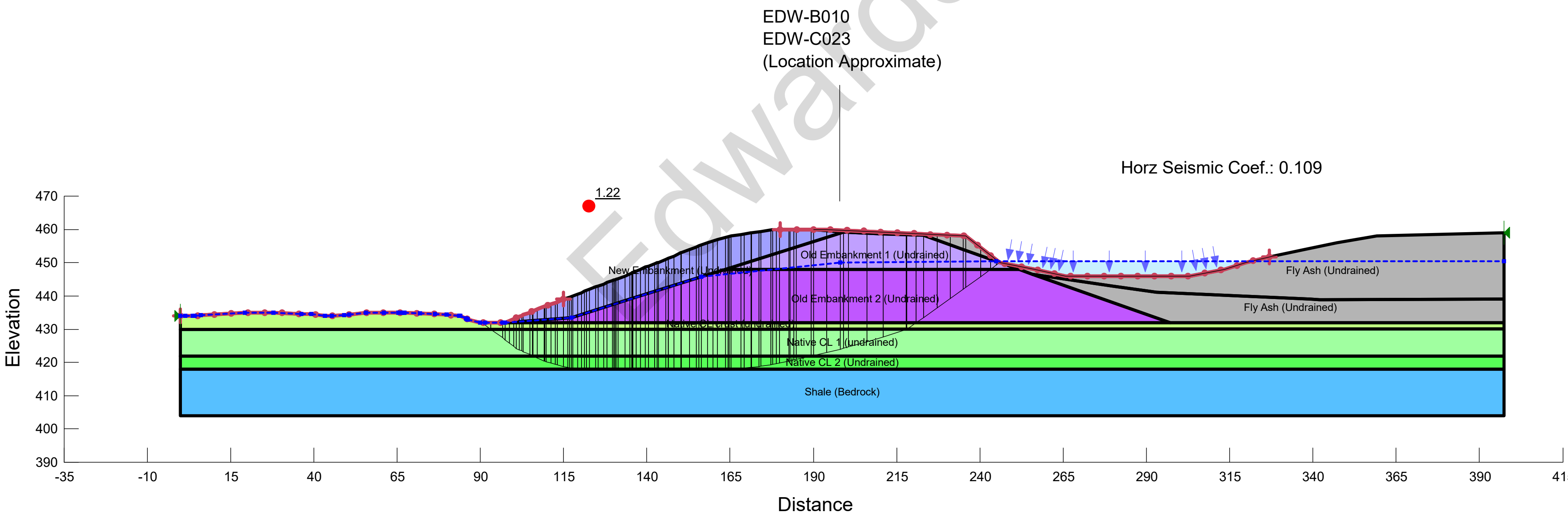
Edwards Power Plant
Cross-section B
Slope Stability - Seismic

Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1



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Edwards Power Plant
Cross-section C
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
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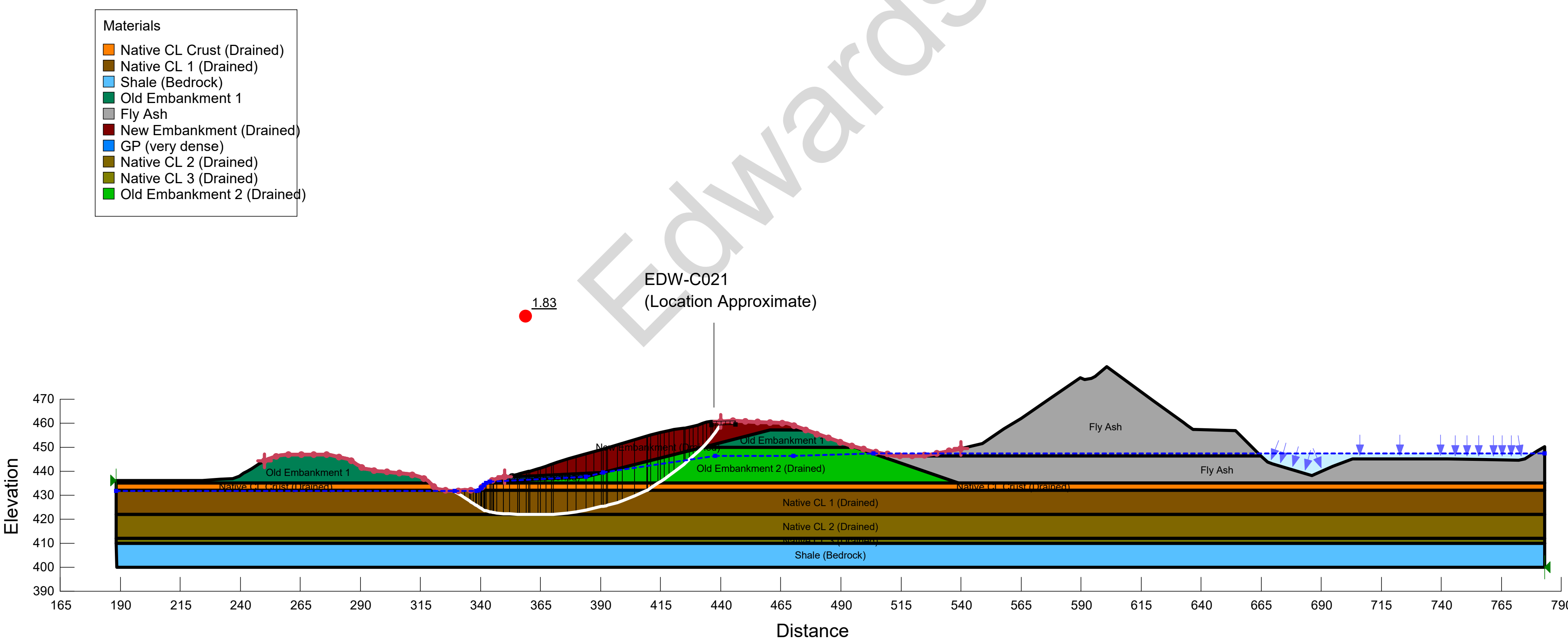
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



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Edwards Power Plant
Cross-section C
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
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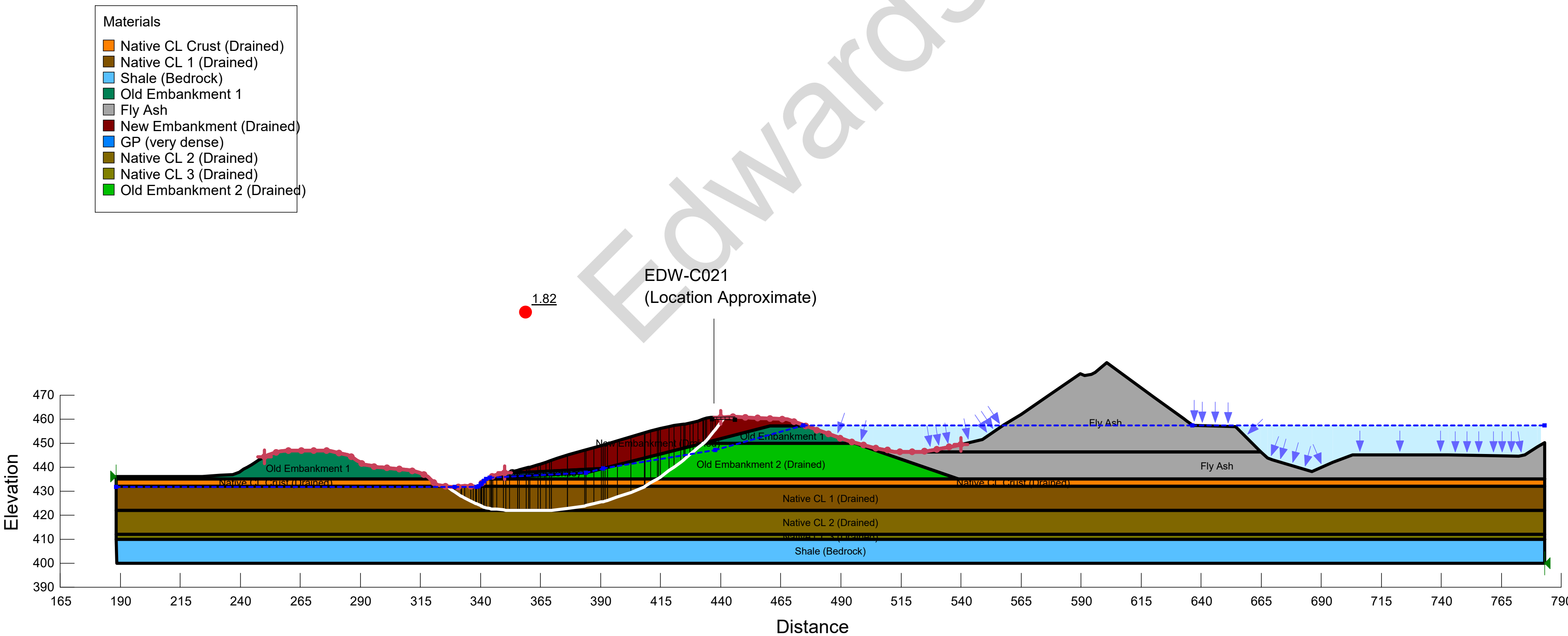

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Edwards Power Plant-
section C
Slope Stability - Seismic

Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
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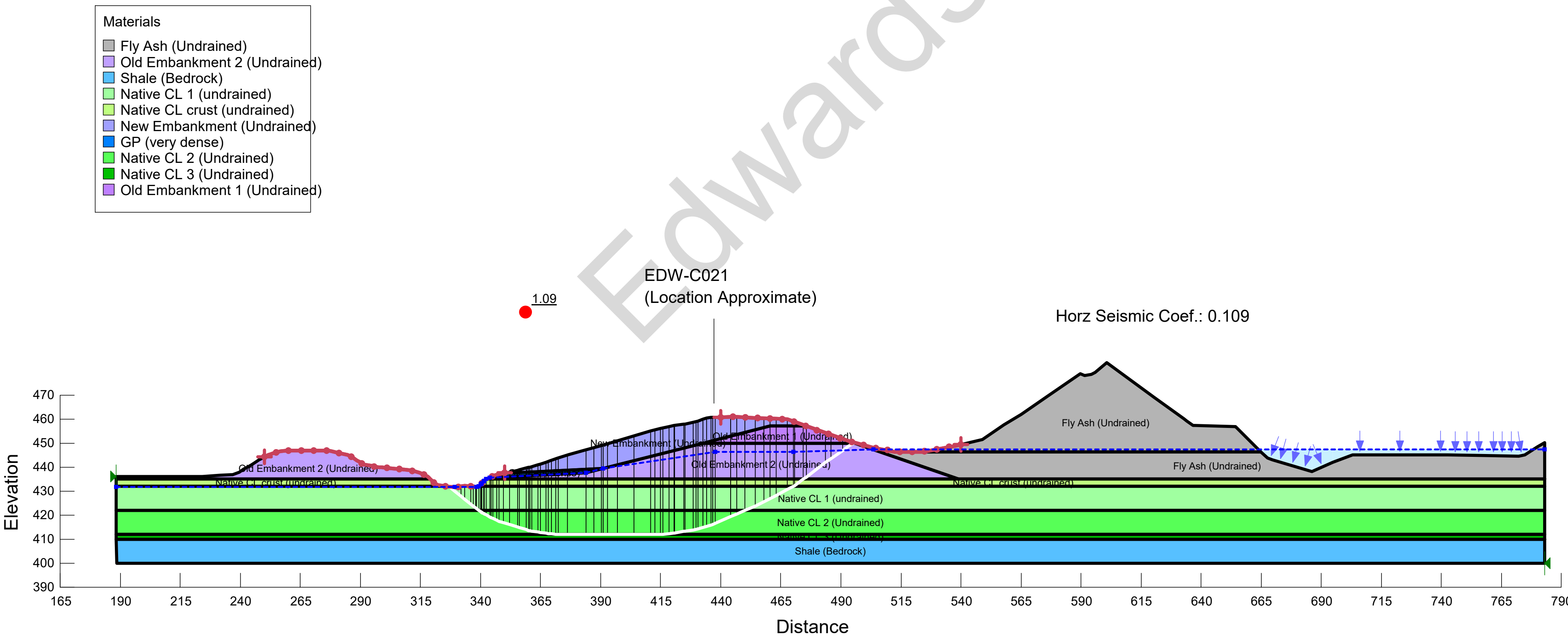
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1



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Edwards Power Plant
Cross-section D
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
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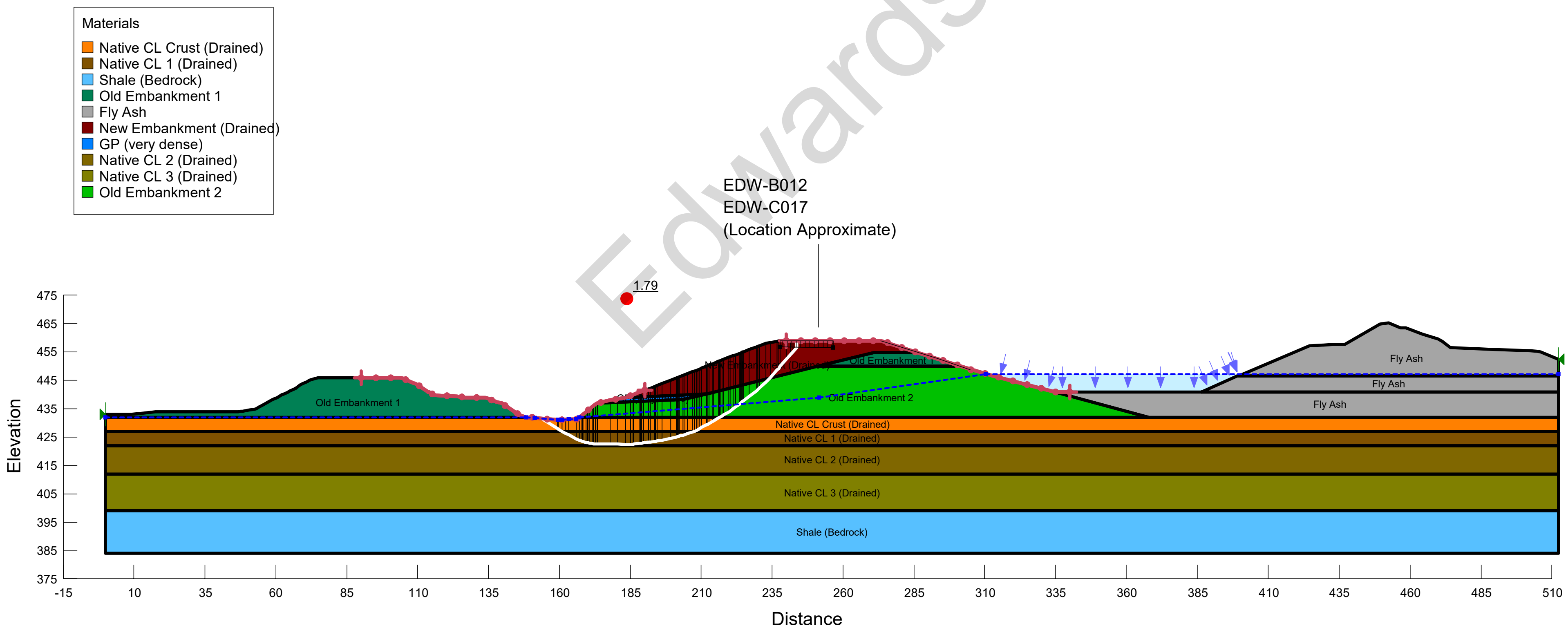

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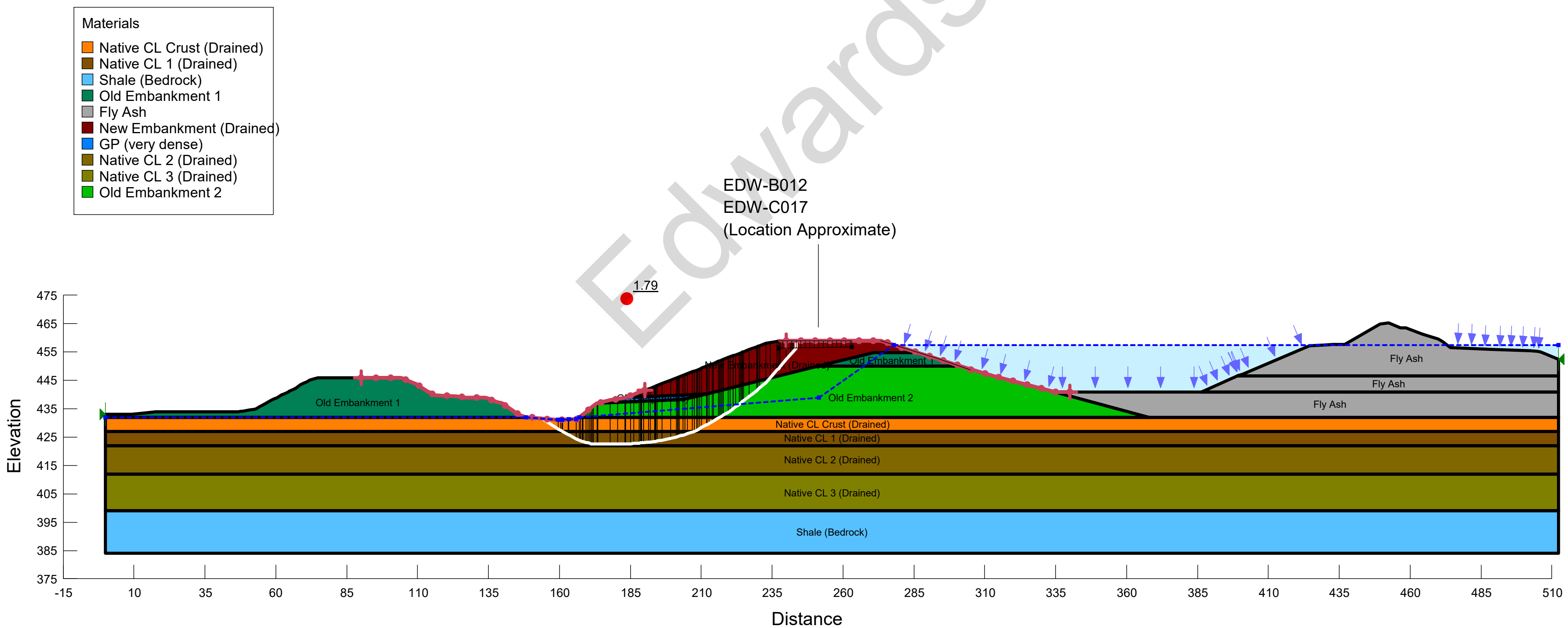
Edwards Power Plant
Cross-section D
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



