

INITIAL SAFETY FACTOR ASSESSMENT

40 CFR 257.73 (e)

Auxillary Ash Pond Complex

Glen Lyn Plant Site

Glen Lyn, Virginia

May, 2026

Prepared for: Appalachian Power Company

Prepared by: American Electric Power Service Corporation

1 Riverside Plaza

Columbus, OH 43215



Glen Lyn Plant Site
Auxiliary Ash Pond Complex
Initial Safety Factor Assessment

PREPARED BY _____ DATE _____
Dan Murphy, P.E.

REVIEWED BY _____ DATE _____
Blake Arthur, P.E.

APPROVED BY David Anthony Miller DATE 05.04.2026
David Anthony Miller, P.E.
Director- Ash Management Services



I certify to the best of my knowledge, information, and belief that the information contained in this safety factor assessment meets the requirements of 40 CFR § 257.73(e)

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Attachment A: Initial Safety Factor Assessment Report

1.0 OBJECTIVE

The “Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Legacy CCR Surface Impoundments”, 89 Fed. Reg. 38950 (May 8, 2024) (amending 40 C.F.R. §257) requires owners and operators of facilities with a legacy coal combustion residual (CCR) surface impoundment to prepare an initial safety factor assessment document for each legacy CCR surface impoundment at the facility.

The Auxiliary Ash Pond Complex at the Glen Lyn Plant Site is subjected to this rule.

2.0 DESCRIPTION OF THE CCR UNIT

The Glen Lyn Plant Site is located adjacent to the New River in Giles County, Virginia, approximately 10 miles east of Princeton, West Virginia. The latitude/longitude of the facility is: 37° 22' 12" N/ 80° 51' 48" W. The facility address is 100 APCO Road, Glen Lyn, VA, 24093. The Auxiliary Ash Pond Complex is located approximately 0.5 miles northwest of the Plant site.

The Glen Lyn Plant operated from 1919 to 2015. The total length of the perimeter dike containing the Auxiliary Ash Pond Complex is nearly 5,000 linear feet, and the Auxiliary Ash Complex is roughly 70 acres in size.

The Auxiliary Ash Pond Complex encompasses areas also known as the West Pond, Auxiliary Pond (Fly Ash Dam), and Glen Lyn Landfill.

3.0 SAFETY FACTOR ASSESSMENT 257.73(e)

The Initial Safety Factor Assessment was prepared by GAI Consultants, Inc. and is included as Attachment A. Two separate reports were prepared for the West Pond and Auxiliary Ash Pond, together capturing the full extent of the Auxiliary Ash Pond Complex.

The most critical failure surfaces of the perimeter dike of the Glen Lyn Auxiliary Ash Pond Complex meet the required factor of safety values. Therefore, it is concluded that the Glen Lyn Auxiliary Ash Pond Complex is stable and meets the stability factors of safety required by 40 CFR §257.73(e).

ATTACHMENT A

Initial Safety Factor Assessment Report



Glen Lyn Auxiliary Ash Pond Initial Safety Factor Assessment Report

American Electric Power
Glen Lyn Plant
Giles County, Virginia

GAI Project Number: C121043.12, Task 003

May 2026



BOUNDLESS ENERGYSM

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Certification/Statement of Professional Opinion

The Initial Safety Factor Assessment (Assessment) Report for the Glen Lyn Auxiliary Ash Pond was prepared by GAI Consultants, Inc. (GAI). The Assessment Report was based on certain information that, other than for information GAI originally prepared, GAI has relied on, but not independently verified. Therefore, this Certification/Statement of Professional Opinion is limited to the information available to GAI at the time the Assessment Report was written. On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the Commonwealth of Virginia (VA), that the Assessment has been prepared in accordance with good and accepted engineering practices, as exercised by other engineers practicing in the same discipline(s), under similar circumstances, and at the time and in the same locale. It is my professional opinion that this Safety Factor Assessment was prepared consistent with the requirements of the United States Environmental Protection Agency's Federal Coal Combustion Residuals (CCR) Rule 40 CFR § 257.73(e), published in the Federal Register on May 8, 2024 with an effective date of November 4, 2024.

The use of the words "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion and is not and shall not to be interpreted or construed as a guarantee, warranty or legal opinion.



Charles F. Straley, P.E.
Engineering Director



1.0 Purpose

Pursuant to the Federal Coal Combustion Residuals (CCR) Rule 40 CFR § 257.73(e)(1)(i-iv), each CCR impoundment is required to conduct an initial and periodic safety factor assessment to determine whether the CCR unit achieves the minimum safety factors at the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations including loading conditions.

2.0 Introduction

The Glen Lyn Auxiliary Ash Pond is associated with the Glen Lyn Plant located in Giles County, Virginia (VA). The Auxiliary Ash Pond is located approximately 0.5 miles northwest of the Plant site. The Station operated from 1919 to 2015. Ash generated after 2008 was disposed off-site. The Auxiliary Ash Pond was closed in 2014 and was used for the management, storage, and disposal of CCR. Available historic records indicate that the primary waste managed by the Auxiliary Ash Pond was fly ash.

The Station began operating in 1919 and was acquired by Appalachian Power Company in 1925. In 1919, the first coal-fired generating unit had a capacity of 15 megawatts of electricity. The first coal-fired unit was retired in 1954. In 1920, the second unit was put into service. The third unit was put into service in 1924. In 1927, the fourth unit was put into service. Units 2, 3, and 4 had the capacity to generate 65 megawatts of electricity and were retired in 1971. The fifth unit was put into service in 1944 and had the capacity to generate 95 megawatts of electricity. The sixth unit was put into service in 1957 and had the capacity to generate 240 megawatts of electricity. The fifth and sixth units were retired in 2015 when the plant ceased production.

The Auxiliary Ash Pond was closed in place in 2014. It is the intent of AEP to close the Auxiliary Ash Pond by closure of removal of all CCR material in future efforts. The CCR material generated from closure will be placed in a proposed CCR Landfill.

3.0 Background Information

As discussed in Section 2.0, the Auxiliary Ash Pond was closed in place in 2014. GAI Consultants, Inc. (GAI) submitted a Closure Plan in February 2013. A subsurface exploration performed by GAI at the Auxiliary Ash Pond in 2006 was used in the development of the Closure Plan. No additional subsurface explorations were performed for this Auxiliary Ash Pond Initial Safety Factor Assessment. Additional reports listed in Section 3.1, submitted by GAI and others for the CCR facilities were used to supplement data for the Auxiliary Ash Pond Initial Safety Factor Assessment.

3.1 Historical Data

GAI reviewed historical records for the CCR facilities to obtain pertinent information to use in this Assessment Report. The historical records for the proposed closures, and previous subsurface explorations and analyses are included in the following documents:

- History of Construction - Auxiliary Ash Pond Complex – Glen Lyn Plant Site, American Electric Power Service Corporation, 2026
- Closure Plan – AEP Auxiliary Fly Ash Pond, GAI Consultants, Inc., 2013
- Bottom Ash Pond Complex Delineation Data Report – Glen Lyn Power Station, GAI Consultants, Inc., 2017
- Bottom Ash Pond Complex Delineation Data Report Addendum – Glen Lyn Power Station, GAI Consultants, Inc., 2018

- Analysis Report – Seismic Stability of Ash Landfill and West Pond at Glen Lyn Plant, GEI Consultants, Inc., 2018
- Data Report – Seismic Stability of Ash Landfill and West Pond at Glen Lyn Plant, GEI Consultants, Inc., 2018
- Closure Plan - AEP Former Glen Lyn Power Plant Bottom Ash Pond, GAI Consultants, Inc., Revised 2024

3.2 Summary of Parameters

Soil parameters used in stability analyses were estimated from the historical data referenced in Section 3.1, literature review, and engineering judgment.

The soil parameters used in stability analyses are summarized in Table 1.

Table 1 – Summary of Parameters

| Material | Drained Friction Angle, ϕ' (degrees) | Drained Cohesion, c' (psf) | Undrained Shear Strength, S_u (psf) | Unit Weight γ (pcf) |
|---------------|--|---------------------------------|--|-------------------------------|
| Dike Fill | 32 | 0 | - | 127 |
| Sand and Clay | 32 | - | 1500 | 127 |
| CCR | 33 | 0 | - | 65 |
| Rip rap | 42 | 0 | - | 115 |
| Bedrock | Infinite Strength | | | 150 |

4.0 Factor of Safety Assessment

GAI reviewed all the documents listed under the References (Section 6.0) in its assessment to determine if the impoundment meets the following safety factors:

- i. The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
- ii. The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
- iii. The calculated seismic factor of safety must equal or exceed 1.00.
- iv. For dikes constructed of soils that are susceptible to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

The stability assessments were evaluated using the Slide2 software package (Rocscience 2024, version 9.034). The analyses were conducted using the Morgenstern-Price Method. The material strength parameters used in the analyses were developed based on previous subsurface explorations including laboratory testing, literature review, and engineering judgment. The CCR rule discusses development of “critical cross section(s)” that represent the most severe cases. These critical sections should produce the lowest factors of safety for a given loading condition. The cross section used in the slope stability analysis is shown in the plan view on Figure A-1 in Appendix A. The phreatic surface used in the analyses were based on water level readings obtained from the network of monitoring wells

in the vicinity of Auxiliary Ash Pond. Sections indicating the critical calculated failure surfaces and the corresponding factors of safety are included as Figures A-2 and A-3 in Appendix A.

4.1 Long-Term, Maximum Storage Pool Loading Condition

The long-term maximum storage pool condition considers slope stability with steady-state seepage under the maximum sustained operating pool. The long-term, maximum storage pool is defined as the maximum water level that can be regularly maintained and results in the full development of a steady state seepage condition. Drained (effective) strength parameters are most applicable for such analyses. The Auxiliary Ash Pond is closed, and there is no normal pool since free water has been removed. The phreatic surface in the stability analysis was modeled at elevation (El.) 1494 feet, which is based on the most recent available monitoring well data from May 2022 to September 2025.

The results of the analysis of the long-term, maximum storage pool loading condition are summarized in Table 2.

Table 2 – Calculated Minimum Factors of Safety – Long-Term, Maximum Pool Loading Condition

| Section Analyzed | Minimum Required FOS | Calculated Minimum FOS | Acceptable (Yes/No) |
|------------------|----------------------|------------------------|---------------------|
| Aux-1 | 1.5 | 1.7 | Yes |

4.2 Maximum Surcharge Pool Loading Condition

The maximum surcharge pool loading condition considers slope stability under the maximum surcharge pool level. The maximum surcharge pool represents a temporary rise in pool elevation above the maximum storage pool in the event of an inflow design flood and spillway discharge condition. This condition allows the evaluation of the effects of a raised level, which is similar to the effects of a flood surcharge. Drained (effective) strength parameters are most applicable for such analyses. The Auxiliary Ash Pond is closed, and there is no surcharge pool since free water has been removed. The phreatic surface in the stability analysis was modeled at elevation (El.) 1494 feet, which is based on the most recent available monitoring well data from May 2022 to September 2025.

The results of the analysis of the maximum surcharge loading condition are summarized in Table 3.

Table 3 – Calculated Minimum Factors of Safety – Maximum Surcharge Loading Condition

| Section Analyzed | Minimum Required FOS | Calculated Minimum FOS | Acceptable (Yes/No) |
|------------------|----------------------|------------------------|---------------------|
| Aux-1 | 1.4 | 1.7 | Yes |

4.3 Seismic Loading Condition

The seismic loading condition considers slope stability as a result of the Maximum Design Earthquake (MDE) event. The MDE is defined by the CCR rule as a seismic event with a 2 percent probability of exceedance in 50 years (i.e. earthquake of approximate 2,500-year return period). Pseudostatic analysis was used to evaluate slope stability under the seismic loading condition. The ground motion used in the analyses was a peak ground acceleration (PGA) of approximately 0.25 times the acceleration of gravity (g), or 0.25 g, obtained from the United States Geological Survey (USGS) seismic hazard tool using the latest 2023 National Seismic Hazard Model (NSHM).

The Auxiliary Ash Pond is closed, and there is no normal pool since free water has been removed. The phreatic surface in the stability analysis was modeled at elevation (El.) 1494 feet, which is based on the most recent available monitoring well data from May 2022 to September 2025. For pseudostatic

analyses, undrained shear strength parameters are most applicable for slow draining materials below the phreatic surface.

The results of the analysis of the seismic loading condition are summarized in Table 4.

Table 4 – Calculated Minimum Factors of Safety – Seismic Loading Condition

| Section Analyzed | Minimum Required FOS | Calculated Minimum FOS | Acceptable (Yes/No) |
|------------------|----------------------|------------------------|---------------------|
| Aux-1 | 1.0 | 1.0 | Yes |

4.4 Liquefaction Factor of Safety

The liquefaction loading condition addresses the potential for loose, saturated, or partially saturated soils to undergo a loss of strength during seismic events. This reduction in strength can result in slope instability, settlement, subsidence, or other forms of embankment distress. The assessment of liquefaction potential generally involves evaluating the susceptibility of each material zone within the embankment and its foundation to liquefaction triggering. For materials identified as susceptible, the potential impacts on embankment stability are then evaluated by incorporating reduced shear strength parameters representative of post-liquefaction conditions.

Liquefaction analysis was performed using the same procedure as provided in the closure document (Andres and Stokoe, 2000) for consistency. However, the ground motions used in the liquefaction analysis were based on the updated PGA described in Section 4.3. Results of the liquefaction evaluation indicate that no soils within the Auxiliary Ash Pond embankment or its foundation are susceptible to liquefaction under the CCR Rule criteria, and calculated liquefaction factors of safety will be equal to or greater than 1.2. Accordingly, a separate post-earthquake stability analysis was not required.

5.0 Conclusion

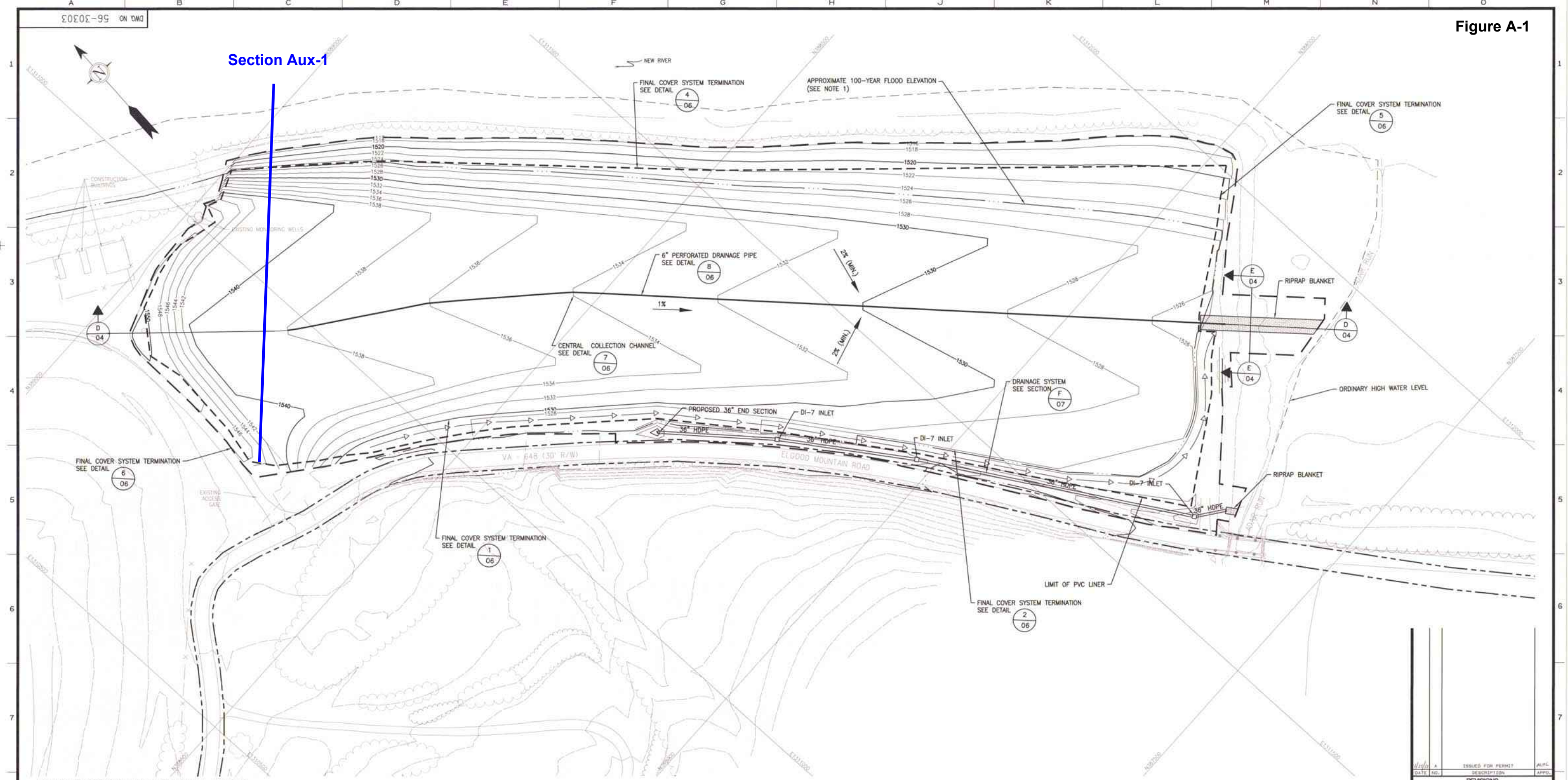
GAI reviewed previous stability analyses for this Safety Factor Assessment and conducted new analyses to meet the requirements of the CCR Rule. Based on the analyses conducted for the conditions outlined in the CCR Rule, the Auxiliary Ash Pond meets or exceeds the required factors of safety.

6.0 References

1. American Electric Power Service Corporation. History of Construction – Auxiliary Ash Pond Complex – Glen Lyn Plant Site. February 2026.
2. GAI Consultants. *Bottom Ash Pond Complex Delineation Data Report*. June 2017.
3. GAI Consultants. *Bottom Ash Pond Complex Delineation Data Report Addendum*. June 2018.
4. GAI Consultants. *Closure Plan – AEP Auxiliary Fly Ash Pond*. February 2013.
5. GAI Consultants. *Closure Plan – AEP Former Glen Lyn Power Plant Bottom Ash Pond*. Revised December 2024.
6. GEI Consultants. *Analysis Report – Seismic Stability of Ash Landfill and West Pond at Glen Lyn Plant*. August 2018.
7. GEI Consultants. *Data Report – Seismic Stability of Ash Landfill and West Pond at Glen Lyn Plant*. August 2018.
8. *Soil Liquefaction during Earthquakes*, Idriss and Boulanger, EERI Monograph MNO-12, 2008.
9. *Coal Ash: Characteristics, Management and Environmental Issues*, Technical Update - Coal Combustion Products - Environmental Issues, Electric Power Research Institute, September 2009.

APPENDIX A Calculations

Figure A-1



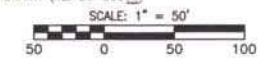
THIS MAP COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED 3-4-06 AND FIELD MAPPING DATED JANUARY 17, 2008 AND FEBRUARY 6, 2008. GRID BASED ON VIRGINIA STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 1927. VERTICAL DATUM BASED ON NOV 1929.

ADDITIONAL EXISTING TOPOGRAPHY SHOWING ADAIR RUN PROVIDED BY AEP. TOPOGRAPHY ORIGINALLY PROVIDED TO AEP ON NOVEMBER 25, 1997. GRID BASED ON VIRGINIA STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 1983. VERTICAL DATUM BASED ON NOV 1988.

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- FENCE
- ROAD
- STRUCTURE
- TREE LINE
- CENTERLINE ADAIR RUN (APPROX.)
- BENCH MARKS
- EXISTING MONITORING WELL
- PERMANENT COLLECTION CHANNEL
- RIPRAP BLANKET
- APPROXIMATE RIGHT-OF-WAY LIMITS
- APPROXIMATE LIMIT OF PVC LINER
- APPROXIMATE LIMIT OF GRADING
- 100-YEAR FLOOD ELEVATION
- ORDINARY HIGH WATER LEVEL
- SLOPE OF PROPOSED SURFACE
- DETAIL IDENTIFICATION NUMBER AND LOCATION
DRAWING NUMBER ON WHICH DETAIL IS DRAWN (I.E. 56-30303)
- SECTION IDENTIFICATION LETTER AND SECTION CUTTING PLANE LOCATION
DRAWING NUMBER ON WHICH DETAIL IS DRAWN (I.E. 56-30305)

NOTES:
 1. APPROXIMATE 100-YEAR FLOOD ELEVATION BASED ON GILES COUNTY, VA FLOOD INSURANCE RATE MAP, MAP #51071C0176C, EFFECTIVE DATE SEPTEMBER 25, 2009.



| DATE | NO. | ISSUED FOR PERMIT | APPROV. |
|------|-----|-------------------|---------|
| | | | |

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APPALACHIAN POWER CO.
GLEN LYN PLANT
 GLEN LYN, VIRGINIA
 AUXILIARY FLY ASH POND CLOSURE
FINAL CLOSURE PLAN

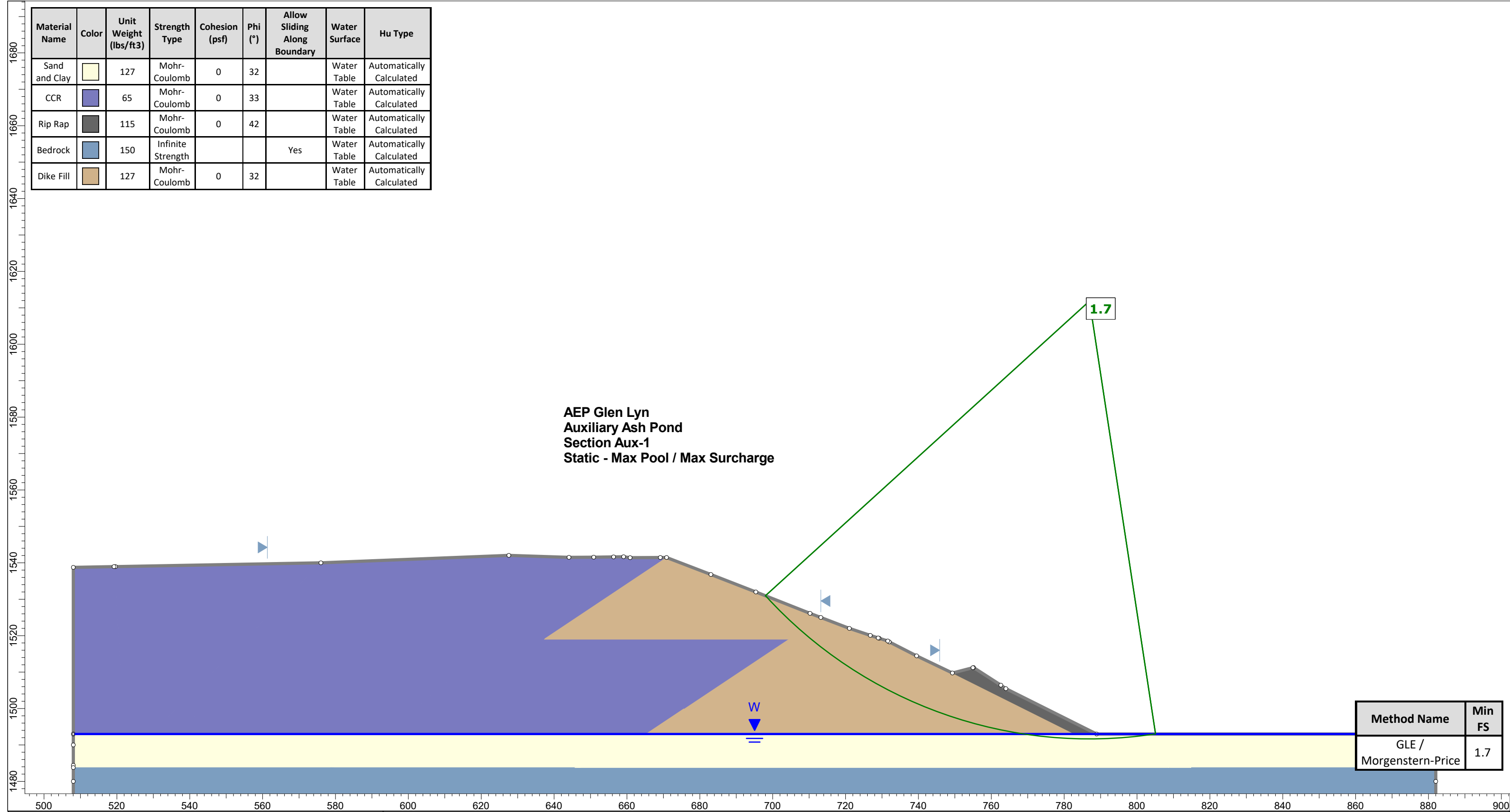
DWG. NO. 56-30303-A

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| SCALE: | CIVIL ENGINEERING DIVISION |
| DRAWN: JDS | APPROVED: [Signature] |
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| SHT. NO. 4 OF 11 | |



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| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Allow Sliding Along Boundary | Water Surface | Hu Type |
|---------------|--------|-----------------------|-------------------|----------------|---------|------------------------------|---------------|--------------------------|
| Sand and Clay | Yellow | 127 | Mohr-Coulomb | 0 | 32 | | Water Table | Automatically Calculated |
| CCR | Purple | 65 | Mohr-Coulomb | 0 | 33 | | Water Table | Automatically Calculated |
| Rip Rap | Grey | 115 | Mohr-Coulomb | 0 | 42 | | Water Table | Automatically Calculated |
| Bedrock | Blue | 150 | Infinite Strength | | | Yes | Water Table | Automatically Calculated |
| Dike Fill | Brown | 127 | Mohr-Coulomb | 0 | 32 | | Water Table | Automatically Calculated |

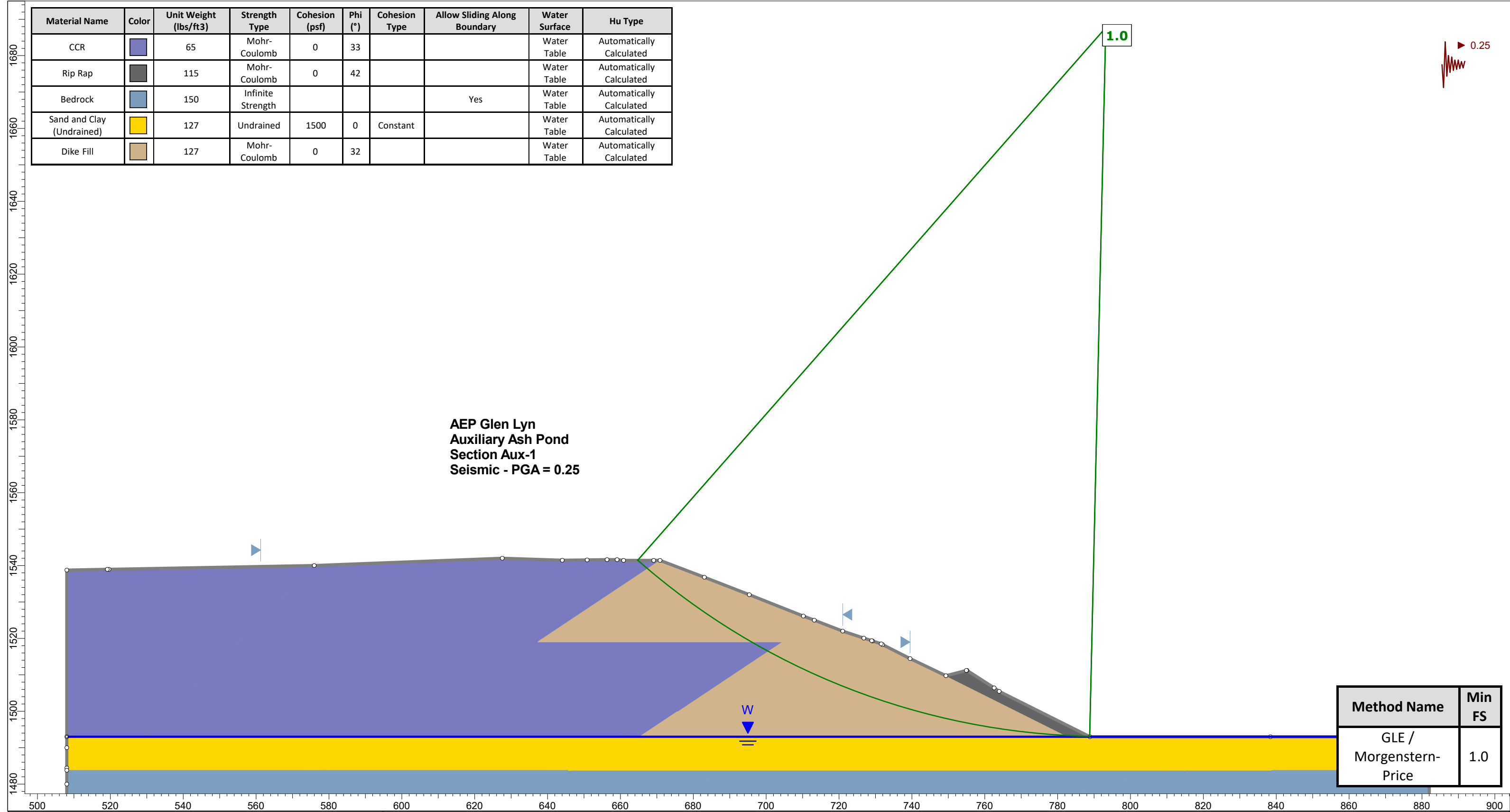


ROCSCIENCE


SLIDEINTERPRET 9.041

| | |
|---|--|
| <i>Project</i> Slide2 - An Interactive Slope Stability Program | |
| <i>Group</i> Max Pool / Surcharge | <i>Scenario</i> Master Scenario |
| <i>Drawn By</i> | <i>Company</i> |
| <i>Date</i> 3/27/2026, 9:18:53 AM | <i>File Name</i> Section Aux-1 - rev parameters - Su.slmd |

| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Cohesion Type | Allow Sliding Along Boundary | Water Surface | Hu Type |
|---------------------------|---|-----------------------|-------------------|----------------|---------|---------------|------------------------------|---------------|--------------------------|
| CCR |  | 65 | Mohr-Coulomb | 0 | 33 | | | Water Table | Automatically Calculated |
| Rip Rap |  | 115 | Mohr-Coulomb | 0 | 42 | | | Water Table | Automatically Calculated |
| Bedrock |  | 150 | Infinite Strength | | | | Yes | Water Table | Automatically Calculated |
| Sand and Clay (Undrained) |  | 127 | Undrained | 1500 | 0 | Constant | | Water Table | Automatically Calculated |
| Dike Fill |  | 127 | Mohr-Coulomb | 0 | 32 | | | Water Table | Automatically Calculated |



| Method Name | Min FS |
|-------------------------|--------|
| GLE / Morgenstern-Price | 1.0 |



Slide2 - An Interactive Slope Stability Program

| | | | |
|-----------------|-----------------------|------------------|--|
| <i>Project</i> | | <i>Scenario</i> | |
| <i>Group</i> | Seismic | <i>Company</i> | Master Scenario |
| <i>Drawn By</i> | | <i>File Name</i> | Section Aux-1 - rev parameters - Su.slmd |
| <i>Date</i> | 3/27/2026, 9:18:53 AM | | |

SLIDEINTERPRET 9.041

SUBJECT AEP GLEN LYN PLANT– AUXILARY FLY ASH POND
INITIAL SAFETY FACTOR ASSESSMENT-LIQUEFACTION
ANALYSIS



BY RRJ DATE 5/1/2025 PROJ. NO. C121043.12

CHKD. BY AB DATE 5/1/2025 SHEET NO. 1 OF 4

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OBJECTIVE:

Determine the liquefaction potential of the unconsolidated materials within and/or beneath the Auxiliary Fly Ash Pond (Aux Pond) for the Glen Lyn Power Station located in Giles County, Virginia.

METHODOLOGY:

To quantify the risk of liquefaction of the unconsolidated materials, consisting of impounded fly ash and New River alluvium, the existing and final grading plans were analyzed using shear-wave velocity data and the Simplified Procedure after Andrus and Stokoe (1999). Same methodology as originally provided in the closure documents was used for consistency; however, the peak ground acceleration (PGA) was updated based on the most recent United States Geological Survey (USGS) data.

REFERENCES:

1. Virginia Administrative Code (VAC), Chapter 80, Solid Waste Management Regulations, December 19, 2005.
2. Andrus, R.D., Stokoe, K.H. (2000, November). Liquefaction Resistance of Soils from Shear-Wave Velocity. *Journal of Geotechnical and Geoenvironmental Engineering*, 126, 1,015-1,025.
3. Part B Application, Appendices (Volume 1 of 2), Coal Combustion By-Product Disposal Facility, Glen Lyn Plant, Glen Lyn, Virginia, June 1993. Prepared by GAI Consultants, Inc.
4. Youd, T.L., Idriss, I.M. Andrus, R.D. Arango, I., Castro, G., Christian, J.T., Dobry, R., Liam Finn, W.D.L., Harder, L.F., Jr., Hynes, M.E., Ishihara, K., Koester, J.P., Liao, S.S.C., Marcuson, W.F., III, Martin, G.R., Mitchell, J.K., Moriwaki, Y., Power, M.S., Robertson, P.K., Seed, R.B., Stokoe, K.H., II, 1997, *Summary Report, Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils*, National Center for Earthquake Engineering Research Technical Report NCEER-97-0022, p. 1-40.

BACKGROUND:

The Glen Lyn Auxiliary Ash Pond is associated with the Glen Lyn Plant located in Giles County, Virginia (VA). The Auxiliary Ash Pond is located approximately 0.5 miles northwest of the Plant site. The Station operated from 1919 to 2015. Ash generated after 2008 was disposed of off-site. The Auxiliary Ash Pond was closed in 2014 and was used for the

SUBJECT AEP GLEN LYN PLANT– AUXILIARY FLY ASH POND
INITIAL SAFETY FACTOR ASSESSMENT-LIQUEFACTION
ANALYSIS



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management, storage, and disposal of CCR. Available historic records indicate that the primary waste managed by the Auxiliary Ash Pond was fly ash.

ANALYSIS:

To evaluate liquefaction potential, the site stratigraphy must be understood with respect to material classification, groundwater conditions, and age of the soil deposits. Research of published and unpublished information in conjunction with multiple site visits and an extensive subsurface investigation were employed to articulate the site conditions for analysis. The following paragraphs explain the methodology used in the analysis.

The Aux Pond is closed, and there is no normal pool since free water has been removed. The most recent monitoring well data from May 2022 to September 2025 indicates that the ground water level is at approximate elevation (El.) 1493 feet MSL, which corresponds to the approximate top of the alluvial soil layer beneath the Aux Pond. Based on the criteria listed in Reference 4, the alluvial soil exhibits characteristics typical of soils susceptible to liquefaction which include the following: materials contained in zones with a degree of saturation of at least 90 percent; visually classified as poorly-graded sand (SP); and exhibiting low shear strength based on SPT and CPT data. Though the age of the soil deposits are not clear, according to the Geologic Map of Giles County, the area was mapped as floodplain, levee, or channel deposits and likely of Holocene age.

Based on this information, the alluvial soil was identified for liquefaction evaluation with an approximate top elevation of 1,492 feet MSL.

In evaluating the potential for liquefaction, shear-wave velocity measurements were used to determine the likelihood of damage resulting from a design earthquake event with a magnitude of 7.5. Site stratigraphy was reconstructed based on field logs recorded during the subsurface investigation including N-values, classification, layer thickness, and groundwater observation. A general profile of the subsurface cross-section is shown in the following figure:

SUBJECT AEP GLEN LYN PLANT- AUXILARY FLY ASH POND
INITIAL SAFETY FACTOR ASSESSMENT-LIQUEFACTION
ANALYSIS

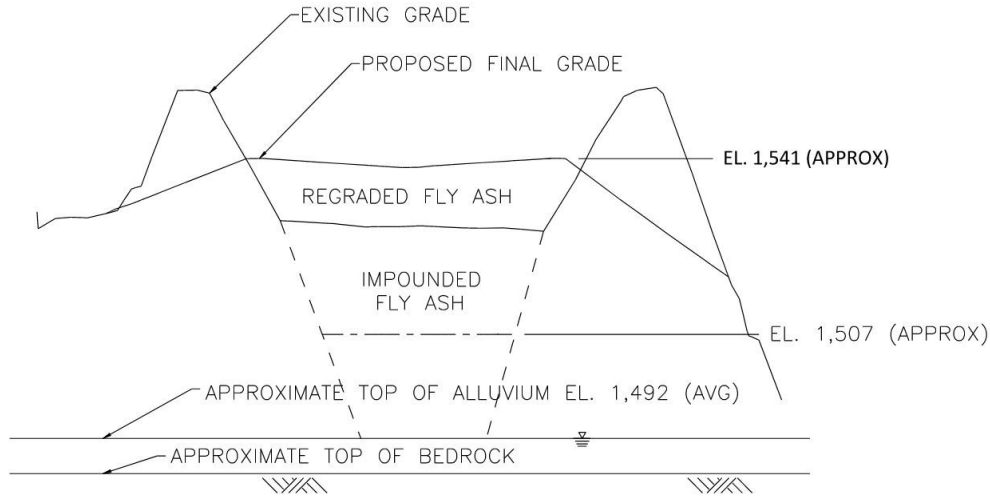


BY RRJ DATE 5/1/2025 PROJ. NO. C121043.12

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CHKD. BY AB DATE 5/1/2025 SHEET NO. 3 OF 4

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Using the elevations provided in the figure above and the following equation from Reference 2, the Cyclic Stress Ratio can be calculated for the critical layers identified previously using information gathered during the subsurface investigation completed in 2006.

$$CSR = 0.65 \left(\frac{a_{max}}{g} \right) \left(\frac{\sigma_v}{\sigma'_v} \right) r_d$$

Where:

- CSR = Cyclic Stress Ratio (dim);
- a_{max} = peak horizontal ground surface acceleration, (m/sec²);
- g = acceleration of gravity, (m/sec²);
- σ_v/σ'_v = total stress to effective stress ratio, (dim);
- r_d = shear stress reduction coefficient = 1-0.015z; and
- z = depth to critical layer (m).

Using a peak ground surface acceleration value of 0.25*g from the United States Geological Survey (USGS) seismic hazard tool using the latest 2023 National Seismic Hazard Model (NSHM), assuming a total stress to effective stress ratio of 1.0, and a depth of 14.9 m for the alluvial soil (EL. 1541 ft - EL. 1492 ft), the CSR value is calculated as:

- *Top of Alluvial Soil (EL. 1,492± (CPT C-3):*

$$0.65 \left(\frac{0.25 * 9.81 \frac{m}{sec^2}}{9.81 \frac{m}{sec^2}} \right) (1.0) (1 - 0.015(14.9m)) = \mathbf{0.126}$$

SUBJECT AEP GLEN LYN PLANT– AUXILARY FLY ASH POND
INITIAL SAFETY FACTOR ASSESSMENT-LIQUEFACTION
ANALYSIS



BY RRJ DATE 5/1/2025 PROJ. NO. C121043.12

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To utilize the site shear-wave velocity data, the reduced field data must be corrected for overburden stress using the following equation:

$$V_{s1} = V_s \left(\frac{P_a}{\sigma'_v} \right)^{0.25}$$

Where: V_{s1} = overburden stress-corrected shear-wave velocity (m/sec);
 V_s = shear-wave velocity;
 P_a = reference stress of 100 kPa, (kPa); and
 σ'_v = vertical effective stress, (kPa).

Using the shear-wave velocity data included in Reference 3 and attached to these calculations, the modified shear-wave velocity is calculated as:

- *Top of Alluvial Soil (EL. 1,492± (CPT C-3):*

$$V_{s1} = 403 \frac{m}{sec} \left(\frac{100kPa}{40 ft \times 120 pcf \times 0.048 \frac{psf}{kPa}} \right)^{0.25} = 327 \text{ m/sec}$$

Utilizing the adjusted shear-wave velocities, the previously calculated CSR's for the saturated fly ash and alluvial sand layer underlying the site, and Figure 2.10 from Reference 2 (Attachment 3), it can be seen that the materials will plot in the lower right corner of Figure 2.10. This suggests that the identified critical soil layers are of low risk for liquefaction.

SUMMARY:

In evaluating the liquefaction risk of the impounded fly ash and underlying alluvial soils at the Aux Pond, GAI considered geotechnical test data collected during the design of the facility expansion prior to 2006, the subsurface exploration completed in 2006, historical reports for the CCR facilities, and the most recent available monitoring well data from May 2022 to September 2025. From this information, GAI noted the layer of alluvial soil meeting established criteria for identifying soils potentially susceptible to liquefaction (Reference 4). As this material consisted of saturated sand and clay, GAI used the Simplified Procedure to quantify the risk of liquefaction. Using in-situ shear-wave velocity data, GAI estimated that liquefaction of these materials is not likely to occur.

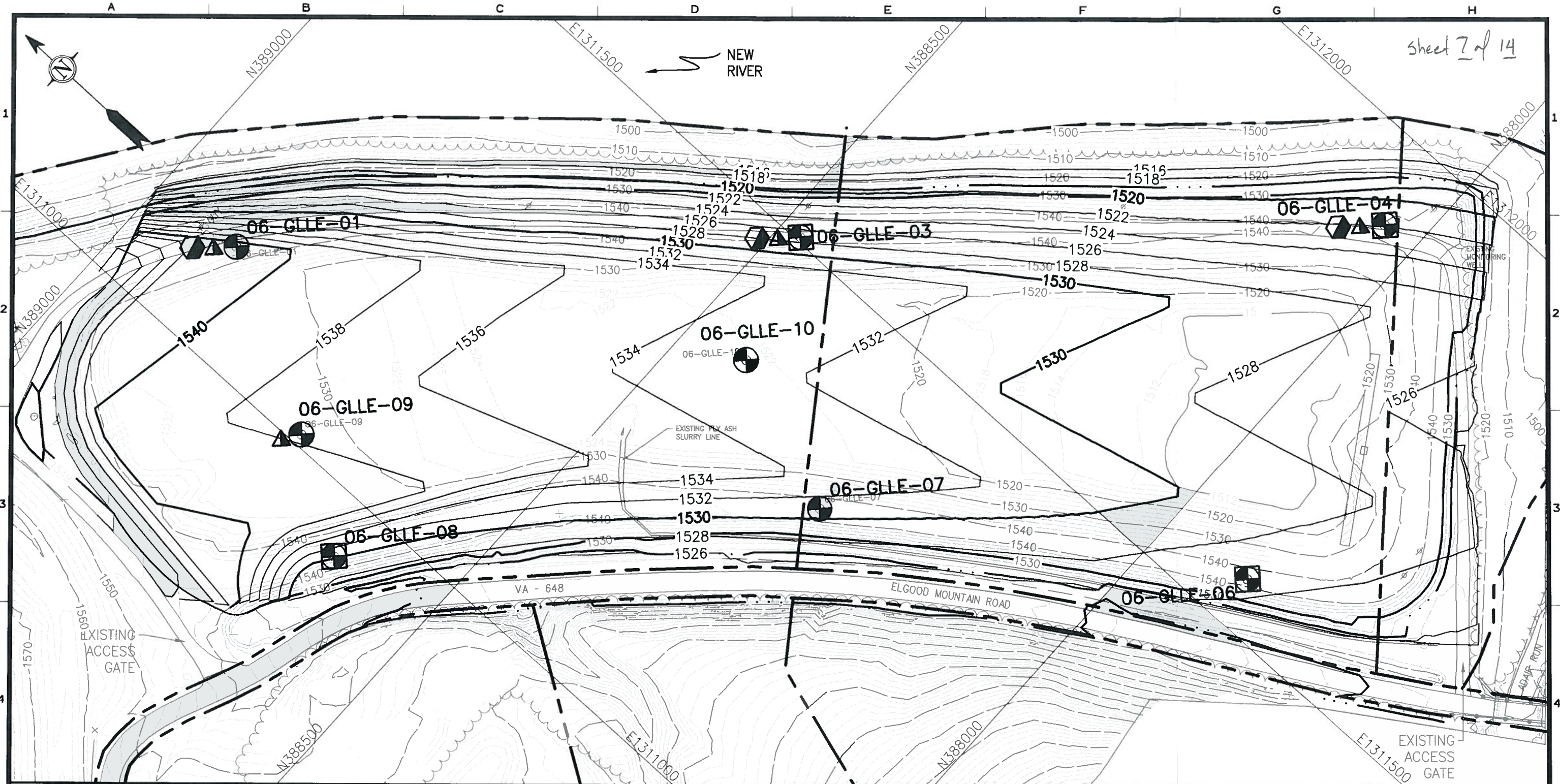


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ATTACHMENT 1

EXISTING CONDITIONS AND FINAL GRADING PLAN



MAP REFERENCE:
 This map compiled by photogrammetric methods from aerial photography dated 3-4-06 and field mapping dated January 17, 2008 and February 6, 2008. Grid based on Virginia State Plane Coordinate System South Zone NAD 1927. Vertical datum based on NGVD 1929.

- LEGEND**
- 06-GLLE-01 BORING
 - 06-GLLE-03 DMT & BOREHOLE SHEAR
 - BORING AND MONITORING WELL
 - CPT LOCATION



| DATE | NO. | DESCRIPTION | APPD. |
|--|-----|-------------|-------|
| REVISIONS | | | |
| <small>THIS DRAWING IS THE PROPERTY OF THE AMERICAN ELECTRIC POWER SERVICE CORP. AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO ANY PERSON WITHOUT THE WRITTEN CONSENT OF THE AEP SERVICE CORP., OR FOR ANY PURPOSE DETRIMENTAL TO THEIR INTEREST, AND IS TO BE RETURNED UPON REQUEST.</small> | | | |

APPALACHIAN POWER CO.
GLEN LYN PLANT
 GLEN LYN, VIRGINIA

**GLEN LYN AUXILIARY
 FLY ASH POND CLOSURE**
 BORING LOCATIONS, EXISTING
 GROUND, AND PROPOSED FINAL GRADES

| | |
|---|-------------------|
| DWG. NO. - | |
| SCALE: 1"=100' | CIVIL ENGINEERING |
| DR: JCN | APPROVED BY |
| CH: - | |
| ENGR: - | |
| DATE: - | |
| | |
| AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215 | |



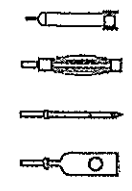
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ATTACHMENT 2