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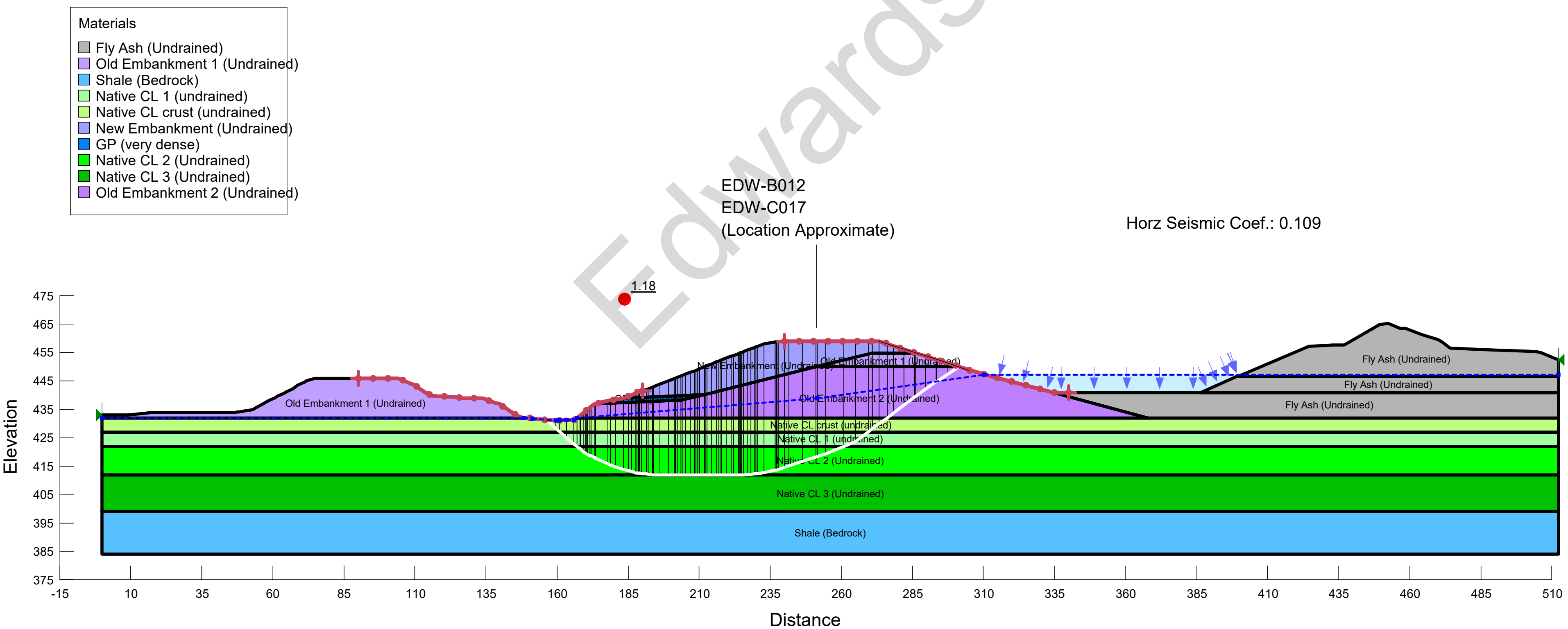
Edwards Power Plant
Cross-section D
Slope Stability - Seismic

Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1



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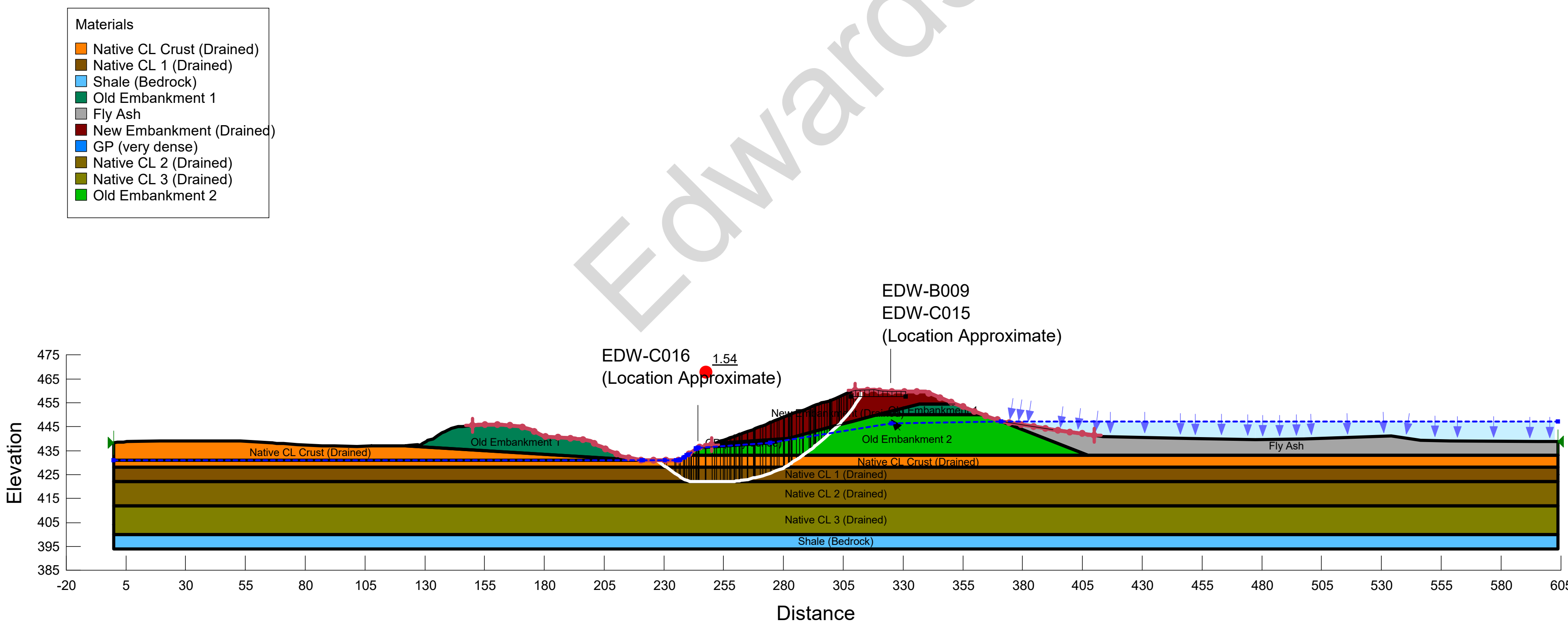
Edwards Power Plant
Cross-section E
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



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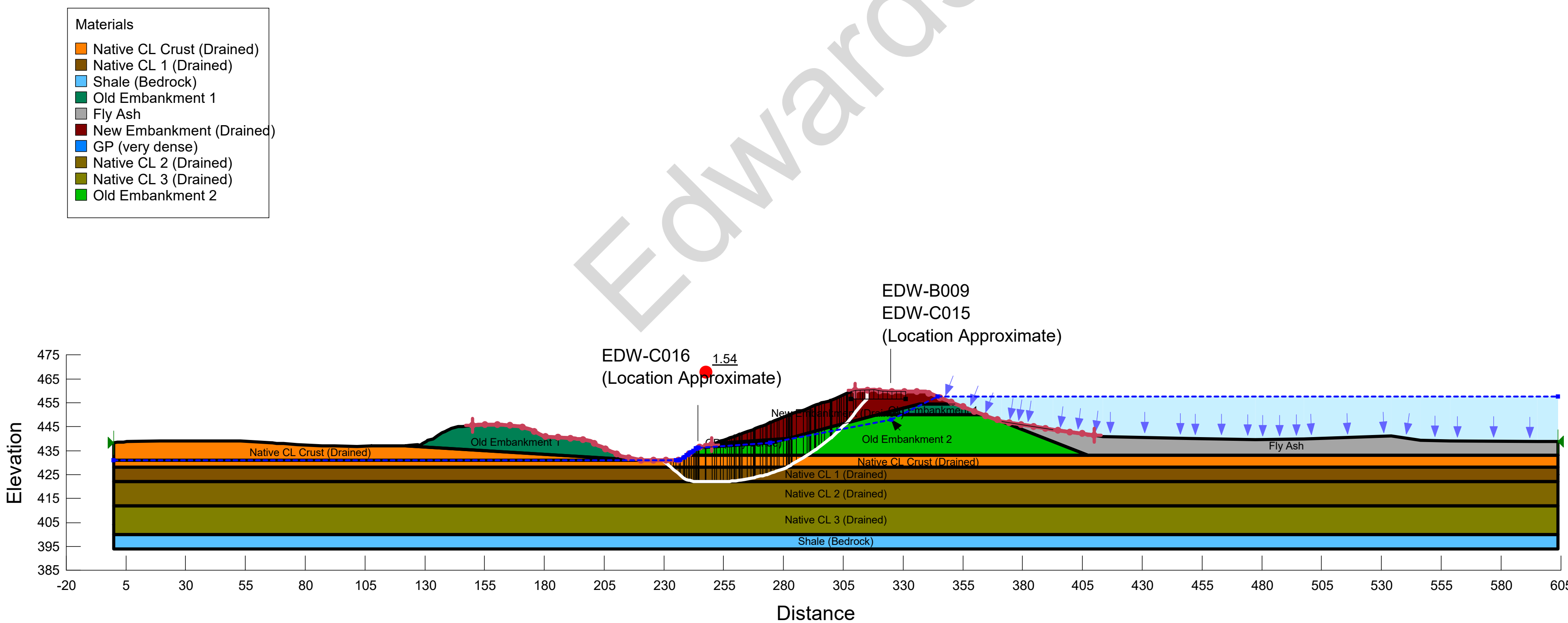
Edwards Power Plant
Cross-section E
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



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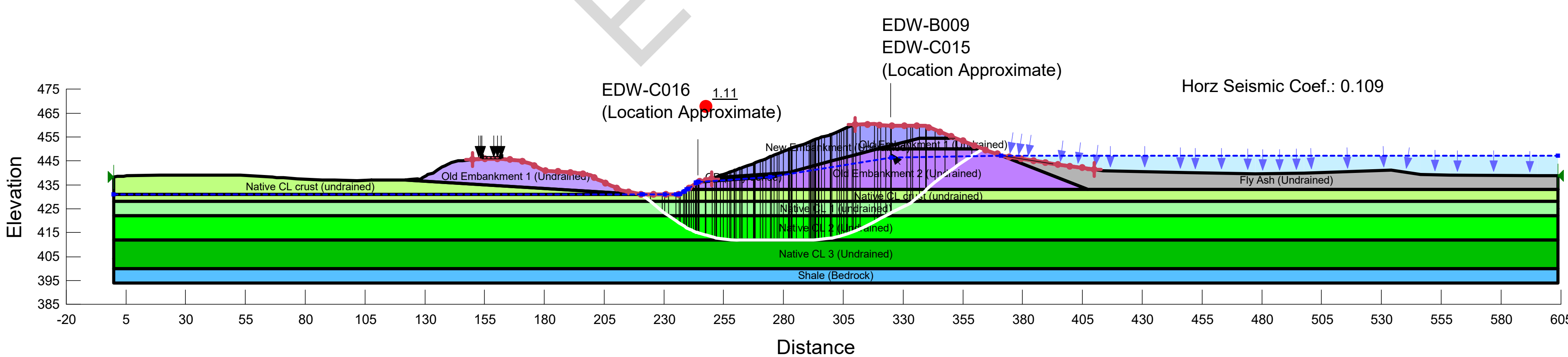
Edwards Power Plant
Cross-section E
Slope Stability - Seismic

Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Materials
- Fly Ash (Undrained)
- Old Embankment 1 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL crust (undrained)
- New Embankment (Undrained)
- GP (very dense)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)
- Old Embankment 2 (Undrained)



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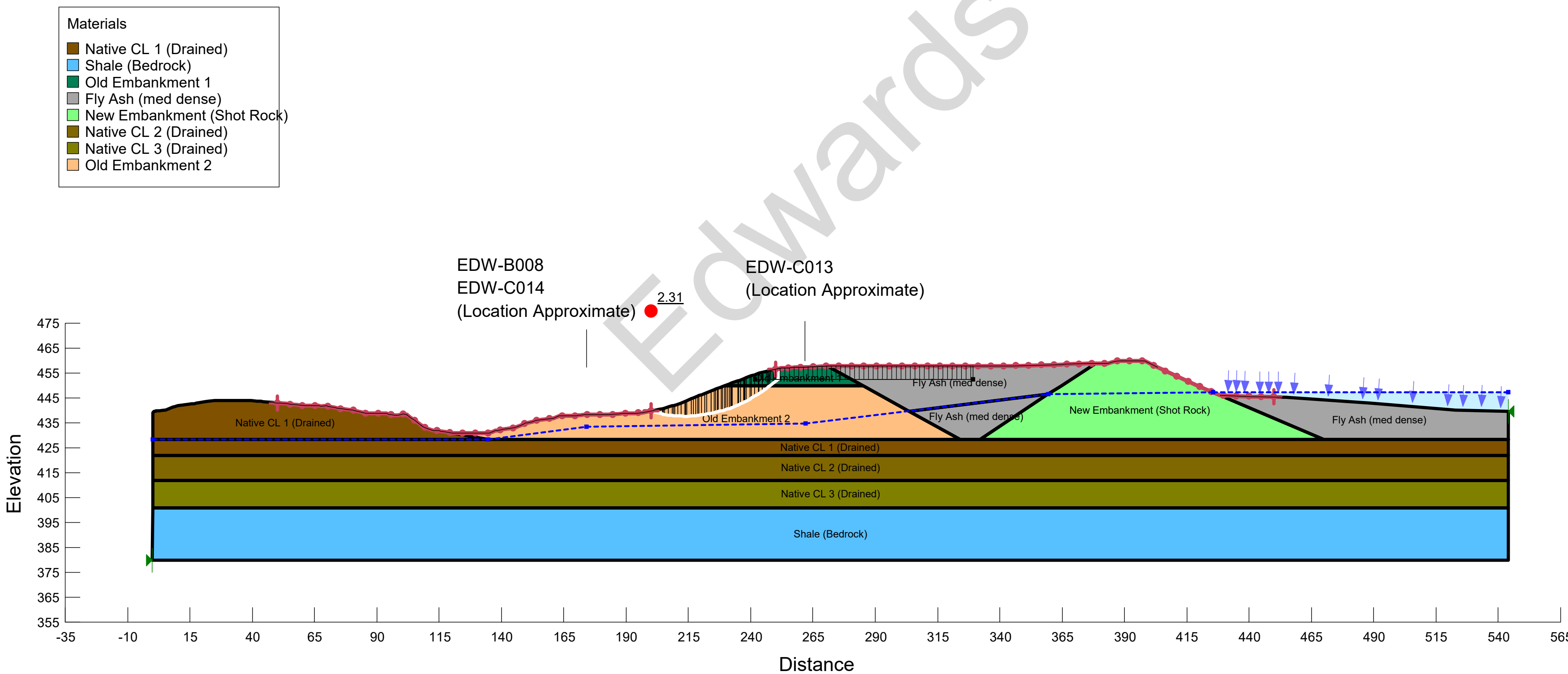
Edwards Power Plant
Cross-section F
Slope Stability - Steady State

Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Shot Rock) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



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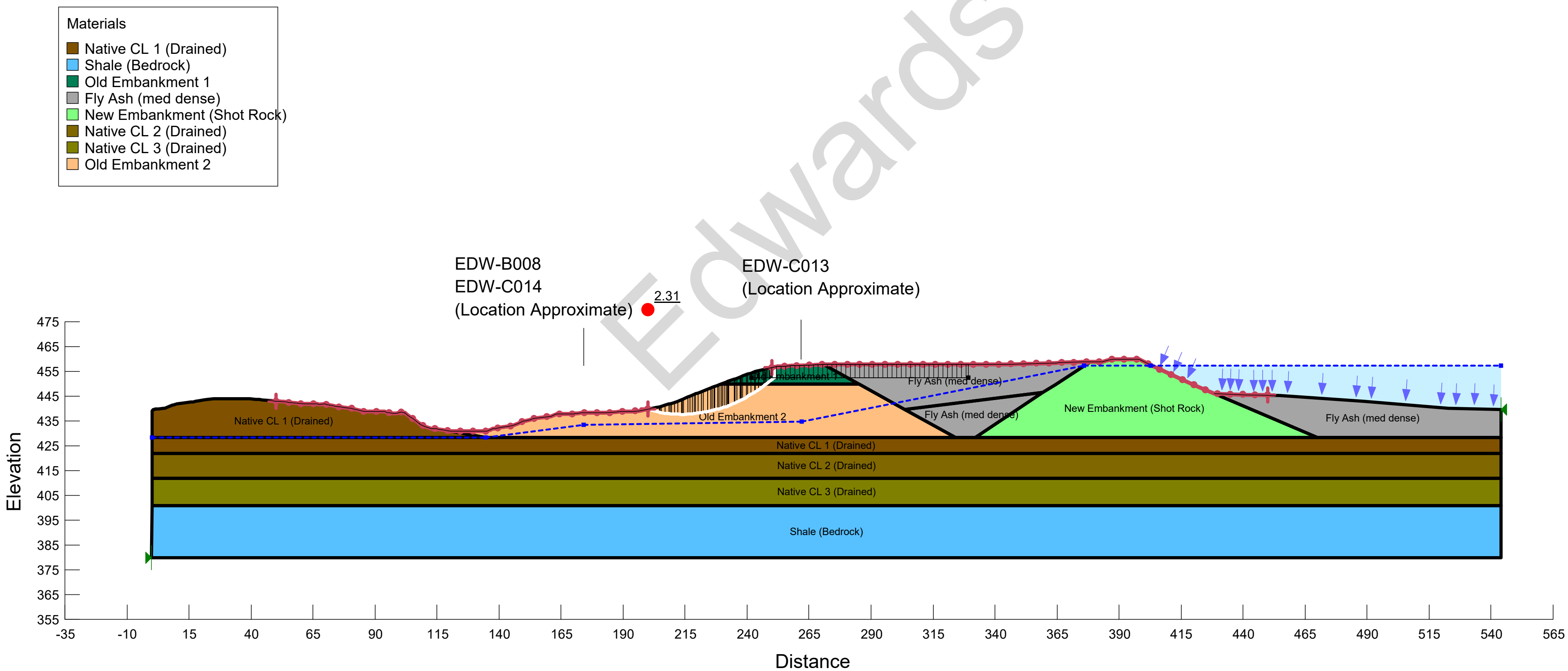
Edwards Power Plant

Cross-section F

Slope Stability - Surcharge Pool

Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Shot Rock) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



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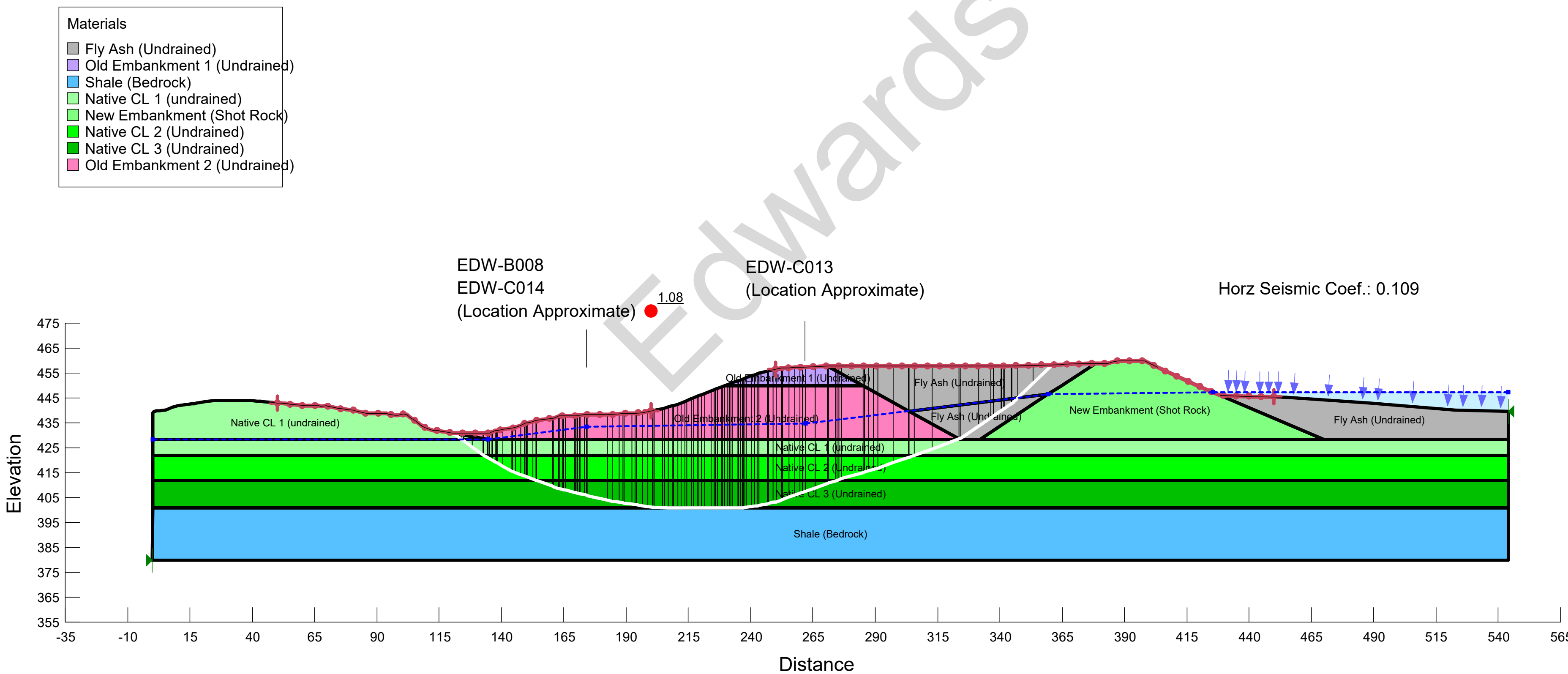
Edwards Power Plant
Cross-section F
Slope Stability - Seismic

Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Shot Rock) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1



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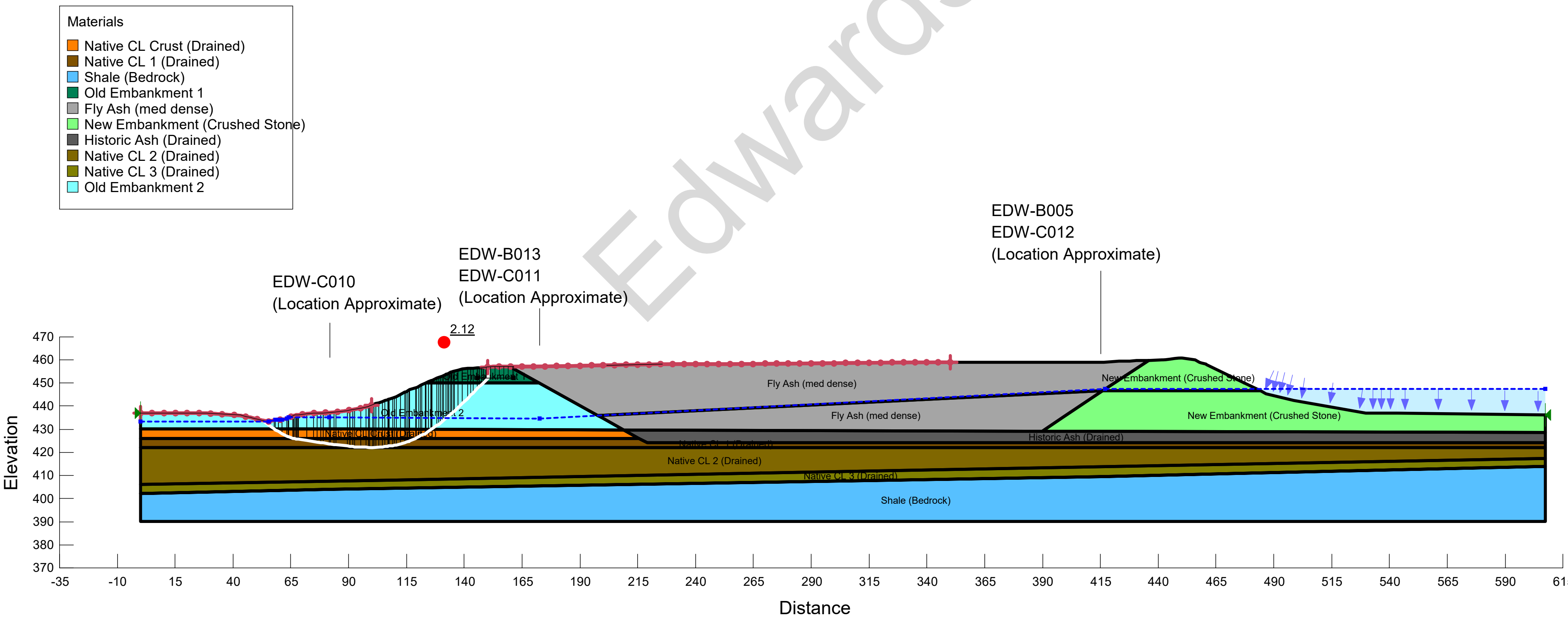
Edwards Power Plant
Cross-section G
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



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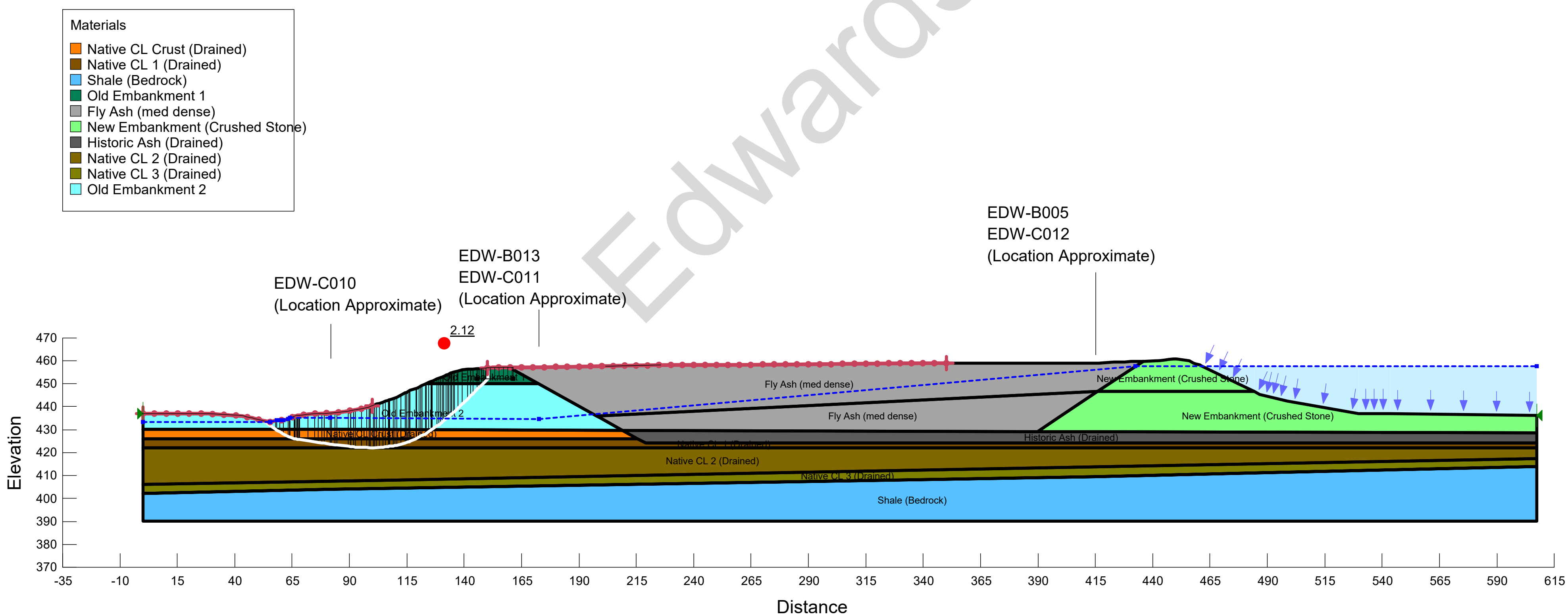
Edwards Power Plant
Cross-section G
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained)   Unit Weight: 120 pcf   Cohesion': 200 psf   Phi': 27.5 °   Piezometric Line: 1
Name: Native CL 1 (Drained)   Unit Weight: 117 pcf   Cohesion': 100 psf   Phi': 26 °   Piezometric Line: 1
Name: Shale (Bedrock)   Unit Weight: 140 pcf   Cohesion': 1,000 psf   Phi': 36 °   Piezometric Line: 1
Name: Old Embankment 1   Unit Weight: 125 pcf   Cohesion': 200 psf   Phi': 28 °   Piezometric Line: 1
Name: Fly Ash (med dense)   Unit Weight: 105 pcf   Cohesion': 100 psf   Phi': 27 °   Piezometric Line: 1
Name: New Embankment (Crushed Stone)   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 32 °   Piezometric Line: 1
Name: Historic Ash (Drained)   Unit Weight: 105 pcf   Cohesion': 100 psf   Phi': 26 °   Piezometric Line: 1
Name: Native CL 2 (Drained)   Unit Weight: 105 pcf   Cohesion': 200 psf   Phi': 26 °   Piezometric Line: 1
Name: Native CL 3 (Drained)   Unit Weight: 105 pcf   Cohesion': 200 psf   Phi': 26 °   Piezometric Line: 1
Name: Old Embankment 2   Unit Weight: 125 pcf   Cohesion': 100 psf   Phi': 29 °   Piezometric Line: 1



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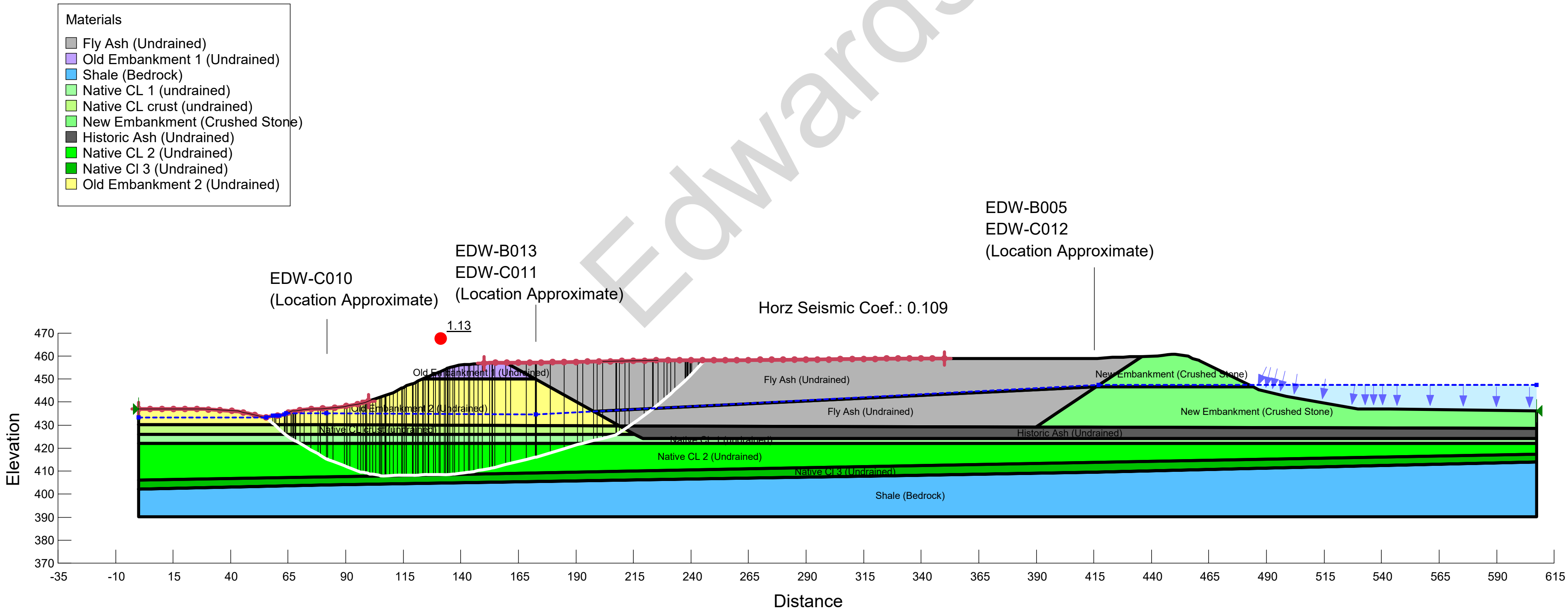
Edwards Power Plant
Cross-section G
Slope Stability - Seismic

Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Undrained) Unit Weight: 105 pcf Cohesion': 750 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Piezometric Line: 1
Name: Native Cl 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1



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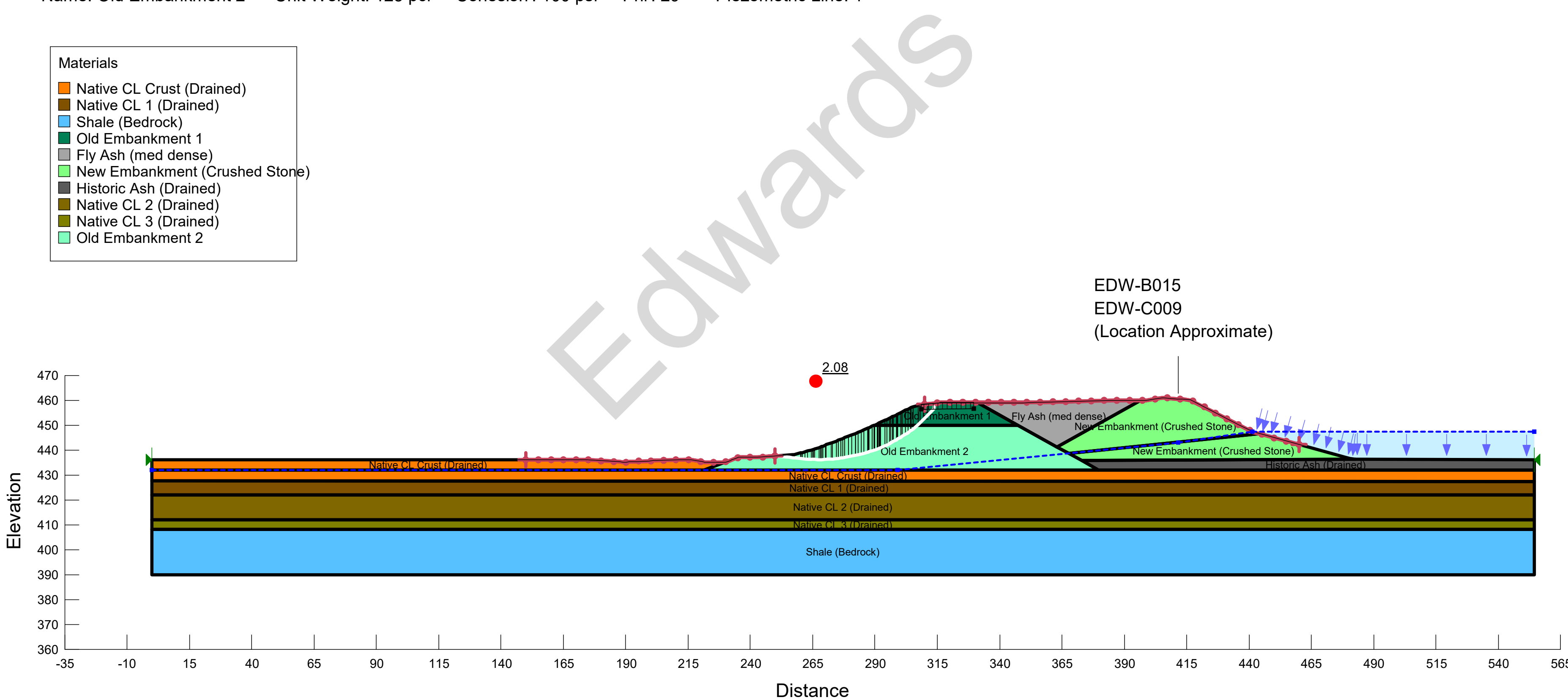
Edwards Power Plant

Cross-section H

Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



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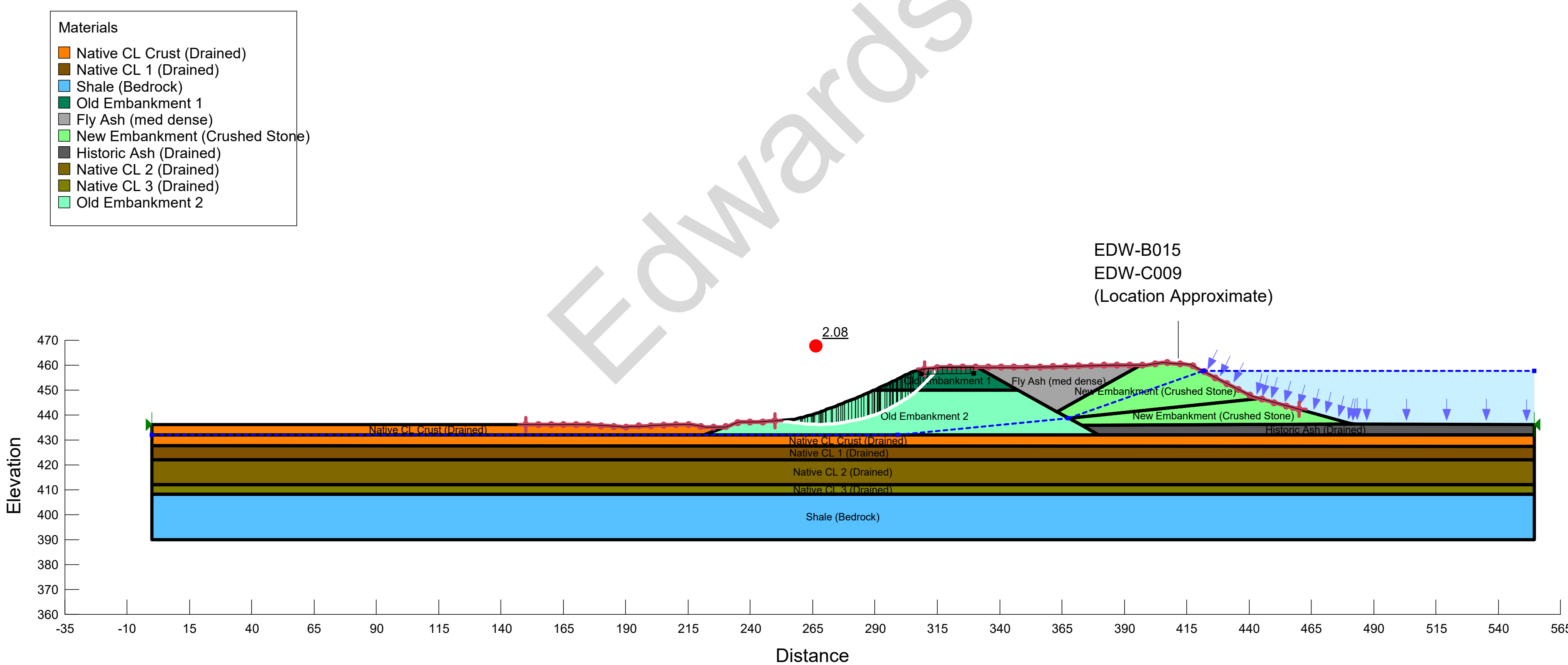
Edwards Power Plant
Cross-section H
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



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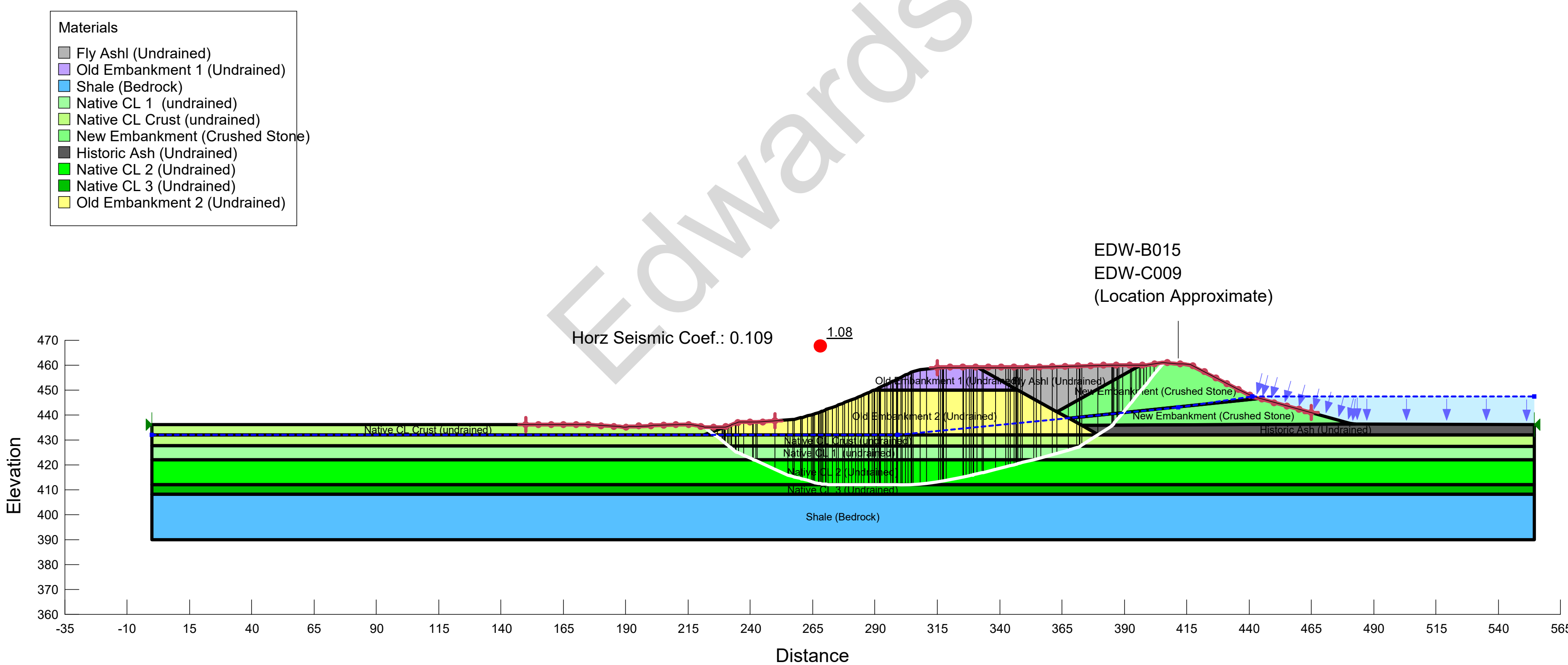
Edwards Power Plant
Cross-section H
Slope Stability - Seismic

Name: Fly Ashl (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL Crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Undrained) Unit Weight: 105 pcf Cohesion': 750 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 117 pcf Cohesion': 700 psf Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1



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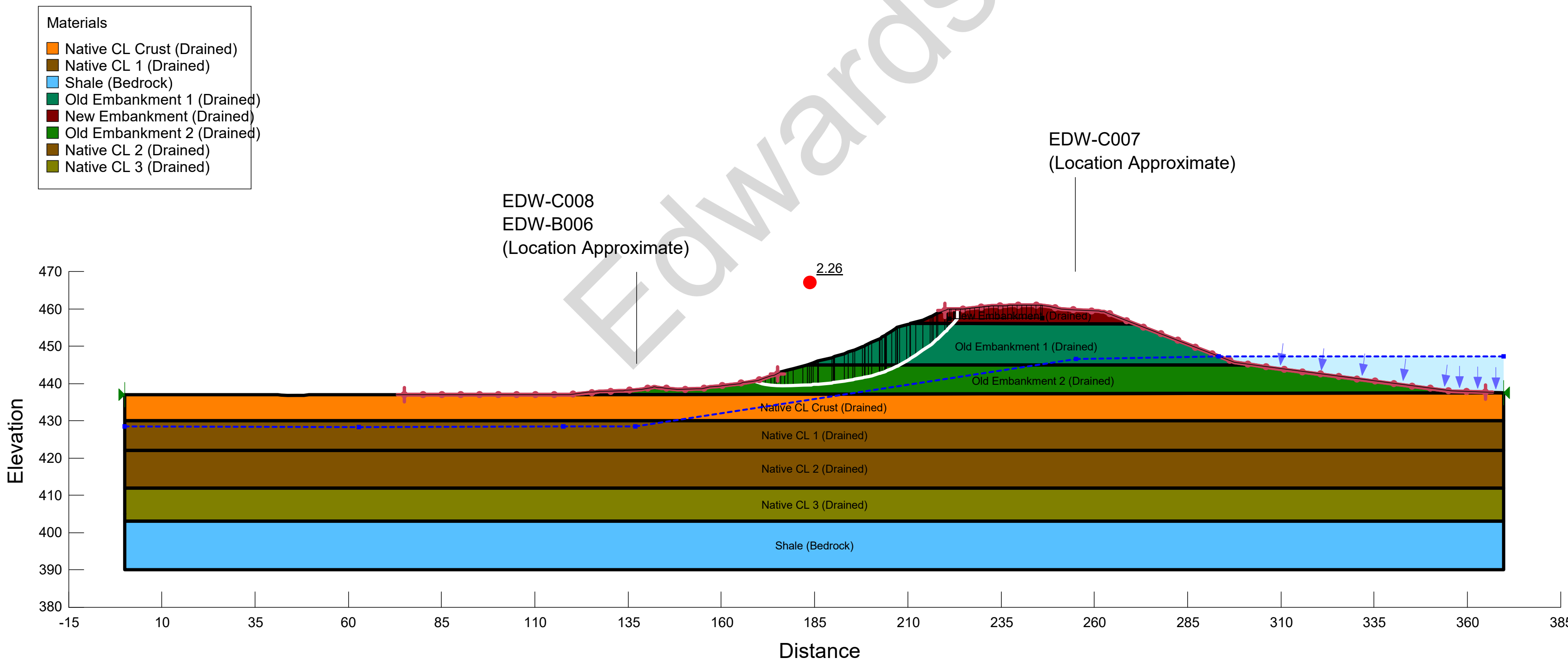
Edwards Power Plant
Cross-section I
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1



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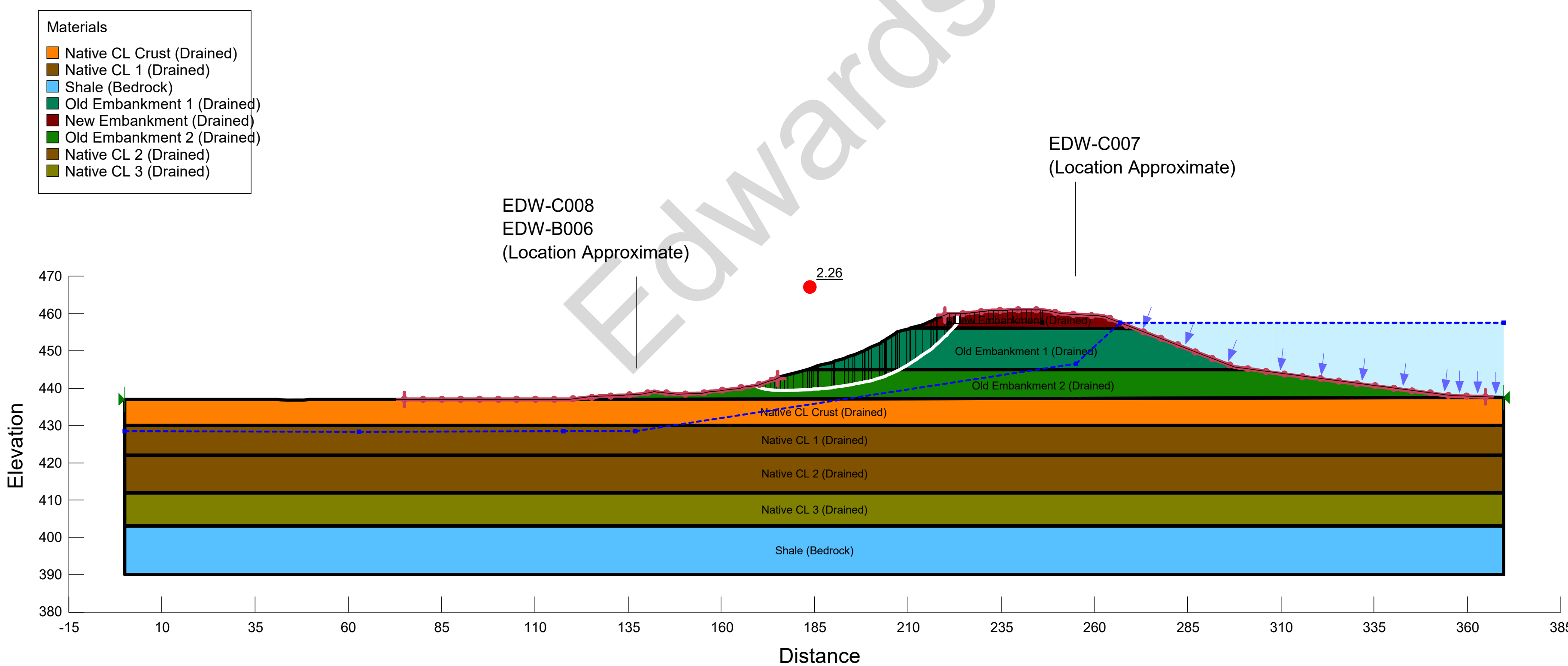
Edwards Power Plant
Cross-section I
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1