RELEVANT SOUNDING DATA FROM GLEN LYN AUXILIARY FLY ASH POND PART B APPLICATION

In-Situ soil testing, L.C. SCPTU Seismic Sounding Data



Project Location
Operator
Engineer

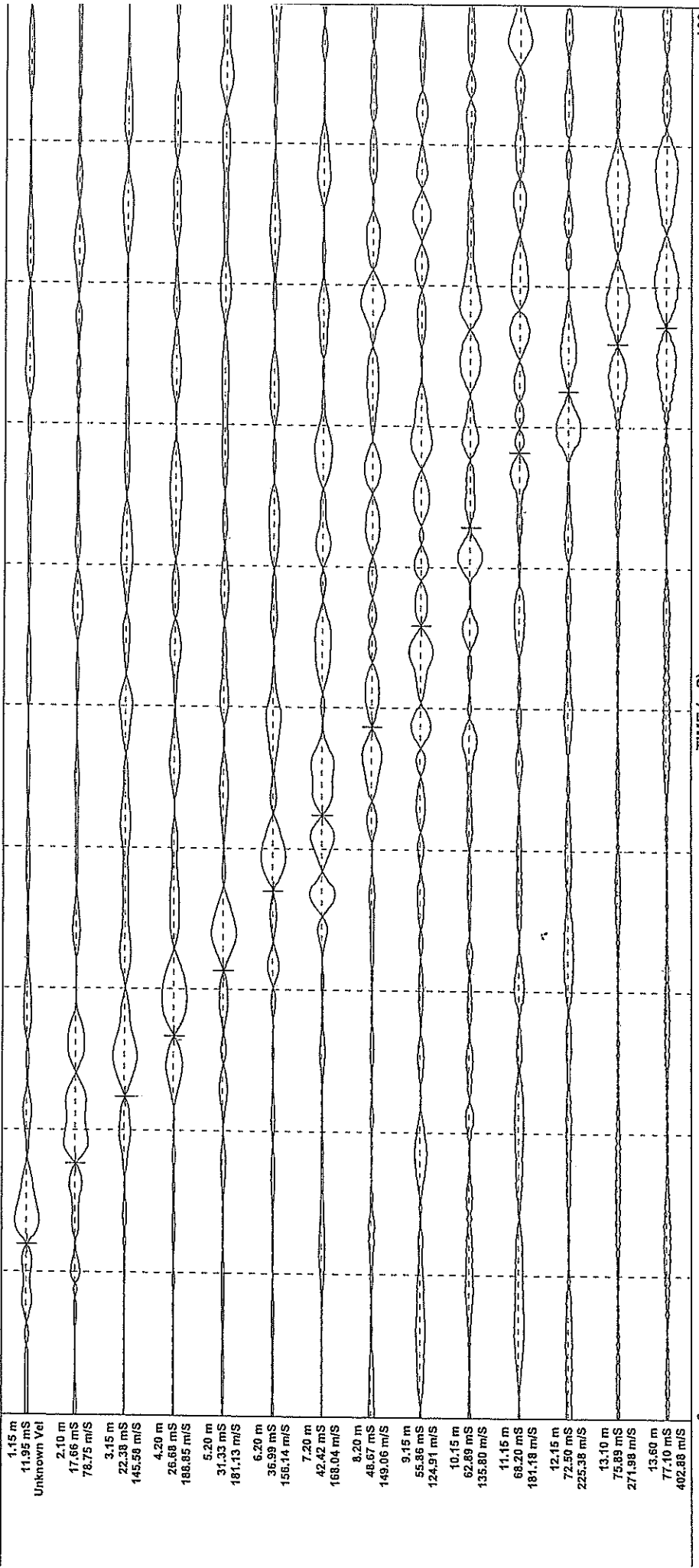
Glen Lyn, Virginia
R Failmezger

Glen Lyn Landfill Modification
Cone Number
Ground Elev.
File Name

C-3
7/27/2006 12:25:02 PM

Sounding Time/Date
Water Depth
Total Depth

G.S. EL ~ 1540



TIME (ms) 0 100

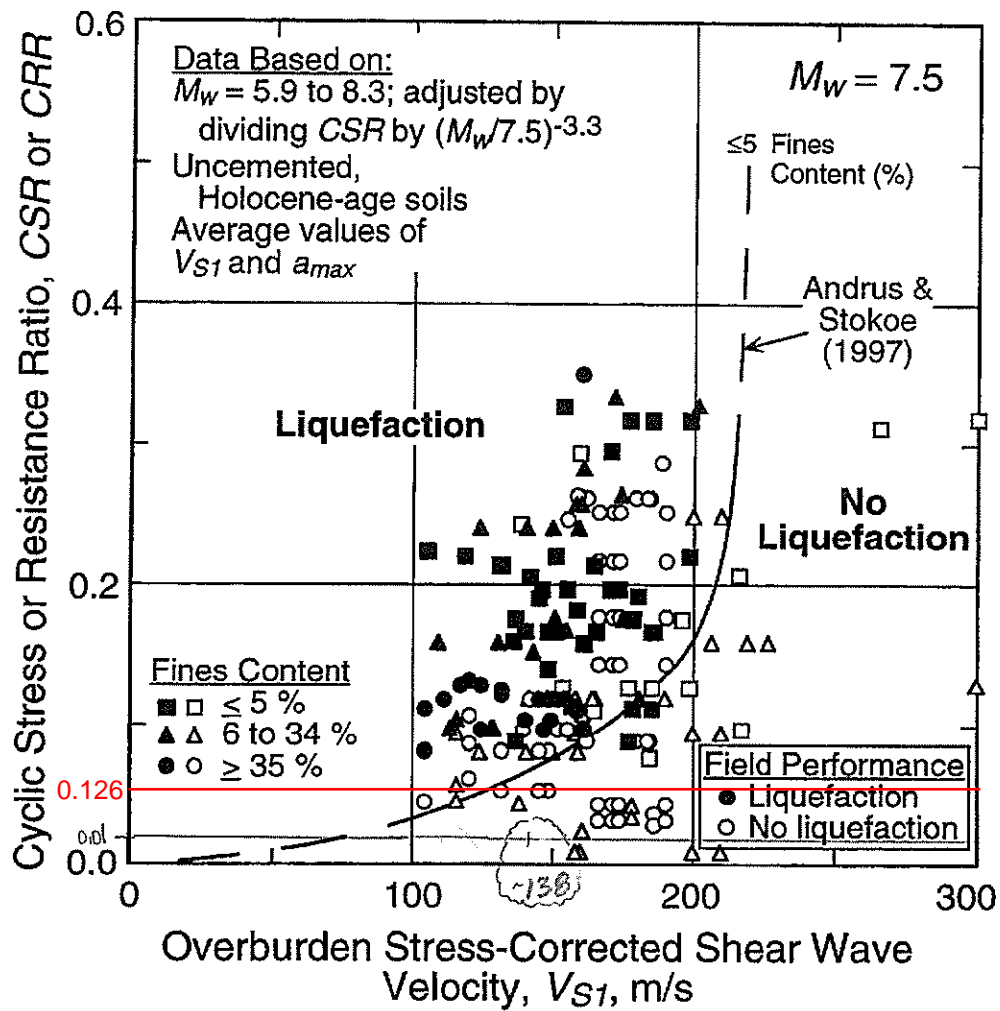


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ATTACHMENT 3

**FIGURE 2.10, SUMMARY REPORT, PROCEEDINGS OF THE
NCEER WORKSHOP ON EVALUATION OF LIQUEFACTION
RESISTANCE OF SOILS, NATIONAL CENTER FOR
EARTHQUAKE ENGINEERING RESEARCH TECHNICAL
REPORT NCEER-97-0022**



327

Fig. 2.10 - Liquefaction Resistance Relationship for Magnitude 7.5 Earthquakes and Uncemented Clean Soils of Holocene Age with Case History Data from Andrus and Stokoe (1997).



Glen Lyn Landfill and West Pond Initial Safety Factor Assessment Report

American Electric Power
Glen Lyn Plant
Giles County, Virginia

GAI Project Number: C121043.12, Task 003

May 2026



BOUNDLESS ENERGYSM

Prepared by: GAI Consultants, Inc.
Pittsburgh Office
385 East Waterfront Drive
Homestead, Pennsylvania 15120-5005

Prepared for: American Electric Power
1 Riverside Plaza, 22nd Floor
Columbus, Ohio 43215

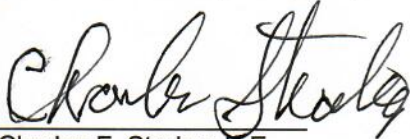
Table of Contents

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Certification/Statement of Professional Opinion

The Initial Safety Factor Assessment (Assessment) Report for the Glen Lyn Landfill and West Pond was prepared by GAI Consultants, Inc. (GAI). The Assessment Report was based on certain information that, other than for information GAI originally prepared, GAI has relied on, but not independently verified. Therefore, this Certification/Statement of Professional Opinion is limited to the information available to GAI at the time the Assessment Report was written. On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the Commonwealth of Virginia (VA), that the Assessment has been prepared in accordance with good and accepted engineering practices, as exercised by other engineers practicing in the same discipline(s), under similar circumstances, and at the time and in the same locale. It is my professional opinion that this Initial Safety Factor Assessment was prepared consistent with the requirements of the United States Environmental Protection Agency's Federal Coal Combustion Residuals (CCR) Rule 40 CFR § 257.73(e), published in the Federal Register on May 8, 2024 with an effective date of November 4, 2024.

The use of the words "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion and is not and shall not to be interpreted or construed as a guarantee, warranty or legal opinion.



Charles F. Straley, P.E.
Engineering Director



1.0 Purpose

Pursuant to the Federal Coal Combustion Residuals (CCR) Rule 40 CFR § 257.73(e)(1)(i-iv), each CCR impoundment is required to conduct an initial and periodic safety factor assessment to determine whether the CCR unit achieves the minimum safety factors at the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations including loading conditions.

2.0 Introduction

The Glen Lyn Landfill and West Pond (West Pond) are associated with the Glen Lyn Plant located in Giles County, Virginia (VA). The Station operated from 1919 to 2015. Ash generated after 2008 was disposed of off-site. The Ash Landfill has been assigned Solid Waste Permit #222. Sections of the West Pond were converted into a Landfill area composed of sluiced fly ash.

The Station began operating in 1919 and was acquired by Appalachian Power Company in 1925. In 1919, the first coal-fired generating unit had a capacity of 15 megawatts of electricity. The first coal-fired unit was retired in 1954. In 1920, the second unit was put into service. The third unit was put into service in 1924. In 1927, the fourth unit was put into service. Units 2, 3, and 4 had the capacity to generate 65 megawatts of electricity and were retired in 1971. The fifth unit was put into service in 1944 and had the capacity to generate 95 megawatts of electricity. The sixth unit was put into service in 1957 and had the capacity to generate 240 megawatts of electricity. The fifth and sixth units were retired in 2015 when the plant ceased production.

The West Pond includes approximately 2.5 acres of open water at the far northwestern edge of the site. The original discharge outfall structure is the primary spillway for the West Pond with a 36-inch diameter pipe and riser. In 2019, a 90-foot wide emergency spillway channel was installed at the western end of the West Pond. There is also a 2-acre, geomembrane lined leachate pond associated with the Landfill overlying the West Pond. The Ash Landfill was capped and closed in 2014. The closure area was regraded and capped with a 30-mil PVC geomembrane, a geocomposite drainage net, and a vegetated cover.

3.0 Background Information

As discussed in Section 2.0, the Station operated from 1919 to 2015 and ash generated after 2008 was disposed of off-site. The Landfill was capped and closed in 2014 where the closure area was regraded and capped with a PVC geomembrane. The West Pond and the leachate collection pond consist of approximately 2.5 acres and 2 acres of open water, respectively. GAI Consultants, Inc. (GAI) submitted a Landfill Stability Analyses Update in March 2017. GEI Consultants, Inc. (GEI) also submitted two reports for Ash landfill and West Pond, titled "Analysis Report – Seismic Stability of Ash Landfill and West Pond at Glen Lyn Plant," and "Data Report – Seismic Stability of Ash Landfill and West Pond at Glen Lyn Plant" in August 2018. Subsurface explorations were performed for the above-mentioned reports submitted by GEI, but no additional subsurface explorations were performed for this Landfill and West Pond Initial Safety Factor Assessment. The reports listed in Section 3.1, submitted by GAI and others for the CCR facilities were used to supplement data for the Ash Landfill and West Pond Initial Safety Factor Assessment.

3.1 Historical Data

GAI reviewed historical records for the CCR facilities to obtain pertinent information to use in this Assessment Report. The historical records for the proposed closures, and previous subsurface explorations and analyses are included in the following documents:

- History of Construction - Auxiliary Ash Pond Complex – Glen Lyn Plant Site, American Electric Power Service Corporation, 2026

- Closure Plan – AEP Auxiliary Fly Ash Pond, GAI Consultants, Inc., 2013
- Bottom Ash Pond Complex Delineation Data Report – Glen Lyn Power Station, GAI Consultants, Inc., 2017
- Bottom Ash Pond Complex Delineation Data Report Addendum – Glen Lyn Power Station, GAI Consultants, Inc., 2018
- Closure Plan - AEP Former Glen Lyn Power Plan Bottom Ash Pond, GAI Consultants, Inc., Revised 2024
- Landfill Stability Analyses Update – AEP Glyn Lyn Plant, GAI Consultants, Inc., March 2017
- Analysis Report – Seismic Stability of Ash Landfill and West Pond at Glen Lyn Plant, GEI Consultants, August 2018
 Data Report – Seismic Stability of Ash Landfill and West Pond at Glen Lyn Plant, GEI Consultants, August 2018

3.2 Summary of Parameters

Soil parameters used in stability analyses were estimated from the historical data referenced in Section 3.1, literature review, and engineering judgment.

The soil parameters used in stability analyses are summarized in Table 1.

Table 1 – Summary of Parameters

| Material | Drained Friction Angle, ϕ' (degrees) | Drained Cohesion, c' (psf) | Undrained Shear Strength (psf) | Undrained Shear Strength Ratio | Unit Weight γ (pcf) |
|---------------------------|--|---------------------------------|-----------------------------------|--------------------------------|-------------------------------|
| Stacked Ash | 33 | 0 | - | - | 78 |
| Dike Fill | 32 | 0 | 2,500 | - | 133 |
| Clay-Like Alluvium | 28 | 0 | 4,000 | 0.35 | 127 |
| Earth Fill | 30 | 0 | 2,000 | - | 133 |
| Sand-Like Alluvium | 30 | 0 | - | - | 127 |
| Sluiced Ash | 33 | 0 | - | - | 77 |
| Sluiced Ash (Untriggered) | - | - | - | 0.34 | 77 |
| Sluiced Ash (Triggered) | - | - | - | 0.15 | 77 |
| Rip Rap | 42 | 0 | - | - | 115 |
| Bedrock | Infinite Strength | | - | - | 150 |

4.0 Factor of Safety Assessment

GAI reviewed all the documents listed under the References (Section 6.0) in its assessment to determine if the impoundment meets the following safety factors:

- i. The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
- ii. The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
- iii. The calculated seismic factor of safety must equal or exceed 1.00.
- iv. For dikes constructed of soils that are susceptible to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

The stability assessments were evaluated using the Slide2 software package (Rocscience 2024, version 9.034). All analyses were conducted using the Morgenstern-Price Method. The material strength parameters used in the analyses were developed based on previous subsurface explorations including laboratory testing, literature review, and engineering judgment. The CCR rule discusses development of “critical cross section(s)” that represent the most severe cases. These critical sections should produce the lowest factors of safety for a given loading condition. The cross sections used in the slope stability analyses are shown in plan view on Figure A-1 in Appendix A. The phreatic surfaces used in the analyses were based on information obtained from the Inflow Report, past analyses performed by GAI and others, and on water level readings obtained from the network of monitoring wells surrounding the Ash Landfill and West Pond. Sections indicating the critical calculated failure surfaces and the corresponding factors of safety are included as Figures A-2 through A-12 in Appendix A.

4.1 Long-Term, Maximum Storage Pool Loading Condition

The long-term maximum storage pool condition considers slope stability with steady-state seepage under the maximum sustained operating pool. The long-term, maximum storage pool is defined as the maximum water level that can be regularly maintained and results in the full development of a steady state seepage condition. Drained (effective) strength parameters are most applicable for such analyses. The Landfill is closed, and there is no normal pool since free water has been removed. The phreatic surface for the Landfill in the stability analyses is based on the most recent available monitoring well data from May 2022 to September 2025 as well as past analyses performed by GAI and others. The leachate pond is lined with a geomembrane that is impervious, and a pool elevation (El.) of approximately 1539.5 feet was used in the stability analyses for the long-term maximum storage pool loading condition. The pool elevation for the leachate pond is based on an assumed freeboard of approximately two feet. As discussed in Section 2.0, in 2019, a 90-foot wide emergency spillway channel was installed in the West Pond. The crest elevation of the emergency spillway was at El. 1532.0 feet. Therefore, the long-term maximum storage pool loading condition for the West Pond was modeled at water elevation of 1532.0 feet.

The results of the analysis of the long-term, maximum storage pool loading condition are summarized in Table 2.

Table 2 – Calculated Minimum Factors of Safety – Long-Term, Maximum Pool Loading Condition

| Section Analyzed | Minimum Required FOS | Calculated Minimum FOS | Acceptable (Yes/No) |
|------------------|----------------------|------------------------|---------------------|
| LF-1 | 1.5 | 1.5 | Yes |
| WP-1 | 1.5 | 1.5 | Yes |
| WP-2 | 1.5 | 2.9 | Yes |

4.2 Maximum Surcharge Pool Loading Condition

The maximum surcharge pool loading condition considers slope stability under the maximum surcharge pool level. The maximum surcharge pool represents a temporary rise in pool elevation above the maximum storage pool in the event of an inflow design flood and spillway discharge condition. This condition allows the evaluation of the effects of a raised level, which is similar to the effects of a flood surcharge.

The Landfill is closed, and there is no maximum surcharge pool since free water has been removed. The phreatic surface for the Landfill in the stability analyses is based on the most recent available monitoring well data from May 2022 to September 2025 as well as past analyses performed by GAI and others. The leachate pond is lined with a geomembrane that is impervious, and a pool elevation (El.) of approximately 1541.5 feet was used in the stability analyses for the maximum surcharge pool loading condition. The pool elevation for the leachate pond is based on no available freeboard. As discussed in Section 2.0, in 2019, a 90-foot wide emergency spillway channel was installed in the West Pond. The peak flow elevation over the emergency spillway during the 1,000 year flood is at approximate El. 1533.6 feet. Therefore, the maximum surcharge pool loading condition for the West Pond was modeled at water elevation of 1533.6 feet.

The results of the analysis of the maximum surcharge loading condition are summarized in Table 3.

Table 3 – Calculated Minimum Factors of Safety – Maximum Surcharge Loading Condition

| Section Analyzed | Minimum Required FOS | Calculated Minimum FOS | Acceptable (Yes/No) |
|------------------|----------------------|------------------------|---------------------|
| LF-1 | 1.4 | 1.5 | Yes |
| WP-1 | 1.4 | 1.5 | Yes |
| WP-2 | 1.4 | 2.9 | Yes |

4.3 Seismic Loading Condition

The seismic loading condition considers slope stability as a result of the Maximum Design Earthquake (MDE) event. The MDE is defined by the CCR rule as a seismic event with a 2 percent probability of exceedance in 50 years (i.e. earthquake of approximate 2,500-year return period). Pseudostatic analysis was used to evaluate slope stability under the seismic loading condition. The ground motion used in the analyses was a peak ground acceleration (PGA) of approximately 0.25 times the acceleration of gravity (g), or 0.25 g, obtained from the United States Geological Survey (USGS) seismic hazard tool using the latest 2023 National Seismic Hazard Model (NSHM). Phreatic surfaces used in the long-term maximum storage pool loading condition as discussed in Section 4.1 were used in the seismic loading condition.

The results of the analysis of the seismic loading condition are summarized in Table 4.

Table 4 – Calculated Minimum Factors of Safety – Seismic Loading Condition

| Section Analyzed | Minimum Required FOS | Calculated Minimum FOS | Acceptable (Yes/No) |
|------------------|----------------------|------------------------|---------------------|
| LF-1 | 1.0 | 1.0 | Yes |
| WP-1 | 1.0 | 2.0 | Yes |
| WP-2 | 1.0 | 1.0 | Yes |

4.4 Liquefaction Factor of Safety

The liquefaction loading condition addresses the potential for loose, saturated, or partially saturated soils to undergo a loss of strength during seismic events. This reduction in strength can result in slope instability, settlement, subsidence, or other forms of embankment distress. The assessment of liquefaction potential generally involves evaluating the susceptibility of each material zone within the embankment and its foundation to liquefaction triggering. For materials identified as susceptible, the potential impacts on embankment stability are then evaluated by incorporating reduced shear strength parameters representative of post-liquefaction conditions.

Liquefaction analysis was performed using the “Simplified Procedure” for each SPT interval in every boring drilled within the Landfill and West Pond (Idriss and Boulanger, 2008). The ground motions used in the liquefaction analysis were based on the PGA described in Section 4.3. Results of the liquefaction evaluation indicate that soils surrounding Borings B-103, B-105, and B-122 within the Landfill and West Pond embankment and its foundations are susceptible to liquefaction under the CCR Rule criteria, as calculated liquefaction factors of safety were less than 1.2. Accordingly, a separate post-earthquake stability analysis is required. Therefore, a post-earthquake stability analysis using the residual (steady state) shear strengths for potentially liquefiable materials was performed. Phreatic surfaces used in the long-term maximum storage pool loading condition as discussed in Section 4.1 were also used for such analyses.

The results of the analysis of the post-earthquake condition are summarized in Table 4.

Table 4 – Calculated Minimum Factors of Safety – Post-earthquake Condition

| Section Analyzed | Minimum Required FOS | Calculated Minimum FOS | Acceptable (Yes/No) |
|------------------|----------------------|------------------------|---------------------|
| LF-1 | 1.2 | 1.5 | Yes |
| WP-1 | 1.2 | 1.6 | Yes |
| WP-2 | 1.2 | 1.3 | Yes |

5.0 Conclusion

GAI reviewed previous stability analyses for this Initial Safety Factor Assessment and conducted new analyses to meet the requirements of the CCR Rule. Based on the analyses conducted for the conditions outlined in the CCR Rule, the Ash Landfill and West Pond meet or exceed the required factors of safety.

6.0 References

1. American Electric Power Service Corporation. History of Construction – Auxiliary Ash Pond Complex – Glen Lyn Plant Site. February 2026.
2. GAI Consultants. *Bottom Ash Pond Complex Delineation Data Report*. June 2017.
3. GAI Consultants. *Bottom Ash Pond Complex Delineation Data Report Addendum*. June 2018.
4. GAI Consultants. *Closure Plan – AEP Auxiliary Fly Ash Pond*. February 2013.
5. GAI Consultants. *Closure Plan – AEP Former Glen Lyn Power Plant Bottom Ash Pond*. Revised December 2024.
6. GAI Consultants. Landfill Stability Analyses Update – AEP Glyn Lyn Plant. March 2017.
7. GEI Consultants. *Analysis Report – Seismic Stability of Ash Landfill and West Pond at Glen Lyn Plant*. August 2018.
8. GEI Consultants. *Data Report – Seismic Stability of Ash Landfill and West Pond at Glen Lyn Plant*. August 2018.
9. *Soil Liquefaction during Earthquakes*, Idriss and Boulanger, EERI Monograph MNO-12, 2008.
10. *Coal Ash: Characteristics, Management and Environmental Issues*, Technical Update - Coal Combustion Products - Environmental Issues, Electric Power Research Institute, September 2009.

APPENDIX A Calculations

Figure A-1

| SITE BOUNDARY COORDINATES | | |
|---------------------------|---------|-----------|
| POINT NO. | NORTH | EAST |
| 1 | 390,228 | 1,309,048 |
| 2 | 390,136 | 1,309,142 |
| 3 | 390,016 | 1,309,292 |
| 4 | 389,936 | 1,309,410 |
| 5 | 389,880 | 1,309,463 |
| 6 | 389,810 | 1,309,548 |
| 7 | 389,636 | 1,309,796 |
| 8 | 389,360 | 1,310,234 |
| 9 | 389,154 | 1,310,623 |
| 10 | 389,056 | 1,310,748 |
| 11 | 389,007 | 1,310,786 |
| 12 | 388,940 | 1,310,810 |
| 13 | 388,864 | 1,310,806 |
| 14 | 388,775 | 1,310,797 |
| 15 | 388,710 | 1,310,719 |
| 16 | 388,532 | 1,310,442 |
| 17 | 388,475 | 1,310,299 |
| 18 | 388,458 | 1,310,134 |
| 19 | 388,474 | 1,310,028 |
| 20 | 388,530 | 1,309,916 |
| 21 | 388,703 | 1,309,692 |
| 22 | 388,744 | 1,309,600 |
| 23 | 388,750 | 1,309,524 |
| 24 | 388,702 | 1,309,466 |
| 25 | 388,694 | 1,309,384 |
| 26 | 388,724 | 1,309,314 |
| 27 | 388,846 | 1,309,224 |
| 28 | 388,894 | 1,309,166 |
| 29 | 389,000 | 1,309,124 |
| 30 | 389,130 | 1,309,023 |
| 31 | 389,240 | 1,309,002 |
| 32 | 389,337 | 1,308,900 |
| 33 | 389,780 | 1,308,638 |

| BENCHMARK | ELEVATION | COORDINATES |
|-----------|-----------|-------------------------------|
| 12103 | 1553.64 | N 389159.908 E 1310516.533 |
| 12106 | 1536.61 | N 390464.566 E 1308686.040 |
| 12107 | 1580.86 | N 389494.701 E 1309600.725 |

LEGEND

- 1560 REGRADED FINAL CONTOUR
- BENCH 20' WIDE BENCH
- DIRECTION OF DRAINAGE
- TOP OF SLOPE
- TOE OF SLOPE
- H.P. DRAINAGE HIGH POINT
- SLOPE DRAIN
- B-16 (MW-12) MONITORING WELL/BORING LOCATION
- B-17 BORING LOCATION
- MW-20 PROPOSED MONITORING WELL LOCATION (APPROXIMATE)
- ON-SITE CONVEYANCE CHANNEL
- OFF-SITE DIVERSION CHANNEL
- LEACHATE CONVEYANCE PIPE
- LIMITS OF PERMANENT VEGETATION
- LIMITS OF SEDIMENT BASIN
- BENCHMARK LOCATION
- SITE BOUNDARY (LIMITS OF CLEARING AND GRADING)
- SECTION IDENTIFICATION LETTER AND SECTION CUTTING PLANE LOCATION SHEET NUMBER ON WHICH SECTION IS DRAWN
- DETAIL IDENTIFICATION NUMBER AND LOCATION SHEET NUMBER ON WHICH DETAIL IS DRAWN
- SECTION IDENTIFICATION LETTER SHEET NUMBER ON WHICH SECTION CUTTING PLANE IS LOCATED
- DETAIL IDENTIFICATION NUMBER SHEET NUMBER(S) ON WHICH DETAIL IS LOCATED

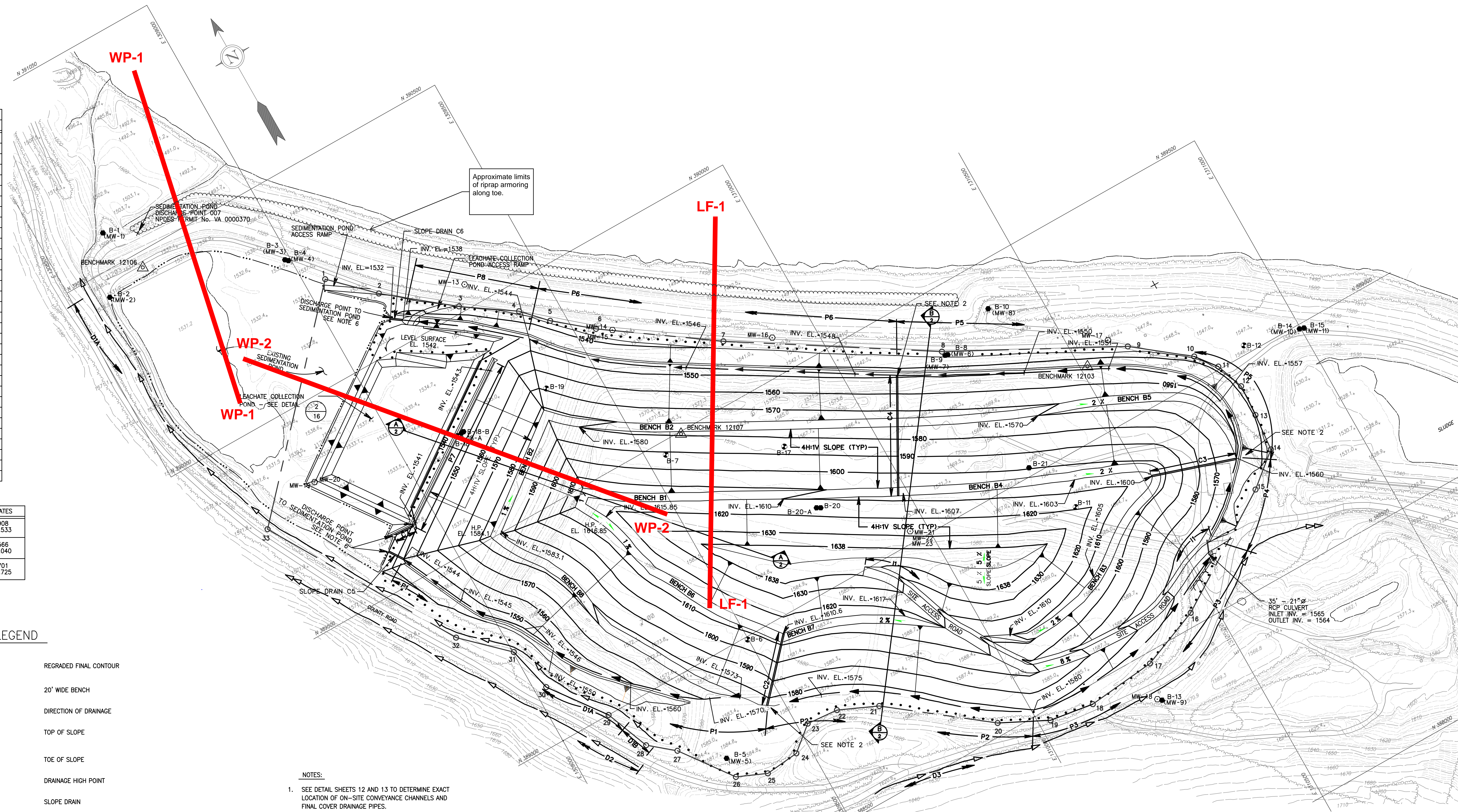
NOTES:

- SEE DETAIL SHEETS 12 AND 13 TO DETERMINE EXACT LOCATION OF ON-SITE CONVEYANCE CHANNELS AND FINAL COVER DRAINAGE PIPES.
- PLACE A MINIMUM 20' x 20' LAYER OF RIPRAP 1.5' THICK WITHIN THE CONVEYANCE CHANNEL AT THE END OF THE SLOPE DRAIN CHANNEL. USE NSA R-6 RIPRAP. EXTEND THE RIPRAP TO THE FAR BANK OF THE CONVEYANCE CHANNEL. SURFACE OF RIPRAP SHALL BE LEVEL WITH CHANNEL BOTTOM. THE OUTLET OF SLOPE DRAINS C2, C3, AND C4 SHALL BE CONSTRUCTED AS SHOWN ON DETAIL.
- FOR ON-SITE CONVEYANCE CHANNEL DIMENSIONS - SEE DETAIL.
- FOR SLOPE DRAIN CHANNEL DIMENSIONS - SEE DETAILS.
- FOR BENCH CHANNEL DIMENSIONS - SEE DETAIL.
- PLACE A MINIMUM 20' WIDE x 20' LONG, 2.5' THICK LAYER OF NSA R-7 RIPRAP AT THE END OF SLOPE DRAIN CHANNELS C5, C6, AND C7. THE RIPRAP SHALL BE UNDERLAID BY NONWOVEN PROTECTIVE CUSHION GEOTEXTILE.
- FOR SITE ACCESS ROAD DETAILS - SEE DETAIL.
- OFF-SITE DIVERSION CHANNEL D1 IS EXISTING AND IS TO BE MODIFIED AS SHOWN ON DETAILS OFF-SITE DIVERSION CHANNELS D2 AND D3 ARE ALSO EXISTING BUT DO NOT REQUIRE ANY ADDITIONAL MODIFICATIONS.
- ACREAGE WITHIN THE SITE BOUNDARY OF THE FACILITY, AS CALCULATED BY THE METHOD OF RECTANGULAR COORDINATES, IS 42.8 ACRES.

MAP REFERENCE:

- THE BASE MAP FOR THIS DRAWING WAS PREPARED BY L. ROBERT KIMBALL AND ASSOCIATES AT A SCALE OF 1" = 100' WITH CONTOUR INTERVALS OF 2 FOOT, FROM AERIAL PHOTOGRAPHY EXPOSED ON JANUARY 20, 1993, AT A SCALE OF 1" = 600', AND MEETS OR EXCEEDS NATIONAL MAP ACCURACY STANDARDS.
- THE HORIZONTAL DATUM IS THE NORTH AMERICAN DATUM, ADJUSTMENT OF 1927, INDIANA WEST ZONE. THE VERTICAL DATUM IS THE NATIONAL GEODETIC VERTICAL DATUM, ADJUSTMENT OF 1929.

Approximate limits of riprap armoring along toe.



SCALE: 1" = 100'

| DATE | NO. | DESCRIPTION | APPRO. |
|-----------|-----|-------------|--------|
| REVISIONS | | | |

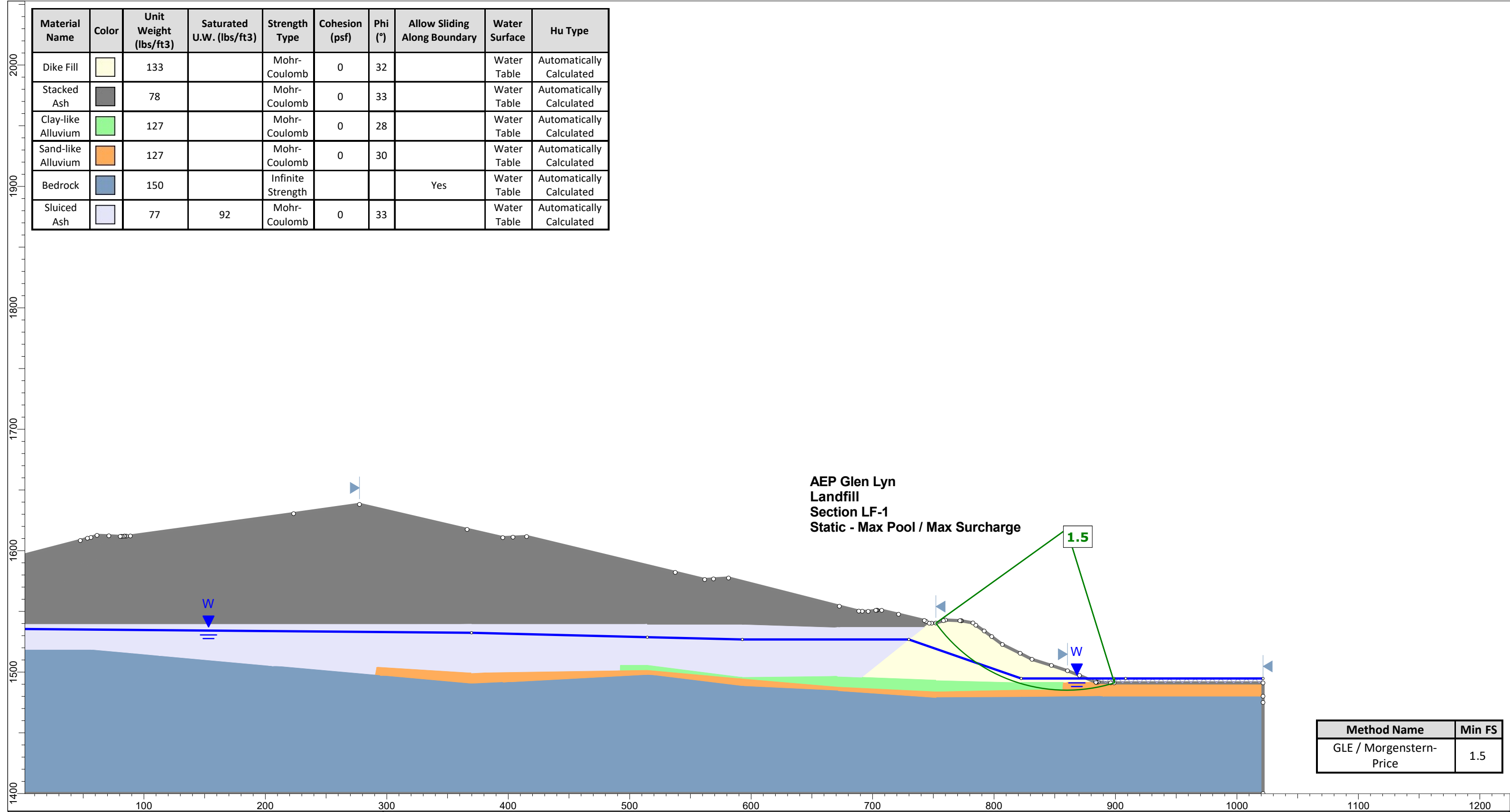
THIS DRAWING IS CLASSIFIED AS:
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APPALACHIAN POWER CO.
GLEN LYN PLANT
 GLEN LYN, VIRGINIA
FIGURE 1
FINAL TOPOGRAPHY AND SECTION LOCATIONS


| | | |
|---|---|---|
| PITTSBURGH OFFICE • 385 EAST WATERFRONT DRIVE, HOMESTEAD, PA 15120-5005 | DRAWN: WJH CHECKED: KS DATE: 09/22/2016 | APPROVED: [Signature] DATE: 09/22/2016 |
| | GAI DRAWING NUMBER: C121043-04-000-00-C-E1-001 SHT. NO. 1 OF 2 | |
| SCALE AS SHOWN: 1" = 100' | | REV: 0 |
| AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215 | | AEP SERVICE CORP. |

Figure A-2

| Material Name | Color | Unit Weight (lbs/ft3) | Saturated U.W. (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Allow Sliding Along Boundary | Water Surface | Hu Type |
|--------------------|-------|-----------------------|--------------------------|-------------------|----------------|---------|------------------------------|---------------|--------------------------|
| Dike Fill | | 133 | | Mohr-Coulomb | 0 | 32 | | Water Table | Automatically Calculated |
| Stacked Ash | | 78 | | Mohr-Coulomb | 0 | 33 | | Water Table | Automatically Calculated |
| Clay-like Alluvium | | 127 | | Mohr-Coulomb | 0 | 28 | | Water Table | Automatically Calculated |
| Sand-like Alluvium | | 127 | | Mohr-Coulomb | 0 | 30 | | Water Table | Automatically Calculated |
| Bedrock | | 150 | | Infinite Strength | | | Yes | Water Table | Automatically Calculated |
| Sluiced Ash | | 77 | 92 | Mohr-Coulomb | 0 | 33 | | Water Table | Automatically Calculated |








| Method Name | Min FS |
|-------------------------|--------|
| GLE / Morgenstern-Price | 1.5 |



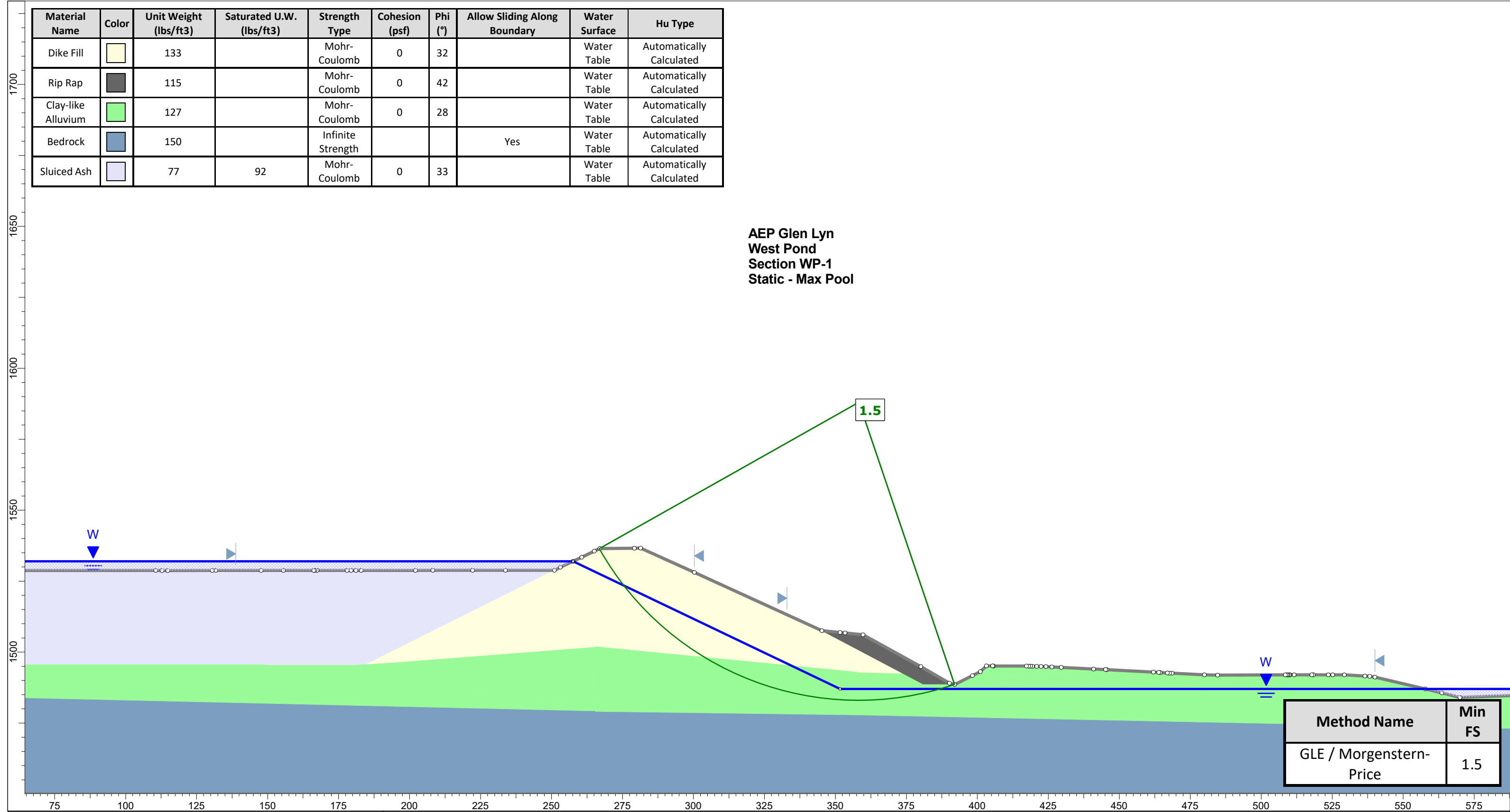
SLIDEINTERPRET 9.041

Slide2 - An Interactive Slope Stability Program

| | | |
|-----------------|--------------------------|------------------------------------|
| <i>Project</i> | | |
| <i>Group</i> | Max Pool / Max Surcharge | <i>Scenario</i> Master Scenario |
| <i>Drawn By</i> | | <i>Company</i> |
| <i>Date</i> | 4/7/2026, 9:00:48 AM | <i>File Name</i> Section LF-1.slmd |

| Material Name | Color | Unit Weight (lbs/ft3) | Saturated U.W. (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Allow Sliding Along Boundary | Water Surface | Hu Type |
|--------------------|---|-----------------------|--------------------------|-------------------|----------------|---------|------------------------------|---------------|--------------------------|
| Dike Fill |  | 133 | | Mohr-Coulomb | 0 | 32 | | Water Table | Automatically Calculated |
| Rip Rap |  | 115 | | Mohr-Coulomb | 0 | 42 | | Water Table | Automatically Calculated |
| Clay-like Alluvium |  | 127 | | Mohr-Coulomb | 0 | 28 | | Water Table | Automatically Calculated |
| Bedrock |  | 150 | | Infinite Strength | | | Yes | Water Table | Automatically Calculated |
| Sluiced Ash |  | 77 | 92 | Mohr-Coulomb | 0 | 33 | | Water Table | Automatically Calculated |

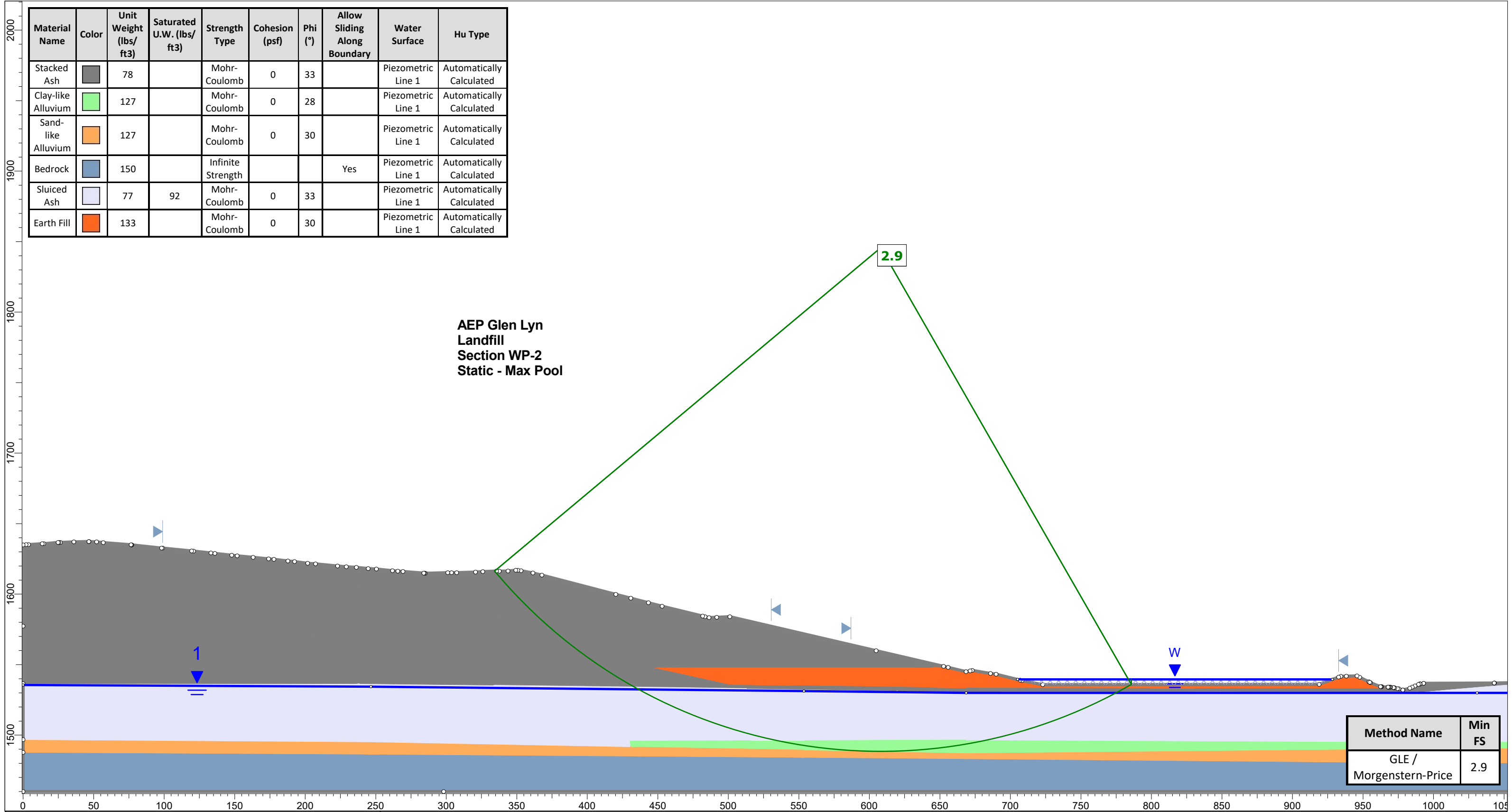
AEP Glen Lyn
West Pond
Section WP-1
Static - Max Pool








| Method Name | Min FS |
|-------------------------|--------|
| GLE / Morgenstern-Price | 1.5 |

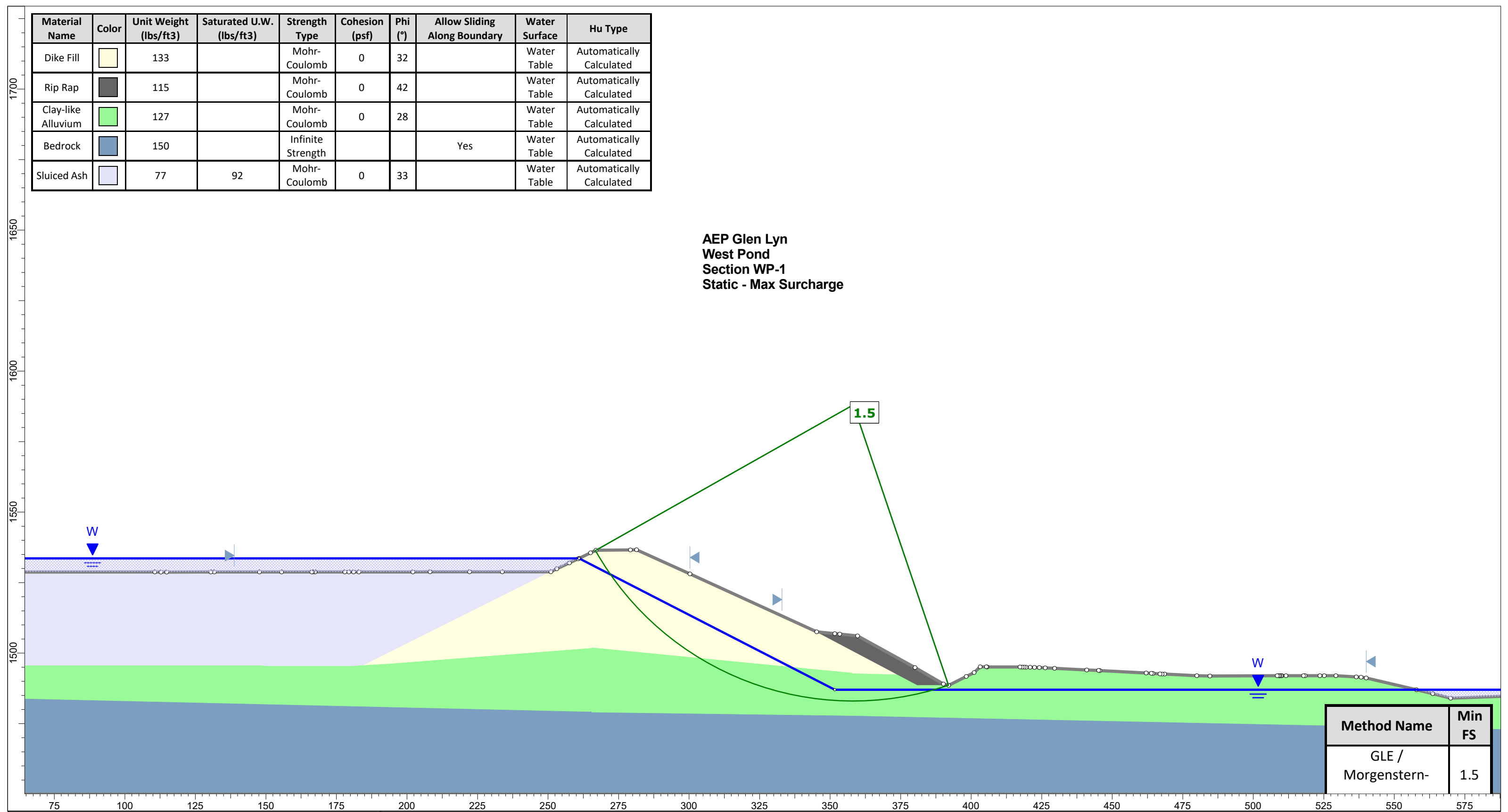


| | | | |
|----------|----------------------|---|------------------|
| Project | | Slide2 - An Interactive Slope Stability Program | |
| Group | Max Pool | Scenario | Master Scenario |
| Drawn By | | Company | |
| Date | 4/7/2026, 9:00:48 AM | File Name | Section WP-1.slm |




| Material Name | Color | Unit Weight (lbs/ft3) | Saturated U.W. (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Allow Sliding Along Boundary | Water Surface | Hu Type |
|--------------------|---|-----------------------|--------------------------|-------------------|----------------|---------|------------------------------|---------------|--------------------------|
| Dike Fill |  | 133 | | Mohr-Coulomb | 0 | 32 | | Water Table | Automatically Calculated |
| Rip Rap |  | 115 | | Mohr-Coulomb | 0 | 42 | | Water Table | Automatically Calculated |
| Clay-like Alluvium |  | 127 | | Mohr-Coulomb | 0 | 28 | | Water Table | Automatically Calculated |
| Bedrock |  | 150 | | Infinite Strength | | | Yes | Water Table | Automatically Calculated |
| Sluiced Ash |  | 77 | 92 | Mohr-Coulomb | 0 | 33 | | Water Table | Automatically Calculated |