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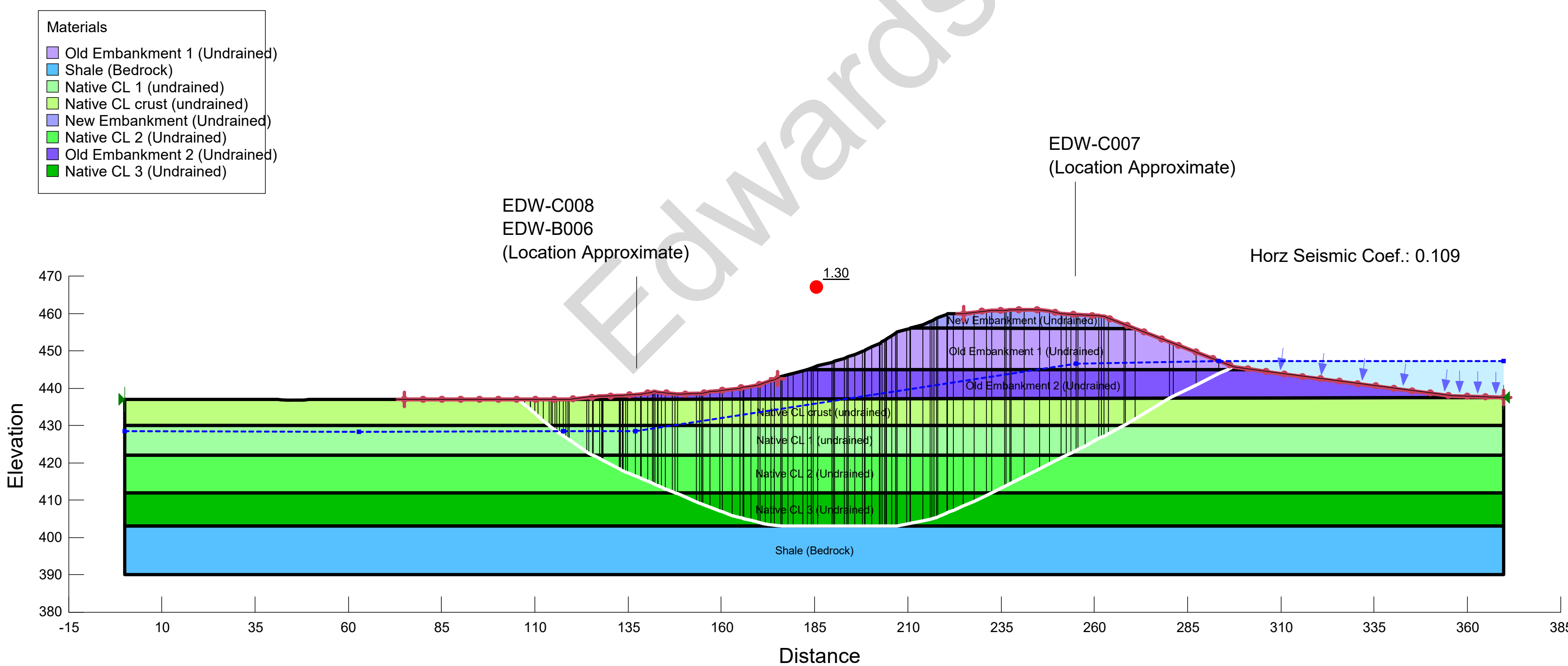
Edwards Power Plant
Cross-section I
Slope Stability - Seismic

Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1



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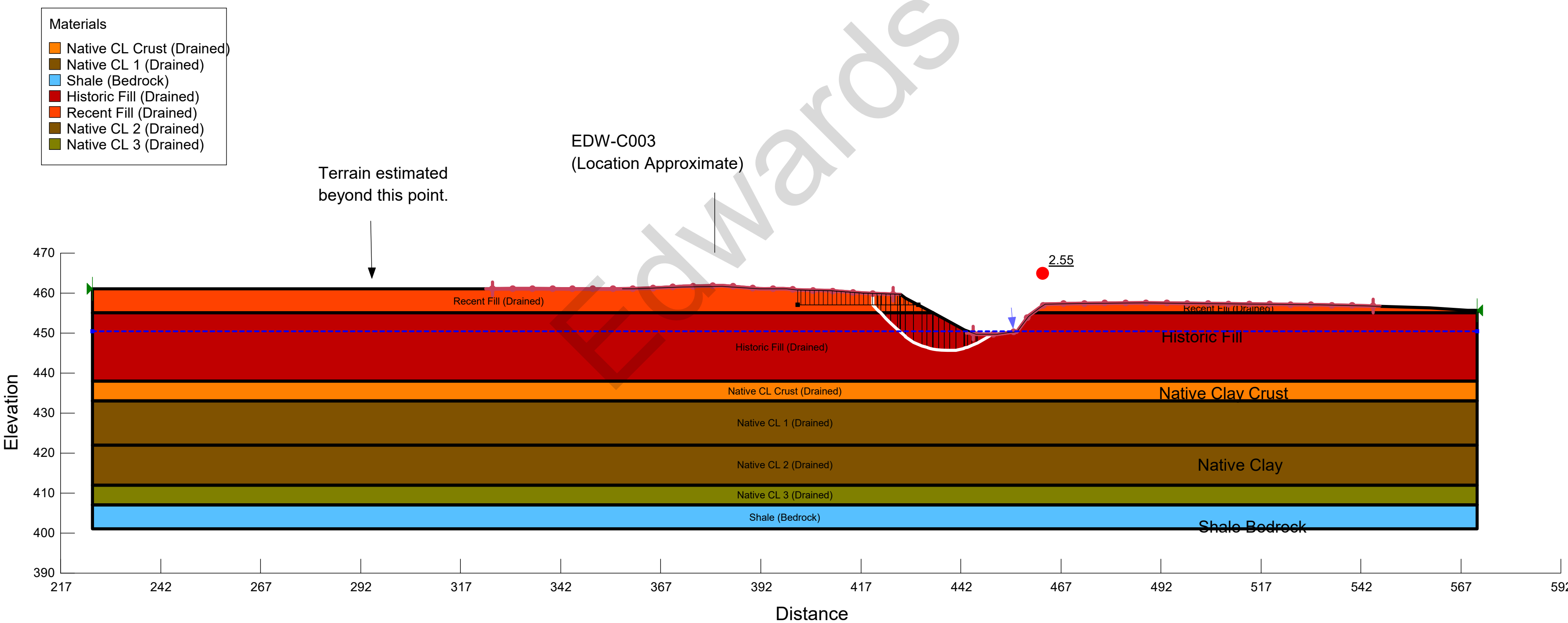
Edwards Power Plant
Cross-section J
Slope Stability - Steady-State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Historic Fill (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Recent Fill (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1



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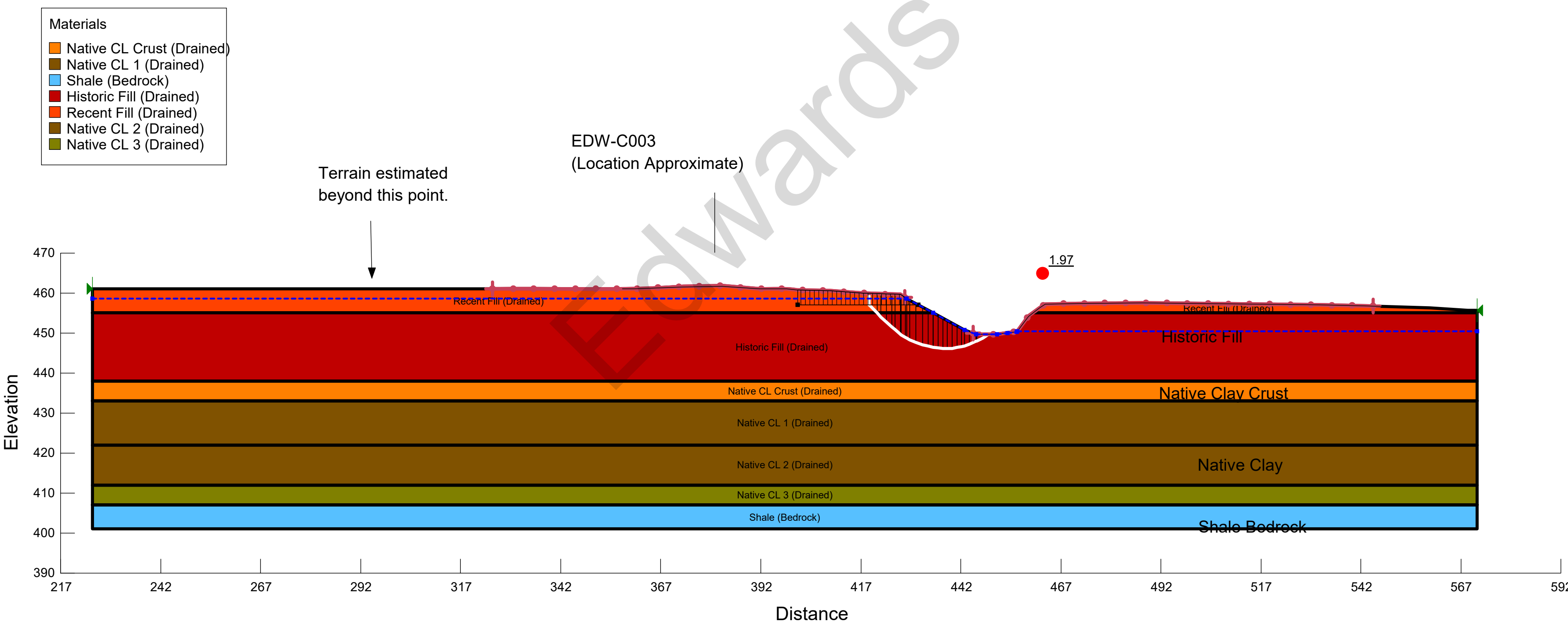
Edwards Power Plant
Cross-section J
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Historic Fill (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Recent Fill (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1



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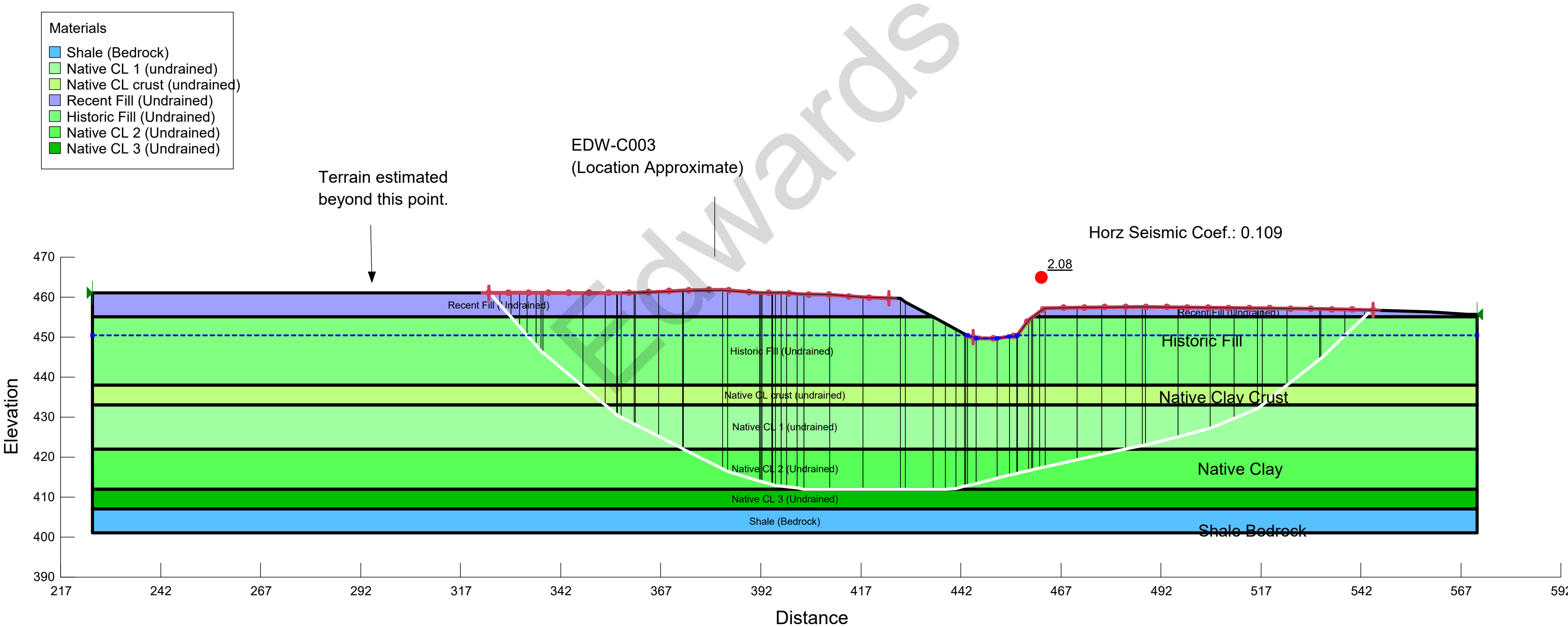
Edwards Power Plant
Cross-section J
Slope Stability - Seismic

Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Recent Fill (Undrained) Unit Weight: 115 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Historic Fill (Undrained) Unit Weight: 125 pcf Cohesion': 1,000 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1