AEP Glen Lyn
West Pond
Section WP-1
Static - Max Surcharge



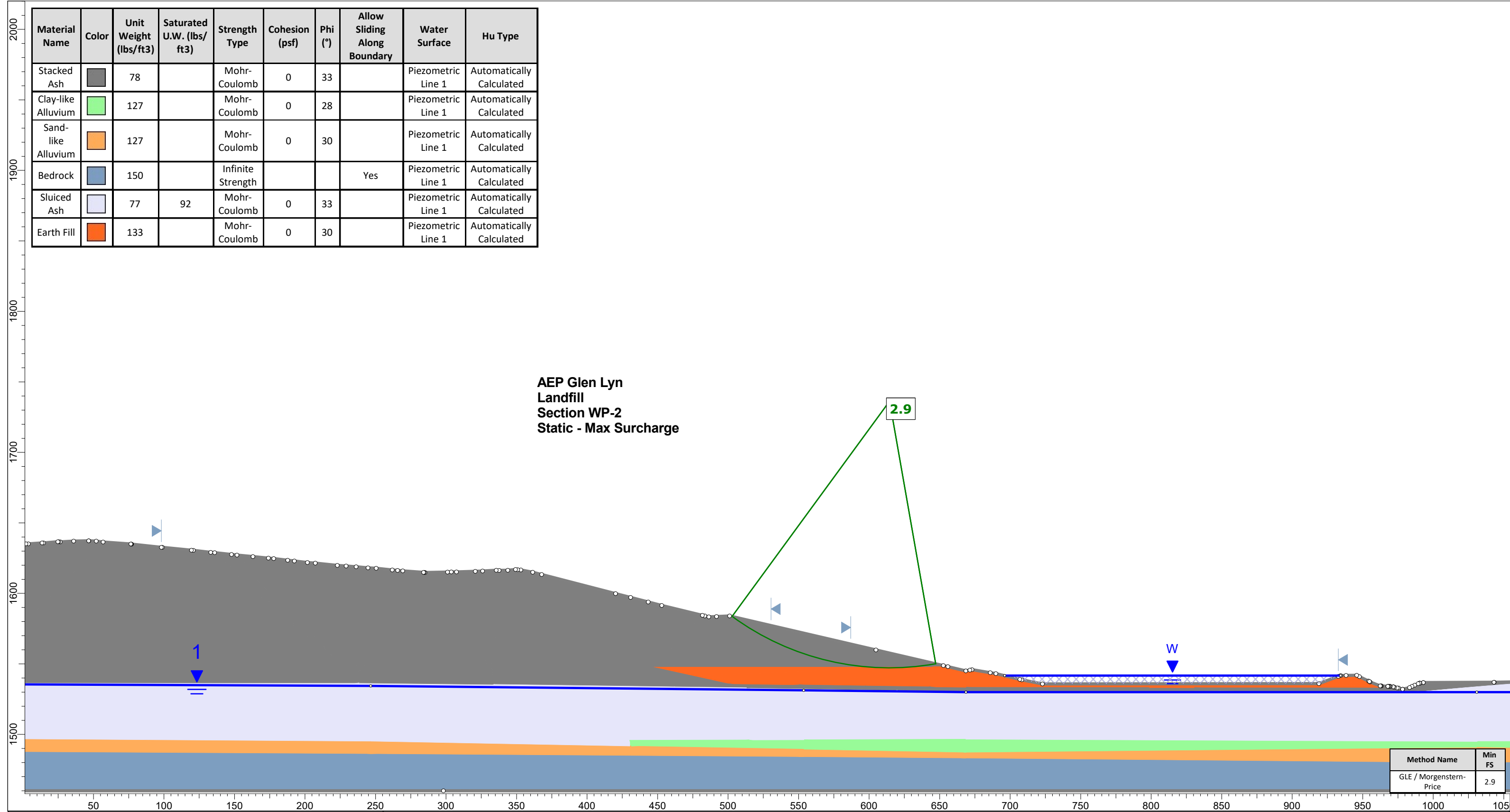
| Method Name | Min FS |
|--------------------|--------|
| GLE / Morgenstern- | 1.5 |



SLIDEINTERPRET 9.041

Slide2 - An Interactive Slope Stability Program

| | | | |
|----------------|----------------------|------------------|-------------------|
| <i>Project</i> | | <i>Scenario</i> | Master Scenario |
| <i>Group</i> | Max Surcharge | <i>Company</i> | |
| <i>Date</i> | 4/7/2026, 9:00:48 AM | <i>File Name</i> | Section WP-1.sldm |



| Method Name | Min FS |
|-------------------------|--------|
| GLE / Morgenstern-Price | 2.9 |

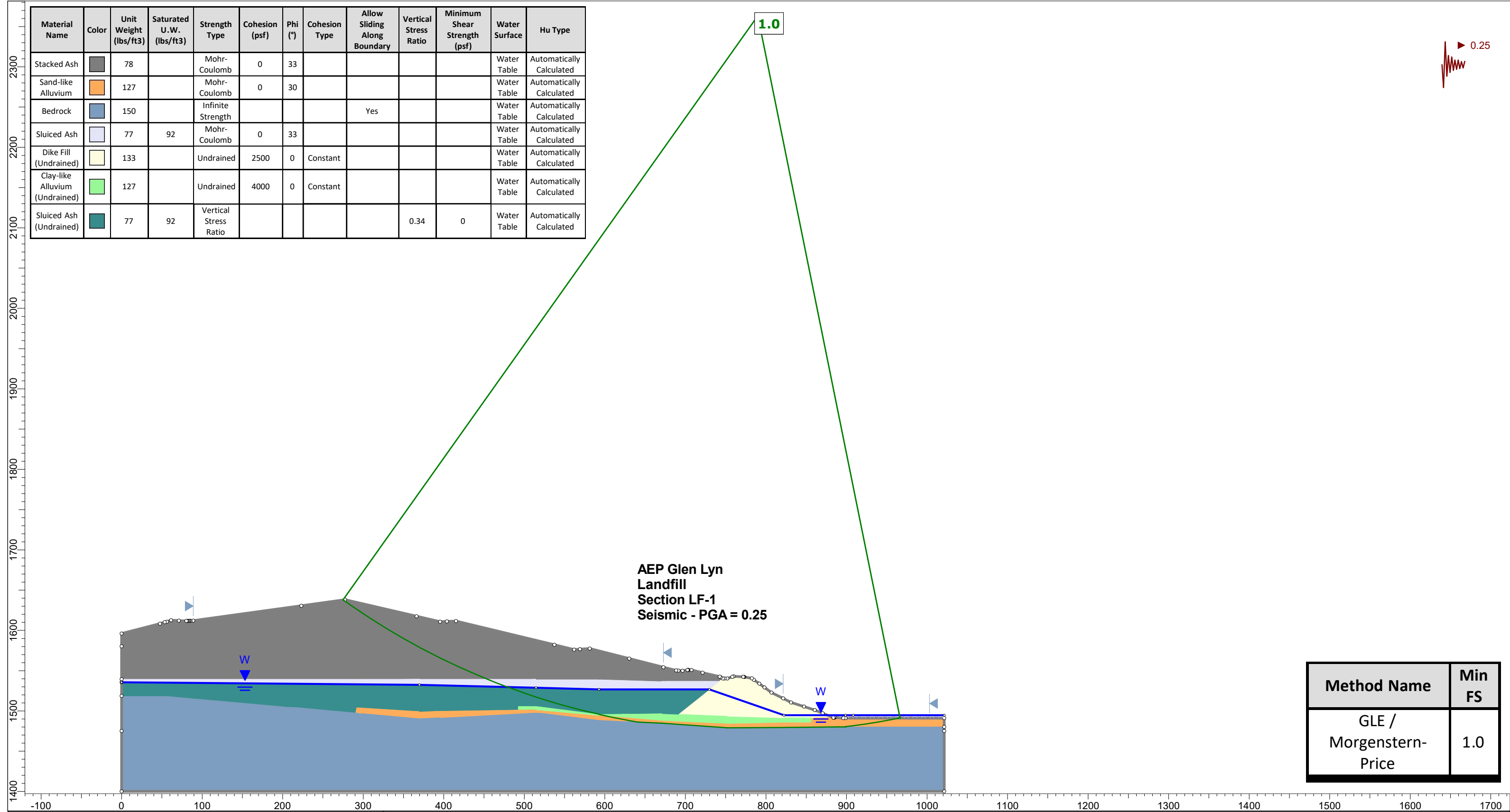
ROCSCIENCE

SLIDEINTERPRET 9.041

Slide2 - An Interactive Slope Stability Program

| | | | |
|-----------------|----------------------|------------------|-------------------|
| <i>Project</i> | | <i>Scenario</i> | |
| <i>Group</i> | Max Surcharge | <i>Company</i> | Master Scenario |
| <i>Drawn By</i> | | <i>File Name</i> | Section WP-2.slmd |
| <i>Date</i> | 4/7/2026, 9:00:48 AM | | |

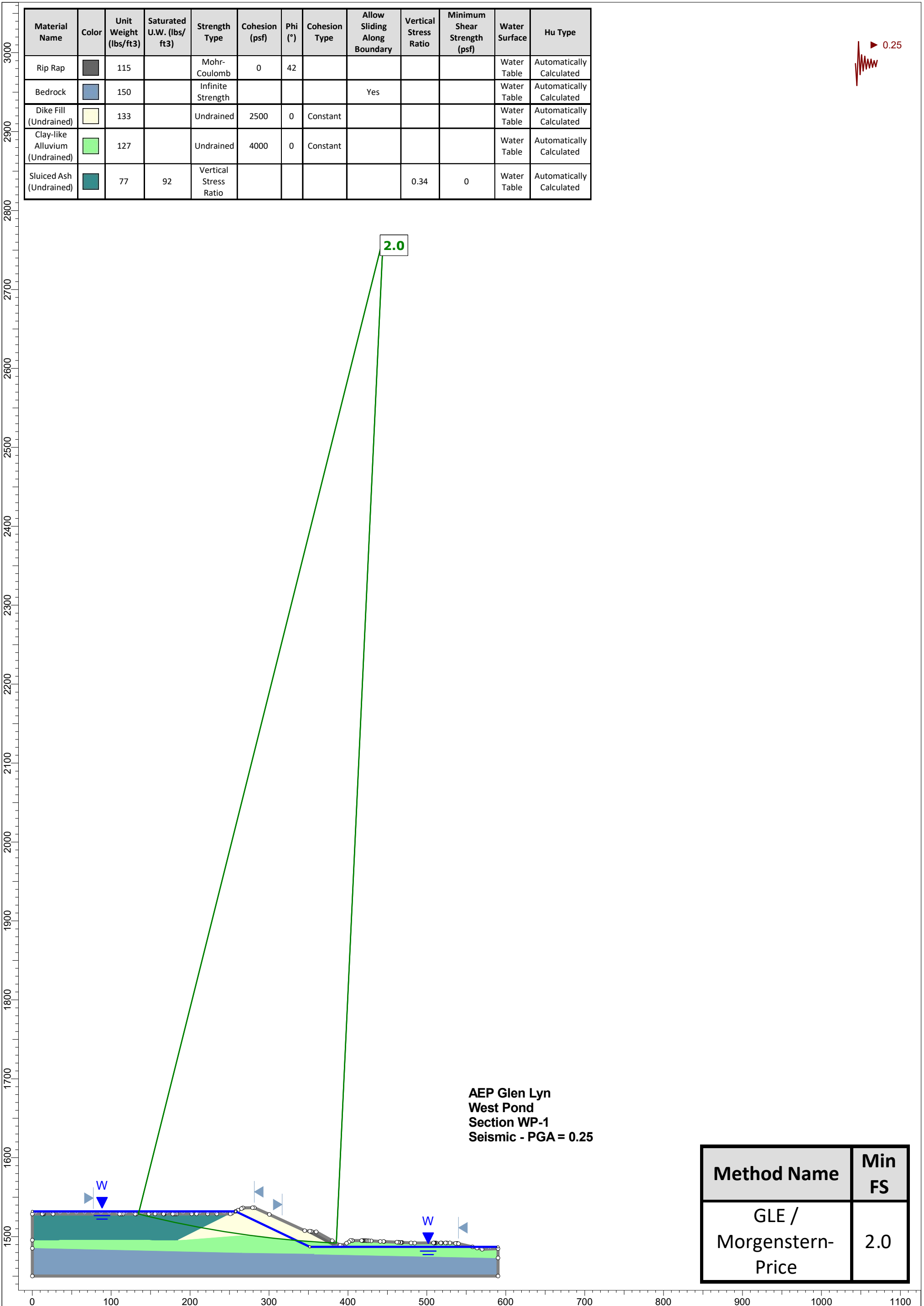
Figure A-7



| Material Name | Color | Unit Weight (lbs/ft3) | Saturated U.W. (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Cohesion Type | Allow Sliding Along Boundary | Vertical Stress Ratio | Minimum Shear Strength (psf) | Water Surface | Hu Type |
|--------------------------------|------------|-----------------------|--------------------------|-----------------------|----------------|---------|---------------|------------------------------|-----------------------|------------------------------|---------------|--------------------------|
| Stacked Ash | Grey | 78 | | Mohr-Coulomb | 0 | 33 | | | | | Water Table | Automatically Calculated |
| Sand-like Alluvium | Orange | 127 | | Mohr-Coulomb | 0 | 30 | | | | | Water Table | Automatically Calculated |
| Bedrock | Blue | 150 | | Infinite Strength | | | | Yes | | | Water Table | Automatically Calculated |
| Sluiced Ash | Light Blue | 77 | 92 | Mohr-Coulomb | 0 | 33 | | | | | Water Table | Automatically Calculated |
| Dike Fill (Undrained) | Yellow | 133 | | Undrained | 2500 | 0 | Constant | | | | Water Table | Automatically Calculated |
| Clay-like Alluvium (Undrained) | Green | 127 | | Undrained | 4000 | 0 | Constant | | | | Water Table | Automatically Calculated |
| Sluiced Ash (Undrained) | Dark Blue | 77 | 92 | Vertical Stress Ratio | | | | | 0.34 | 0 | Water Table | Automatically Calculated |

| Method Name | Min FS |
|-------------------------|--------|
| GLE / Morgenstern-Price | 1.0 |

Figure A-8



| Material Name | Color | Unit Weight (lbs/ft3) | Saturated U.W. (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Cohesion Type | Allow Sliding Along Boundary | Vertical Stress Ratio | Minimum Shear Strength (psf) | Water Surface | Hu Type |
|--------------------------------|--------|-----------------------|--------------------------|-----------------------|----------------|---------|---------------|------------------------------|-----------------------|------------------------------|---------------|--------------------------|
| Rip Rap | Grey | 115 | | Mohr-Coulomb | 0 | 42 | | | | | Water Table | Automatically Calculated |
| Bedrock | Blue | 150 | | Infinite Strength | | | | Yes | | | Water Table | Automatically Calculated |
| Dike Fill (Undrained) | Yellow | 133 | | Undrained | 2500 | 0 | Constant | | | | Water Table | Automatically Calculated |
| Clay-like Alluvium (Undrained) | Green | 127 | | Undrained | 4000 | 0 | Constant | | | | Water Table | Automatically Calculated |
| Sluiced Ash (Undrained) | Teal | 77 | 92 | Vertical Stress Ratio | | | | | 0.34 | 0 | Water Table | Automatically Calculated |

PGA = 0.25

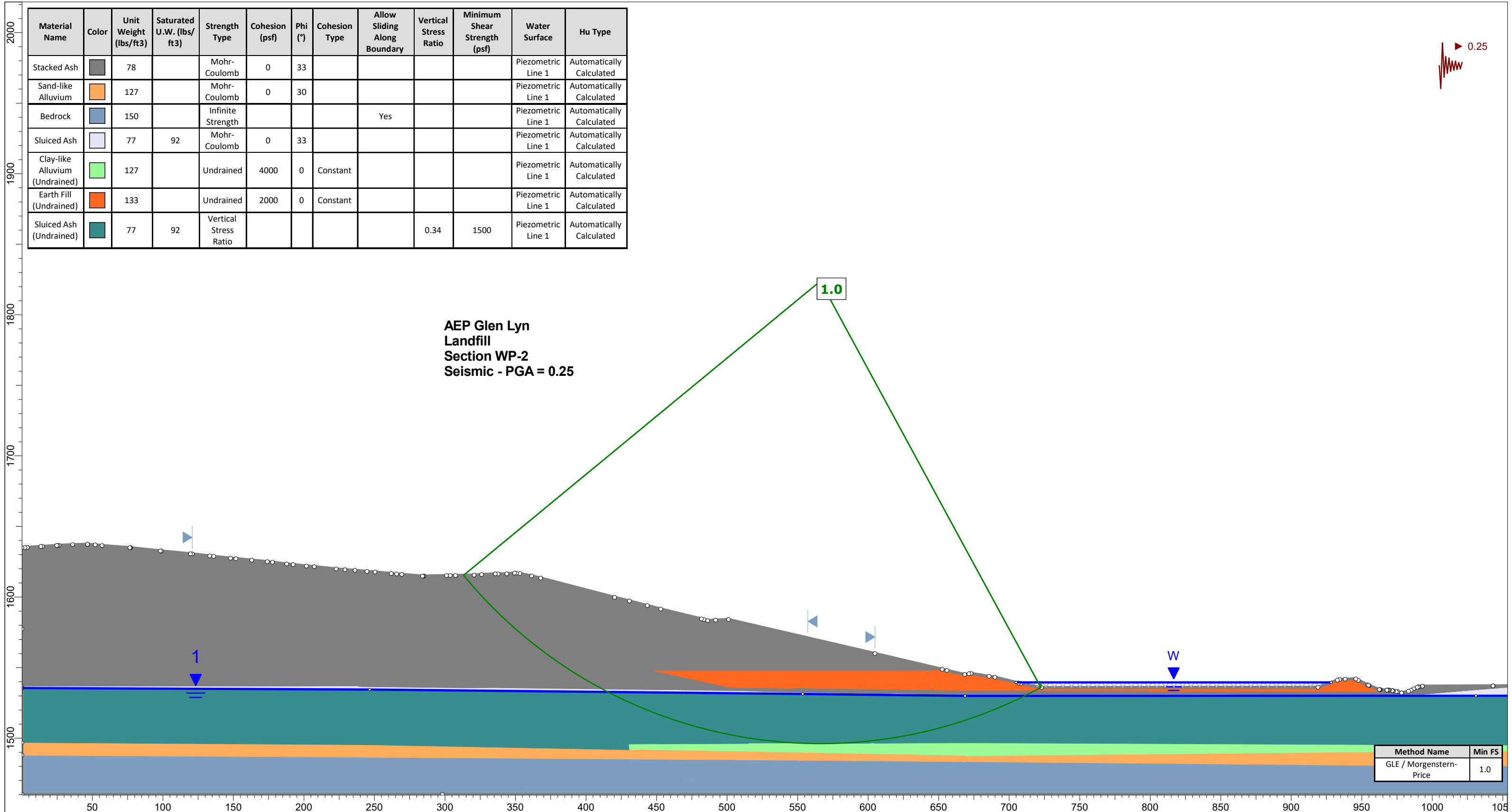
2.0

AEP Glen Lyn
West Pond
Section WP-1
Seismic - PGA = 0.25

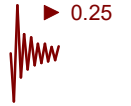
| Method Name | Min FS |
|-------------------------|--------|
| GLE / Morgenstern-Price | 2.0 |

SLIDEINTERPRET 9.041

Figure A-9



| Material Name | Color | Unit Weight (lbs/ft3) | Saturated U.W. (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (°) | Cohesion Type | Allow Sliding Along Boundary | Vertical Stress Ratio | Minimum Shear Strength (psf) | Water Surface | Hu Type |
|--------------------------------|------------|-----------------------|--------------------------|-----------------------|----------------|---------|---------------|------------------------------|-----------------------|------------------------------|--------------------|--------------------------|
| Stacked Ash | Grey | 78 | | Mohr-Coulomb | 0 | 33 | | | | | Piezometric Line 1 | Automatically Calculated |
| Sand-like Alluvium | Orange | 127 | | Mohr-Coulomb | 0 | 30 | | | | | Piezometric Line 1 | Automatically Calculated |
| Bedrock | Blue | 150 | | Infinite Strength | | | | Yes | | | Piezometric Line 1 | Automatically Calculated |
| Sluiced Ash | Light Blue | 77 | 92 | Mohr-Coulomb | 0 | 33 | | | | | Piezometric Line 1 | Automatically Calculated |
| Clay-like Alluvium (Undrained) | Green | 127 | | Undrained | 4000 | 0 | Constant | | | | Piezometric Line 1 | Automatically Calculated |
| Earth Fill (Undrained) | Red | 133 | | Undrained | 2000 | 0 | Constant | | | | Piezometric Line 1 | Automatically Calculated |
| Sluiced Ash (Undrained) | Teal | 77 | 92 | Vertical Stress Ratio | | | | | 0.34 | 1500 | Piezometric Line 1 | Automatically Calculated |



| | | | |
|----------|----------------------|---|-------------------|
| Project | | Slide2 - An Interactive Slope Stability Program | |
| Group | Seismic | Scenario | Master Scenario |
| Drawn By | | Company | |
| Date | 4/7/2026, 9:00:48 AM | File Name | Section WP-2.slmd |

| | | | | | | | | | |
|--|------------|--------------|--------|---|--------|-------------------|-----|----------------------------|------|
| G.S. Elev. = | 1536.6 | W.T. Elev. = | 1529.9 | Bottom Elev. of Additional Ash= | 1536.6 | Fines Content = | 85 | Atmospheric Pressure (kPa) | 100 |
| (γ_{total}) _{ash&soil} = | 90.0 (pcf) | a_{max} | 0.250 | Top Elev. Existing Landfill (Additional Ash)= | 1536.6 | Relative Density= | 0% | (tsf) | 1.04 |
| (γ_{sat}) _{ash&soil} = | 95.0 (pcf) | Est. EQ Mag | 5.7 | | | f= | 0.8 | | |
| (γ_{tot}) _{newash} = | 95.0 | | | | | | | | |

| Boring B-103 | | | Table 3 ⁽¹⁾ | | | | | Eq. (41) ⁽¹⁾ | | Eq. (31) ⁽¹⁾ | | Eq. (76) ⁽¹⁾ | Eq. (75) ⁽¹⁾ | Eq. (22,23,24) ⁽¹⁾ | Eq. (25) ⁽¹⁾ | Eq. (51,52) ⁽¹⁾ | Eq. (54) ⁽¹⁾ | Eq. (70) ⁽¹⁾ | Eq. (72) ⁽¹⁾ | Eq. (73) ⁽¹⁾ | | | |
|----------------|-----------------|---------------------|------------------------|----------------|----------------|----------------|----------------|-------------------------|------------------------------|-------------------------------|----------------|----------------------------|-----------------------------|---------------------------------|------------------------------|-----------------------------------|-------------------------|-------------------------|-------------------------|----------------------------------|---------------------------------------|------|------------------|
| Test Depth (m) | Test Depth (ft) | Test Elevation (ft) | N | C _E | C _B | C _S | C _R | N ₆₀ | Existing σ_{vo} (tsf) | Existing σ'_{vo} (tsf) | C _N | Design σ_{vo} (tsf) | Design σ'_{vo} (tsf) | (N ₁) ₆₀ | ΔN for fines content | (N ₁) _{60cs} | r _d | CSR | MSF | K _{σ} | CRR for M=7.5 and $\sigma_{vc}'=1atm$ | CRR | Factor of Safety |
| 0.3 | 1.0 | 1535.6 | 5 | 1.5 | 1 | 1.2 | 0.75 | 7 | 0.0450 | 0.0450 | 1.7 | 0.05 | 0.05 | 12 | 6 | 18 | 1.00 | 0.163 | 1.6 | 1.10 | 0.18 | 0.32 | - |
| 0.9 | 3.0 | 1533.6 | 4 | 1.5 | 1 | 1.2 | 0.75 | 5 | 0.1350 | 0.1350 | 1.7 | 0.14 | 0.14 | 9 | 6 | 15 | 0.99 | 0.161 | 1.6 | 1.10 | 0.16 | 0.28 | - |
| 1.8 | 6.0 | 1530.6 | 2 | 1.5 | 1 | 1.2 | 0.75 | 3 | 0.2700 | 0.2700 | 1.7 | 0.27 | 0.27 | 5 | 6 | 11 | 0.98 | 0.159 | 1.6 | 1.10 | 0.13 | 0.23 | - |
| 2.6 | 8.5 | 1528.1 | 0 | 1.5 | 1 | 1.2 | 0.75 | 0 | 0.3870 | 0.3308 | 1.7 | 0.39 | 0.33 | 0 | 6 | 6 | 0.96 | 0.184 | 1.6 | 1.09 | 0.09 | 0.16 | 0.9 |
| 3.4 | 11.0 | 1525.6 | 0 | 1.5 | 1 | 1.2 | 0.8 | 0 | 0.5058 | 0.3716 | 1.7 | 0.51 | 0.37 | 0 | 6 | 6 | 0.95 | 0.213 | 1.6 | 1.08 | 0.09 | 0.16 | 0.8 |
| 4.1 | 13.5 | 1523.1 | 0 | 1.5 | 1 | 1.2 | 0.85 | 0 | 0.6245 | 0.4123 | 1.6 | 0.62 | 0.41 | 0 | 6 | 6 | 0.93 | 0.229 | 1.6 | 1.07 | 0.09 | 0.15 | 0.7 |
| 4.9 | 16.0 | 1520.6 | 0 | 1.5 | 1 | 1.2 | 0.85 | 0 | 0.7433 | 0.4531 | 1.5 | 0.74 | 0.45 | 0 | 6 | 6 | 0.91 | 0.243 | 1.6 | 1.07 | 0.09 | 0.15 | 0.6 |
| 5.6 | 18.5 | 1518.1 | 0 | 1.5 | 1 | 1.2 | 0.85 | 0 | 0.8620 | 0.4938 | 1.5 | 0.86 | 0.49 | 0 | 6 | 6 | 0.90 | 0.257 | 1.6 | 1.06 | 0.09 | 0.15 | 0.6 |
| 6.7 | 22.0 | 1514.6 | 0 | 1.5 | 1 | 1.2 | 0.95 | 0 | 1.0283 | 0.5509 | 1.4 | 1.03 | 0.55 | 0 | 6 | 6 | 0.87 | 0.265 | 1.6 | 1.05 | 0.09 | 0.15 | 0.6 |
| 8.0 | 26.3 | 1510.3 | 0 | 1.5 | 1 | 1.2 | 0.95 | 0 | 1.2325 | 0.6210 | 1.3 | 1.23 | 0.62 | 0 | 6 | 6 | 0.83 | 0.268 | 1.6 | 1.04 | 0.09 | 0.15 | 0.6 |
| 11.0 | 36.1 | 1500.5 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 1.6980 | 0.7807 | 1.2 | 1.70 | 0.78 | 0 | 6 | 6 | 0.75 | 0.266 | 1.6 | 1.02 | 0.09 | 0.15 | 0.6 |
| 12.0 | 39.5 | 1497.1 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 1.8595 | 0.8361 | 1.1 | 1.86 | 0.84 | 0 | 6 | 6 | 0.73 | 0.263 | 1.6 | 1.02 | 0.09 | 0.15 | 0.6 |
| 12.6 | 41.5 | 1495.1 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 1.9545 | 0.8687 | 1.1 | 1.95 | 0.87 | 0 | 6 | 6 | 0.71 | 0.259 | 1.6 | 1.01 | 0.09 | 0.15 | 0.6 |
| 13.3 | 43.5 | 1493.1 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.0495 | 0.9013 | 1.1 | 2.05 | 0.90 | 0 | 6 | 6 | 0.69 | 0.255 | 1.6 | 1.01 | 0.09 | 0.15 | 0.6 |
| 14.4 | 47.4 | 1489.2 | 57 | 1.5 | 1 | 1.2 | 1 | 103 | 2.2347 | 0.9649 | 1.0 | 2.23 | 0.96 | 103 | 6 | 109 | 0.67 | 0.253 | 1.6 | 1.02 | 2.00 | 3.26 | 12.9 |

- (N₁)_{60cs} Standardized and Normalized SPT blow counts adjusted for an equivalent clean sand (blows/foot)
- r_d Stress Reduction Factor (dimensionless)
- a_{max} Peak horizontal ground surface acceleration (in g)
- CSR Cyclic stress ratio based on design earthquake (dimensionless)
- CRR_{M=7.5, $\sigma_{vc}'=1$} Cyclic resistance ratio based on an earthquake of magnitude 7.5 and effective overburden stress of 1 atm (dimensionless)
- MSF Magnitude scaling factor (dimensionless)
- K _{σ} High overburden stress correction factor (dimensionless)
- CRR Corrected cyclic resistance ratio based on overburden pressure (dimensionless) = CRR7.5 * K _{σ}
- FS_L Factor of safety against liquefaction (dimensionless)

References:

(1) Soil Liquefaction during Earthquakes, Idriss and Boulanger, EERI Monograph MNO-12, 2008

G.S. Elev. = 1545.4 W.T. Elev. = 1530.4 Bottom Elev. of Additional Ash = 1545.4 Fines Content = 85 Atmospheric Pressure (kPa) = 100
 $(\gamma_{total})_{ash\&soil}$ = 90.0 (pcf) a_{max} = 0.250 Top Elev. Existing Landfill (Additional Ash) = 1545.4 Relative Density = 0% (tsf) = 1.04
 $(\gamma_{sat})_{ash\&soil}$ = 95.0 (pcf) Est. EQ Mag = 5.7 f = 0.8
 $(\gamma_{tot})_{newash}$ = 95.0

| Boring B-105 | | | Table 3 ⁽¹⁾ | | | | | Eq. (41) ⁽¹⁾ | | Eq. (31) ⁽¹⁾ | | Eq. (76) ⁽¹⁾ | Eq. (75) ⁽¹⁾ | Eq. (22,23,24) ⁽¹⁾ | Eq. (25) ⁽¹⁾ | Eq. (51,52) ⁽¹⁾ | Eq. (54) ⁽¹⁾ | Eq. (70) ⁽¹⁾ | Eq. (72) ⁽¹⁾ | Eq. (73) ⁽¹⁾ | | | |
|----------------|-----------------|---------------------|------------------------|----------------|----------------|----------------|----------------|-------------------------|------------------------------|-------------------------------|----------------|----------------------------|-----------------------------|---------------------------------|------------------------------|-----------------------------------|-------------------------|-------------------------|-------------------------|----------------------------------|--|------|------------------|
| Test Depth (m) | Test Depth (ft) | Test Elevation (ft) | N | C _E | C _B | C _S | C _R | N ₆₀ | Existing σ_{vo} (tsf) | Existing σ'_{vo} (tsf) | C _N | Design σ_{vo} (tsf) | Design σ'_{vo} (tsf) | (N ₁) ₆₀ | ΔN for fines content | (N ₁) _{60cs} | r _d | CSR | MSF | K _{σ} | CRR for M=7.5 and $\sigma'_{vc}=1$ atm | CRR | Factor of Safety |
| 1.8 | 6.0 | 1539.4 | 14 | 1.5 | 1 | 1.2 | 0.75 | 19 | 0.2700 | 0.2700 | 1.7 | 0.27 | 0.27 | 32 | 6 | 38 | 0.98 | 0.16 | 1.6 | 1.1 | 2.00 | 3.52 | - |
| 2.6 | 8.5 | 1536.9 | 5 | 1.5 | 1 | 1.2 | 0.75 | 7 | 0.3825 | 0.3825 | 1.7 | 0.38 | 0.38 | 12 | 6 | 18 | 0.96 | 0.16 | 1.6 | 1.1 | 0.18 | 0.32 | - |
| 3.4 | 11.0 | 1534.4 | 11 | 1.5 | 1 | 1.2 | 0.8 | 16 | 0.4950 | 0.4950 | 1.4 | 0.50 | 0.50 | 22 | 6 | 28 | 0.95 | 0.15 | 1.6 | 1.1 | 0.38 | 0.67 | - |
| 4.1 | 13.5 | 1531.9 | 11 | 1.5 | 1 | 1.2 | 0.85 | 17 | 0.6075 | 0.6075 | 1.3 | 0.61 | 0.61 | 22 | 6 | 28 | 0.93 | 0.15 | 1.6 | 1.1 | 0.38 | 0.67 | - |
| 4.9 | 16.0 | 1529.4 | 2 | 1.5 | 1 | 1.2 | 0.85 | 3 | 0.7225 | 0.6913 | 1.2 | 0.72 | 0.69 | 4 | 6 | 10 | 0.91 | 0.15 | 1.6 | 1.0 | 0.12 | 0.19 | 1.3 |
| 5.6 | 18.5 | 1526.9 | 1 | 1.5 | 1 | 1.2 | 0.85 | 2 | 0.8413 | 0.7321 | 1.2 | 0.84 | 0.73 | 2 | 6 | 8 | 0.90 | 0.17 | 1.6 | 1.0 | 0.10 | 0.16 | 0.9 |
| 6.4 | 21.0 | 1524.4 | 1 | 1.5 | 1 | 1.2 | 0.95 | 2 | 0.9600 | 0.7728 | 1.2 | 0.96 | 0.77 | 2 | 6 | 8 | 0.88 | 0.18 | 1.6 | 1.0 | 0.10 | 0.16 | 0.9 |
| 7.2 | 23.5 | 1521.9 | 0 | 1.5 | 1 | 1.2 | 0.95 | 0 | 1.0788 | 0.8136 | 1.1 | 1.08 | 0.81 | 0 | 6 | 6 | 0.86 | 0.19 | 1.6 | 1.0 | 0.09 | 0.14 | 0.7 |
| 8.0 | 26.3 | 1519.1 | 0 | 1.5 | 1 | 1.2 | 0.95 | 0 | 1.2118 | 0.8592 | 1.1 | 1.21 | 0.86 | 0 | 6 | 6 | 0.83 | 0.19 | 1.6 | 1.0 | 0.09 | 0.14 | 0.7 |
| 8.8 | 28.8 | 1516.6 | 0 | 1.5 | 1 | 1.2 | 0.95 | 0 | 1.3305 | 0.8999 | 1.1 | 1.33 | 0.90 | 0 | 6 | 6 | 0.81 | 0.19 | 1.6 | 1.0 | 0.09 | 0.14 | 0.7 |
| 9.5 | 31.3 | 1514.1 | 0 | 1.5 | 1 | 1.2 | 0.95 | 0 | 1.4493 | 0.9407 | 1.1 | 1.45 | 0.94 | 0 | 6 | 6 | 0.79 | 0.20 | 1.6 | 1.0 | 0.09 | 0.14 | 0.7 |
| 10.2 | 33.5 | 1511.9 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 1.5538 | 0.9766 | 1.0 | 1.55 | 0.98 | 0 | 6 | 6 | 0.78 | 0.20 | 1.6 | 1.0 | 0.09 | 0.14 | 0.7 |
| 11.1 | 36.3 | 1509.1 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 1.6868 | 1.0222 | 1.0 | 1.69 | 1.02 | 0 | 6 | 6 | 0.75 | 0.20 | 1.6 | 1.0 | 0.09 | 0.14 | 0.7 |
| 11.7 | 38.5 | 1506.9 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 1.7913 | 1.0581 | 1.0 | 1.79 | 1.06 | 0 | 6 | 6 | 0.74 | 0.20 | 1.6 | 1.0 | 0.09 | 0.14 | 0.7 |
| 12.5 | 41.0 | 1504.4 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 1.9100 | 1.0988 | 1.0 | 1.91 | 1.10 | 2 | 6 | 8 | 0.72 | 0.20 | 1.6 | 1.0 | 0.10 | 0.16 | 0.8 |
| 13.4 | 43.8 | 1501.6 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.0430 | 1.1444 | 1.0 | 2.04 | 1.14 | 0 | 6 | 6 | 0.69 | 0.20 | 1.6 | 1.0 | 0.09 | 0.14 | 0.7 |
| 14.0 | 46.0 | 1499.4 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 2.1475 | 1.1803 | 0.9 | 2.15 | 1.18 | 2 | 6 | 8 | 0.68 | 0.20 | 1.6 | 1.0 | 0.10 | 0.16 | 0.8 |
| 14.6 | 48.0 | 1497.4 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.2425 | 1.2129 | 0.9 | 2.24 | 1.21 | 0 | 6 | 6 | 0.66 | 0.20 | 1.6 | 1.0 | 0.09 | 0.14 | 0.7 |
| 15.2 | 50.0 | 1495.4 | 45 | 1.5 | 1 | 1.2 | 1 | 81 | 2.3375 | 1.2455 | 0.9 | 2.34 | 1.25 | 73 | 6 | 79 | 0.65 | 0.20 | 1.6 | 0.9 | 2.00 | 2.88 | 14.4 |
| 15.8 | 52.0 | 1493.4 | 18 | 1.5 | 1 | 1.2 | 1 | 32 | 2.4325 | 1.2781 | 0.9 | 2.43 | 1.28 | 29 | 6 | 35 | 0.63 | 0.19 | 1.6 | 0.9 | 1.11 | 1.60 | 8.4 |
| 16.5 | 54.0 | 1491.4 | 11 | 1.5 | 1 | 1.2 | 1 | 20 | 2.5275 | 1.3107 | 0.9 | 2.53 | 1.31 | 18 | 6 | 24 | 0.62 | 0.19 | 1.6 | 1.0 | 0.27 | 0.43 | 2.3 |
| 17.1 | 56.0 | 1489.4 | 13 | 1.5 | 1 | 1.2 | 1 | 23 | 2.6225 | 1.3433 | 0.9 | 2.62 | 1.34 | 21 | 6 | 27 | 0.61 | 0.19 | 1.6 | 1.0 | 0.35 | 0.56 | 2.9 |
| 17.7 | 58.0 | 1487.4 | 19 | 1.5 | 1 | 1.2 | 1 | 34 | 2.7175 | 1.3759 | 0.9 | 2.72 | 1.38 | 31 | 6 | 37 | 0.59 | 0.19 | 1.6 | 0.9 | 1.75 | 2.52 | 13.3 |
| 18.3 | 60.0 | 1485.4 | 5 | 1.5 | 1 | 1.2 | 1 | 9 | 2.8125 | 1.4085 | 0.9 | 2.81 | 1.41 | 8 | 6 | 14 | 0.58 | 0.19 | 1.6 | 1.0 | 0.15 | 0.24 | 1.3 |
| 18.7 | 61.5 | 1483.9 | 50 | 1.5 | 1 | 1.2 | 1 | 90 | 2.8838 | 1.4330 | 0.9 | 2.88 | 1.43 | 81 | 6 | 87 | 0.57 | 0.19 | 1.6 | 0.9 | 2.00 | 2.88 | 15.2 |
| 19.2 | 63.0 | 1482.4 | 50 | 1.5 | 1 | 1.2 | 1 | 90 | 2.9550 | 1.4574 | 0.8 | 2.96 | 1.46 | 72 | 6 | 78 | 0.56 | 0.18 | 1.6 | 0.9 | 2.00 | 2.88 | 16.0 |

- (N₁)_{60cs} Standardized and Normalized SPT blow counts adjusted for an equivalent clean sand (blows/foot)
- r_d Stress Reduction Factor (dimensionless)
- a_{max} Peak horizontal ground surface acceleration (in g)
- CSR Cyclic stress ratio based on design earthquake (dimensionless)
- CRR_{M=7.5, $\sigma'_{vc}=1$} Cyclic resistance ratio based on an earthquake of magnitude 7.5 and effective overburden stress of 1 atm (dimensionless)
- MSF Magnitude scaling factor (dimensionless)
- K _{σ} High overburden stress correction factor (dimensionless)
- CRR Corrected cyclic resistance ratio based on overburden pressure (dimensionless) = CRR7.5 * K _{σ}
- FS_L Factor of safety against liquefaction (dimensionless)

References:

- (1) Soil Liquefaction during Earthquakes, Idriss and Boulanger, EERI Monograph MNO-12, 2008

| | | | | | | | | | |
|----------------------------------|------------|--------------|--------|---|--------|-------------------|-----|----------------------------|------|
| G.S. Elev. = | 1572.1 | W.T. Elev. = | 1572.6 | Bottom Elev. of Additional Ash= | 1572.1 | Fines Content = | 85 | Atmospheric Pressure (kPa) | 100 |
| $(\gamma_{total})_{ash\&soil}$ = | 90.0 (pcf) | a_{max} | 0.250 | Top Elev. Existing Landfill (Additional Ash)= | 1572.1 | Relative Density= | 0% | (tsf) | 1.04 |
| $(\gamma_{sat})_{ash\&soil}$ = | 95.0 (pcf) | Est. EQ Mag | 5.7 | | | f= | 0.8 | | |
| $(\gamma_{tot})_{newash}$ = | 95.0 | | | | | | | | |

| Boring B-109 | | | Table 3 ⁽¹⁾ | | | | | | | Eq. (41) ⁽¹⁾ | | Eq. (31) ⁽¹⁾ | | Eq. (76) ⁽¹⁾ | Eq. (75) ⁽¹⁾ | Eq. (22,23,24) ⁽¹⁾ | Eq. (25) ⁽¹⁾ | Eq. (51,52) ⁽¹⁾ | Eq. (54) ⁽¹⁾ | Eq. (70) ⁽¹⁾ | Eq. (72) ⁽¹⁾ | Eq. (73) ⁽¹⁾ | |
|----------------|-----------------|---------------------|------------------------|----------------|----------------|----------------|----------------|-----------------|------------------------------|-------------------------------|----------------|----------------------------|-----------------------------|---------------------------------|------------------------------|-----------------------------------|-------------------------|----------------------------|-------------------------|----------------------------------|---------------------------------------|-------------------------|------------------|
| Test Depth (m) | Test Depth (ft) | Test Elevation (ft) | N | C _E | C _B | C _S | C _R | N ₆₀ | Existing σ_{vo} (tsf) | Existing σ'_{vo} (tsf) | C _N | Design σ_{vo} (tsf) | Design σ'_{vo} (tsf) | (N ₁) ₆₀ | ΔN for fines content | (N ₁) _{60cs} | r _d | CSR | MSF | K _{σ} | CRR for M=7.5 and $\sigma_{vc}'=1atm$ | CRR | Factor of Safety |
| 1.8 | 6.0 | 1566.1 | 11 | 1.5 | 1 | 1.2 | 0.75 | 15 | 0.2700 | 0.2700 | 1.7 | 0.27 | 0.27 | 26 | 6 | 32 | 0.98 | 0.159 | 1.6 | 1.10 | 0.64 | 1.13 | - |
| 2.6 | 8.5 | 1563.6 | 12 | 1.5 | 1 | 1.2 | 0.75 | 16 | 0.3825 | 0.3825 | 1.7 | 0.38 | 0.38 | 27 | 6 | 33 | 0.96 | 0.156 | 1.6 | 1.10 | 0.76 | 1.34 | - |
| 3.4 | 11.0 | 1561.1 | 9 | 1.5 | 1 | 1.2 | 0.8 | 13 | 0.4950 | 0.4950 | 1.4 | 0.50 | 0.50 | 18 | 6 | 24 | 0.95 | 0.154 | 1.6 | 1.10 | 0.27 | 0.48 | - |
| 4.1 | 13.5 | 1558.6 | 10 | 1.5 | 1 | 1.2 | 0.85 | 15 | 0.6075 | 0.6075 | 1.3 | 0.61 | 0.61 | 20 | 6 | 26 | 0.93 | 0.151 | 1.6 | 1.09 | 0.32 | 0.56 | - |
| 4.9 | 16.0 | 1556.1 | 12 | 1.5 | 1 | 1.2 | 0.85 | 18 | 0.7200 | 0.7200 | 1.2 | 0.72 | 0.72 | 22 | 6 | 28 | 0.91 | 0.148 | 1.6 | 1.07 | 0.38 | 0.65 | - |
| 5.6 | 18.5 | 1553.6 | 9 | 1.5 | 1 | 1.2 | 0.85 | 14 | 0.8325 | 0.8325 | 1.1 | 0.83 | 0.83 | 15 | 6 | 21 | 0.90 | 0.146 | 1.6 | 1.03 | 0.22 | 0.36 | - |
| 6.4 | 21.0 | 1551.1 | 11 | 1.5 | 1 | 1.2 | 0.95 | 19 | 0.9450 | 0.9450 | 1.1 | 0.95 | 0.95 | 21 | 6 | 27 | 0.88 | 0.143 | 1.6 | 1.02 | 0.35 | 0.57 | - |
| 7.2 | 23.5 | 1548.6 | 16 | 1.5 | 1 | 1.2 | 0.95 | 27 | 1.0575 | 1.0575 | 1.0 | 1.06 | 1.06 | 27 | 6 | 33 | 0.86 | 0.140 | 1.6 | 1.00 | 0.76 | 1.22 | - |
| 7.9 | 26.0 | 1546.1 | 16 | 1.5 | 1 | 1.2 | 0.95 | 27 | 1.1700 | 1.1700 | 0.9 | 1.17 | 1.17 | 24 | 6 | 30 | 0.84 | 0.137 | 1.6 | 0.98 | 0.48 | 0.75 | - |
| 8.7 | 28.5 | 1543.6 | 19 | 1.5 | 1 | 1.2 | 0.95 | 32 | 1.2825 | 1.2825 | 0.9 | 1.28 | 1.28 | 29 | 6 | 35 | 0.82 | 0.133 | 1.6 | 0.95 | 1.11 | 1.69 | - |
| 9.4 | 31.0 | 1541.1 | 19 | 1.5 | 1 | 1.2 | 0.95 | 32 | 1.3950 | 1.3950 | 0.9 | 1.40 | 1.40 | 29 | 6 | 35 | 0.80 | 0.130 | 1.6 | 0.92 | 1.11 | 1.63 | - |
| 10.2 | 33.5 | 1538.6 | 16 | 1.5 | 1 | 1.2 | 1 | 29 | 1.5075 | 1.5075 | 0.8 | 1.51 | 1.51 | 23 | 6 | 29 | 0.78 | 0.127 | 1.6 | 0.93 | 0.43 | 0.64 | - |
| 11.0 | 36.0 | 1536.1 | 6 | 1.5 | 1 | 1.2 | 1 | 11 | 1.6200 | 1.6200 | 0.8 | 1.62 | 1.62 | 9 | 6 | 15 | 0.75 | 0.122 | 1.6 | 0.95 | 0.16 | 0.24 | - |
| 11.7 | 38.5 | 1533.6 | 4 | 1.5 | 1 | 1.2 | 1 | 7 | 1.7325 | 1.7325 | 0.8 | 1.73 | 1.73 | 6 | 6 | 12 | 0.74 | 0.120 | 1.6 | 0.95 | 0.13 | 0.20 | - |
| 12.5 | 41.0 | 1531.1 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 1.8450 | 1.8450 | 0.8 | 1.85 | 1.85 | 2 | 6 | 8 | 0.72 | 0.117 | 1.6 | 0.95 | 0.10 | 0.15 | - |
| 13.3 | 43.5 | 1528.6 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 1.9575 | 1.9575 | 0.7 | 1.96 | 1.96 | 1 | 6 | 7 | 0.69 | 0.112 | 1.6 | 0.95 | 0.10 | 0.15 | - |
| 14.0 | 46.0 | 1526.1 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 2.0713 | 2.0557 | 0.7 | 2.07 | 2.06 | 1 | 6 | 7 | 0.68 | 0.111 | 1.6 | 0.94 | 0.10 | 0.15 | 1.4 |
| 14.8 | 48.5 | 1523.6 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.1900 | 2.0964 | 0.7 | 2.19 | 2.10 | 0 | 6 | 6 | 0.66 | 0.112 | 1.6 | 0.94 | 0.09 | 0.14 | 1.3 |
| 15.5 | 51.0 | 1521.1 | 2 | 1.5 | 1 | 1.2 | 1 | 4 | 2.3088 | 2.1372 | 0.7 | 2.31 | 2.14 | 3 | 6 | 9 | 0.64 | 0.112 | 1.6 | 0.94 | 0.11 | 0.17 | 1.5 |
| 16.3 | 53.5 | 1518.6 | 2 | 1.5 | 1 | 1.2 | 1 | 4 | 2.4275 | 2.1779 | 0.7 | 2.43 | 2.18 | 3 | 6 | 9 | 0.62 | 0.112 | 1.6 | 0.93 | 0.11 | 0.16 | 1.4 |
| 17.1 | 56.0 | 1516.1 | 4 | 1.5 | 1 | 1.2 | 1 | 7 | 2.5463 | 2.2187 | 0.7 | 2.55 | 2.22 | 5 | 6 | 11 | 0.61 | 0.114 | 1.6 | 0.93 | 0.13 | 0.19 | 1.7 |
| 17.8 | 58.5 | 1513.6 | 2 | 1.5 | 1 | 1.2 | 1 | 4 | 2.6650 | 2.2594 | 0.7 | 2.67 | 2.26 | 3 | 6 | 9 | 0.59 | 0.113 | 1.6 | 0.93 | 0.11 | 0.16 | 1.4 |
| 18.6 | 61.0 | 1511.1 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.7838 | 2.3002 | 0.7 | 2.78 | 2.30 | 0 | 6 | 6 | 0.57 | 0.112 | 1.6 | 0.94 | 0.09 | 0.14 | 1.3 |
| 19.4 | 63.5 | 1508.6 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.9025 | 2.3409 | 0.7 | 2.90 | 2.34 | 0 | 6 | 6 | 0.56 | 0.113 | 1.6 | 0.94 | 0.09 | 0.14 | 1.2 |
| 20.1 | 66.0 | 1506.1 | 2 | 1.5 | 1 | 1.2 | 1 | 4 | 3.0213 | 2.3817 | 0.7 | 3.02 | 2.38 | 3 | 6 | 9 | 0.54 | 0.111 | 1.6 | 0.93 | 0.11 | 0.16 | 1.4 |
| 20.9 | 68.5 | 1503.6 | 4 | 1.5 | 1 | 1.2 | 1 | 7 | 3.1400 | 2.4224 | 0.7 | 3.14 | 2.42 | 5 | 6 | 11 | 0.53 | 0.112 | 1.6 | 0.92 | 0.13 | 0.19 | 1.7 |
| 21.6 | 71.0 | 1501.1 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 3.2588 | 2.4632 | 0.7 | 3.26 | 2.46 | 1 | 6 | 7 | 0.52 | 0.112 | 1.6 | 0.93 | 0.10 | 0.15 | 1.3 |
| 22.4 | 73.5 | 1498.6 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 3.3775 | 2.5039 | 0.6 | 3.38 | 2.50 | 0 | 6 | 6 | 0.51 | 0.112 | 1.6 | 0.93 | 0.09 | 0.13 | 1.2 |
| 23.2 | 76.0 | 1496.1 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 3.4963 | 2.5447 | 0.6 | 3.50 | 2.54 | 1 | 6 | 7 | 0.49 | 0.110 | 1.6 | 0.93 | 0.10 | 0.15 | 1.4 |
| 23.9 | 78.5 | 1493.6 | 15 | 1.5 | 1 | 1.2 | 1 | 27 | 3.6150 | 2.5854 | 0.6 | 3.62 | 2.59 | 16 | 6 | 22 | 0.49 | 0.111 | 1.6 | 0.87 | 0.23 | 0.32 | 2.9 |
| 24.7 | 81.0 | 1491.1 | 7 | 1.5 | 1 | 1.2 | 1 | 13 | 3.7338 | 2.6262 | 0.6 | 3.73 | 2.63 | 8 | 6 | 14 | 0.48 | 0.111 | 1.6 | 0.90 | 0.15 | 0.22 | 2.0 |
| 25.5 | 83.5 | 1488.6 | 26 | 1.5 | 1 | 1.2 | 1 | 47 | 3.8525 | 2.6669 | 0.6 | 3.85 | 2.67 | 28 | 6 | 34 | 0.47 | 0.110 | 1.6 | 0.77 | 0.91 | 1.12 | 10.2 |
| 25.9 | 85.0 | 1487.1 | 26 | 1.5 | 1 | 1.2 | 1 | 47 | 3.9238 | 2.6914 | 0.6 | 3.92 | 2.69 | 28 | 6 | 34 | 0.46 | 0.109 | 1.6 | 0.76 | 0.91 | 1.11 | 10.2 |
| 26.3 | 86.4 | 1485.7 | 50 | 1.5 | 1 | 1.2 | 1 | 90 | 3.9902 | 2.7142 | 0.6 | 3.99 | 2.71 | 54 | 6 | 60 | 0.46 | 0.110 | 1.6 | 0.72 | 2.00 | 2.30 | 20.9 |