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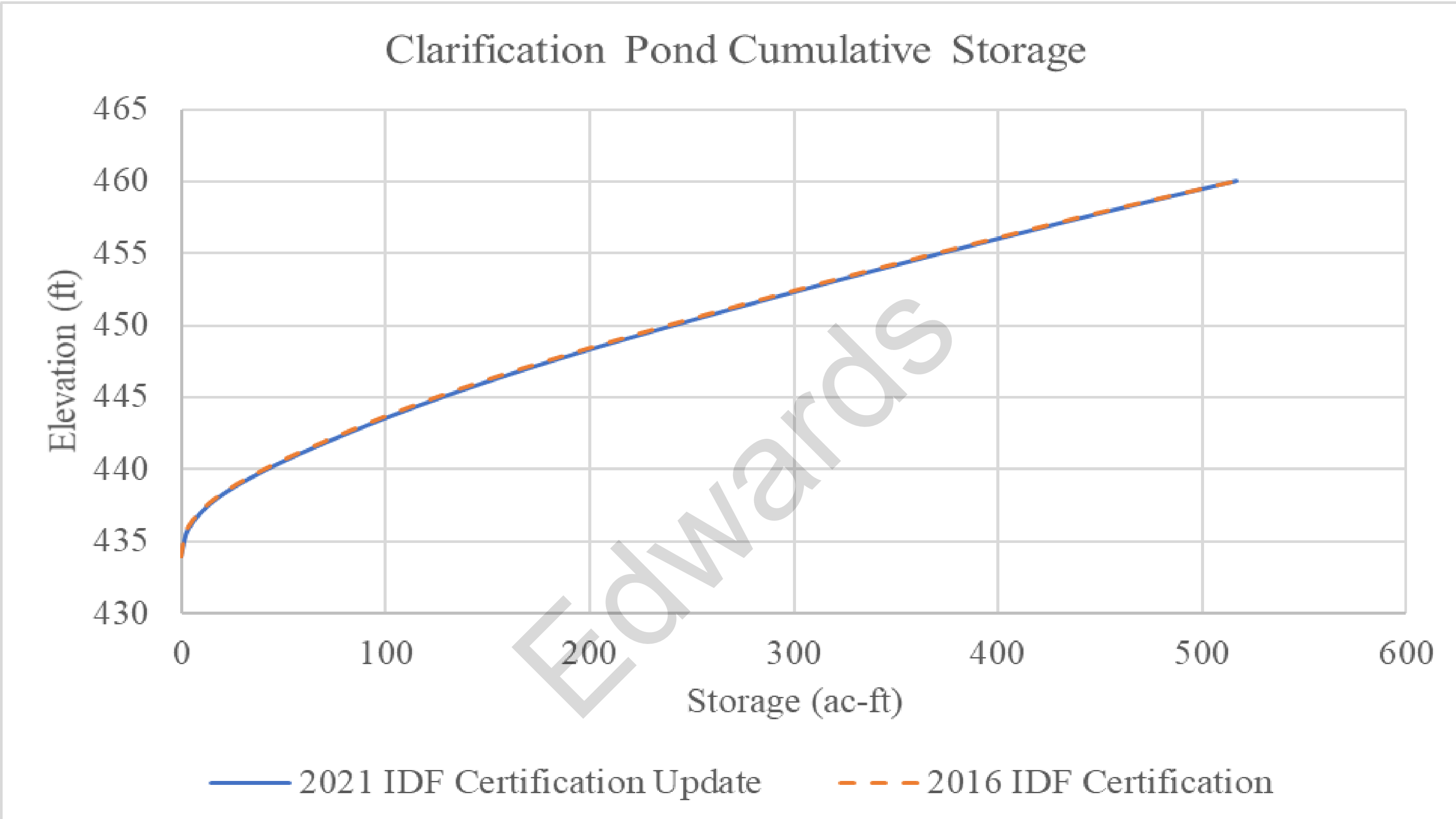
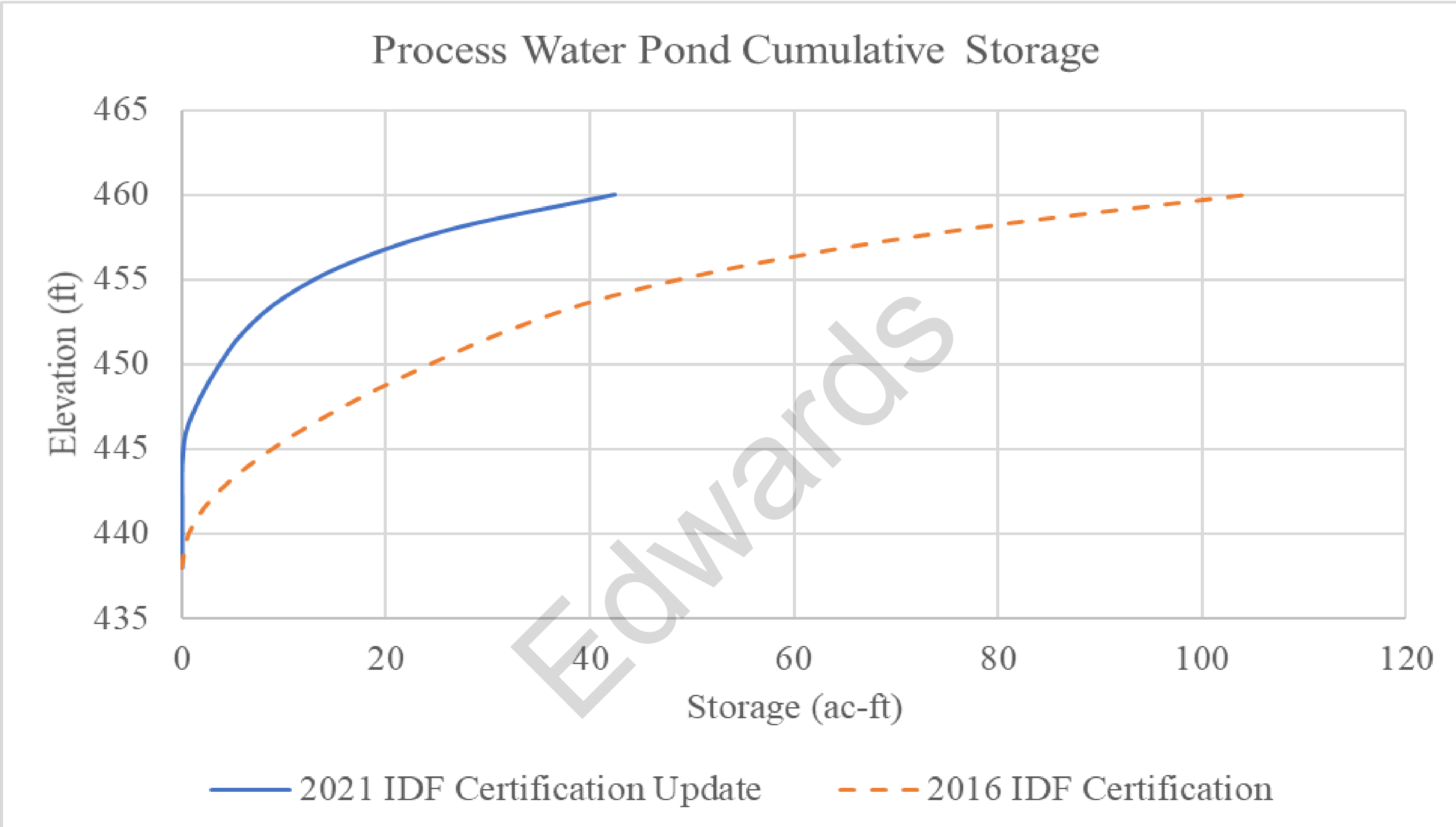
Attachment E

Periodic Inflow Design Flood Control System Plan Analyses



CLARIFICATION POND CUMULATIVE STORAGE PERIODIC CERTIFICATION EDWARDS POWER PLANT EDWARDS, ILLINOIS	
Geosyntec consultants	Figure E-1
GLP8027 8/30/2021	

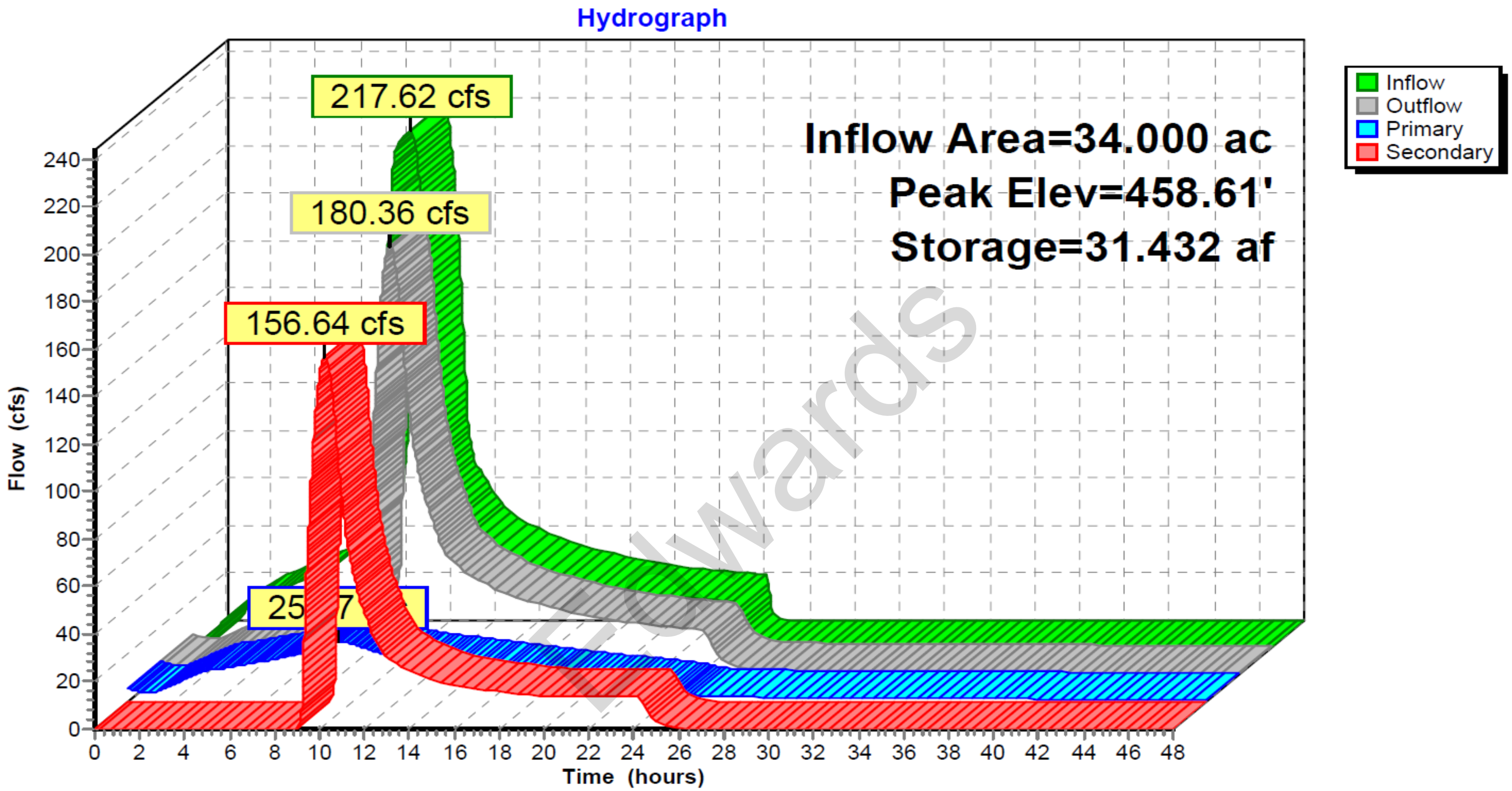


PROCESS WATER POND CUMULATIVE STORAGE
PERIODIC CERTIFICATION
EDWARDS POWER PLANT
EDWARDS, ILLINOIS

Geosyntec consultants

Figure

E-2

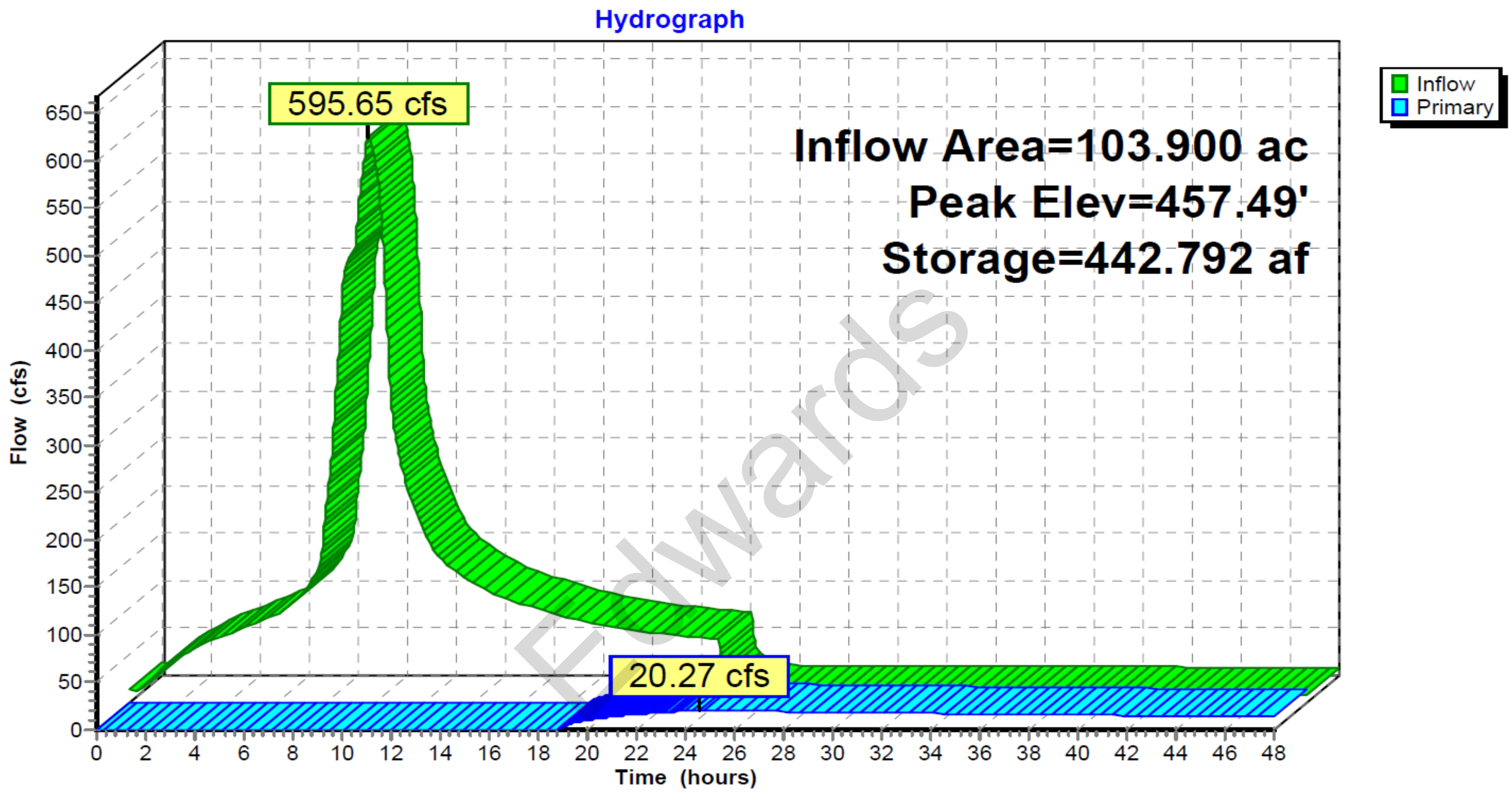


PROCESS WATER POND - HYDROGRAPH
PERIODIC CERTIFICATION
EDWARDS POWER PLANT
EDWARDS, ILLINOIS

Geosyntec consultants

Figure E-3

GLP8027 | 8/30/2021



CLARIFICATION POND - HYDROGRAPH PERIODIC CERTIFICATION EDWARDS POWER PLANT EDWARDS, ILLINOIS	
Geosyntec consultants	Figure E-4
GLP8027 8/30/2021	

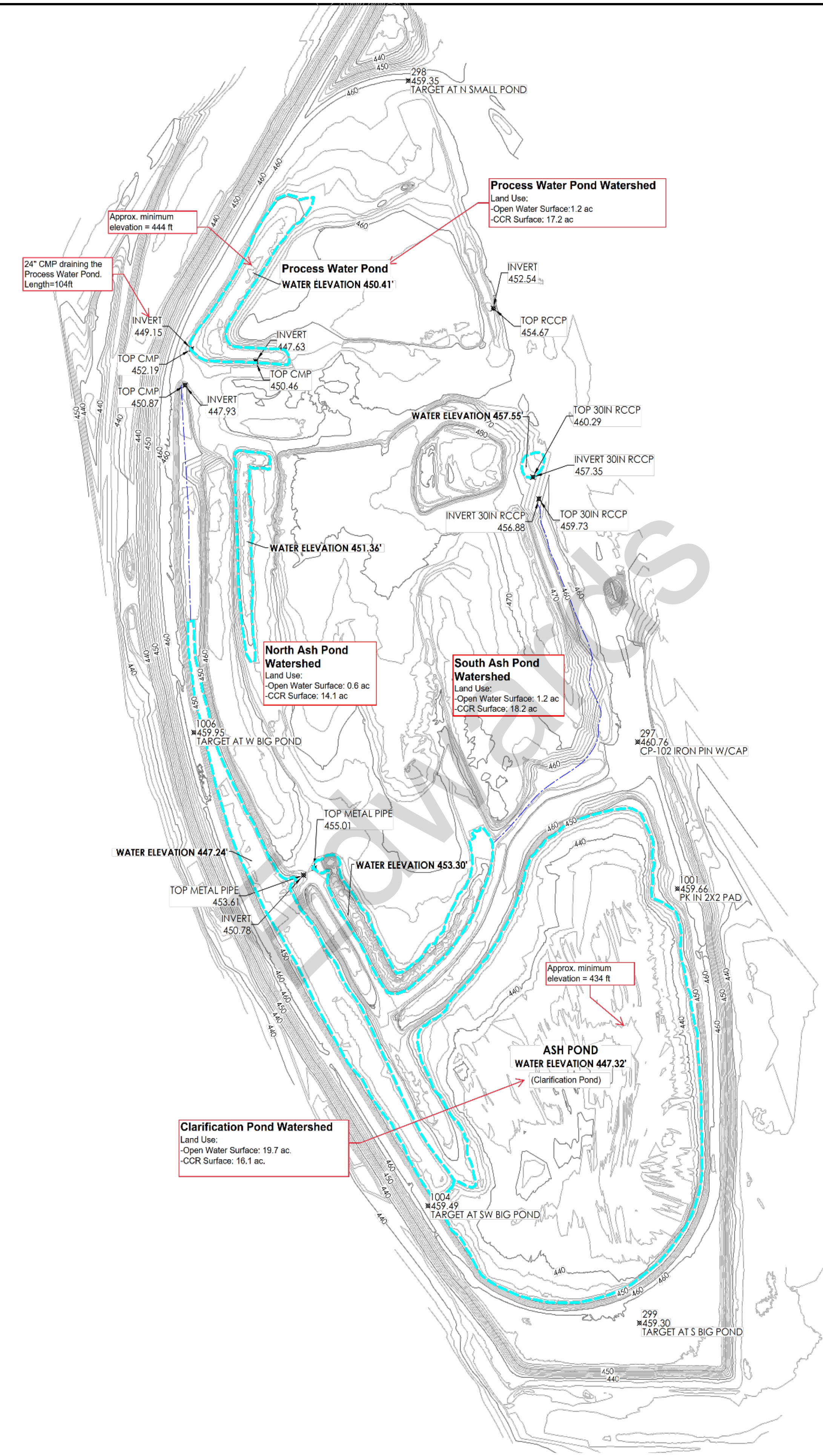
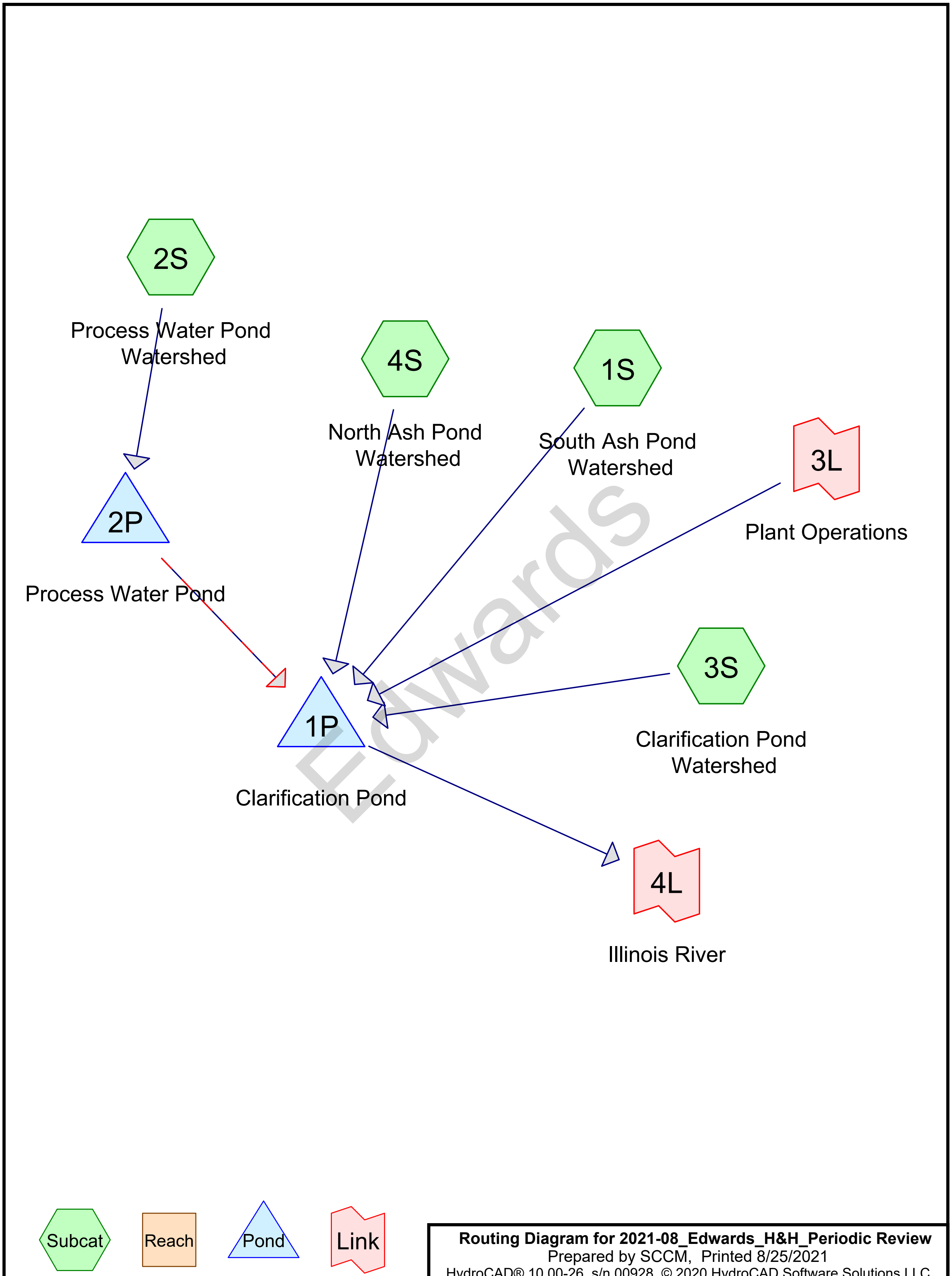