- (N₁)_{60cs} Standardized and Normalized SPT blow counts adjusted for an equivalent clean sand (blows/foot)
- r_d Stress Reduction Factor (dimensionless)
- a_{max} Peak horizontal ground surface acceleration (in g)
- CSR Cyclic stress ratio based on design earthquake (dimensionless)
- CRR_{M=7.5, $\sigma_{vc}'=1$} Cyclic resistance ratio based on an earthquake of magnitude 7.5 and effective overburden stress of 1 atm (dimensionless)
- MSF Magnitude scaling factor (dimensionless)
- K _{σ} High overburden stress correction factor (dimensionless)
- CRR Corrected cyclic resistance ratio based on overburden pressure (dimensionless) = CRR7.5 * K _{σ}
- FS_L Factor of safety against liquefaction (dimensionless)

References:

- (1) Soil Liquefaction during Earthquakes, Idriss and Boulanger, EERI Monograph MNO-12, 2008

| | | | | | | | | | |
|----------------------------------|------------|--------------|--------|--|--------|--------------------|-----|----------------------------|------|
| G.S. Elev. = | 1569.9 | W.T. Elev. = | 1508.4 | Bottom Elev. of Additional Ash = | 1569.9 | Fines Content = | 85 | Atmospheric Pressure (kPa) | 100 |
| $(\gamma_{total})_{ash\&soil}$ = | 90.0 (pcf) | a_{max} | 0.250 | Top Elev. Existing Landfill (Additional Ash) = | 1569.9 | Relative Density = | 0% | (tsf) | 1.04 |
| $(\gamma_{sat})_{ash\&soil}$ = | 95.0 (pcf) | Est. EQ Mag | 5.7 | | | f = | 0.8 | | |
| $(\gamma_{tot})_{newash}$ = | 95.0 | | | | | | | | |

| Boring B-115 | | | Table 3 ⁽¹⁾ | | | | | | Eq. (41) ⁽¹⁾ | | Eq. (31) ⁽¹⁾ | | Eq. (76) ⁽¹⁾ | Eq. (75) ⁽¹⁾ | Eq. (22,23,24) ⁽¹⁾ | | Eq. (25) ⁽¹⁾ | Eq. (51,52) ⁽¹⁾ | Eq. (54) ⁽¹⁾ | Eq. (70) ⁽¹⁾ | Eq. (72) ⁽¹⁾ | Eq. (73) ⁽¹⁾ | |
|----------------|-----------------|---------------------|------------------------|----------------|----------------|----------------|----------------|-----------------|------------------------------|-------------------------------|-------------------------|----------------------------|-----------------------------|---------------------------------|-------------------------------|-----------------------------------|-------------------------|----------------------------|-------------------------|----------------------------------|---------------------------------------|-------------------------|------------------|
| Test Depth (m) | Test Depth (ft) | Test Elevation (ft) | N | C _E | C _B | C _S | C _R | N ₆₀ | Existing σ_{vo} (tsf) | Existing σ'_{vo} (tsf) | C _N | Design σ_{vo} (tsf) | Design σ'_{vo} (tsf) | (N ₁) ₆₀ | ΔN for fines content | (N ₁) _{60cs} | r _d | CSR | MSF | K _{σ} | CRR for M=7.5 and $\sigma_{vc}'=1atm$ | CRR | Factor of Safety |
| 1.1 | 3.5 | 1566.4 | 28 | 1.5 | 1 | 1.2 | 0.75 | 38 | 0.1575 | 0.1575 | 1.7 | 0.16 | 0.16 | 65 | 6 | 71 | 0.99 | 0.161 | 1.6 | 1.10 | 2.00 | 3.52 | - |
| 1.8 | 6.0 | 1563.9 | 28 | 1.5 | 1 | 1.2 | 0.75 | 38 | 0.2700 | 0.2700 | 1.7 | 0.27 | 0.27 | 65 | 6 | 71 | 0.98 | 0.159 | 1.6 | 1.10 | 2.00 | 3.52 | - |
| 2.6 | 8.5 | 1561.4 | 12 | 1.5 | 1 | 1.2 | 0.75 | 16 | 0.3825 | 0.3825 | 1.7 | 0.38 | 0.38 | 27 | 6 | 33 | 0.96 | 0.156 | 1.6 | 1.10 | 0.76 | 1.34 | - |
| 3.4 | 11.0 | 1558.9 | 16 | 1.5 | 1 | 1.2 | 0.8 | 23 | 0.4950 | 0.4950 | 1.4 | 0.50 | 0.50 | 32 | 6 | 38 | 0.95 | 0.154 | 1.6 | 1.10 | 2.00 | 3.52 | - |
| 4.1 | 13.5 | 1556.4 | 15 | 1.5 | 1 | 1.2 | 0.85 | 23 | 0.6075 | 0.6075 | 1.3 | 0.61 | 0.61 | 30 | 6 | 36 | 0.93 | 0.151 | 1.6 | 1.10 | 1.38 | 2.43 | - |
| 4.9 | 16.0 | 1553.9 | 14 | 1.5 | 1 | 1.2 | 0.85 | 21 | 0.7200 | 0.7200 | 1.2 | 0.72 | 0.72 | 25 | 6 | 31 | 0.91 | 0.148 | 1.6 | 1.08 | 0.56 | 0.97 | - |
| 5.6 | 18.5 | 1551.4 | 28 | 1.5 | 1 | 1.2 | 0.85 | 43 | 0.8325 | 0.8325 | 1.1 | 0.83 | 0.83 | 47 | 6 | 53 | 0.90 | 0.146 | 1.6 | 1.07 | 2.00 | 3.42 | - |
| 6.4 | 21.0 | 1548.9 | 7 | 1.5 | 1 | 1.2 | 0.95 | 12 | 0.9450 | 0.9450 | 1.1 | 0.95 | 0.95 | 13 | 6 | 19 | 0.88 | 0.143 | 1.6 | 1.01 | 0.19 | 0.31 | - |
| 7.2 | 23.5 | 1546.4 | 5 | 1.5 | 1 | 1.2 | 0.95 | 9 | 1.0575 | 1.0575 | 1.0 | 1.06 | 1.06 | 9 | 6 | 15 | 0.86 | 0.140 | 1.6 | 1.00 | 0.16 | 0.26 | - |
| 7.9 | 26.0 | 1543.9 | 9 | 1.5 | 1 | 1.2 | 0.95 | 15 | 1.1700 | 1.1700 | 0.9 | 1.17 | 1.17 | 14 | 6 | 20 | 0.84 | 0.137 | 1.6 | 0.98 | 0.21 | 0.33 | - |
| 8.7 | 28.5 | 1541.4 | 9 | 1.5 | 1 | 1.2 | 0.95 | 15 | 1.2825 | 1.2825 | 0.9 | 1.28 | 1.28 | 14 | 6 | 20 | 0.82 | 0.133 | 1.6 | 0.97 | 0.21 | 0.33 | - |
| 9.4 | 31.0 | 1538.9 | 24 | 1.5 | 1 | 1.2 | 0.95 | 41 | 1.3950 | 1.3950 | 0.9 | 1.40 | 1.40 | 37 | 6 | 43 | 0.80 | 0.130 | 1.6 | 0.91 | 2.00 | 2.91 | - |
| 10.2 | 33.5 | 1536.4 | 13 | 1.5 | 1 | 1.2 | 1 | 23 | 1.5075 | 1.5075 | 0.8 | 1.51 | 1.51 | 18 | 6 | 24 | 0.78 | 0.127 | 1.6 | 0.94 | 0.27 | 0.41 | - |
| 11.0 | 36.0 | 1533.9 | 8 | 1.5 | 1 | 1.2 | 1 | 14 | 1.6200 | 1.6200 | 0.8 | 1.62 | 1.62 | 11 | 6 | 17 | 0.75 | 0.122 | 1.6 | 0.95 | 0.17 | 0.26 | - |
| 11.7 | 38.5 | 1531.4 | 3 | 1.5 | 1 | 1.2 | 1 | 5 | 1.7325 | 1.7325 | 0.8 | 1.73 | 1.73 | 4 | 6 | 10 | 0.74 | 0.120 | 1.6 | 0.95 | 0.12 | 0.18 | - |
| 12.5 | 41.0 | 1528.9 | 4 | 1.5 | 1 | 1.2 | 1 | 7 | 1.8450 | 1.8450 | 0.8 | 1.85 | 1.85 | 6 | 6 | 12 | 0.72 | 0.117 | 1.6 | 0.94 | 0.13 | 0.20 | - |
| 13.3 | 43.5 | 1526.4 | 9 | 1.5 | 1 | 1.2 | 1 | 16 | 1.9575 | 1.9575 | 0.7 | 1.96 | 1.96 | 11 | 6 | 17 | 0.69 | 0.112 | 1.6 | 0.92 | 0.17 | 0.25 | - |
| 14.0 | 46.0 | 1523.9 | 9 | 1.5 | 1 | 1.2 | 1 | 16 | 2.0700 | 2.0700 | 0.7 | 2.07 | 2.07 | 11 | 6 | 17 | 0.68 | 0.111 | 1.6 | 0.92 | 0.17 | 0.25 | - |
| 14.8 | 48.5 | 1521.4 | 7 | 1.5 | 1 | 1.2 | 1 | 13 | 2.1825 | 2.1825 | 0.7 | 2.18 | 2.18 | 9 | 6 | 15 | 0.66 | 0.107 | 1.6 | 0.92 | 0.16 | 0.24 | - |
| 15.5 | 51.0 | 1518.9 | 7 | 1.5 | 1 | 1.2 | 1 | 13 | 2.2950 | 2.2950 | 0.7 | 2.30 | 2.30 | 9 | 6 | 15 | 0.64 | 0.104 | 1.6 | 0.91 | 0.16 | 0.23 | - |
| 16.3 | 53.5 | 1516.4 | 6 | 1.5 | 1 | 1.2 | 1 | 11 | 2.4075 | 2.4075 | 0.7 | 2.41 | 2.41 | 8 | 6 | 14 | 0.62 | 0.101 | 1.6 | 0.91 | 0.15 | 0.22 | - |
| 17.1 | 56.0 | 1513.9 | 3 | 1.5 | 1 | 1.2 | 1 | 5 | 2.5200 | 2.5200 | 0.6 | 2.52 | 2.52 | 3 | 6 | 9 | 0.61 | 0.099 | 1.6 | 0.92 | 0.11 | 0.16 | - |
| 17.8 | 58.5 | 1511.4 | 5 | 1.5 | 1 | 1.2 | 1 | 9 | 2.6325 | 2.6325 | 0.6 | 2.63 | 2.63 | 5 | 6 | 11 | 0.59 | 0.096 | 1.6 | 0.91 | 0.13 | 0.19 | - |
| 18.6 | 61.0 | 1508.9 | 2 | 1.5 | 1 | 1.2 | 1 | 4 | 2.7450 | 2.7450 | 0.6 | 2.75 | 2.75 | 2 | 6 | 8 | 0.57 | 0.093 | 1.6 | 0.92 | 0.10 | 0.15 | - |
| 19.2 | 63.0 | 1506.9 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 2.8388 | 2.7920 | 0.6 | 2.84 | 2.79 | 1 | 6 | 7 | 0.56 | 0.093 | 1.6 | 0.92 | 0.10 | 0.15 | 1.6 |
| 19.8 | 65.0 | 1504.9 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 2.9338 | 2.8246 | 0.6 | 2.93 | 2.82 | 1 | 6 | 7 | 0.55 | 0.093 | 1.6 | 0.92 | 0.10 | 0.15 | 1.6 |
| 20.4 | 67.0 | 1502.9 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 3.0288 | 2.8572 | 0.6 | 3.03 | 2.86 | 0 | 6 | 6 | 0.54 | 0.093 | 1.6 | 0.92 | 0.09 | 0.13 | 1.4 |
| 21.0 | 69.0 | 1500.9 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 3.1238 | 2.8898 | 0.6 | 3.12 | 2.89 | 0 | 6 | 6 | 0.53 | 0.093 | 1.6 | 0.92 | 0.09 | 0.13 | 1.4 |
| 21.7 | 71.3 | 1498.6 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 3.2330 | 2.9272 | 0.6 | 3.23 | 2.93 | 0 | 6 | 6 | 0.52 | 0.093 | 1.6 | 0.92 | 0.09 | 0.13 | 1.4 |
| 22.6 | 74.0 | 1495.9 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 3.3613 | 2.9713 | 0.6 | 3.36 | 2.97 | 1 | 6 | 7 | 0.50 | 0.092 | 1.6 | 0.91 | 0.10 | 0.15 | 1.6 |
| 23.2 | 76.0 | 1493.9 | 8 | 1.5 | 1 | 1.2 | 1 | 14 | 3.4563 | 3.0039 | 0.6 | 3.46 | 3.00 | 8 | 6 | 14 | 0.49 | 0.092 | 1.6 | 0.89 | 0.15 | 0.21 | 2.3 |
| 23.8 | 78.0 | 1491.9 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 3.5513 | 3.0365 | 0.6 | 3.55 | 3.04 | 0 | 6 | 6 | 0.49 | 0.093 | 1.6 | 0.92 | 0.09 | 0.13 | 1.4 |
| 24.4 | 80.0 | 1489.9 | 3 | 1.5 | 1 | 1.2 | 1 | 5 | 3.6463 | 3.0691 | 0.6 | 3.65 | 3.07 | 3 | 6 | 9 | 0.48 | 0.093 | 1.6 | 0.90 | 0.11 | 0.16 | 1.7 |
| 25.0 | 82.0 | 1487.9 | 11 | 1.5 | 1 | 1.2 | 1 | 20 | 3.7413 | 3.1017 | 0.6 | 3.74 | 3.10 | 12 | 6 | 18 | 0.47 | 0.092 | 1.6 | 0.86 | 0.18 | 0.25 | 2.7 |
| 25.6 | 84.0 | 1485.9 | 10 | 1.5 | 1 | 1.2 | 1 | 18 | 3.8363 | 3.1343 | 0.6 | 3.84 | 3.13 | 11 | 6 | 17 | 0.46 | 0.092 | 1.6 | 0.87 | 0.17 | 0.24 | 2.6 |
| 26.2 | 86.0 | 1483.9 | 6 | 1.5 | 1 | 1.2 | 1 | 11 | 3.9313 | 3.1669 | 0.6 | 3.93 | 3.17 | 7 | 6 | 13 | 0.46 | 0.093 | 1.6 | 0.89 | 0.14 | 0.20 | 2.2 |
| 26.8 | 88.0 | 1481.9 | 23 | 1.5 | 1 | 1.2 | 1 | 41 | 4.0263 | 3.1995 | 0.6 | 4.03 | 3.20 | 25 | 6 | 31 | 0.45 | 0.092 | 1.6 | 0.76 | 0.56 | 0.68 | 7.4 |
| 27.2 | 89.1 | 1480.8 | 50 | 1.5 | 1 | 1.2 | 1 | 90 | 4.0785 | 3.2174 | 0.6 | 4.08 | 3.22 | 54 | 6 | 60 | 0.45 | 0.093 | 1.6 | 0.67 | 2.00 | 2.14 | 23.0 |

- (N₁)_{60cs} Standardized and Normalized SPT blow counts adjusted for an equivalent clean sand (blows/foot)
- r_d Stress Reduction Factor (dimensionless)
- a_{max} Peak horizontal ground surface acceleration (in g)
- CSR Cyclic stress ratio based on design earthquake (dimensionless)
- CRR_{M=7.5, $\sigma_{vc}'=1$} Cyclic resistance ratio based on an earthquake of magnitude 7.5 and effective overburden stress of 1 atm (dimensionless)
- MSF Magnitude scaling factor (dimensionless)
- K _{σ} High overburden stress correction factor (dimensionless)
- CRR Corrected cyclic resistance ratio based on overburden pressure (dimensionless) = CRR7.5 * K _{σ}
- FS_L Factor of safety against liquefaction (dimensionless)

References:

- (1) Soil Liquefaction during Earthquakes, Idriss and Boulanger, EERI Monograph MNO-12, 2008

| | | | | | | | | | |
|--|------------|--------------|--------|---|--------|-------------------|-----|----------------------------|------|
| G.S. Elev. = | 1551.8 | W.T. Elev. = | 1526.5 | Bottom Elev. of Additional Ash= | 1551.8 | Fines Content = | 85 | Atmospheric Pressure (kPa) | 100 |
| (γ_{total}) _{ash&soil} = | 90.0 (pcf) | a_{max} | 0.250 | Top Elev. Existing Landfill (Additional Ash)= | 1551.8 | Relative Density= | 0% | (tsf) | 1.04 |
| (γ_{sat}) _{ash&soil} = | 95.0 (pcf) | Est. EQ Mag | 5.7 | | | f= | 0.8 | | |
| (γ_{tot}) _{newash} = | 95.0 | | | | | | | | |