Figure based on IngenAE 2020 Site Topo

NOT TO SCALE

Edwards Power Plant Hydrologic Workmap		
Geosyntec consultants		Figure
GLP8027	September 2021	E-5



Routing Diagram for 2021-08_Edwards_H&H_Periodic Review
Prepared by SCCM, Printed 8/25/2021
HydroCAD® 10.00-26 s/n 00928 © 2020 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 1671 IL Peoria

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
15.600	96	Gravel Surface, HSG C (2S)
65.600	91	Urban industrial, 72% imp, HSG C (1S, 2S, 3S, 4S)
22.700	98	Water Surface, HSG C (1S, 2S, 3S, 4S)
103.900	**93**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
103.900	HSG C	1S, 2S, 3S, 4S
0.000	HSG D	
0.000	Other	
103.900		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	15.600	0.000	0.000	15.600	Gravel Surface	2S
0.000	0.000	65.600	0.000	0.000	65.600	Urban industrial, 72% imp	1S, 2S, 3S, 4S
0.000	0.000	22.700	0.000	0.000	22.700	Water Surface	1S, 2S, 3S, 4S
0.000	**0.000**	**103.900**	**0.000**	**0.000**	**103.900**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	434.00	432.00	1,090.5	0.0018	0.011	36.0	0.0	0.0
2	2P	449.15	447.93	104.0	0.0117	0.025	24.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: South Ash Pond Runoff Area=19.400 ac 73.73% Impervious Runoff Depth=31.64"
Flow Length=3,764' Tc=11.3 min CN=91 Runoff=124.07 cfs 51.155 af

Subcatchment 2S: Process Water Pond Runoff Area=34.000 ac 39.95% Impervious Runoff Depth=32.05"
Flow Length=1,400' Tc=16.8 min CN=94 Runoff=217.62 cfs 90.798 af

Subcatchment 3S: Clarification Pond Runoff Area=35.800 ac 87.41% Impervious Runoff Depth=32.18"
Tc=6.0 min CN=95 Runoff=229.80 cfs 95.994 af

Subcatchment 4S: North Ash Pond Runoff Area=14.700 ac 73.14% Impervious Runoff Depth=31.64"
Flow Length=2,545' Tc=8.0 min CN=91 Runoff=94.08 cfs 38.762 af

Pond 1P: Clarification Pond Peak Elev=457.49' Storage=442.792 af Inflow=595.65 cfs 291.027 af
Outflow=20.27 cfs 39.676 af

Pond 2P: Process Water Pond Peak Elev=458.61' Storage=31.432 af Inflow=217.62 cfs 90.798 af
Primary=25.67 cfs 30.614 af Secondary=156.64 cfs 42.760 af Outflow=180.36 cfs 73.374 af

Link 3L: Plant Operations Manual Hydrograph Inflow=8.00 cfs 31.742 af
Primary=8.00 cfs 31.742 af

Link 4L: Illinois River Inflow=20.27 cfs 39.676 af
Primary=20.27 cfs 39.676 af

Total Runoff Area = 103.900 ac Runoff Volume = 276.709 af Average Runoff Depth = 31.96"
32.69% Pervious = 33.968 ac 67.31% Impervious = 69.932 ac

Summary for Subcatchment 1S: South Ash Pond Watershed

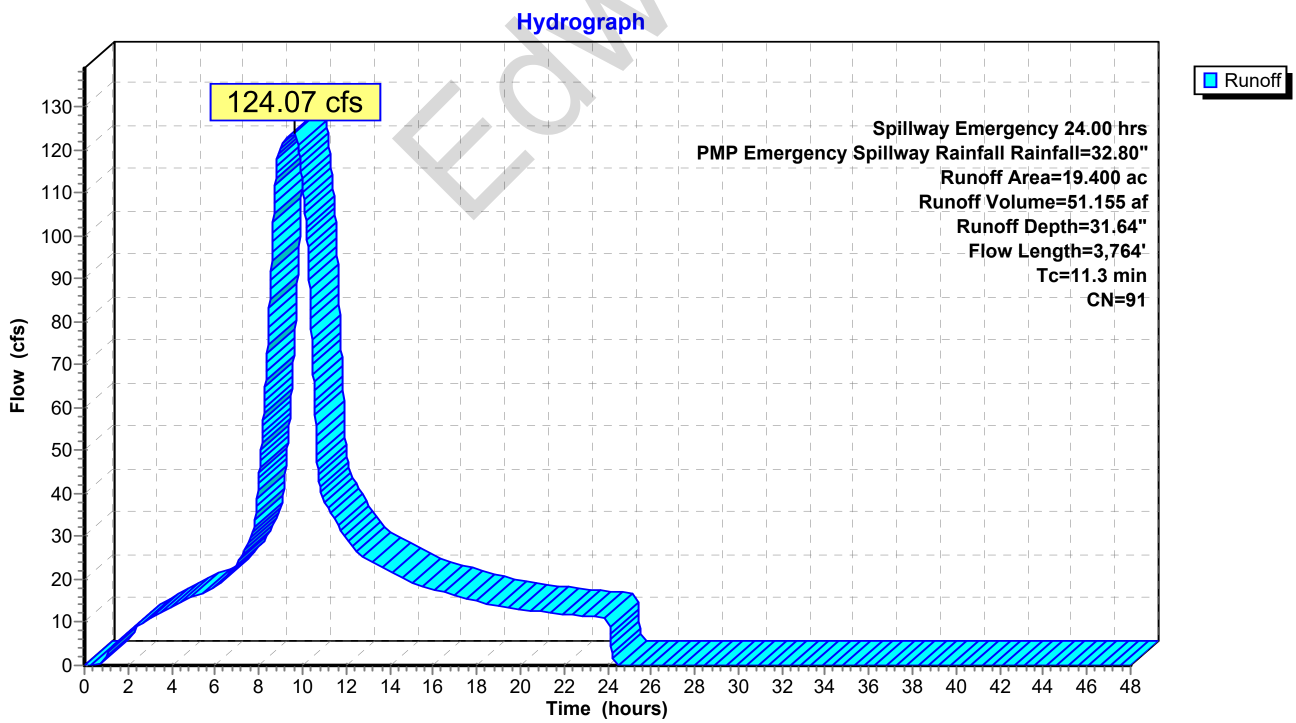
Runoff = 124.07 cfs @ 9.68 hrs, Volume= 51.155 af, Depth=31.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Spillway Emergency 24.00 hrs PMP Emergency Spillway Rainfall Rainfall=32.80"

	Area (ac)	CN	Description
*	1.200	98	Water Surface, HSG C
*	18.200	91	Urban industrial, 72% imp, HSG C
	19.400	91	Weighted Average
	5.096		26.27% Pervious Area
	14.304		73.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	64	0.0400	1.60		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.97"
10.6	3,700	0.0020	5.81	3,198.10	**Channel Flow, Channel Flow** Area= 550.0 sf Perim= 84.0' r= 6.55' n= 0.040 Winding stream, pools & shoals
11.3	3,764	Total			

Subcatchment 1S: South Ash Pond Watershed



Summary for Subcatchment 2S: Process Water Pond Watershed

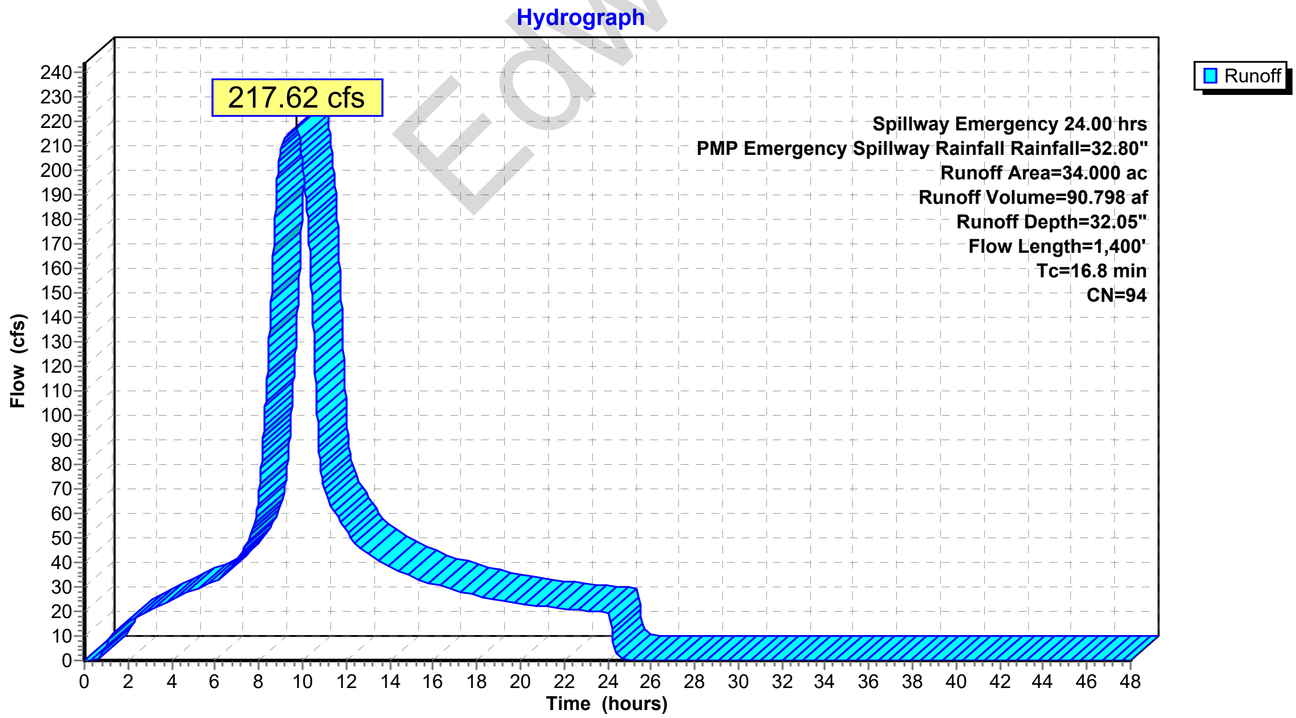
Runoff = 217.62 cfs @ 9.69 hrs, Volume= 90.798 af, Depth=32.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Spillway Emergency 24.00 hrs PMP Emergency Spillway Rainfall Rainfall=32.80"

	Area (ac)	CN	Description
	1.200	98	Water Surface, HSG C
*	15.600	96	Gravel Surface, HSG C
	17.200	91	Urban industrial, 72% imp, HSG C
	34.000	94	Weighted Average
	20.416		60.05% Pervious Area
	13.584		39.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	100	0.0100	1.00		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.97"
15.1	1,300	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.8	1,400	Total			

Subcatchment 2S: Process Water Pond Watershed



Summary for Subcatchment 3S: Clarification Pond Watershed

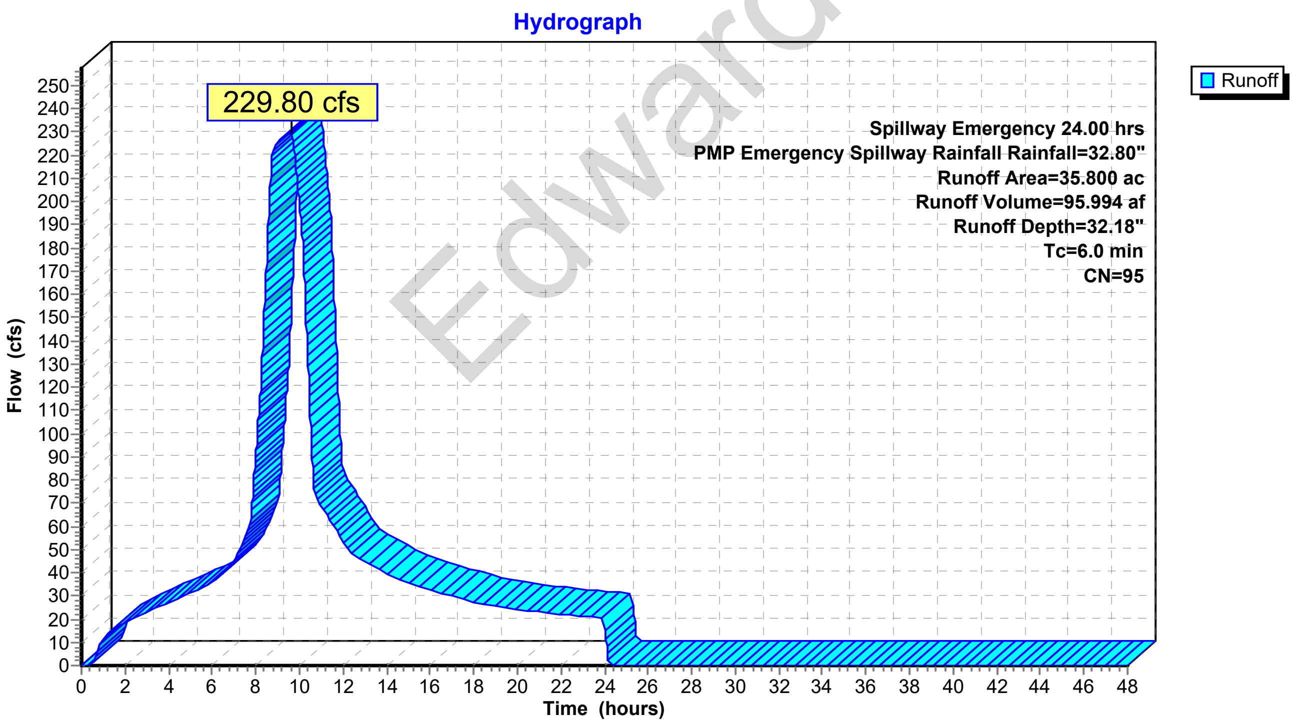
Runoff = 229.80 cfs @ 9.62 hrs, Volume= 95.994 af, Depth=32.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Spillway Emergency 24.00 hrs PMP Emergency Spillway Rainfall Rainfall=32.80"