| Boring B-122 | | | Table 3 ⁽¹⁾ | | | | | | | Eq. (41) ⁽¹⁾ | | Eq. (31) ⁽¹⁾ | Eq. (76) ⁽¹⁾ | Eq. (75) ⁽¹⁾ | Eq. (22,23,24) ⁽¹⁾ | Eq. (25) ⁽¹⁾ | Eq. (51,52) ⁽¹⁾ | Eq. (54) ⁽¹⁾ | Eq. (70) ⁽¹⁾ | Eq. (72) ⁽¹⁾ | Eq. (73) ⁽¹⁾ | | |
|----------------|-----------------|---------------------|------------------------|----------------|----------------|----------------|----------------|-----------------|------------------------------|-------------------------------|----------------|----------------------------|-----------------------------|---------------------------------|-------------------------------|-----------------------------------|----------------------------|-------------------------|-------------------------|----------------------------------|---------------------------------------|------|------------------|
| Test Depth (m) | Test Depth (ft) | Test Elevation (ft) | N | C _E | C _B | C _S | C _R | N ₆₀ | Existing σ_{vo} (tsf) | Existing σ'_{vo} (tsf) | C _N | Design σ_{vo} (tsf) | Design σ'_{vo} (tsf) | (N ₁) ₆₀ | ΔN for fines content | (N ₁) _{60cs} | r _d | CSR | MSF | K _{σ} | CRR for M=7.5 and $\sigma_{vc}=1$ atm | CRR | Factor of Safety |
| 1.8 | 6.0 | 1545.8 | 12 | 1.5 | 1 | 1.2 | 0.75 | 16 | 0.2700 | 0.2700 | 1.7 | 0.27 | 0.27 | 27 | 6 | 33 | 0.98 | 0.159 | 1.6 | 1.10 | 0.76 | 1.34 | - |
| 3.4 | 11.0 | 1540.8 | 8 | 1.5 | 1 | 1.2 | 0.8 | 12 | 0.4950 | 0.4950 | 1.4 | 0.50 | 0.50 | 17 | 6 | 23 | 0.95 | 0.154 | 1.6 | 1.10 | 0.25 | 0.44 | - |
| 4.9 | 16.0 | 1535.8 | 4 | 1.5 | 1 | 1.2 | 0.85 | 6 | 0.7200 | 0.7200 | 1.2 | 0.72 | 0.72 | 7 | 6 | 13 | 0.91 | 0.148 | 1.6 | 1.04 | 0.14 | 0.23 | - |
| 6.4 | 21.0 | 1530.8 | 0 | 1.5 | 1 | 1.2 | 0.95 | 0 | 0.9450 | 0.9450 | 1.1 | 0.95 | 0.95 | 0 | 6 | 6 | 0.88 | 0.143 | 1.6 | 1.01 | 0.09 | 0.15 | - |
| 7.9 | 26.0 | 1525.8 | 0 | 1.5 | 1 | 1.2 | 0.95 | 0 | 1.1718 | 1.1499 | 1.0 | 1.17 | 1.15 | 0 | 6 | 6 | 0.84 | 0.139 | 1.6 | 0.99 | 0.09 | 0.14 | 1.0 |
| 9.4 | 31.0 | 1520.8 | 1 | 1.5 | 1 | 1.2 | 0.95 | 2 | 1.4093 | 1.2314 | 0.9 | 1.41 | 1.23 | 2 | 6 | 8 | 0.80 | 0.149 | 1.6 | 0.99 | 0.10 | 0.16 | 1.1 |
| 11.0 | 36.0 | 1515.8 | 1 | 1.5 | 1 | 1.2 | 1 | 2 | 1.6468 | 1.3129 | 0.9 | 1.65 | 1.31 | 2 | 6 | 8 | 0.75 | 0.154 | 1.6 | 0.98 | 0.10 | 0.16 | 1.0 |
| 12.5 | 41.0 | 1510.8 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 1.8843 | 1.3944 | 0.9 | 1.88 | 1.39 | 0 | 6 | 6 | 0.72 | 0.158 | 1.6 | 0.98 | 0.09 | 0.14 | 0.9 |
| 14.0 | 46.0 | 1505.8 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.1218 | 1.4759 | 0.8 | 2.12 | 1.48 | 0 | 6 | 6 | 0.68 | 0.158 | 1.6 | 0.97 | 0.09 | 0.14 | 0.9 |
| 14.6 | 48.0 | 1503.8 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.2168 | 1.5085 | 0.8 | 2.22 | 1.51 | 0 | 6 | 6 | 0.66 | 0.158 | 1.6 | 0.97 | 0.09 | 0.14 | 0.9 |
| 15.2 | 50.0 | 1501.8 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.3118 | 1.5411 | 0.8 | 2.31 | 1.54 | 0 | 6 | 6 | 0.65 | 0.158 | 1.6 | 0.97 | 0.09 | 0.14 | 0.9 |
| 15.8 | 52.0 | 1499.8 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.4068 | 1.5737 | 0.8 | 2.41 | 1.57 | 0 | 6 | 6 | 0.63 | 0.157 | 1.6 | 0.97 | 0.09 | 0.14 | 0.9 |
| 16.5 | 54.0 | 1497.8 | 0 | 1.5 | 1 | 1.2 | 1 | 0 | 2.5018 | 1.6063 | 0.8 | 2.50 | 1.61 | 0 | 6 | 6 | 0.62 | 0.156 | 1.6 | 0.97 | 0.09 | 0.14 | 0.9 |
| 17.1 | 56.0 | 1495.8 | 4 | 1.5 | 1 | 1.2 | 1 | 7 | 2.5968 | 1.6389 | 0.8 | 2.60 | 1.64 | 6 | 6 | 12 | 0.61 | 0.157 | 1.6 | 0.95 | 0.13 | 0.20 | 1.3 |
| 17.7 | 58.0 | 1493.8 | 14 | 1.5 | 1 | 1.2 | 1 | 25 | 2.6918 | 1.6715 | 0.8 | 2.69 | 1.67 | 20 | 6 | 26 | 0.59 | 0.154 | 1.6 | 0.92 | 0.32 | 0.47 | 3.1 |
| 18.3 | 60.0 | 1491.8 | 6 | 1.5 | 1 | 1.2 | 1 | 11 | 2.7868 | 1.7041 | 0.8 | 2.79 | 1.70 | 9 | 6 | 15 | 0.58 | 0.155 | 1.6 | 0.95 | 0.16 | 0.24 | 1.5 |
| 18.9 | 62.0 | 1489.8 | 5 | 1.5 | 1 | 1.2 | 1 | 9 | 2.8818 | 1.7367 | 0.8 | 2.88 | 1.74 | 7 | 6 | 13 | 0.57 | 0.153 | 1.6 | 0.95 | 0.14 | 0.21 | 1.4 |
| 19.5 | 64.0 | 1487.8 | 3 | 1.5 | 1 | 1.2 | 1 | 5 | 2.9768 | 1.7693 | 0.8 | 2.98 | 1.77 | 4 | 6 | 10 | 0.56 | 0.153 | 1.6 | 0.95 | 0.12 | 0.18 | 1.2 |
| 20.1 | 66.0 | 1485.8 | 41 | 1.5 | 1 | 1.2 | 1 | 74 | 3.0718 | 1.8019 | 0.8 | 3.07 | 1.80 | 59 | 6 | 65 | 0.54 | 0.150 | 1.6 | 0.84 | 2.00 | 2.69 | 17.9 |
| 20.7 | 68.0 | 1483.8 | 54 | 1.5 | 1 | 1.2 | 1 | 97 | 3.1668 | 1.8345 | 0.8 | 3.17 | 1.83 | 78 | 6 | 84 | 0.53 | 0.149 | 1.6 | 0.83 | 2.00 | 2.66 | 17.9 |
| 21.3 | 70.0 | 1481.8 | 44 | 1.5 | 1 | 1.2 | 1 | 79 | 3.2618 | 1.8671 | 0.8 | 3.26 | 1.87 | 63 | 6 | 69 | 0.52 | 0.147 | 1.6 | 0.83 | 2.00 | 2.66 | 18.1 |

- (N₁)_{60cs} Standardized and Normalized SPT blow counts adjusted for an equivalent clean sand (blows/foot)
- r_d Stress Reduction Factor (dimensionless)
- a_{max} Peak horizontal ground surface acceleration (in g)
- CSR Cyclic stress ratio based on design earthquake (dimensionless)
- CRR_{M=7.5, $\sigma'_{vc}=1$} Cyclic resistance ratio based on an earthquake of magnitude 7.5 and effective overburden stress of 1 atm (dimensionless)
- MSF Magnitude scaling factor (dimensionless)
- K _{σ} High overburden stress correction factor (dimensionless)
- CRR Corrected cyclic resistance ratio based on overburden pressure (dimensionless) = CRR7.5 * K _{σ}
- FS_L Factor of safety against liquefaction (dimensionless)

References:

(1) Soil Liquefaction during Earthquakes, Idriss and Boulanger, EERI Monograph MNO-12, 2008

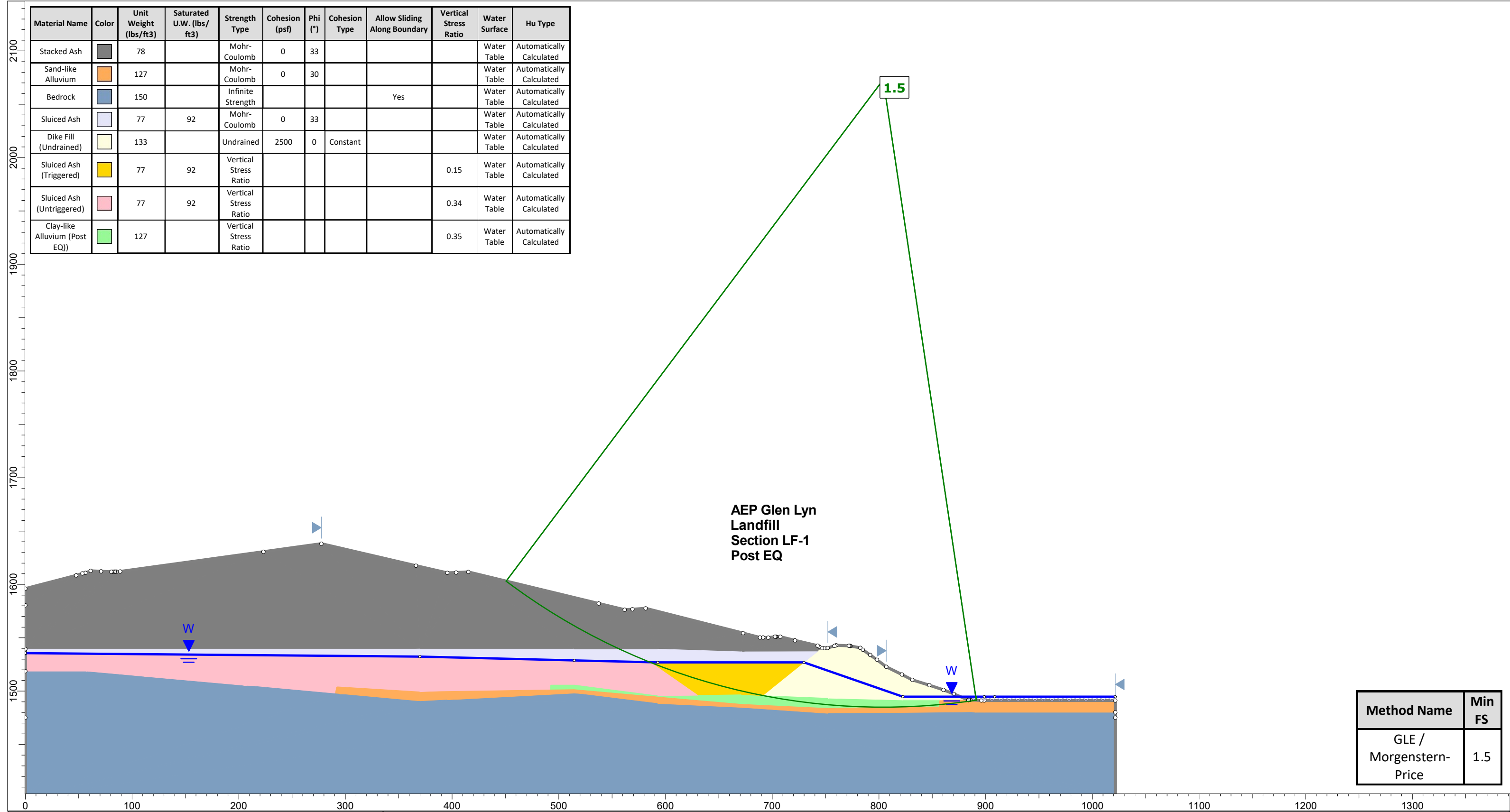
G.S. Elev. = 1569.8 W.T. Elev. = 1539.8 Bottom Elev. of Additional Ash = 1569.8 Fines Content = 85 Atmospheric Pressure (kPa) = 100
 $(\gamma_{total})_{ash\&soil} = 90.0$ (pcf) $a_{max} = 0.250$ Top Elev. Existing Landfill (Additional Ash) = 1569.8 Relative Density = 0% (tsf) = 1.04
 $(\gamma_{sat})_{ash\&soil} = 95.0$ (pcf) Est. EQ Mag = 5.7 $f = 0.8$
 $(\gamma_{tot})_{newash} = 95.0$


| Boring B-17 | | | Table 3 ⁽¹⁾ | | | | | Eq. (41) ⁽¹⁾ | | Eq. (31) ⁽¹⁾ | | Eq. (76) ⁽¹⁾ | Eq. (75) ⁽¹⁾ | Eq. (22,23,24) ⁽¹⁾ | Eq. (25) ⁽¹⁾ | Eq. (51,52) ⁽¹⁾ | Eq. (54) ⁽¹⁾ | Eq. (70) ⁽¹⁾ | Eq. (72) ⁽¹⁾ | Eq. (73) ⁽¹⁾ | | | |
|----------------|-----------------|---------------------|------------------------|----------------|----------------|----------------|----------------|-------------------------|------------------------------|-------------------------------|----------------|----------------------------|-----------------------------|---------------------------------|------------------------------|-----------------------------------|-------------------------|-------------------------|-------------------------|----------------------------------|---------------------------------------|------|------------------|
| Test Depth (m) | Test Depth (ft) | Test Elevation (ft) | N | C _E | C _B | C _S | C _R | N ₆₀ | Existing σ_{vo} (tsf) | Existing σ'_{vo} (tsf) | C _N | Design σ_{vo} (tsf) | Design σ'_{vo} (tsf) | (N ₁) ₆₀ | ΔN for fines content | (N ₁) _{60cs} | r _d | CSR | MSF | K _{σ} | CRR for M=7.5 and $\sigma_{vc}'=1atm$ | CRR | Factor of Safety |
| 0.5 | 1.5 | 1568.3 | 15 | 1 | 1 | 1.2 | 0.75 | 14 | 0.0675 | 0.0675 | 1.7 | 0.07 | 0.07 | 24 | 6 | 30 | 1.00 | 0.163 | 1.6 | 1.10 | 0.48 | 0.84 | - |
| 1.5 | 5.0 | 1564.8 | 32 | 1 | 1 | 1.2 | 0.75 | 29 | 0.2250 | 0.2250 | 1.7 | 0.23 | 0.23 | 49 | 6 | 55 | 0.98 | 0.159 | 1.6 | 1.10 | 2.00 | 3.52 | - |
| 3.0 | 10.0 | 1559.8 | 8 | 1 | 1 | 1.2 | 0.8 | 8 | 0.4500 | 0.4500 | 1.5 | 0.45 | 0.45 | 12 | 6 | 18 | 0.96 | 0.156 | 1.6 | 1.10 | 0.18 | 0.32 | - |
| 4.6 | 15.0 | 1554.8 | 7 | 1 | 1 | 1.2 | 0.85 | 7 | 0.6750 | 0.6750 | 1.2 | 0.68 | 0.68 | 8 | 6 | 14 | 0.92 | 0.150 | 1.6 | 1.05 | 0.15 | 0.25 | - |
| 6.1 | 20.0 | 1549.8 | 5 | 1 | 1 | 1.2 | 0.95 | 6 | 0.9000 | 0.9000 | 1.1 | 0.90 | 0.90 | 7 | 6 | 13 | 0.88 | 0.143 | 1.6 | 1.01 | 0.14 | 0.23 | - |
| 7.6 | 25.0 | 1544.8 | 5 | 1 | 1 | 1.2 | 0.95 | 6 | 1.1250 | 1.1250 | 1.0 | 1.13 | 1.13 | 6 | 6 | 12 | 0.84 | 0.137 | 1.6 | 0.99 | 0.13 | 0.21 | - |
| 9.1 | 30.0 | 1539.8 | 20 | 1 | 1 | 1.2 | 0.95 | 23 | 1.3500 | 1.3500 | 0.9 | 1.35 | 1.35 | 21 | 6 | 27 | 0.81 | 0.132 | 1.6 | 0.95 | 0.35 | 0.53 | 4.0 |
| 10.7 | 35.0 | 1534.8 | 5 | 1 | 1 | 1.2 | 1 | 6 | 1.5875 | 1.4315 | 0.9 | 1.59 | 1.43 | 5 | 6 | 11 | 0.76 | 0.137 | 1.6 | 0.97 | 0.13 | 0.20 | 1.5 |
| 15.2 | 50.0 | 1519.8 | 6 | 1 | 1 | 1.2 | 1 | 7 | 2.3000 | 1.6760 | 0.8 | 2.30 | 1.68 | 6 | 6 | 12 | 0.65 | 0.145 | 1.6 | 0.95 | 0.13 | 0.20 | 1.4 |
| 16.8 | 55.0 | 1514.8 | 4 | 1 | 1 | 1.2 | 1 | 5 | 2.5375 | 1.7575 | 0.8 | 2.54 | 1.76 | 4 | 6 | 10 | 0.61 | 0.143 | 1.6 | 0.95 | 0.12 | 0.18 | 1.3 |
| 19.8 | 65.0 | 1504.8 | 49 | 1 | 1 | 1.2 | 1 | 59 | 3.0125 | 1.9205 | 0.7 | 3.01 | 1.92 | 41 | 6 | 47 | 0.55 | 0.140 | 1.6 | 0.82 | 2.00 | 2.62 | 18.7 |
| 21.3 | 70.0 | 1499.8 | 23 | 1 | 1 | 1.2 | 1 | 28 | 3.2500 | 2.0020 | 0.7 | 3.25 | 2.00 | 20 | 6 | 26 | 0.52 | 0.137 | 1.6 | 0.89 | 0.32 | 0.46 | 3.4 |

- (N₁)_{60cs} Standardized and Normalized SPT blow counts adjusted for an equivalent clean sand (blows/foot)
- r_d Stress Reduction Factor (dimensionless)
- a_{max} Peak horizontal ground surface acceleration (in g)
- CSR Cyclic stress ratio based on design earthquake (dimensionless)
- CRR_{M=7.5, $\sigma'_{vc}=1$} Cyclic resistance ratio based on an earthquake of magnitude 7.5 and effective overburden stress of 1 atm (dimensionless)
- MSF Magnitude scaling factor (dimensionless)
- K _{σ} High overburden stress correction factor (dimensionless)
- CRR Corrected cyclic resistance ratio based on overburden pressure (dimensionless) = CRR7.5 * K _{σ}
- FS_L Factor of safety against liquefaction (dimensionless)

References:

(1) Soil Liquefaction during Earthquakes, Idriss and Boulanger, EERI Monograph MNO-12, 2008

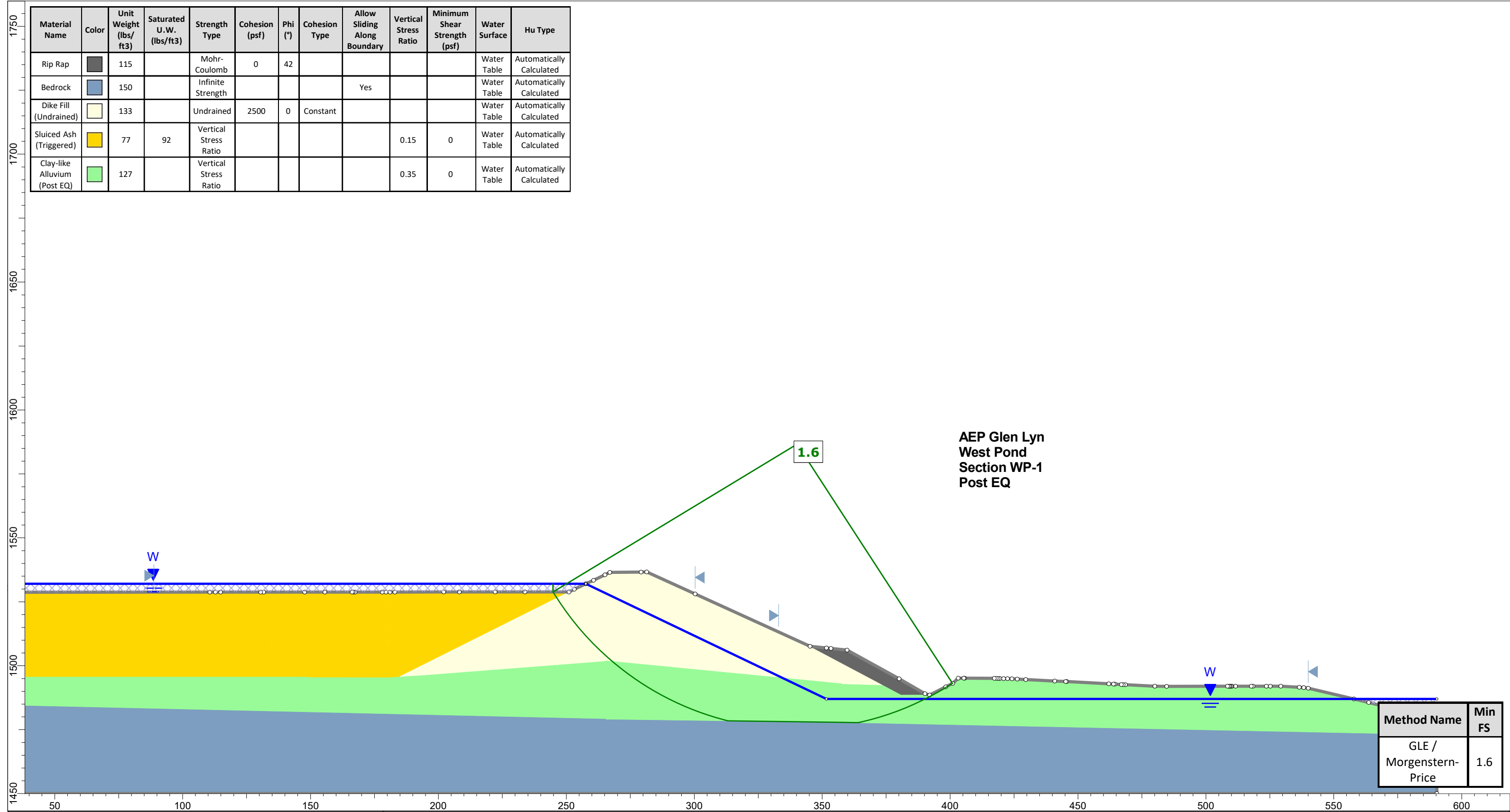




Slide2 - An Interactive Slope Stability Program

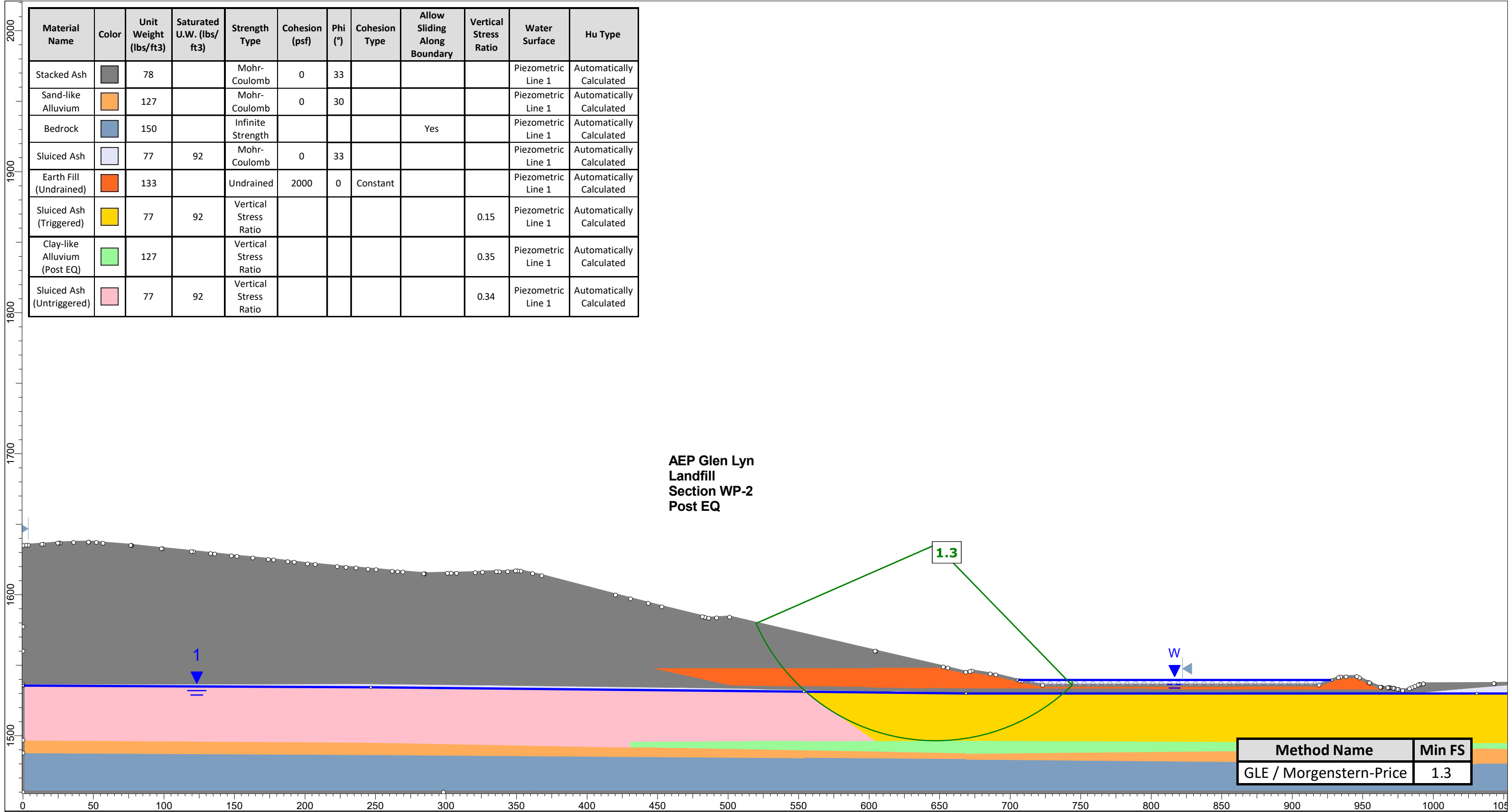
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|----------------|----------------------|------------------|------------------|
| <i>Project</i> | | <i>Scenario</i> | Master Scenario |
| <i>Group</i> | Post EQ | <i>Company</i> | |
| <i>Date</i> | 4/7/2026, 9:00:48 AM | <i>File Name</i> | Section LF-1.slm |

SLIDEINTERPRET 9.041



| | | |
|--|--|------------------------------|
| | Project: Slide2 - An Interactive Slope Stability Program | |
| | Group: Post EQ | Scenario: Master Scenario |
| | Drawn By: | Company: |
| | Date: 4/7/2026, 9:00:48 AM | File Name: Section WP-1.slmd |

Figure A-12



AEP Glen Lyn
Landfill
Section WP-2
Post EQ

| | |
|---|----------------------|
| Slide2 - An Interactive Slope Stability Program | |
| Project | Master Scenario |
| Group | Post EQ |
| Scenario | Master Scenario |
| Drawn By | Company |
| Date | 4/7/2026, 9:00:48 AM |
| File Name | Section WP-2.slmd |

SLIDEINTERPRET 9.041