Area (ac)	CN	Description
19.700	98	Water Surface, HSG C
16.100	91	Urban industrial, 72% imp, HSG C
35.800	95	Weighted Average
4.508		12.59% Pervious Area
31.292		87.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct Entry**

Subcatchment 3S: Clarification Pond Watershed



Summary for Subcatchment 4S: North Ash Pond Watershed

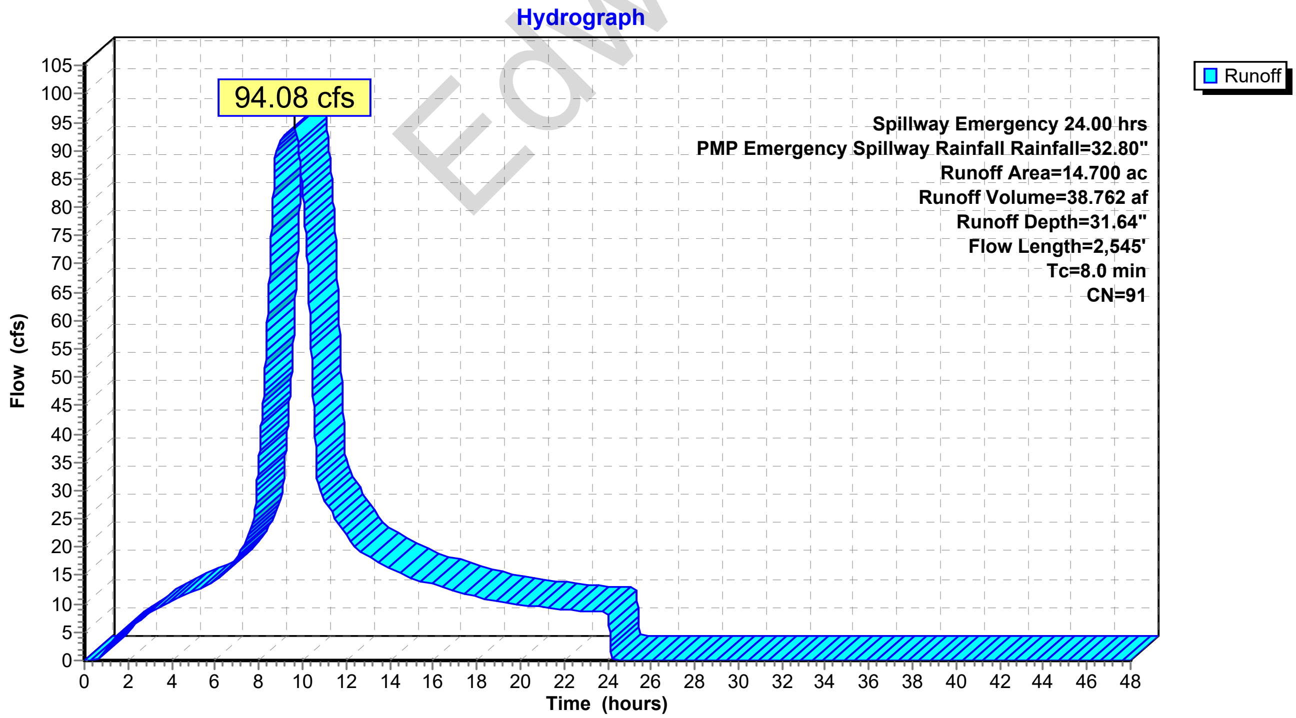
Runoff = 94.08 cfs @ 9.66 hrs, Volume= 38.762 af, Depth=31.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Spillway Emergency 24.00 hrs PMP Emergency Spillway Rainfall Rainfall=32.80"

Area (ac)	CN	Description
0.600	98	Water Surface, HSG C
14.100	91	Urban industrial, 72% imp, HSG C
14.700	91	Weighted Average
3.948		26.86% Pervious Area
10.752		73.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0400	1.75		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.97"
7.0	2,445	0.0020	5.81	3,198.10	**Channel Flow,** Area= 550.0 sf Perim= 84.0' r= 6.55' n= 0.040 Winding stream, pools & shoals
8.0	2,545	Total			

Subcatchment 4S: North Ash Pond Watershed



Summary for Pond 1P: Clarification Pond

Inflow Area = 103.900 ac, 67.31% Impervious, Inflow Depth > 33.61" for PMP Emergency Spillway Rainfall ev
Inflow = 595.65 cfs @ 9.75 hrs, Volume= 291.027 af
Outflow = 20.27 cfs @ 24.56 hrs, Volume= 39.676 af, Atten= 97%, Lag= 888.9 min
Primary = 20.27 cfs @ 24.56 hrs, Volume= 39.676 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 447.32' Surf.Area= 0.000 ac Storage= 177.470 af
Peak Elev= 457.49' @ 24.56 hrs Surf.Area= 0.000 ac Storage= 442.792 af (265.322 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,199.2 min (1,991.7 - 792.4)

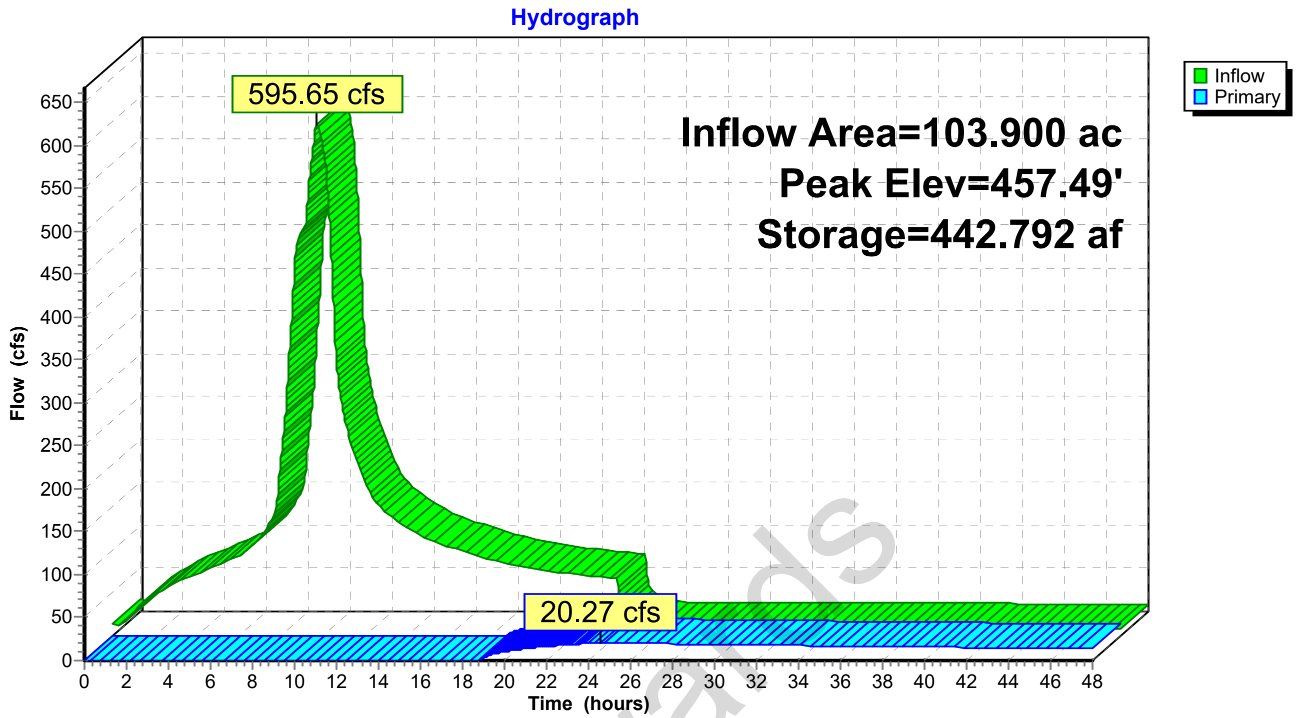
Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	517.029 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
434.00	0.000
436.00	4.022
438.00	17.504
440.00	41.759
442.00	72.854
444.00	108.189
446.00	148.070
448.00	192.615
450.00	241.465
452.00	292.504
454.00	345.457
456.00	400.409
458.00	457.312
460.00	517.029

Device	Routing	Invert	Outlet Devices
#1	Primary	434.00'	**36.0" Round Culvert** L= 1,090.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 434.00' / 432.00' S= 0.0018 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf
#2	Device 1	447.20'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=20.32 cfs @ 24.56 hrs HW=457.49' TW=456.57' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 20.32 cfs @ 2.87 fps)
  └─**2=Orifice/Grate** (Passes 20.32 cfs of 32.64 cfs potential flow)

Pond 1P: Clarification Pond



Summary for Pond 2P: Process Water Pond

Inflow Area =	34.000 ac,	39.95% Impervious,	Inflow Depth = 32.05"	for PMP Emergency Spillway Rainfall ev
Inflow =	217.62 cfs @	9.69 hrs, Volume=	90.798 af	
Outflow =	180.36 cfs @	10.23 hrs, Volume=	73.374 af, Atten= 17%, Lag= 32.2 min	
Primary =	25.67 cfs @	9.34 hrs, Volume=	30.614 af	
Secondary =	156.64 cfs @	10.24 hrs, Volume=	42.760 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 450.41' Surf.Area= 0.000 ac Storage= 4.187 af
Peak Elev= 458.61' @ 10.24 hrs Surf.Area= 0.000 ac Storage= 31.432 af (27.245 af above start)

Plug-Flow detention time= 312.5 min calculated for 69.187 af (76% of inflow)
Center-of-Mass det. time= 138.2 min (817.0 - 678.8)

Volume	Invert	Avail.Storage	Storage Description
#1	444.00'	42.450 af	**Custom Stage Data** Listed below

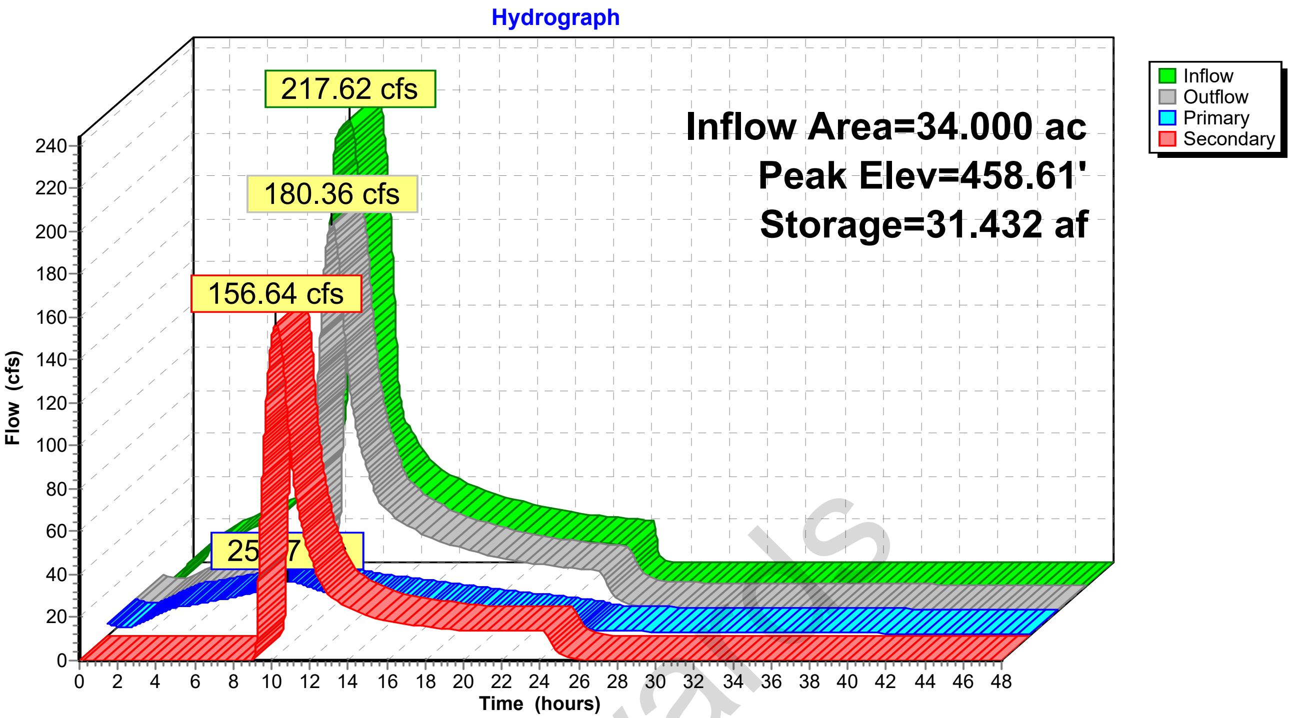
Elevation (feet)	Cum.Store (acre-feet)
444.00	0.000
446.00	0.382
448.00	1.763
450.00	3.674
452.00	6.177
454.00	10.150
456.00	16.537
458.00	26.618
460.00	42.450

Device	Routing	Invert	Outlet Devices
#1	Primary	449.15'	**24.0" Round Culvert** L= 104.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 449.15' / 447.93' S= 0.0117 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Secondary	457.50'	**50.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=25.67 cfs @ 9.34 hrs HW=458.00' TW=451.06' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 25.67 cfs @ 8.17 fps)

Secondary OutFlow Max=156.64 cfs @ 10.24 hrs HW=458.61' TW=452.69' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 156.64 cfs @ 2.83 fps)

Pond 2P: Process Water Pond



Summary for Link 3L: Plant Operations

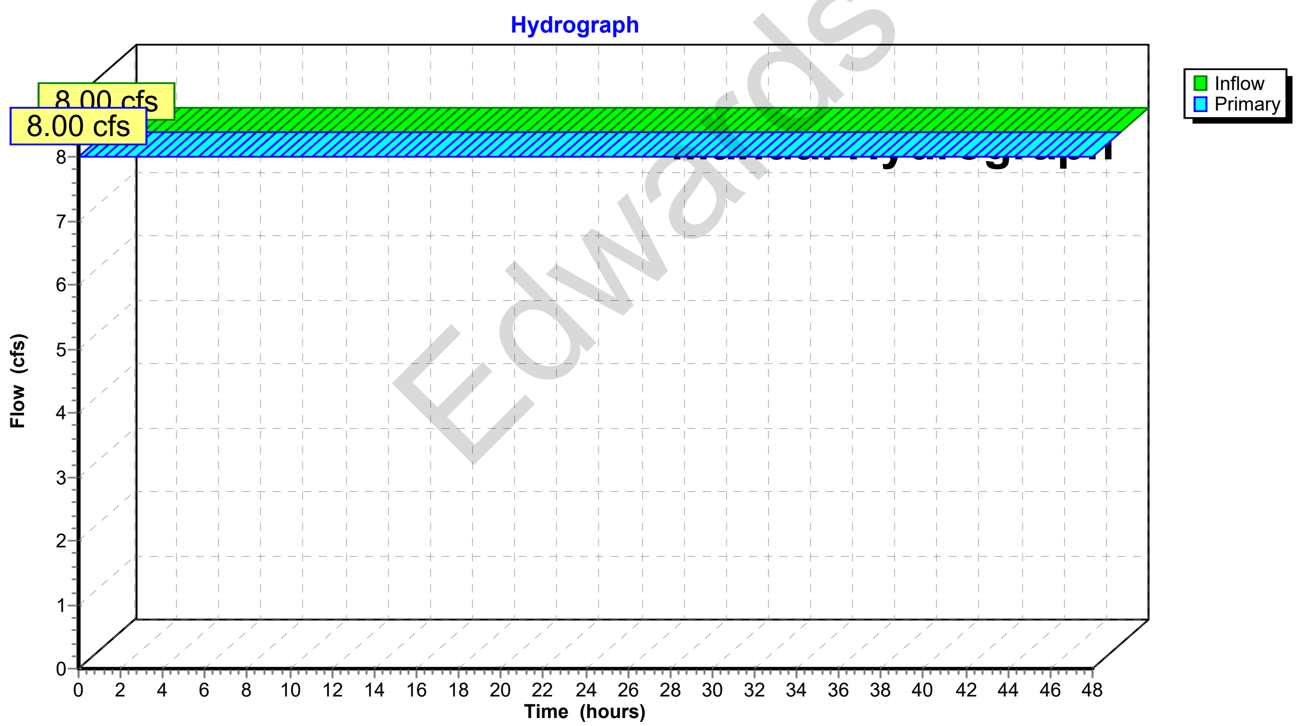
Inflow	=	8.00 cfs @	0.00 hrs, Volume=	31.742 af	
Primary	=	8.00 cfs @	0.00 hrs, Volume=	31.742 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

61 Point manual hydrograph, To= 0.00 hrs, dt= 1.00 hrs, cfs =

8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
8.00									

Link 3L: Plant Operations



Summary for Link 4L: Illinois River

Historic Illinois River high water elevation

[80] Warning: Exceeded Pond 1P by 9.25' @ 0.00 hrs (64.44 cfs 66.867 af)

Inflow Area = 103.900 ac, 67.31% Impervious, Inflow Depth > 4.58" for PMP Emergency Spillway Rainfall ev
Inflow = 20.27 cfs @ 24.56 hrs, Volume= 39.676 af
Primary = 20.27 cfs @ 24.56 hrs, Volume= 39.676 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 456.57'